PERFORMANCE ANALYSIS OF SCHOOL VEGETABLE GARDENS IN PALAKKAD DISTRICT

By

AJIT T. G.

(2017-11-080)

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF HORTICULTURE

VELLANIKKARA, THRISSUR - 680 656

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THESIS

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DECLARATION

I, **Ajit T. G.** hereby declare that the thesis entitled **"Performance analysis of school vegetable gardens in Palakkad district"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Vellanikkara **Ajit T.G**

Date: 23.01.2020 **(2017-11-080)**

CERTIFICATE

Certified that the thesis entitled **"Performance analysis of school vegetable gardens in Palakkad district"** is a record of research work done independently by **Ms. Ajit T. G.** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.

Vellanikkara
Date: - -2020

Dr. Mercykutty M. J.
(Major Advisor)
Associate Professor
Dept. of Agricultural Extension
College of Horticulture, Vellanikkara

CERTIFICATE

We, the undersigned members of the advisory committee of **Ms. Ajit T. G. (2017-11-080)**, a candidate for the degree of **Master of Science in Agriculture**, with major field in **Agricultural Extension**, agree that the thesis entitled **"Performance analysis of school vegetable gardens in Palakkad district"** may be submitted by **Ms. Ajit T. G.** in partial fulfilment of the requirement for the degree.

Dr. Mercykutty M. J.
(Major Advisor)
Associate Professor
Dept. of Agricultural Extension
CoH, Vellanikkara, KAU Thrissur

Dr. Binoo P. Bonny
Professor and Head
Dept. of Agricultural Extension
CoH, Vellanikkara, KAU Thrissur

Dr. Jayasree Krishnankutty M.
Professor and Head
Communication centre, Mannuthy
KAU, Thrissur

Dr. Sharon C. L.
Assistant Professor
Dept. of Community Science
CoH, Vellanikkara, KAU Thrissur

Dr. Smitha Baby
Assistant Professor
Central Training Institute, Mannuthy
KAU, Thrissur

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Ajit T. G.

Affectionately dedicated to my beloved parents and

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Introduction

CHAPTER I
INTRODUCTION

As the population grows and living standards improve, the demand for high-quality safe-to-eat food is also increasing quickly. Various projects and other initiatives are being launched by Government at different levels to promote vegetable cultivation and thereby to achieve self-sufficiency in vegetable production. The activities include promotion of homestead and terrace vegetable cultivation, promotion of institutional vegetable garden, promotion of high tech farming etc. School vegetable gardening is such an initiative aimed at inculcating and nurturing the students' growing capacities and orient them towards gardening or farming to create a healthy and green tomorrow.

School vegetable garden is the practice of cultivation of vegetables in and around the school premises by the students. School gardens are known to connect kids with the natural world by offering a hands-on approach to learning. This provides opportunities for students to get engaged and have direct and first-hand experiences. It also helps students to consolidate and apply knowledge, gain understanding of environmental and farming processes, inter-relationships, acquire a number of life skills and foster attitudes, values and sensitivity towards environmental and sustainability concerns. Such an education is holistic in nature and ensures the overall development of the students as it is integrated and embedded across all aspects of the school, encompassing formal and informal learning experiences inside and outside the school boundary. The major motive of doing the school vegetable garden is to give hands on experience in the captivation for growing of vegetables from the formal educational institution. The vegetable garden let the students in engaging different farming operations which provide an energising natural environment for learning by doing. It can be considered as a 'live laboratory' where the students learn, identify and discover all the naturally occurring events. It provides a real live experience rather than

the text book knowledge, which triggers the active learning process among students. Practicing vegetable gardening in schools will mold the students to become self-reliant by producing safe to eat vegetable to meet their own consumption needs. The interest and enthusiasm arousing at the schools need not always be confined to the school premises. They can make replicas at their respective houses of what they practice at the school or carry out new experiments on their own or along with the family members. This in turn can increase the domestic production of vegetables and ensure nutrition security. The knowledge gained from learning by doing the vegetable garden activities will last for life time and the mean time it will be useful for the entire life.

The school gardens act as a resource for learning as well as for improving children's diet and implants the habit of leading a healthy lifestyle. It is an area for learning about nature, agriculture and nutrition. Garden, a place of pleasure and recreation is being transformed into a place which will have a long and everlasting imprint in the minds of the children. It helps in continuing lesson in respecting the environment and taking pride in one's school. The school garden offers transfer of knowledge and practices from school to children's home in a way of learning by doing and the variety of activities give variety of learning outcomes. It also caters to the physical, mental and emotional needs of a child by ensuring a school environment that is physically safe, emotionally secure and psychologically enabling. In a nutshell school vegetable garden inculcates a healthy attitude and positive concern towards farming, thus enabling the upcoming generation to address the issues related to it.

The aims of school vegetable gardens

School garden is a wonderful way to use the schoolyard as a classroom, reconnect students with the natural world and the true source of their food, and teach them valuable gardening and agriculture concepts and skills that integrate with several subjects, such as math's, science, art, health and physical education**.** The school gardens have multitude of uses and aims, mainly in the areas of gardening, nutrition, marketing, environment, subjects, life skills and benefits to school and community.

Gardening: School garden can be used to create a successful and sustainable garden using organic methods. It helps to provide a model of mixed kitchen garden for the community. This helps how to grow things in a safe and sustainable way, and how to run their own successful gardens by the students. The students can enjoy gardening and have positive attitudes to agriculture. The students may talk with their families and community members about gardening practices may catch the attention of public and awareness about gardening.

Nutrition: The school garden can be used as a source for serving the mid-day meals at the school, it further improves children's diet with garden produce. This can positively influence the children's eating habits. The students will appreciate healthy foods and they will change their own eating habits.

Marketing: The economic attraction of school gardening is to sell garden produce to get income for school as well as for garden maintenance. This will help to develop entrepreneurial and management skills among the students.

Environment: The students will develop a positive outlook to their school environment and will try to nurture and preserve the environment. It will create environmental awareness, respect for nature and they will understand the importance of natural resource management.

Life skills: The school garden will help the students to how to plan, take decisions, collaborate and take responsibility. It helps the children to survive and prosper in the world.

Benefits to school and community: It brings together school children, families and community in a common endeavor. It can relate adults in various ways and to be aware of gardening practices in the community.

School garden and sustainability of agriculture

It has been reported that gardens could improve the ecological complexity of the schoolyard in ways that promote effective experiential learning in many subjects particularly the areas of science, environmental education, and food education (Blair, 2009). Major advances in technology have led to more focus being given to non-

agricultural majors and careers, with less focus on knowledge of agriculture and agricultural sciences. As a result, society has become further removed from agriculture. This disconnect has resulted in failure to gain knowledge about agriculture by society as a whole (Nkembe, 2012). White (2012) stated that small-scale agriculture is the developing world's single biggest source of employment, and with the necessary support, it can offer a sustainable and productive alternative to the expansion of large-scale, capital-intensive, labor-displacing corporate farming. Even though it assumes a generation of young rural men and women who want to be small farmers, while mounting evidence suggests that young people are uninterested in farming or in rural futures. Fathima (2015) revealed that with growing urbanization, better literacy standards and greater skill attainment by rural youth, our younger generation is moving away from agriculture. In India, children get hardly any exposure to agriculture through a curriculum predominated by arts and science. When4 young children connect with nature, we can feel that they can change the world. School gardens are the best place to teach what science and nature is all about and we most certainly need them in more numbers (Basu, 2016). In school gardens lessons are internalized from real-life experiences rather than textbook examples, thus, allowing students to become active (Dilip and Thomas, 2017).

In this backdrop, the study was taken up with the following objectives:

Objectives of the study

- To explore the effectiveness of school vegetable garden as perceived by the students, school authorities and extension personnel
- To assess knowledge level and attitude of students on vegetable cultivation and its association between personal and socio-economic characteristics
- To analyse the career aspirations of students as influenced by the involvement in school agriculture or nature clubs

- ✶ To study the impact of the school vegetable garden on the food consumption pattern of students
- ✶ To identify constraints faced by the institution and students while undertaking school vegetable garden

Scope of the study

The results from the study are expected to give an overview of the effectiveness of school vegetable gardens in Palakkad district and also to ascertain the major constraints faced by the students and institutions. It will help to formulate effective policy recommendations and assist the implementation of such programmes effectively.

The present study aims to analyse the knowledge level and attitude of students on vegetable cultivation among the school students of Palakkad district of Kerala. The analysis of profile characteristics of the students with the dependent variable knowledge would provide the critically contributing variable for their participation in such programmes. Based on the details, it paves way for policy makers, planners and developmental professionals to take concentrated efforts for formulating developmental programmes. In addition, it will internalize the gardening concepts, skills and cultivation of vegetables. Teachers, parents and extension functionaries can also suitably tailor the students' efforts to achieve success fully.

The study will highlight crops cultivated by students at their home as well as school, their cultivation practices, benefits and the constraints faced by the institution and students in creation and maintenance of school vegetable garden. The findings would help to strengthen in creation of vegetable garden programmes in schools among the extension policy makers to develop appropriate strategies to educate the growing children about farming.

Limitations of the study

The study was part of the post graduate research work and had the inherent restrictions of time and resources. Moreover, it was based on the opinion of respondents in Palakkad district of Kerala and hence generalization need not be entirely precise. Since it was a qualitative study, which largely relied on the responses received from the students about what they knew and felt about, the normal errors inherent in social surveys like inadequacy of information, common limitations of statistical analysis etc. might also have some effect on the study. Inspite of these limitations, extreme care has been taken to make the study as unbiased and methodical as possible. It is hoped that this study would provide better insight towards the concept of school vegetable garden among upper primary and high school students and helps in formulating such programmes for wide spread adoption.

Presentation of the thesis

The thesis is presented in five chapters.

Chapter 1: Introduction -Explains the importance of the topic, objectives, scope and limitation of the study.

Chapter 2: Review of literature -Includes the theoretical orientation and review of important literatures published related to the study.

Chapter 3: Research Methodology -Specifics the study area, the research design, the sampling design, the materials and methods used for analysing the study including the operationalization of concepts, measurement procedures of variables and the statistical tools used.

Chapter 4: Results and discussion -Discusses the results of the study to draw specific inferences.

Chapter 5: Summary - Concisely summarises the work done and the salient findings. Explains the implications based on the results of the study

Review of Literature

CHAPTER II
REVIEW OF LITERATURE

Any scientific endeavor becomes valid and concrete when it is supported by pertinent studies conducted earlier in its regard. Review of such efforts, either theoretical or empirical, would help to outline the new problem areas and develop a conceptual framework for the study. Hence this chapter is devoted to the reflective analysis of the available research literature related to the present study. Keeping this in mind, based on the objectives of this study, an attempt was made to review the literature which had a meaningful relation to the study and is presented under the following subheads.

2.1 Concept of school vegetable garden
2.2 School vegetable garden initiatives in Kerala
2.3 Need for school vegetable garden
2.4 Effectiveness of school vegetable gardens
2.5 Profile characteristics of respondents
2.6 Attitude of students on vegetable cultivation
2.7 Career aspirations of students
2.8 Food consumption pattern of students
2.9 Benefits of school vegetable garden activities
2.10 Constraints experienced by the respondents

2.1 Concept of school vegetable garden

A school garden is an educational strategy to influence students into the natural environment through gardening activities. The gardening activities give the students a positive attitude towards the environment, responsible self-learning procedure, knowledge about the hardship of raising crops on a small scale, awareness about the

production of healthy food for consumption and helps to identify the limitations for doing gardening practices.

Vegetable gardening can encourage student interaction with teachers, parents, and volunteers, primarily by means of growing plants and discovering the relationships between people, plants and environment (Alexander *et al.*, 1995)

In the 1890s progressive educators like John Dewey proposed expansive ideas about integrating school and society. Working to make the boundaries between classroom learning and pupils' natural environment more permeable, for example, Dewey urged teachers to connect intellectual and practical elements within their curricula. Highly visible and widespread examples of this integrative goal were the school gardens that flourished from the 1890s well into the twentieth century. Evidence of their manifestation was recorded in newspapers, national magazines, and annual school reports whose illustrations typically portrayed well-dressed children cultivating large gardens next to impressive urban school buildings. Whether in large cities or country settings, school gardens were expressions of modern and progressive education of the sort encouraged by Dewey. Gardens were encouraged in theory and in practice not only at the laboratory school affiliated with the University of Chicago but also in normal schools across the country (Kohlstedt, 2008).

2.2 School vegetable garden initiatives in Kerala

Vegetable and Fruits Promotion Council Keralam (VFPCK) initiated to establish vegetable gardens in 1,000 schools within three months as part of its agri@schoolprogramme aimed at developing an interest in agriculture among school children. The concept is 'A Vegetable Garden in my School' for children, the area covered by the vegetable garden is determined by the availability of land within the school premises. According to VFPCK estimates, 2 to 15 cents land will be used for the vegetable gardens. It was estimated that 600 tonnes of vegetables could be produced from the 1,000 gardens in schools (The Hindu, 2006).

To mobilize the student community into the field of agriculture, make them aware of safe to eat food production and to bring uncultivable lands in the government and private institutions under vegetable cultivation. Vegetable cultivation in the educational institution and others under Vegetable Development Programme of the Agriculture Development and Farmers Welfare Department of Kerala about Rs. 130.00 lakhs fund were allotted during the financial year 2018-19 (GoK, 2018). It is targeted to implement the activities in selected 2500 educational institutions, other institution in the state. The selected institutions must have sufficient and suitable land (at least 10 cents) to take up cultivations. A group of 20-25 students headed by a teacher will implement the activity. Required seeds will be supplied to them and training will be imparted by the extensive functionaries of the KrishiBhavan concerned. An assistance of Rs.4000/- will be given to educational institution including the cost of seeds and towards the expense for taking up cultivation.

In addition to this, schools which are willing to participate in this program, but do not have 10 cents of cultivable land, may be allowed to take up vegetable cultivation in the available land or in grow-bags, and assistance provided as per norms.

Institutions will be selected by the Agricultural Officer/Assistant Director of Agriculture taking into account of the availability of space and the willingness to take up cultivation. Potential areas with adequate irrigation facilities need to be selected for institutional cultivation. The application should be collected from the head of the institution. Soil testing of institutions selected should be done prior to vegetable cultivation and necessary corrective methods should be followed if required. KrishiBhavan may also prepare a calendar of activities for vegetable cultivation in institutions. Each institution should have a layout plan for the vegetable garden prepared well in advance. Organic pest and disease control measures should be followed. The Agricultural officer will prepare the claim and submit to the Assistant Director of Agriculture concerned and the funds will be released by the Assistant Director of Agriculture (GoK, 2018).

SEED (Student Employment for Environmental Development) is an initiative of Mathrubhumi group, which aims to create and spread awareness among the growing student community on environmental protection and enable them to protect the air, water, and soil. This project aims to gives away for green culture by assembling high school, higher secondary schools and upper primary schools in the state of Kerala. Public awareness initiative of mathrubhumi is a major tool in environmental protection through media. SEED perhaps the largest initiative in India at the school level by a newspaper organization. It was launched on 5th June, 2009. School students will carry out simple but effective steps in protection of environment by means of planting and protection of saplings, biodiversity conservation, energy conservation, reduce and reuse of plastics etc. The impact of SEED programme was tremendous behavioural changes in the student community. It has been reported that there were 6,997 active schools spread across all the districts of Kerala. Several other activities were done by the members of SEED club in each schools (Mathrubhumi, 2019).

2.3 Need for school vegetable garden

As our society continues to advance technologically, children find more reasons to stay inside (e.g., watching television, playing video games), instead of engaging in activities within the natural environment (McCurdy *et al*., 2010). Researchers reported that children who spend less time outside have decreased physical activity. The reduction in physical activity has led to the lethargy that may influence children's development of social skills and sense of self (Sackett, 2010). Thus, it is essential to create opportunities for children to experience the natural environment. Gardening is one of the important options for creating interest and motivation among students for spending time at outdoors with increased healthy habits like physical activity, eating healthy foods etc.

2.4 Effectiveness of school vegetable gardens

The incorporation of a garden program within the school curriculum supports a student-centered experiential learning environment (Skelly and Bradley, 2000; Klemmer *et al*., 2005; Block *et al*., 2012).

School personnel can use this gardening environment to promote academic learning (Klemmer *et al*., 2005; Ozer, 2006; Skelly and Bradley, 2000); health (Newell *et al*., 2004; Ozer, 2006; McCurdy *et al*., 2010) and social and emotional learning and life skill development of students (Block *et al*., 2012). Integrating garden activities within the school curriculum fosters the growth and development of children and promotes awareness of the natural environment.

Skinner *et al.* (2011) showed that engagement in the garden was significantly and positively correlated with students' academic engagement and perceptions of their sense of relatedness, competence, intrinsic motivation, and autonomy in school.

Childs (2011) reported that, from the gardening attitude responses, all students were having high garden maintenance knowledge. The gardening concept at schools had positively influenced the mode of teaching and the skills of students. It also improved household food production and nutritional security of student learners (Laurie *et al*., 2013).

2.4.1 Academic achievement

Schools have integrated gardening within the academic curriculum to promote environmental learning with regards to state academic standards. Schools may integrate gardening within various aspects of the curriculum such as science, maths, reading, writing, art and physical education. Skelly and Bradley (2000) surveyed teachers (N = 71) who were using gardens within the curriculum and found that 84% of the teachers reported that the garden helped children learn better. The teachers also reported that gardening fostered experiential learning and simplified environmental education. Klemmer *et al.* (2005) examined the effects of incorporating gardening within the science curriculum and found that elementary school students who participated in the garden programme scored higher on science achievement evaluation test. Furthermore, involvement in the garden had allowed children to demonstrate skills and areas of intelligence with respect to visual-spatial skills and physical strength. (Ozer, 2006). Therefore, gardening initiatives in school curriculum may encourage interest and engagement in the general learning process, as well as helps to promote academic

success within specific subject areas as children get excited about learning in the natural environment.

2.4.2 Health benefits

Sandel (2004) reported that youth involved in a gardening project within a juvenile detention center was more calm and relaxed and gardening was also therapeutic to the well-being of staff by decreasing anxiety and stress. The exposure to nature enhances healthy growth and development with regard to both physical and mental health. Students who spend more time outside are more likely to engage in physical activity, which may help to prevent health problems. Moreover, exposure to natural settings may help to reduce stress (McCurdy *et al*., 2010).

Furthermore, the school garden provides an opportunity for children to obtain exposure to vegetables and taste them (Ozer, 2006), which was found to create positive attitudes and increased knowledge about fruits and vegetables (Newell *et al*., 2004). The peer influence associated with the group context also normalized healthy practices within the garden setting (Ozer, 2006). Thus, involvement in the garden enhances positive attitudes and practices regarding health.

2.4.3 Social/Emotional Learning and Life Skill Development

Sandel (2004) found that juvenile involved in gardening within a detention facility translated experiences in the garden to insight about their own lives. Additionally, Sandel reported that involvement in gardening activities may promote pride in oneself, and will create a sense of belongingness.

Additionally, activities involved in the natural environment may enhance children's social and emotional learning, personal development, and facilitate behaviors conducive to the learning environment. Robinson and Zajicek (2005) studied the effects of a garden programme on children's life skill development.

Moreover, Block *et al*. (2012) identified that children engaged in a garden and kitchen program were able to self-direct and finish tasks without repeated redirection or close supervision. Children's self-confidence was also strengthened through a sense of achievement and parents, teachers, and program volunteers reported that the

program fostered self-esteem and independence. Thus, researchers have demonstrated the effects of gardening in relation to children's personal and emotional growth and development.

Furthermore, the incorporation of gardening activities may facilitate student ownership, pride, a sense of belonging, and engagement within the learning environment (Ozer, 2006; Block *et al*., 2012). Gardening activities were useful in creating a positive relationship between children and the school environment for children who were previously detached at school. This was evident in providing an opportunity for some students to be successful in school for the first time (Block *et al*., 2012). Additionally, involvement in the garden may assist students in connecting with adults, and thus creating healthy relationships with positive adult role models (Ozer, 2006). Consequently, children involved in gardening activities viewed the school environment more positively, which contributed to increased engagement.

2.5 Profile characteristics of respondents

2.5.1 Age

Age is the chronological number of years fulfilled by the respondents at the time of data collection.

Phibbs and Relf (2005) conducted a survey using a questionnaire mailed to 17 school-gardening researchers and the response rate was 76 per cent. The age groups they have chosen for the study were predominantly elementary (85%) or middle school (38%). They found that the learning outcomes most often studied were health and nutrition (69%), environmental education (30%), and self-esteem or self-concept (30%). Gardens proved a fertile ground for mathematical thinking for people of all ages (NFER, 2011).

2.5.2 Class of study

The specified class in which the student respondents were undergoing formal education at the time of investigation. Education is the extent of formal institutional learning possessed by the respondents. Hence, the respondents were asked to note the class in which they were undergoing their formal education.

The study on the effect of a school gardening program on the science achievement of elementary students by Klemmer *et al.* (2005) stated that garden program was more effective for 5th-grade students than younger students.

Dircks and Orvis (2005) concluded from their research on evaluation of junior master gardener program in third grade classrooms in 11 elementary schools throughout Indiana that the programme had academic merit for interdisciplinary use in classrooms.

Studies among adolescents showed that nutrition education in the classroom set up significantly improved their nutrition knowledge (Rao *et al*., 2007). It is well documented in the literature that nutrition education has been realized as one of the essential means of helping youngsters to improve or maintain their health and thereby ensuring the health status of future generation.

The study by Barnidge *et al*. (2011) among sixth and seventh-grade students on student garden engagement, as rated by both students and teachers, was positively correlated with student perceptions of how much they learned in the garden.

2.5.4 Domicile

Domicile in this study implies that the respondents actually live together with family. It was measured in terms of being rural or urban in nature.

Adebayo *et al.* (2006) noted that despite their (youths) rich rural life, farming background and experience, rural youths were yet to actively and productively participate in the development of a nation's agricultural sector.

The result of the study by Kohlstedt (2008) showed that African American school gardens were used primarily to teach agricultural practices, as students were likely to remain in rural life as adults.

The research by Fathima (2015) revealed that highest level of awareness on agriculture was exhibited by the students from rural state syllabus school of Alappuzha

District closely followed by the students from rural state syllabus school of Thrissur district.

2.5.5 Participation in extracurricular activities

Extracurricular activities are defined as those activities that fall outside the system of the formal curriculum of school education. Participation denotes the extent to which the respondent gets involved in extra activities outside the school curriculum but which imparts knowledge and skill.

McNeal and Ralph (1995) indicated that extracurricular participation provide previously marginalized students with access to a more "elite" stratum of the student population and exposes the students to peers who have better attitudes and awareness toward the school activities, nature and environment.

Fathima (2015) identified that the participation in extracurricular activities give a strong positive correlation with awareness and perception of students and it is the key contributing factor.

2.5.6 Training

Graham *et al*. (2005) observed lack of relevant training for the garden programs and teachers expressed a strong need for training and curriculum.

Ganpat and Webster (2010) suggested that although young people need education and training to prepare them to become viable master gardeners and leaders of the future, more importantly, they must receive support and access to resources to enable them to become a part of this formula.

The United States Department of Agriculture (USDA) is taking many initiatives to inculcate the spirit of farming among children. In addition to education and training-based programs, the USDA website includes a link for kids with activities on the subject of farming.

2.5.7 Crops grown in school vegetable garden

Dilip (2017) studied on crops grown by 10 schools in Thiruvanamthapuram district and reported that 14 varieties of vegetables (spinach, okra, cucumber, bitter

gourd, tomato drumstick, brinjal, cauliflower, chilly, beans, banana, amaranthus, cowpea and ash gourd) were raised by the students involved in school vegetable garden. The dominant crop grown by the schools was okra (100 %) and the leasts were beans (10 %) and banana (10%).

2.5.8 Knowledge level of students on vegetable cultivation

Kahtz (1995) evaluated the effect on knowledge of elementary school children and found that compared to control group, higher knowledge level was observed among participating children.

The study by Klemmer *et al*. (2005) on 'Effect of school gardening program' indicated that students who participated in a hands-on gardening programme had higher science achievement score than who did not. Hence it could be inferred that student's knowledge level increases through hands-on experimental activities.

Parmer *et al.* (2009) conducted the study on 'School gardens' resulted that school gardens as a component of nutrition education could increase fruit and vegetable knowledge and cause behavioral change among children. They suggested that school administrators, classroom teachers, and nutrition educators should implement school gardens as a way to positively influence dietary habits at an early age.

Dilip (2017) reported that 71.00 per cent of the students had a medium level of knowledge whereas 26.00 per cent low level of knowledge and 3.00 per cent high level of knowledge on vegetable cultivation.

2.6 Attitude of students on vegetable cultivation

Attitude is a mental and impartial condition of status sorted out through involvement (Allport, 1935).

In a study on 'Attitude-behavior relations' by Fishbein and Ajzen (1977), students' and parents' personal experiences, observations, knowledge, and values about agriculture affect their attitudes about agriculture, which in turn affect their beliefs, intentions, and decisions to participate.

Townsend (1990) believed that a pre-secondary agricultural education program can build a positive attitude with students that will help them to develop into positive leaders.

Riedmiller (1995) stated that the quality of a school garden or agricultural learning material is the single most vital factor influencing the knowledge, skills, and attitudes of youth learning about agriculture.

Scofield (1995) reported that students and parent's experiences with the agriscience courses have the possibility to influence their attitudes towards agriculture and subsequent career choices.

Lineberger and Zajicek (2000) conducted the study on ' School Gardens' revealed that after gardening, students' attitudes towards vegetables became significantly more positive.

Juma (2007) reported that the attitude of the younger generation towards farming as a 'dirty activity' due to lack of proper facilities. It resulted in the fact that agriculture is regarded as an employment of the last resort to young people.

The study on 'Impact of school gardens on student attitudes and beliefs' by Childs (2011) revealed that the school gardens implied positive changes in student attitudes.

Dilip (2017) in a study on ' Influence of school vegetable gardens on students and teachers' reported that as a result of students engaging in vegetable garden activities possessed attitude with high scores (60%).

2.7 Career aspirations of students

The students and parents' experiences with the agriscience courses have the possibility to influence their attitudes toward agriculture and subsequent career choices (Scofield, 1995).

Children's outdoor experiences were important in the long-term development of children because they impact career choices and conservation efforts. Findings from the Project GREEN by Waliczek and Zajicek (1999) on school gardening research

indicated that gardening activities, accompanied by educational lessons, positively influenced children's environmental attitudes.

Overbay and Broyles (2008), in a study conducted in Virginia, reported that students were found to prefer public service careers than agricultural careers as they perceived agriculture careers as being low-waged and mainly involving manual labor.

Today's urban children often lack the opportunity to learn about farming, or how the science of agriculture affects them daily. Confined within the strict schedules of classes, structured activities and tuitions, children today seem to be far away from the primary activity for man's survival, namely growing of food. In order to make our children agriculturally literate, it is important to assess where they stand in terms of agricultural awareness and what are their perceptions regarding agriculture as a profession and a career option (Fathima, 2015).

2.8 Food consumption pattern of students

Neumark-sztainer *et al.* (1997) studied the behavioural profile of a school-based population in Minnesota reported that 33.33 per cent of their sample was vegetarians and 66.67 per cent was non-vegetarians. The result of their study indicated that vegetarian adolescents were twice as likely to consume fruits and vegetables, one third as likely to consume sweets, and one fourth as likely to eat salty snack foods, more than once a day compared with non-vegetarians.

The study on 'children is growing healthy in South Carolina' showed that an increase in willingness to taste fruits and vegetable among children. There was also an increase in the number of students able to identify fruits and vegetables through garden intervention program (Cason, 1999).

As reported by the Kerala Statistical Institute (2001), 98 per cent of Keralites were habituated to non-vegetarian foods and consumption of fruits and vegetables were very low.

Children who grow their own vegetables are more likely to eat fresh vegetables (Pothukuchi, 2004). The children also expressed a preference for a vegetable that they grew (Morris and Zidenberg-Cherr, 2002).

The dietary perception and practices in senior secondary boys in Delhi schools studied by Vibha and Sibal (2003) reported that the cereals, fat and oil and sugar were consumed daily by adolescents.

Hermann *et al.* (2006) in a study on the after-school gardening and vegetable intake among third to eighth grade male and female students resulted that there was a significant increase in report of daily vegetable intake.

Youth gardening programme participants were more willing to eat nutritious food, try ethnic and unfamiliar food, greater likelihood to cook and garden, and expressed a greater appreciation for other individuals and cultures than the nonparticipants (Lautenschlager and Smith, 2007)

McAleese and Rankin (2007) investigated the effects of garden-based nutrition education on adolescents' fruit and vegetable consumption using a nonequivalent control group design. A repeated measure analysis of variance showed that adolescents who participated in the garden-based nutrition intervention increased their preference of fruits and vegetables more than students in the two other groups. The results of this study revealed the efficacy of garden-based nutrition education to increase adolescents' consumption of fruits and vegetables.

Many studies revealed that Children who grow their own food were more likely to eat fresh fruits and vegetables (Hermann *et al*., 2006; McAleese and Rankin, 2007; Pothukuchi, 2004) or expressed a preference for these foods (Morris and Zidenberg-Cherr, 2002).

The findings by Parmer *et al*. (2009) suggested that school administrators, classroom teachers, and nutrition educators should implement school gardens as a way to positively influence dietary habits at an early age. The results of the study by Miguel and Ivanovic (2010) on a short-term school vegetable gardens program focused on preschoolers and their mothers from Sao Paulo, Brazil showed that there was an increased number of daily meals and the frequency with which they consume vegetables, as well as the number of vegetables that they consumed.

Nolan *et al*. (2012) conducted a study on 'effects of nutrition education and gardening on attitudes, preferences, and knowledge of second to fifth graders in the Rio Grande valley toward fruit and vegetables'. Differences were identified between pre- and post-test scores for all the study variables. After comparing pre- and post-test scores, they concluded that gardening and nutritional instruction had a positive effect on students' nutritional knowledge, fruit and vegetable preference, and snack choices.

The study on eating habit among school going adolescents in Mumbai by Kumar *et al.* (2013) reported that two third of the sample adolescents were non-vegetarian. The outcome of the study revealed that more than two third of respondents opined that a combination of vegetarian and non-vegetarian food items was healthy while close to 30 percent opined that vegetarian food is healthy.

2.9 Benefits of school vegetable garden activities

Alexander *et al*. (1995) revealed that children were likely to have positive bonding experiences with their parents and other adults in a community garden program in San Antonio.

Chawla's (1998) review of the qualitative and survey literature found that adults who had significant and positive exposure to nature as children experienced, often with significant adults, that socialized them to view nature in positive ways and were more environmentally sensitive and concerned.

Gardening has long been accepted as a therapeutic healing activity which can positively affect mental health and well-being (Ulrich, 1999). Children who grow their own food are more likely to eat fresh fruits and vegetables (Canaris, 1995) and express a preference to eat these foods (Lineberger and Zajicek, 2000).

Klemmer*et al*. (2005) in their study on the effect of a school gardening program on science achievement of fifth-grade students who participated in school gardening activities showed that the students secured scores significantly higher on science achievement tests than students who had a curriculum without garden experiences.

A study on assessment of changes in the life skill development of elementary school students by participating in a 1-year school garden program by

Robinson and Zajicek (2005) revealed that the students in the experimental group had significant improvement in their overall life skills scores after participating in the garden program. The Life Skills Inventory included statements for six constructs including teamwork, self-understanding, leadership, decision making skills, communication skills, and volunteerism.

Garden programs often include lessons on nutrition, resulting in greater knowledge about healthy eating behavior among children (Koch *et al*., 2006).

In a qualitative assessment of an intergenerational gardening project by Mayer-Smith *et al*. (2007) revealed that the students expressed an increased understanding of ecology, interconnections in nature, and responsibility to care for the environment.

Gardening offers diverse forms of engagement for children, including designing, planting, and maintaining gardens; harvesting, preparing, and sharing food; working cooperatively in groups; learning about science and nutrition, and creating art and stories inspired by gardens. (Yost *et al.,* 2009)

The study by Heim *et al*. (2011) revealed that 99 per cent of parents reported that their children enjoyed the garden programme, and 88 per cent said that their children shared information about the garden with their family at least once in a week.

Research regarding the effects of school gardens specifically on education, Williams and Dixon (2013) did a study with a purpose of finding the impact of school gardens on academic outcomes. This research was based on twelve different studies, and the results showed improved academic results among students. It was found from these studies that advanced science scores were obtained for all types of students who took part in school gardening. There was an improved cognitive function as a result of working in the gardens and being in direct contact with the land and nature. The study also revealed improvements in attitudes and behaviors of children towards fruits and vegetables.

2.10 Constraints experienced by the respondents

A constraint simply indicates limit or restriction. In this study, constraints indicate the factors which restrict the process of creating and maintaining a vegetable garden in schools.

Ozer (2006) discussed that schools face multiple challenges in the implementation of garden programs, mainly related to limited resources of funding, human resources and time.

FAO (2010) pointed out that starting, reviving or reorienting school gardens may face conceptual, practical and social issues. They reported that adequate inputs, enough time, sufficient land and water, vacation maintenance, a positive image about gardening, good garden security, technical support and training, continuing support from school management, community and family support, timetable space and integration into the mainstream curriculum were the challenges and keys to success.

Huys *et al.* (2017) reported that the various barriers for implementing school garden were difficulties with startup, maintenance during summer holidays and integration in the school curriculum.

The study by Dilip and Thomas (2017) in Thiruvananthapuram district of Kerala state revealed that the major constraints as perceived by students in school vegetable garden projects were, high input cost followed by lack of students' participation, lack of teacher's involvement, non-availability of implements, high labour cost, poor storage facilities and lack of knowledge about gardening.

Research Methodology

CHAPTER III

RESEARCH METHODOLOGY

This chapter comprises the details of the methodology used in the present investigation conducted during 2018-19 and are furnished under the following heads.

3.1 Research design
3.2 Sampling Frame
3.3 Operationalization and measurement of variables and parameters
3.4 Statistical techniques used for the study

3.1 RESEARCH DESIGN

Research design is the plan and structure of the study so conceived as to obtain answers to research questions. The 'plan' is the overall scheme or program of the research. It includes the skeleton of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of data. The 'structure' is a paradigm or model of the relations among variables of a study (Kerlinger, 1995).

Ex-post facto research design was adopted for the study. According to Kerlinger (1995), *ex-post facto* research is a systematic inquiry in which the researcher does not have any direct control over the variables because their manifestation has already happened or which are inherently not manipulative.

3.2 SAMPLING FRAME

3.2.1 Locale of the study

The study was conducted in Palakkad district. Many government, aided and unaided schools were involved in maintaining school vegetable gardens. The major

source of service and funding were extended through the Department of Agriculture Development and Farmers' Welfare of Kerala under the scheme 'Vegetable Development Programme' (2012). Vegetable Development Programme is also focused on Special Agricultural Zones of Vattavada-Kanthalloor, Eastern Palakkad, Kanjikkuzhi, Cherthala, Pazhayannur and adjoining areas for the thirteenth five year plan 2017-22 of Kerala. Palakkad district was selected from the above list.

Scheme was implemented in three selected schools from each panchayath of the district. The study area comprised of one school each from the three selected panchayaths of two randomly selected blocks of Palakkad district.

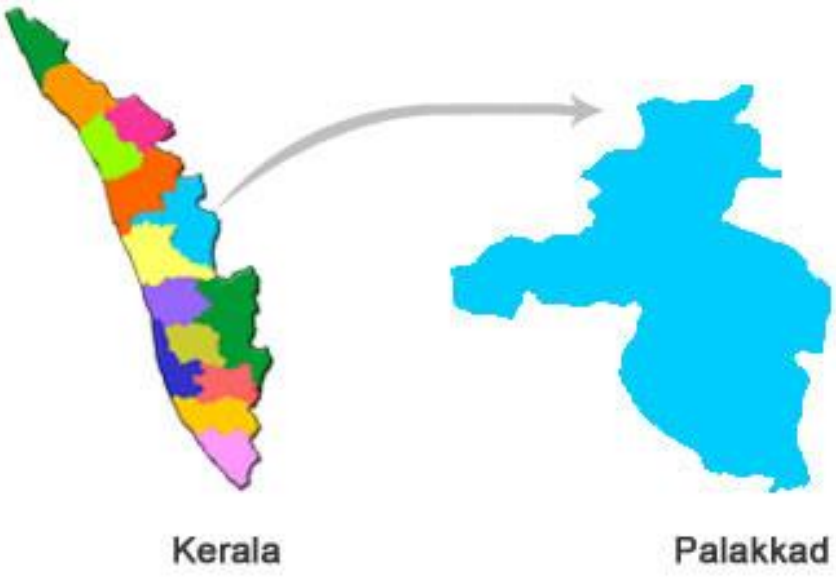

Fig 3.1. Map showing locale of the study

3.2.2 Sampling procedure

Three panchayaths each from Kollengode and Nenmara blocks were randomly selected. From these six panchayath one school each was selected randomly. Two stage random sampling procedure was adopted.

The details of selected panchayaths, schools and respondents are furnished in Tables 3.1 and Table 3.2

Table 3.1 List of selected panchayaths

Sl.No.	Panchayat	Respondents (N=18)
		Extension personnel
1	Pallasana	3
2	Nemmara	3
3	Muthalamada	3
4	Elevanchery	3
5	Koduvayur	3
6	Vadavannur	3
	Total	**18**

Table 3.2 Details of selected schools and respondents

Sl.No.	School Name	Respondents (N=216)		
		Students	**Teachers**	**Parents**
1	VIMHSS Pallasana	30	1	5
2	GUPS Chathamangalam	30	1	5
3	GHSS Muthalamada	30	1	5
4	DMUPS Elevanchery	30	1	5
5	GUPS Ethannur	30	1	5
6	AMMUPS Vadavannur	30	1	5
	Total	**180**	**6**	**30**

Based on the objectives of the study the different categories of parameters and variables (both independent and dependent) were identified through literature search.

The identified items were included in the study after discussion with experts in the concerned fields. Survey and personal interview methods were implemented to gather data on profile characteristics and other details of the respondents.

3.3 OPERATIONALIZATION AND MEASUREMENT OF VARIABLES AND PARAMETERS

3.3.1 Independent variables

Different categories of variables were identified and included through literature review. These were subjected to judges rating. The judges were asked to rate the degree of relevance of each item on a five-point continuum indicating relevance from maximum to minimum with scores of five to one respectively. Based on the relevancy score final items were selected by mean relevancy score which was calculated by summing up all the scores obtained by each variable and dividing it by the total number of judges responded. The items which scored more than mean score were selected and included in this study. The list of independent variables with their measurement techniques is presented in the Table 3.3.

Table 3.3 List of independent variables and their measurement

Sl.No.	Independent Variable	Measurement
1	Age	Number of years of completed life
2	Gender	Coding procedure followed by Mridula (2010)
3	Class of study	Scoring procedure followed by Dilip (2017)
4	Domicile	Coded as rural and urban
5	Achievement Motivation	Scoring procedure developed for the study

7	Social orientation	Scoring procedure followed by Dilip (2017)
8	Extent of volunteering	Scoring procedure followed by Dilip (2017)
10	Participation in extracurricular activities	Scoring procedure followed by Fathima (2015)
11	Level of eagerness	Scale developed by Safvenbom *et al.* (2016) with modifications
12	Mass media exposure	Scoring procedure developed for the study
13	Information source utilization	Scale developed by Sasikala (1997) with modifications

3.3.1.1 Age

Age was operationally defined as the number of years completed by the respondents at the time of the study.

The students were categorized based on the frequency under each age that ranged from 11-16 years.

3.3.1.2 Gender

Gender is operationally defined as the state of being male or female. The coding procedure adopted by Mridula (2010) was used for the study.

3.3.1.3 Class of study

Class of study refers to the extent of formal institutional learning possessed by the respondents at the time of the investigation. The scoring procedure adopted by Dilip (2017) with slight modification was used for the study. The respondents were

categorized based on their level of education. The student's education was categorized based on the frequency under each class of study that ranged from 7-10 standards.

3.3.1.4 Domicile

Domicile in this study means where the respondents actually live together with family. It was categorised in terms of being rural or urban in nature.

3.3.1.5 Social Orientation

Social orientation in this study refers to the respondents' willingness to participate in socially visible work and a positive approach towards society's wellbeing and civic affairs. The statements as well as scoring procedure adopted by Dilip (2017) was used with slight modifications. It consists of statements for which respondents were requested to respond as regular, sometimes and never with scores 3, 2 and 1 respectively. The responses were added up for each statement to get the total score of the individual respondent.

3.3.1.6 Extent of volunteering

The extent of volunteering in this study was described as how habitually the respondents volunteered to work for school vegetable garden. It was measured in terms of their frequency of involvement in managing and maintaining a school vegetable garden and expressed daily, twice a week, weekly, once in 15 days and never. The frequencies were scored as 5,4,3,2 and 1 respectively. The respondents were grouped into three different categories viz., high, medium and low with mean values as a measure of check.

3.3.1.7 Participation in extracurricular activities

Extracurricular activities were defined as those activities that performed by students fall outside the domain of the normal curriculum of school. Participation in extracurricular activities denotes the extent to which the respondent gets involved in

extra activities other than gardening outside the school curriculum but which imparts knowledge and skill. The scoring procedure adopted by Fathima (2015) was used for the study.

The respondents were asked to indicate whichever extracurricular activities they used to participate and based on the number of such activities the scores were given. A score of zero was given if they were not participating in any extracurricular activity, score 1 was given if they were actively participating in one activity, score 2 was given if they were involved in two activities and so on.

Accordingly, the respondents were categorized as:

Category	Score
No participation in extracurricular activities	0
One extracurricular activity	1
Two extracurricular activities	2

3.3.1.8 Level of eagerness

Level of eagerness in this study is the level of readiness and interest of students to get involved in school vegetable gardening. The scale developed by Safvenbom *et al.* (2016) with modifications was used. The respondents were asked to comment on selected five statements in a three-point continuum with scores ranging from 3 to 1 for very relevant to less relevant respectively. The total score for each respondent was found out separately.

3.3.1.9 Mass media exposure

Exposure to mass media can be operationally defined as the extent to which the respondent was using the support of mass media for developing their knowledge and skills. The respondents were grouped into different categories and the scores were expressed as frequency and percentage.

Category	Score
Regular	3
Occasionally	2
Never	1

3.3.1.10 Information source utilization

This has been referred as the use of different types of information sources by the respondents for getting information on farm technologies. It was measured in a three point continuum. The scoring procedure followed by Sasikala (1997) was adopted for this variable with suitable modifications.

Utilization	Score
Very effective	3
Moderately Effective	2
Less effective	1

3.3.1.11 Achievement motivation

Motivation is factor that influences the students to do particular activity in the desired way. The arbitrary scoring procedure was developed for the study. It was measured using three point continuum.

Category	Score
Highly motivated	3
Moderately motivated	2
Less motivated	1

3.3.2 Dependent variables

3.3.2.1 Knowledge on vegetable cultivation

Knowledge in this study refers to the conceptualized understanding of the basic concepts and awareness of the respondents regarding the different aspects of vegetables like crop production, crop protection, processing, and nutritional aspects.

A standardized knowledge test was developed to measure the knowledge of student respondents. To assess the knowledge of the students on vegetable cultivation, 25 questions including open-ended questions, yes/no questions and multiple choice questions were included in the questionnaire.

These questions were framed with a view to assess the awareness of respondents on various aspects of agriculture including basic awareness on crops, crop production, crop protection, harvesting and processing.

The procedures adopted by Jaganathan *et al.* (2012) was used with suitable modification. The formulae for calculating knowledge index is mentioned below;

$$Knowledge\ Index = \frac{Respondents\ total\ score}{Total\ possible\ score} \times 100$$

3.3.2.2 Attitude towards vegetable cultivation

Attitude can be defined as the predisposition to respond positively or negatively towards a certain object, idea, person or situation. The attitude of school students was the main dependent variable of the study. It was measured using the procedure developed in the EARTH [Education and Resiliency Through Horticulture] program (1999). The attitude statements are given in appendix.

A total of 10 statements were used and the students' responses were recorded in a five-point continuum as 'Strongly agree', 'Agree', 'neither agree nor disagree', 'Disagree' and 'Strongly disagree' with scores 5,4,3,2 and 1 respectively for positive statements and in the reverse order for negative statements. Summation of scores were done. Based up on the scores students were categorized into different categories.

3.3.2.3 Perceived effectiveness of school vegetable garden program

The respondents were asked to mark their responses on statements reflecting indicators on a three-point continuum with weightage, as 'Mostly felt (3)', 'Moderately felt (2)' and 'less felt (1)'. Overall as well as dimension wise Perception score was calculated for each respondent. Overall as well as dimension wise perception index was calculated using the following equation.

$$Perception\ Index = \frac{Total\ score\ of\ each\ statement}{Maximum\ score\ of\ each\ statement} \times 100$$

Overall perception index = $\frac{\sum X}{M \times N \times S}$

$\sum X$ = Sum of total scores of all statement

M = Maximum score

N = Number of respondents

S = Number of statements

The statements employed by Fathima (2015) were used with suitable modifications.

3.3.2.4 Career aspiration

The career aspirations of students were identified based on a set of career options at different levels of higher education i.e., higher secondary, diploma, degree or professional degree. The frequency and percentage of the students' responses were analysed.

3.3.2.5 Crops grown in school vegetable garden

The crops cultivated as part of the school vegetable garden activities were collected and documented. The crops and its occurrence in the respective schools were recorded and tabulated in terms of frequency and percentage.

3.3.2.6 Club details of school garden

The details of club were collected using the queries mentioned below;

a) Is there any club for garden activities like agri/nature/seed club?
b) If yes, Name of the club:
c) Number of members:
d) Working started from:
e) Criteria for membership:
f) Membership fee:

The responses from teachers were recorded, tabulated and presented in a structured way.

3.3.2.7 Perceived benefits of the programme

Benefits in this study measures the benefit of school vegetable garden as perceived by parents by the involvement of their children in the school vegetable garden.

A total of 11 items were selected and responses from parents of student respondents were collected and categorised into three-point continuum as 'Highly relevant', 'Moderately relevant', and 'Not relevant' with scores 3,2 and 1 respectively. Based up on the scores the items were ranked to identify the major perceived benefits.

3.3.2.8 Dietary habit

The students' respondents involved in school vegetable garden activities were asked to note their food choice i.e., vegetarian or non-vegetarian. The responses were calculated as frequency and percentage.

3.3.2.9 Perceived changes in food consumption among students

The perceived changes in preferences in food consumption among the students involved in school vegetable garden were analyzed using the following parameters.

1. Positive changes in preferences and willingness to taste vegetables
2. Increase in quantity of vegetables consumption
3. Increase in variety of vegetable consumption
4. Decrease in fast food consumption
5. Preference for healthy foods
6. Preference towards vegetables produced by self
7. Preference towards leafy vegetables

The scale consisted of seven statements, where 4^{th} statement is negative. Perception on each statement was recorded on a five-point continuum, strongly agree, agree,

undecided, disagree, strongly disagree with scores 5,4,3,2 and 1 for positive statements and 1,2,3,4 and 5 for negative statements. The scores ranged from 7 to 35.

Perceptions on individual parameter by the respondents were also recorded. For that, the total scores of individual parameter for 180 students was calculated and ranked. The sum off all the parameters were added and based on the mean value three categories viz; high, medium and low were formed.

3.3.2.10 Frequency of food consumption

Food consumption of students was analysed to explore the actual choice of food that the students used to take in their diet. The students were asked to mention the frequency and different kinds of foods they usually consume.

3.3.2.11 Vegetable consumption of students involved in school vegetable garden

The vegetables actually used to consume by the students involved in school vegetable garden were identified by giving a list of vegetables and was asked to choose the items consumed in their diet. The frequency and percentage of each vegetable consumed was identified. And it was classified arbitrarily as ‘most preferred’ having a vegetable consumption percentage of ‘above 86 per cent’, ‘medium preferred’ ranges from ’70 to 80 per cent’ and ‘less preferred’ is ‘below 70 per cent’.

3.3.2.12 Constraints

The students and teachers experience a number of difficulties while undertaking school vegetable garden activities. A number of constraints experienced by the students were identified, ranked and presented. The constraints faced by the institution were identified from the teacher in charge of the garden activities.

The scale consisted of 15 statements, each statement was provided with four-point continuum, very relevant, moderately relevant, less relevant, and not irrelevant with

scores 4, 3, 2 and 1. The statement which obtained maximum scores was given 1st rank and least score was given last rank.

3.4 STATISTICAL TECHNIQUES USED

The data collected were analysed using Statistical Package for Social Sciences (SPSS version 22). The following statistical tools were used for analysis and interpretation of the results are:

1. Descriptive statistics
2. Kruskal- Wallis test
3. Spearman's rank correlation coefficient
4. Kendall's coefficient of concordance (w)

3.4.1 Descriptive statistics

The respondents were classified with respect to the mean as a check of the selected independent variables. For analysing personal variables and variables related to school vegetable garden activities, percentage analysis was employed. Standard deviation is the measure of the dispersion of data set. It was used to categorize the dependent variable and independent variables. The standard error is used to measure the statistical correctness of an approximate in the standard deviation results.

3.4.2 Kruskal - Wallis test

Kruskal Wallis one-way analysis of variance by ranks is used for deciding whether k independent samples are from different populations. Kruskal Wallis technique tests the null hypothesis test whether k samples come from same population or from identical populations with same median. The test was used to analyse the difference between the students of six schools with respect to their knowledge, attitude and perception of effectiveness of school vegetable garden programme.

$$\text{KW (Kruskal wallis statistic)} = \frac{12}{N(N+1)} \sum_{j=1}^{k} n_j \left(mR_j - mR\right)^2$$

k =number of samples or groups

n_1 = number of cases in the j^{th} sample

N=number of cases in the combined sample (the ample of the n_1s)

R_j = sum of the ranks in the j^{th} sample or group

m R_j = average of the ranks in the j^{th} sample or group

m R = (N+1)/2 = the average of the ranks in the combined sample (the grand)

The data analysed using SPSS version 20.0

3.4.3 Spearman's rank correlation coefficient

It is a popular measure which starts with ranking of the measurement of the variables X and Y separately. It is denoted by r_s, the ranks are assigned for variables and the difference between the ranks of each of n pairs are then found out. They are denoted by d. The spearman's rank correlation is then compounded bu using the formula.

$$r_s = 1 - \frac{6 \Sigma d^2}{n(n^2 - 1)}$$

The value of r_s ranges between -1to +1.

3.4.4 Kendall's coefficient of concordance (W)

It was used to determine the association among K sets of rankings.

To compute 'W' the sum of ranks (Rj) in each column of a K/N table is found out. In this study it was used to identify the most felt constraint from a set of constraints by ranking.

W is computed using the formula

$$W = \frac{12S}{K2(N3-N)}$$

S = sum of squares of the observed deviations from the mean of Rj.

Where, $S = \sum \left(Rj - \frac{\sum Rj}{N} \right)^2$

K= Number of rankings

N= no of entities or objects ranked

The significance of ‘W’ is tested using chi-square.

Plate 1. Interaction with Agriculture officer Krishibhavan, Pallavur

Plate 2. Interaction with Agriculture officer Krishibhavan, Koduvayur

Plate 3. Interaction with Agriculture officer Krishibhavan, Muthalamada

Plate 4. Interaction with Agriculture officer Krishibhavan, Vadavannur

Plate 5. School vegetable garden of VIMHSS, Pallasana

Plate 6. Interaction with students GHSS, Chathamangalam

Plate 7. Interaction with students of GUPS, Ethannur

Plate 8. Interaction with students of GHSS, Muthalamada

Plate 9. Interaction with students of AMMUPS, Muthalamada

Results and Discussion

CHAPTER IV

RESULTS AND DISCUSSION

This chapter highlights the results and discussion based on the analysis of data obtained after survey research. The results and discussion are presented in a way to directly address the objectives set forth.

The major subheads are here under;

4.1 Guidelines for implementation of school vegetable garden by the funding agency

4.2 Profile of agriculture/nature club of selected schools

4.3 Profile characteristics of student respondents

4.4 Knowledge and attitude of students on vegetable cultivation

4.5 Perception on the effectiveness of school vegetable garden

4.6 Comparison of schools on attitude, knowledge level and perceived effectiveness

4.7 Benefits of school vegetable garden as perceived by parents of student respondents

4.8 Profile of selected school vegetable gardens

4.9 Vegetable cultivation by students at their home

4.10 Career aspirations of students as influenced by the involvement in school agriculture or nature clubs

4.11 Impact of food consumption pattern among students

4.12 Constraints faced by the Institution and students while undertaking school vegetable garden

4.1 Guidelines for implementation of school vegetable garden by the funding agency

Vegetable Development Program of the Department of Agriculture Development and Farmer's Welfare of Kerala was implemented in educational institutions and others with specific objectives and guidelines. During the financial year 2018-19, Rs.130 lakhs were allotted.

4.1.1 Objectives

- To mobilize the student community into the field of agriculture
- To make them aware of safe to eat food production and
- To bring uncultivable lands in the government and private institutions under vegetable cultivation

4.1.2 Selection of schools

- The selected institutions must have sufficient and suitable land (at least 10 cents) to take up cultivation
- Schools which are willing to participate, but do not have 10 cents of cultivable land, may be allowed to take up vegetable cultivation in the available land or in grow-bags
- Institutions are selected by the Agricultural Officer/Assistant Director of Agriculture according to the availability of space and the willingness to take up cultivation

4.1.3 Mode of implementation/operation

- The activity will be implemented by a group of 20-25 students headed by a teacher
- Seeds and training will be arranged by the Krishi Bhavan concerned

4.1.4 Financial Assistance

- An assistance of Rs.4000-/- to educational institution towards the expense for taking up cultivation

4.2 Profile of agriculture/nature club of selected schools

The details of clubs in each school were collected and are presented in Table1.It is worth mentioning to note that membership is voluntary and no fee was collected from students.

Table 4.1. Distribution of schools with respect to club details

Schools	**VIMHSS Pallasana**	**GUPS Chathamangalam**	**GHSS Muthalamada**	**DMUPS Elevanchery**	**GUPS Ethannur**	**AMMUPS Vadavannur**
Club details						
a)Name /type of the club involved in vegetable garden activities:	Newton club	Seed club	Nature club	Nature club	Nature club	Agri club
b)Number of members	50	30	30	30	30	30
c)Month of establishment	June 2018	June 2018	June 2018	June 2018	June 2018	June 2017

It could be seen from Table 4.1, that all the schools selected for the study had a club which was purposively engaged in vegetable garden activities. Three schools named them as 'Nature club' while the others called as 'Newton club', 'Seed club', and 'Agri club'. Five clubs (83.33 %) had a minimum of 30 members whereas there were

50 members in one club. Similarly, five of the schools started garden activities during June 2018 whereas one school started school garden from 2017 June itself.

4.3 Profile characteristics of student respondents

The profile characteristics of student respondents are presented as follows.

Following are the results of the analysis of the profile of student respondents involved in school vegetable garden in the selected schools for this study. This would help in a clear understanding of the student respondents and interpreting the data gathered in an effective manner. The characteristics of student respondents are presented in the following paragraph.

4.3.1 Age

Age was operationally defined as the number of years completed by the respondents at the time of the study.

Table 4.2. Distribution of students according to their age group

Category (age)	Students (N=180)	
	Frequency	**Percentage (%)**
11	7	03.89
12	102	56.67
13	43	23.89
14	6	03.33
15	21	11.67
16	1	00.55
Mean	12.64	
SD	01.072	
SE	00.08	

From the Table 4.2, it is evident that majority of the student respondents (56.67 %) were of 12 years followed by 13 years with 23.89 per cent while 11.67 per cent possessed 15 years. The mean age of the students involved in school gardening activities was 12.64.

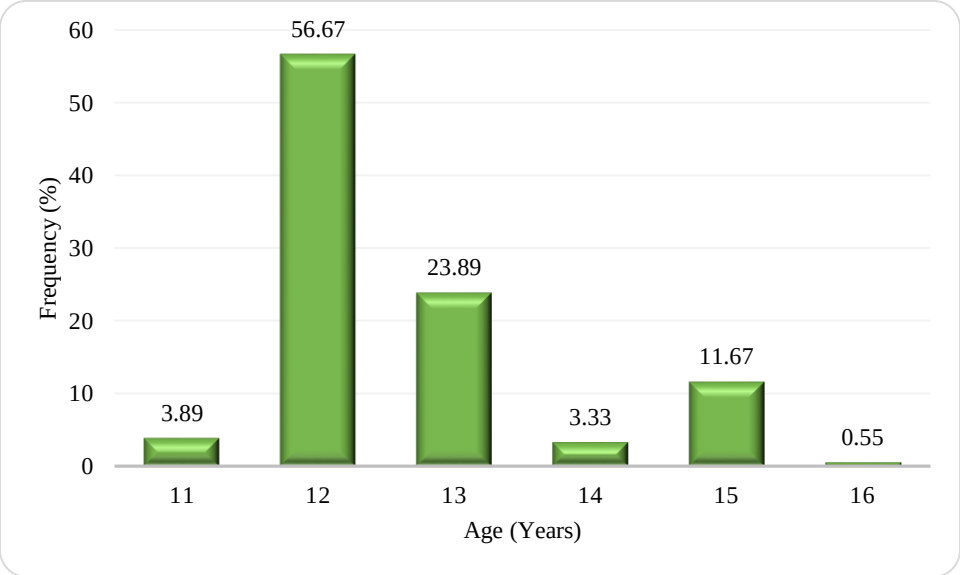

Fig. 4.1. Distribution of student respondents based on their age

From this, it can be clearly inferred that the children who are engaged and interested in school garden activities belong 11 to 16 age group. The results also reflect the findings of Lineberger and Zajicek (2000), McAleese and Rankin (2007) and Dilip (2017).

4.3.2 Gender

Gender refers to the socially constructed characteristics of male and female. In this study the number of girls and boys involved in school vegetable garden was recorded and the distribution is tabulated below.

Table 4.3. Distribution of students involved in the school vegetable garden based on gender (n=180)

Sl. No.	Gender	Frequency	Percentage (%)
1	Male	84	46.67
2	Female	96	53.33
	Total	180	100

It is clear from the above table that majority of the respondents were females representing 53.33 per cent, whereas 46.67 per cent were males. This gives a true representation of the Kerala state where the population of females is more than males. The state is known to be unique in terms of its sex ratio among all other states and union territories of our nation.

Klemmer *et al.* (2005) found out that there was no significant difference in scores between males and females involved in the garden programme, suggesting the program was equally effective for both sexes.

4.3.3 Domicile

Domicile implies the place where respondents actually live together with family. It was classified in terms of being rural or urban in nature.

All the student respondents of this study were living in rural areas. This may be due to the fact that the selected schools were situated in the rural and semi-rural areas.

The result of the study by Kohlstedt (2008) showed that African American school gardens were used primarily to teach agricultural practices, as students were likely to remain in rural life as adults.

4.3.4 Number of family members

The actual number of people living together in the home of the student respondents. The responses are categorized, tabulated and presented in the table below.

Table 4.4. Distribution of the number of family members of the respondents (N=180)

Category	Frequency	Percentage
Small (1 – 4)	88	48.89
Medium (5 - 7)	67	37.22
Large (>8)	25	13.89
Total	180	100

Table 4.4, indicates that 48.89 per cent of the students belonged to small family with two to four members while 37.22 per cent were hailing from medium-sized families with five to seven members. Only 11 per cent students belonged to families with eight members and more.

4.3.5 Farming as major occupation

If the major source of family income is from farming activities, it is considered as the main occupation. The respondents were asked to express the major source of income and occupation of parents.

Regarding the major source of family income, 40 per cent of the family of student respondents were practicing farming as main occupation.

4.3.6 Vegetable garden at home of student respondents

The vegetable garden at home of student respondents indicates the practice of growing vegetables at the backyard or around home or on roof top.

All the students reported that they were maintaining vegetable garden at their home. The parents of students also responded the same.

The study on the impact of a school-based kitchen program by Gibbs *et al.* (2013) showed that there is a significant transfer of impacts to the home environment.

4.3.7. Class of study

The specified class in which the student respondents were undergoing formal education at the time of the investigation. All the students belonged to the category consisting of 7^{th} to 10^{th}standard.

The study on the effect of a school gardening program on the science achievement of elementary students by Klemmer *et al.* (2005) stated that garden program was more effective for 5^{th} grade students than the younger students.

4.3.8 Social Orientation

It can be observed from Table 4.4.a, that 82.77 per cent of the students had medium level of social orientation followed by 14.44 per cent with high level. Only 2.77 per cent of the students had low level of social orientation. Hence it could be concluded that the social orientation of the majority of students ranged from medium to high level. The result supports the findings of Dilip (2017).

Table 4.4.a Distribution of student respondents according to social orientation

Category	Class limits	Students (N=180)	
		Frequency	Percentage
Low	<5.3	5	2.77
Medium	≥5.3 to <7.5	149	82.77
High	≥7.5	26	14.44
Mean			6.43
SD			1.1
SE			0.082

4.3.9 Extent of volunteering

The respondents were grouped into three different categories viz., high, medium and low with weighted mean values as a measure of check. It can be seen from the Table 4.4.b, that majority (63.88 %) of the students were highly volunteering followed by 27.79 per cent in the medium category and only 8.33 per cent in the lower category.

Table 4.4.b. Distribution of student respondents based on extent of volunteering

Category	Frequency	Percentage
High	115	63.88
Medium	50	27.79
Low	15	8.33

4.3.10 Participation in extracurricular activities

It can be observed from Table 4.4.c, that majority ie; 76.11 per cent of the students were under medium level of participation in extracurricular activities. About 18.33 percent students had high level and 5.56 with low level of participation in extracurricular activities. The results are in line with findings of Fathima (2015).

Table 4.4.c. Distribution of student respondents according to participation in extracurricular activities

articipation in extracurricular activities			
Category	**Class limits**	**Students (N= 180)**	
		Frequency	**Percentage**
Low	<10	10	5.55
Medium	10 to 15	137	76.11
High	>15	33	18.33
Mean	13.16		
SD	2.43		
SE	0.181		

4.3.11 Level of eagerness

It was observed that 83 per cent of the students were very much eager to do gardening activities whereas 10 per cent students were moderately eager and only 7 per cent students showed less eagerness Table 4.4.d. These results are in line with the findings of Safvenbom (2016).

Table 4.4.d. Distribution of student respondents based on eagerness level

Category	Frequency	Percentage
Very much eager	149	83
Moderately eager	18	10
Less eager	13	7

4.3.12 Achievement motivation

It could be seen from the Table 4.4.e. that majority of the students were moderately (62.77 %) motivated whereas 30.23 per cent students were highly motivated in doing gardening activities. Only seven per cent were found to be less motivated.

Table 4.4.e. Distribution of student respondents based on achievement motivation

Category	Frequency	Percentage
Highly motivated	113	62.77
Moderately motivated	54	30.23
Less motivated	13	7.00

4.3.13 Information source utilization

It was found that 31.11 per cent students were very effectively using the information sources while 52.77 per cent students were using it at a moderate level. Only 16.12 per cent of the respondents were using those resources not effectively Table 4.4.f. The result in line with findings of Sasikala (1997).

Table 4.4.f. Distribution of student respondents based on information source utilization

Category	Frequency	Percentage
Very effective	56	31.11
Moderately effective	95	52.77
Not effective	29	16.12

4.4 Knowledge and attitude of students on vegetable cultivation

4.4.1 Knowledge level of students on vegetable cultivation

Knowledge in this study is explained as the extent of information possessed by the students on vegetable cultivation. A set of pretested questions were employed and the answers were noted and scored. According to the marks obtained students were grouped into five categories.

Table 4.5. Distribution of students according to their knowledge on vegetable cultivation

Knowledge level of students			
	Students (N=180)		
Category	**Class limits**	**Frequency**	**Percentage**
Very low	<79.41	37	20.55
Low	79.41-82.19	13	7.22
Medium	82.19-87.75	71	39.44
High	87.75-90.52	27	15.02
Very high	> 90.52	32	17.77
Total		180	
Mean	84.97		
SD	2.77		
SE	0.207		

From the Table 4.5, it is evident that 17.77 per cent students had possessed very high level of knowledge followed by 15.02 per cent with high level and 39.44 per cent with medium level. It was observed that only 7.2 per cent had low and 20.5 percent had very low level knowledge. From this result, it is clear that the students involved in managing and maintaining school vegetable garden will have a greater level of knowledge on vegetables. It was observed that the majority of the students had a medium level of knowledge on vegetable production, crop protection, manuring, irrigation, intercultural operations, harvesting, processing, and nutritional aspects.

This might be due to the active involvement of students in garden activities. The result also supports the findings of work done by Dilip (2017).

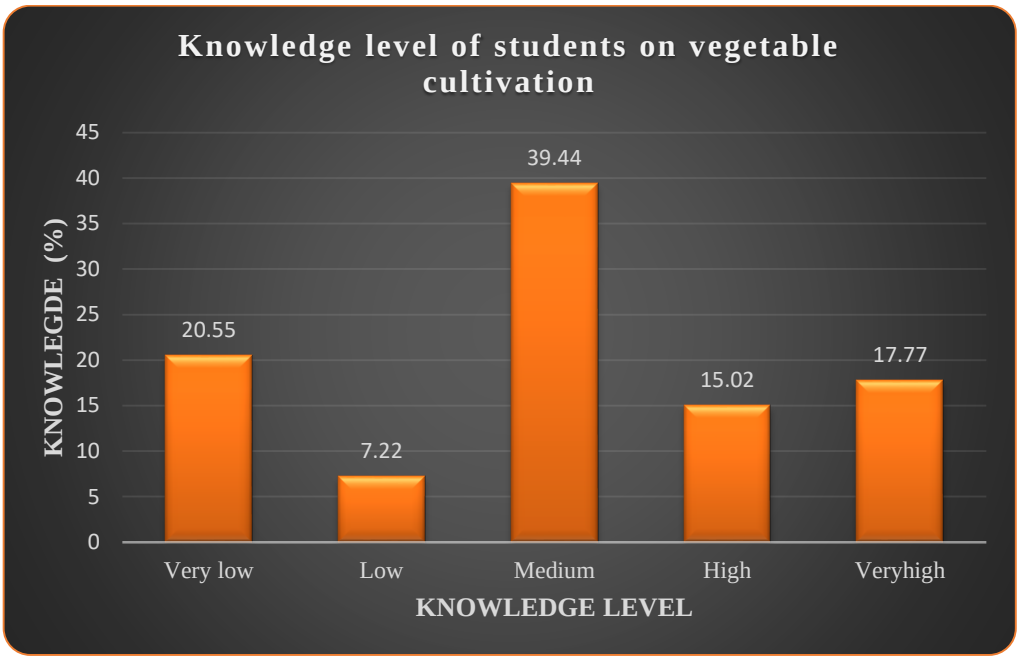

Fig. 4.2 Distribution of students based on their knowledge level

4.4.2 Attitude of students towards managing and maintaining school vegetable garden

The attitude of school students was one of the dependent variables of the study.

The students were categorized based on different mean value of total attitude score as the check and the results are given in Table 4.6.

Table 4.6. Distribution of students based on their attitude towards managing and maintaining school vegetable garden

Category	Attitude Score	Students(N=180)	
		Frequency	Percentage
High	>47	25	14.00
Medium	35-47	114	63.00
Low	<35	41	23.00
Mean	41.63		

SD	5.85	
SE	0.43	

It is evident from Table 4.6 that 14 per cent students had possessed high attitude towards gardening and majority (63 %) of the students belonged to medium category. This might be due to the active involvement of students in school vegetable garden activities. Only 23 per cent students fell in the low category.

The result was in conformity with the findings of the study on the effect of hands on teaching involving vegetable and fruit cultivation on attitude and behavior by Lineberger and Zajicek (2000).

Similar results were obtained by Childs's (2011) study on impact of school garden on attitude and belief of students.

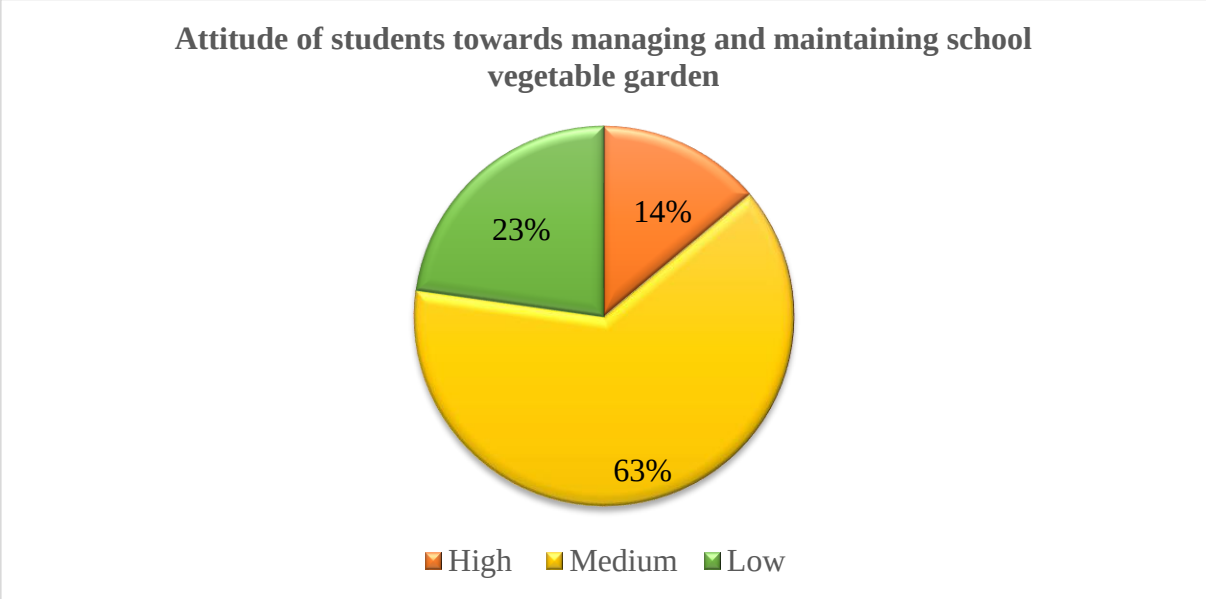

Fig. 4.3 Distribution of students based on their attitude

4.4.3 Knowledge level and attitude of students on vegetable cultivation and its association with personal and socio-economic characteristics

Table 4.7. Correlation of knowledge and attitude with personal and socio-economic characteristics

Sl. No.	Variables	Correlation coefficient	
		Knowledge	Attitude
1	Age	0.156*	0.146*
2	Class of study	0.197**	0.124
3	Social orientation	0.187*	0.209**
4	Extent of volunteering	0.167*	0.089
5	Participation in extracurricular activities	0.985**	0.330**
6	Level of eagerness	0.111	0.057
7	Mass media exposure	0.051	0.062
8	Achievement Motivation	0.043	0.206*
9	Information source utilization	0.018	0.078
*Correlation is significant at the 0.05 level			
**Correlation is significant at the 0.01 level			

The relationship between knowledge and socio-economic and personal characteristics of the students was studied using spearman's rank correlation coefficient. The results showed that 'class of study' (0.197) and participation in

extracurricular activities (0.985) had positive correlation at 0.01 level of significance whereas age (0.156), social orientation (0.187) and extent of volunteering (0.167) were positively significant at 0.05 level. Further, the relationship between attitude and the above characteristics of students was studied and the results showed that social orientation (0.209) and participation in extracurricular activities (0.330) had significant positive correlation at 0.01 level while age (0.146) and achievement motivation (0.206) showed a positive correlation at 0.05 level of significance.

Active participation by same age group students in extracurricular activities might have developed a positive attitude in learning and in-turn contributed to their knowledge.

Cammack *et al.* (2002) found a significant improvement in the horticultural knowledge of participants after the 16-week community-based horticultural programme for juvenile offenders.

The study by Graham *et al.* (2005) revealed that most of the principals perceived school gardens as "moderately" to "very effective" at enhancing science achievement (69%). Principals strongly believed that teaching materials and other resources were needed to increase school garden use.

4.5 Perception on the effectiveness of school vegetable garden

4.5.1 Effectiveness of school vegetable garden as perceived by the teachers and extension personnel

Table 4.8. Effectiveness of school vegetable garden as perceived by teachers

Sl. No.	Parameter	Teachers (N=6)	
		Perception index	Rank
1	Selection of crop and season	67.67	6
2	Supply of agricultural inputs	81.48	5

3	Performance of intercultural operations	53.70	7
4	Participation and involvement of students	83.33	4
5	Socio-economic aspects	48.15	8
6	Institutional aspects	35.19	9
7	Knowledge aspects	88.89	3
8	Development of life skills	96.30	2
9	Improvement in environment stewardship	98.14	1
Overall perception index		72.22	

Table 4.9. Effectiveness of school vegetable garden as perceived by extension personnel

Sl. No.	Parameter	Extension officer (N=18)	
		Perception index	Rank
1	Selection of crop and season	76.62	4
2	Supply of agricultural inputs	79.22	2
3	Performance of intercultural operations	40.26	5
4	Participation and involvement of students	77.92	6
5	Socio-economic aspects	68.83	8
6	Institutional aspects	57.14	7
7	Knowledge aspects	71.43	3
8	Improvement in environment stewardship	93.51	1
Overall perception index		70.61	

4.5.2 Effectiveness of school vegetable garden as perceived by the student respondents

Table 4.10. Effectiveness of school vegetable garden as perceived by student respondents (N=180)

Sl. No.	Parameter	Perception index	Rank
1	Development of life skills	90.11	1
2	Performance of intercultural operations	85.03	2
3	Knowledge aspects	84.97	3
4	Participation and involvement of students	83.25	4
5	Improvement in environment stewardship	82.22	5
6	Selection of crop and season	71.54	6
7	Supply of agricultural inputs	54.92	7
Overall perception index		78.86	

From tables 4.8, 4.9, and 4.10 it can be seen that improvement in environmental stewardship had the highest index among teachers and extension personnel while the development of life skills had a higher index in the perception of students. The supply of agricultural inputs was the least perceived parameter by the students while institutional aspects and socio-economic aspects were perceived as the least by the teachers and extension personnel. Gardening provides unique opportunities, for interaction among students, teachers, parents, and community volunteers. A garden is an environment in miniature, and to be successful one must work in sympathy with nature. The garden programme will influence students to ask questions, share thoughts, and work cooperatively towards a common goal.

Skelly and Bradley (2000) found that most of the teachers were using gardening for environmental education (97.1%) and for experiential learning (42%) and

concluded gardening as a way that can enhance students' learning ability (84.3%). The present study results are in line with the findings of Skelly and Bradley.

A school vegetable garden is a powerful tool for environmental education. The gardening activities helps students to become responsible caretakers of natural ecosystem. The students will get an opportunity to explore the agricultural practices on a small scale, learning about the responsibilities and impacts of cultivation. They will learn the web of interactions among living and nonliving components of life that are important in a garden. By doing so, they develop a greater understanding of the natural world (Lohr *et al.,* 2005).

Similar result was obtained by Robinson and Zajicek (2005) while studying on a one-year school garden program on six among elementary school children, it was found that gardening will improve life skills, including working with groups and self-understanding of the students.

Similar finding was resulted from a study on evaluation of impacts of school-based extension garden programs from a child's perspective by Rodriguez *et al*. (2015) and it reveals that the students were having greater technical knowledge from their participation and appreciated spending time outside. They perceived gardening as a source of income and pride and could provide safer vegetables. Participants could also get an idea on the health benefits of vegetables and some of them had tried new vegetables.

4.6 Comparison of schools on attitude, knowledge level and perceived effectiveness

Table 4.11. Group variability among students (Kruskal - Wallis test)

Variables	VIMHSS PALLASHANA	GUPS CHATHAMANGALAM	GHSS MUTHALAMADA	DMUPS ELEVANCHERY	DMUPS ELEVANCHERY	AMMUPS VADAVANNUR	H Value
Knowledge	53.60 (5)	87.52 (4)	117.03 (3)	31.60 (6)	131.77 (1)	121.48 (2)	92.32**
Attitude	53.88 (6)	88.68 (4)	112.67 (2)	92.03 (3)	116.05 (1)	79.68 (5)	29.16**
Perceived effectiveness	84.72 (5)	100.1 (1)	94.07 (2)	90.4 (4)	93.98 (3)	79.73 (6)	3.01

Kruskal Wallis H test was performed to analyse if there was any significant difference between the students of six selected schools with reference to their knowledge, attitude and perceived effectiveness. From table 11, the results indicate that there was a significant difference in their knowledge and attitude at 1 per cent level with H values 92.32 and 29.16 respectively. While there was no significant difference with regard to their perception on effectiveness of school vegetable garden programme. It may be due to the fact that the scheme was implemented based on the given guidelines and procedure.

4.7 Perceived benefits of school vegetable garden as given by parents of student respondents

Table 4.12. Perceived benefits of school vegetable garden as given by parents (N=30)

Sl. No.	Parameters	Score	Rank
1	Improvement in food habits	85	4
2	Active hands-on experience in vegetable cultivation	84	5
3	Improvement in knowledge on vegetables	83	7
4	Development of positive attitude towards learning	84	5
5	Improvement in academic achievement	86	3
6	Development of landscaping and design skills	79	9
7	Improvement in environmental stewardship	90	1
8	Progress in social relationships	80	8
9	Recreation and enjoyment opportunities	76	10
10	Interest in transferring skills and messages learned from school garden back to their homes	76	10
11	Personal development	88	2

The most important benefits perceived by parents by the involvement of their children in the vegetable gardens were the improvement in environmental stewardship, personal development and improvement in academic achievement. The parents also felt that school vegetable garden programme could influence in food habits and it was an active hands-on experience in vegetable cultivation.

Parents felt that the school vegetable garden program would have influenced their children in an effective manner by developing environmental awareness and affection towards nature. The routine garden activities will make the children capable of doing work in an organized manner.

The garden activities may develop the child's personal as well as academic achievements by involving different activities and improving personal qualities. The parents have felt that the dietary intake of students as influenced by their involvement in the garden and it would help them to safe to eat foods.

Ratcliffe *et. al*. (2011) found that school gardens had an impact on children's knowledge and positive attitudes on vegetables and its consumption. Smith and Motsenbocker (2015) observed that there were improved science test scores as a result of engaging in school garden programs.

4.8 Profile of selected school vegetable gardens

The profile of the school vegetable garden includes the school wise activities in detail with respect to the selected schools. Type of school, project cost for the programme, name of the club, number of student members and age group of members are tabulated in the table below.

Table 4.13. Profile of the school vegetable garden (N=6)

Profile	AMMUPS Vadavannur	DMUPS Elavanchery	GHSS Muthalamada	GBUPS Ethanur	VIMHSS Pallassana	GUPS Chathamangalam
Type of school	Aided	Aided	Govt.	Govt.	Govt.	Govt.
Project Cost	4000	4000	4000	4000	4000	4000
Name of clubs	Newton club	Seed club	Nature club	Nature club	Nature club	Agri club
No. of student members	30	30	30	30	50	30
Age group of members	11-13	12-13	13-16	12-14	12-13	12-13

It is clear from Table 4.13 that four out of six were government schools and the remaining two were government aided. The project cost for the implementation of the program was given through krishi bhavan under vegetable development scheme of Department of Agriculture Development and Farmer's Welfare of Kerala, and the amount was of Rs.4000. Each of these schools had given different names for their clubs namely newton club, seed club, nature club, and agri club. Five schools (83.33 %) had a minimum of 30 members in these clubs whereas remaining one school was having 50 members. The age of group members varied from 11 to 16 years.

4.8.1 Types of garden at schools

Gardening can be more than just planting flowers. Several different types of gardens can be created based upon the interest like ornamental garden, kitchen garden, fruit or vegetable garden, mixed crop garden, theme based garden and more. The type of garden adopted by each schools were identified and were noted.

All the schools were maintaining a mixed crop vegetable garden. It gives the advantage of raising different crop simultaneously on the same piece of land without proper row arrangement. It also gives a variety of vegetable for consumption as well as students can understand the biology of these vegetables. All these vegetables produced in the schools were used for the midday meal scheme in the respective schools. The most common garden types reported by Skelly and Bradley (2000) were flower (84.3%) and vegetable (71.4%) in their study on the importance of school gardens as perceived by Florida elementary school teachers. The results match with the findings of works done by Pothukuchi (2004) and Dilip (2017).

4.8.2 Area/number of grow bags under the school vegetable garden

The area under the school vegetable garden can be operationally defined as the actual area used by each of the school for the school vegetable garden program and it was measured in cents. The grow bag is a polybag containing potting mixture used for growing plants, each bag can be used to raise a plant.

Out of six, two schools, GUPS Chathamangalam and AMMUPS Vadavannur was practicing vegetable cultivation along with 25 grow bags and remaining four schools were using 50 grow bags. This indicates that all the schools were very much interested in doing vegetable garden activities even in the absence of available land by making use of grow bags.

4.8.3 Irrigation

Irrigation sources were operationally defined for this study as the source of water used by the schools for irrigating the school vegetable garden.

It was observed that four (66.66 %) schools were depending on public water distribution network from panchayath and municipality and the remaining two (33.33 %) schools were depending on wells maintained at their schools. Five schools were using hose while students from one school were collecting water from the tap with buckets and rose can for irrigating the crops. The results reflect that the majority of the schools used hose method of irrigation but the more efficient one was drip irrigation method. It was felt that educating the students and teachers regarding the water use efficiency and effective utilization of available water without wastage is also important. It was revealed that daily irrigation was followed in five schools while only one school was practicing thrice a week.

4.8.4 Type of soil

It was observed that the prevailing soil type of the area of all selected schools were laterite. As per the report of Department of Agriculture Development and Farmer's Welfare of Kerala, the major soil prevalent in Palakkad district is Alluvial and Laterite and the major soil in chitter taluk is also laterite. The selected schools are situated in Chittur taluk and the reports and results indicate the same.

4.8.5 Crops grown in school vegetable garden

The details of crops cultivated at the selected schools were documented and tabulated in terms of frequency and percentage.

Table 4.14. Crops cultivated in the school vegetable garden (N=6)

Sl. No.	Crop	Frequency	Percentage
1	Chilly	6	100
2	Amaranthus	6	100
3	Brinjal	5	83.33
4	Tomato	5	83.33
5	Cauliflower	3	50
6	Cabbage	3	50
7	Cowpea	2	33.33
8	Okra	1	16.66

From Table 4.14, it could be observed that 8 different vegetables were cultivated. All schools had cultivated chilly and amaranthus (100 %) while five schools had cultivated brinjal and tomato (83.33 %). Cauliflower and cabbage were cultivated by three schools while cowpea and okra were cultivated by two and one school respectively. From this, it could be inferred that the most preferred vegetable crops for school garden might be based on easiness to grow and manage with less physical work. It is also important to note that these schools were growing cool season crops in their garden, which might have helped the students to know the biology and growth stages of these vegetables. The results were in line with the findings of the work done by Dilip (2017).

4.8.6 Fencing

A fence is a barrier or upright structure typically of bamboo, wire or mesh net used to enclose an area of land to separate, protect and control access to the land. In schools, the garden area is fenced to separate and protect from external disturbance. The type of fencing used by each school was observed.

Four schools had protective fencing out of which two each were using wire fence and mesh netting. The other two schools were not going for any fencing at all. This might be due to the practicing of grow bag cultivation. The results were in line with the findings of Dilip (2017) that seven out of 10 schools were using fencing for protecting the garden, of which five were made using brick walls and two were protected using a combination of live and mesh netting.

Baraun *et al.* (1989) reflected that most of the schools were using brick walls for protecting the school resource.

4.8.7 Availability of planting material for school vegetable garden

Planting material is the plant part used for raising a young plant. The selected schools had received planting materials like seeds and seedlings of vegetables from Krishi Bhavan.

4.8.8 Plant protection

Plant protection is used to protect the plants from pest and disease. Botanicals were used for plant protection by all the six selected schools.

Plant protection measures are used to protect the plants from pest and disease. In this study, the teacher respondents were asked to identify the plant protectants used in schools for protecting the vegetables from pest and diseases.

The all the teachers from each school responded that they are using botanicals for plant protection and their application is by manual means.

4.8.9 Weeding

Weeding is the act of removing unwanted plants from the crop field. All the six selected schools were practicing manual weeding and was easier in the case of grow bags.

4.8.10 Consumption of produce

Consumption of produce in this study indicates the consumption of vegetables produced in the school vegetable garden. All the six selected schools were using vegetables in their mid-day meal scheme. The students were happy in consuming the vegetables that they had grown.

4.8.11 Training

Training is teaching or developing capabilities in oneself or others, any skills, and knowledge related to the vegetable garden. It was revealed that only two schools received formal trainings. They had received training from Department of Agriculture and Farmer's welfare and Kerala Agricultural University.

Regarding training needs all the teachers were of the opinion of getting trained in different areas. It is learnt that all the teachers involving school vegetable garden needs training from experts. Therefore, it can be inferred that if the teachers receive appropriate training then it will be more easy for students to get proper information and directions from them for doing all the activities involved in managing and maintaining the vegetable garden.

Table 4.15. Distribution of teachers based on their training need of different activities

Sl. No	Training need	Teachers (N=6)		Rank
		Score	Percentage	
1	Crop Production	16	88.88	1
2	Plant Protection	14	77.77	2
3	Processing technology	12	66.66	3
4	Marketing activities	8	44.44	4

From table 4.15, it was found that the majority (88.88 %) of the teachers need training on production aspect followed by 77.77 per cent on crop protection and 66.66 per cent on post-harvest technology. Training in marketing activities was wanted by only 44.44 per cent. The teacher's response indicates that for maintaining a vegetable garden in school they need training in areas of production and crop protection, the basic needs for growing vegetables. Only after knowing the basic need they can apply the technologies. Since the vegetables produced in the gardens were used for mid-day meal scheme they were not concerned about the marketing aspects.

The result confirms the findings of works done by Dilip (2017).

4.9 Vegetable cultivation by students at their home

The different activities undertaken by the students for managing and maintaining a vegetable garden at their homes were studied.

4.9.1 Garden type

Garden is the piece of land adjoining to the house, in which flowers, fruits, grass, and vegetables are grown. Different types namely ornamental, kitchen, nutritional, indoor and terrace gardens were maintained by the students at their home. The different types of garden maintained by individual student at his or her home were noted.

Table 4.16. Type of gardens maintained by students at their home

Category	Students (N=180)	
	Frequency	**Percentage**
Any one type of garden from the following: Ornamental /Kitchen/Indoor/Terrace	111	61.66
More than one of above	69	38.34

Table 4.17. Distribution of types garden maintained by students at their home (N=180)

Garden type	Frequency
Ornamental	86
Kitchen	114
Indoor	22
Terrace	27

From the above table it is clear that all the students were maintaining either one or two types of garden at their home and majority used to nurture kitchen and ornamental gardens. From table 4.16, it could be observed that majority (61.66 %) were having one type of garden whereas 38. 33 per cent having more than one of the listed gardens.

4.9.2 Vegetable crops cultivated at home by students

The responses of students regarding the vegetable crops raised and maintained at their home were collected and tabulated.

Table 4.18. Vegetables cultivated at home

	(Students N=180)		
Crop	**Frequency**	**Percentage**	**Rank**
Okra	82	45.56	5
Chilly	151	84.44	1
Brinjal	126	70	3
Tomato	152	41.67	6
Pumpkin	54	30	9
Bittergourd	64	35.56	7
Amaranthus	117	65	4

Cucumber	53	29.44	10
Ashgourd	25	13.89	11
Yam	75	31.67	8
Vegetable cowpea	57	83.89	2

It can be seen from Table 4.18, that majority of the students were growing chilly (84.44 %), vegetable cowpea (83.89 %), brinjal (70 %), followed by amaranthus (65 %) at their home gardens. They were also cultivating okra (45.56 %), yam (31.67 %), pumpkin (30 %) and cucumber (29.44 %) in their gardens.

The results indicate that the major crops raised by students at their home gardens were solanaceous crops namely tomato, chilly and brinjal. It may be due to the easiness to maintain.

4.9.3 Source of planting material

All the students were obtaining planting material from krishi bhavan and few students were receiving it from other sources namely neighbours, friends and relatives.

4.9.4 Nutrient management

Fertilizer was used to promote the growth and yield of a plant by supplementing appropriate nutrient on frequent intervals. The student respondents were asked about the usage of chemical fertilizers or organic manures at their home. It was found that only 12.23 per cent of the students' families were using chemical fertilizer. Majority were applying organic manures only

Organic manures were used by all the students at their home gardens for raising vegetable crops.

4.9.5 Weeding

Manual weeding was practiced by students for maintaining home garden.

4.9.6 Method of irrigation

The methods used by the students for irrigating the vegetable gardens at their home were studied. Majority (80 %) of the students revealed that manual irrigation was practiced while the remaining members were using hose for the purpose.

4.9.7 Harvesting

All the students were practicing manual harvesting. They used to pluck the matured vegetables from regularly.

4.10 Career aspirations of students as influenced by the involvement in school agriculture or nature clubs

The career aspiration intended to explore the ambitions of students involved in the school vegetable garden.

Students were asked to note down their career choice after completing their matriculation studies. The responses are tabulated individually for higher studies preferably plus two, degree, diploma and professional degree.

Table 4.19. Distribution of students based on their preference to higher secondary education (N=180)

Sl. No.	Plus two	Frequency	Percentage
1	VHSE Agriculture	21	12
2	VHSE Computer Science	34	19
3	HSE Biology science	79	44
4	HSE Commerce	42	23
5	HSE Humanities	4	2

It was found that for higher secondary studies 44 per cent of the students were interested in biological science followed by HSE Commerce (23 %), VHSE Computer

Science (19%) and VHSE Agriculture (12%). Only 2 per cent students preferred HSE Humanities.

Table 4.20. Distribution of students based on their preference to higher education (Diploma/ Traditional Degree/professional degree course) (N=180)

Sl. No.	Name of the course	Frequency	Percentage
Traditional Degree Course			
1	Science	38	21
2	Social science	10	6
3	Arts and literature	36	20
Diploma Course			
1	Engineering	32	18
Professional degree course			
1	B Tech	17	9
2	B.Sc (Agriculture)	42	23
3	MBBS	5	3

It was found that 18 per cent expressed their interest in the field of engineering. In the cases of degree and professional degree, 21 per cent expressed interest in science degree and 23 per cent in agriculture professional degree. The students also showed interest in other fields even though majority expressed the above-mentioned areas.

Hence it can be concluded that the students involved in the school vegetable garden will have a tendency to go for a career which needs science background. Waliczek and Zajicek (1999) findings is that children's outdoor experiences are important in the long-term development of children because they impact career choices and conservation efforts, it matches with the above results.

4.11 Impact on food consumption pattern among students

4.11.1 Dietary habits of the students

The students were asked to mention their dietary habit; vegetarian or non-vegetarian. It was observed that majority of the students (92.78 %) followed a non-vegetarian diet. It was found out that all the students were following three meals per day.

The study on the behavioural profile of a school-based population in Minnesota by Neumark-sztainer *et al.* (1997) revealed that 66.67 percent of their sample was non-vegetarians and only 33.33 per cent was vegetarians. A similar trend was observed in the report of Kerala Statistical Institute (2001) and the study conducted by Kumar *et al.* (2013).

4.11.2 Perceived changes in preference in food consumption among students

The perceived changes in preferences in food consumption among the students involved in the school vegetable garden were analysed using seven parameters.

Table 4.21. Perceived changes in preference of food consumption among students (N=180)

Sl. No.	Parameter	Score	Rank
1	Positive changes in preferences and willingness to taste vegetables	808	3
2	Increase in quantity of vegetables consumption	780	6
3	Increase in variety of vegetable consumption	770	7
4	Decrease in fast food consumption	788	5
5	Preference for healthy foods	804	4
6	Preference towards vegetables produced by self	825	2
7	Preference for leafy vegetables	849	1

From Table 4.21, it can be observed that students had expressed a greater preference for leafy vegetables after involvement in school vegetable garden. Not only the preference for leafy vegetables but also the preference for the vegetables raised by themselves was higher. The students had strongly perceived a positive change in the willingness to taste vegetables. They had also developed moderate level of preference for healthy food and drop in fast food consumption. Preference for increased quantity of vegetable consumption and interest towards more number of varieties scored low compared to other parameters. The increased preference may be due to the availability of fresh leafy vegetables and affinity towards crops grown at their homesteads.

Heim *et al.* (2009) while studying on the garden pilot project concluded that the project remarkably enhanced the food consumption and preferences among the children. He pointed out that there was a significant increase in interest among children for the fruits and vegetables.

Table 4.22. Distribution of students based on perceived changes in preference in food consumption (N=180)

Category	**Frequency**	**Index**	
High	24	>33	
Medium	137	29-33	
Low	19	<29	
Mean	31.30	SD	2.16

The perceived changes were classified into high, medium and low. From Table 4.22, it is evident that the majority of the students fall in medium category followed by high and low. The results draw the conclusion that, the students involved in school vegetable garden expressed a positive change in their perception towards consumption of vegetables. The results give the wholesome idea of a positive change in their preference towards consumption especially leafy vegetables. A remarkable change can

happen if the school vegetable garden programmes are continuously implemented and students are ready to follow the cultivation practices at their homesteads.

4.11.3 Food consumption of students

The students were asked to mention the different kinds of foods they usually consume and the frequency followed. The results are tabulated and presented in Table 4.23.

Table 4.23. Distribution of students based on their food consumption (N=180)

	Frequency percentage								
Category	**Daily**	**Weekly Thrice**	**Weekly Twice**	**Weekly once**	**Monthly once**	**Occasionally**	**Rarely**	**Never**	**Total Percentage**
Cereals	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Vegetables	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Fat and oil	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Pulses	43.89	19.44	15.56	13.33	6.11	1.67	0.00	0.00	100.00
Fruits	2.78	36.67	41.11	10.00	0.00	9.44	0.00	0.00	100.00
Egg	16.67	7.22	63.33	5.56	0.00	0.00	0.00	7.22	100.00
Milk	42.22	7.78	15.56	8.33	2.22	0.00	23.89	0.00	100.00
Fish	9.44	15.56	11.11	24.44	10.00	5.56	14.40	9.49	100.00
Meat	0.00	7.22	3.33	44.44	8.89	11.67	16.04	8.40	100.00
Tropical tubers (yam, colocasia& coleus)	10.00	12.22	6.11	8.33	5.56	11.67	46.11	00.00	100.00

The above table depicts the food consumption pattern at different frequency levels. It can be observed that all the students used to have some kind of cereal, pulses, vegetables, fruits and fat or oil-based foods. Tropical tubers were the least consumed among all the food choices. The frequency of consumption of other items varied at different intervals.

Rice followed by wheat were the main cereals used in their daily diet. It was observed that 43.89 per cent students consumed pulses on a daily basis whereas 1.67 per cent take pulses occasionally. Majority of the students (41%) included fruits only weekly twice. Egg was also included only weekly twice by majority (63.33%) of the students. Daily consumption of milk was followed only by 42.22 per cent of students.

The study on impact of school based kitchen programme by Gibbs *et al.* (2013) had revealed that transfer of impacts to the home environment influenced the children's food experiences. The results are also in line with the findings of Vibha and Sibal (2003).

4.11.4 Vegetable consumption of students involved in school vegetable garden

The frequency of consumption of various vegetables by the students was analyzed. For each vegetable per cent was calculated separately. Based on the per cent of consumption by the students, vegetables were classified as most preferred (85 above percentage score) medium preferred (70-85 percentage score) and less preferred (below 70 percentage score).

Table 4.24. Vegetables consumed by students based on percentage (N=180)

Particulars	Most preferred (above 85 per cent)	Medium preferred (70 – 85 per cent)	Less preferred (Below 70 per cent)
Vegetables consumed	Potato	Beans	Drumstick
	Vegetable cowpea	Beetroot	Breadfruit
	Amaranthus	Cauliflower	Yam
	Okra		Colocasia
	Plantain		
	Carrot		
	Papaya		
	Solanaceous		
	Cabbage		
	Onion		
	Peas		
	Coriander		
	Cucurbits		
	Curry leaves		

From the above table 4.24, it is clear that majority of the students prefer solanaceous vegetable along with curry leaves and coriander leaves which are the common ingredients in most of the culinary preparations.

The consumption of different vegetables by the students are depicted in the following graph.

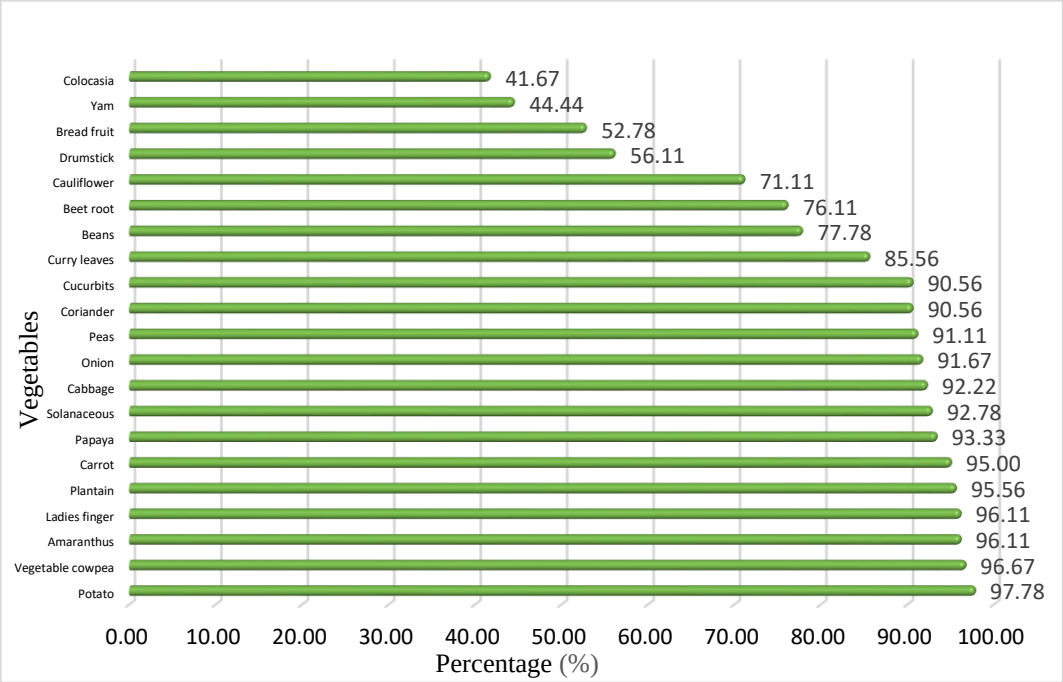

Fig 4.4 Distribution of vegetable consumption of students

NB: After involving SVG change in vegetable consumption of students
*Amaranthus -- 0.55 %
*Solanaceous – 2.22 %

The results indicate that most consumed vegetable is potato (97.78 %) and the least consumed is colocasia (41.67 %). Not much significant change in consumption was observed among students after involving in school vegetable garden. Only in case of amaranths (0.55 %) and solanaceous vegetables (2.22%) changes were observed.

The results of the study by Miguel and Ivanovic (2010) about a short-term school vegetable gardens program focused on preschoolers and their mothers from Sao Paulo, Brazil showed that there was an increase in number of daily meals and the frequency with which they consume vegetables, as well as the number of vegetables they consumed.

4.12 Constraints faced by the Institution and students while undertaking school vegetable garden

Table 4.25. Constraints experienced by the students in establishing, managing and maintaining the school vegetable garden

Sl. No.	Constraint	Students (N=180)		Teachers (N=6)	Extension personnel (N=18)		
		Mean Rank	Rank order	Mean Rank	Rank order	Mean Rank	Rank order
1	Inadequate irrigation facility	8.06	7	6.67	9	8.64	6
2	Scarcity of land for cultivation	8.92	4	11.00	3	13.58	1
3	High input cost	8.80	3	11.67	1	12.08	3
4	Inadequate fund	7.42	11	10.67	4	10.53	4
5	Low level of student's interest	8.13	6	5.17	15	5.69	10
6	Poor knowledge about gardening	8.47	7	7.67	8	8.19	8
7	Poor storage facility	7.50	9	6.67	9	7.53	9
8	Less involvement of teachers	6.16	15	5.08	13	4.64	12
9	Difficulty in obtaining implements	8.29	5	8.92	6	8.86	7
10	Difficulty in allotting sufficient time for garden activities	9.35	1	8.33	6	10.39	5
11	Crop damage by wild animals	7.37	12	5.50	11	4.06	15
12	Inadequate training/ extension service	7.89	10	9.67	5	4.86	11
13	Negative attitude towards physical work	7.28	13	4.92	13	3.78	13

14	Theft of vegetables from school	7.00	14	6.33	12	4.17	13
15	Maintenance problems during vacation	9.34	2	11.75	1	13.00	2
	Kendall's W[a]	0.06		0.381		0.633	
	Chi-Square	150.681		32.007		159.528	
	df	14		14		14	
	Asymp. Sig.	0.000		0.004		0.000	

It is evident from Table 4.25, that the major constraints experienced by the students in practicing school vegetable garden were difficulty in allotting sufficient time for gardening followed by maintenance problems during vacation, high input cost, scarcity of land for cultivation, difficulty in obtaining implements and so on.

As there was no predefined time in the academic curriculum for garden activities, students had to find extra time and this might be the reason for perceiving time factor as the most important constraint.

Scarcity of land was another main constraint. Once the land is available they can easily go for continuous and effective gardening activities. Grow bag cultivation for overcoming these limitations should be appreciated. The availability of implements can either be increased by means of raising funds and purchasing implements through the garden clubs or by hiring from custom hiring centers.

It was also noted that the constraints such as less involvement of teachers, theft of vegetables from the school during vacation and negative attitude towards physical work were of least importance. It can be inferred that the teachers were actively directing students in all the garden activities and the members in the garden clubs were interested in doing physical works.

Whereas teachers' responses also revealed that high input cost and maintenance problems during vacations were the major constraints and lack of students' interest, less involvement of teachers and negative attitude towards physical work were not perceived as important constraints.

According to Graham *et al*. (2004) the teacher in charge and principal are major variables contributing to the success of school-garden. Major issues among teachers could be lack of capabilities and knowledge in the field of agriculture and time constraints.

Extension personnel perceived scarcity for land and difficulty in maintenance during vacation as major constraints. The least important constraints perceived were the crop damage by wild animals and negative attitude towards physical work and theft of vegetables from school.

In Las Vegas, sequential surveys of principals in gardening and non-gardening schools regarding potential problems and barriers to school gardening led to the hiring of a community-based instructor to provide training and coordinate the gardening program and the volunteer master gardeners (O'Callaghan, 2005).

These observations are in line with the findings of the works of Ozer (2006), FAO (2010), Huys *et al.* (2017) and Dilp and Thomas (2017).

Good quality inputs at the required time and amount' should be made available at school for the un-interrupted and successful conduct of the program. 'An alternative arrangement for garden maintenance during summer vacations' was another felt requirement by both students and teachers. The school council should consider an alternative arrangement to engage labour and supervisory team during vacations so that the crops in field are not affected. Also, a mechanism to provide incentives for teachers and students who come, attend and manage school vegetable garden during vacation period could be developed.

Summary

CHAPTER V
SUMMARY AND CONCLUSION

A school garden is an innovative teaching tool and strategy that lets educators incorporate hands-on activities in a diversity of interdisciplinary, standards-based lessons. The garden engages students by providing a dynamic environment in which to observe, discover, experiment, nurture, and learn. It is a living laboratory where lessons are drawn from real-life experiences rather than textbook examples, allowing students to become active participants in the learning process. Through the garden, students gain an understanding of ecosystems, an appreciation for food source and nutrition, and knowledge of plant life cycles. At the same time, they learn practical horticultural skills that last a lifetime.

The school garden movement originated in Europe and arrived in the United States in the 1890s. Gardens sprang up at schools all over the country during the early 20th century, with particular booms as Victory Gardens intended to increase the food supply during World War I and World War II. During the 1950s, the number of gardens decreased as schools placed more emphasis on technology. However, the environmental movement of the 1970s renewed educators' interest. More recently, the popularity of school gardens as an educational tool has steadily grown as a way to teach healthy eating behaviors and a way to incorporate and increase hands-on learning experiences in interdisciplinary lessons. In Kerala the school vegetable garden programmes are implemented by state Agriculture and Farmers Welfare Department as a component of vegetable development programme. The programme aims to mobilize the student community into the field of agriculture, make them aware of safe to eat food production and to bring uncultivable lands in the government and private institutions under vegetable cultivation.

Keeping this in mind the present study titled **"Performance analysis of school vegetable gardens in Palakkad district"** has been conducted with the following

objectives.

- To explore the effectiveness of school vegetable garden as perceived by the students, school authorities and extension personnel
- To assess knowledge level and attitude of students on vegetable cultivation and its association between personal and socio-economic characteristics
- To analyse the career aspirations of students as influenced by the involvement in school agriculture or nature clubs
- To study the impact of the school vegetable garden on the food consumption pattern of students
- To identify constraints faced by the Institution and students while undertaking school vegetable garden

The study was carried out in Nenmara and Kollengode blocks of Palakkad district. One school each was chosen from the three selected panchayats of each block. The six panchayats were Nenmara, Pallasana, and Elavanchery from Nenmara block and Koduvayur, Muthalamada, and Vadavannur from Kollengode. Two stage random sampling procedure was adopted. The respondents included 30 students and one teacher each from six schools, three extension personnel each from six panchayats and 30 parents and thus making the total sample size to 234.

The independent variables taken for the study included age, gender, class of study, dwelling place, school vegetable garden size, social orientation, extent of volunteering, political orientation, participation in extracurricular activities, level of eagerness, mass media exposure and training whereas knowledge, perception, attitude and food consumption pattern was taken as dependent variables.

5.1 Salient findings

5.1.1 Guidelines for implementation of school vegetable garden by the funding agency

- The selected institutions must have sufficient and suitable land (at least 10 cents) to take up cultivations. A group of 20-25 students headed by a teacher will implement the activity. An assistance of Rs. 4000/- will be given to educational institution including the cost of seeds and towards the expense for taking up cultivation.
- In addition to this, schools which are willing to participate in this program, but do not have 10 cents of cultivable land, may be allowed to take up vegetable cultivation in the available land or in grow-bags, and assistance provided as per norms.
- Institutions will be selected by the Agricultural Officer/Assistant Director of Agriculture taking into account the availability of space and the willingness to take up cultivation.
- Each institution should have a layout plan for the vegetable garden prepared well in advance. Integration of organic pest and disease control measures should be followed. Monitoring will be done by extension personnel.

5.1.2 Profile of agriculture/nature/seed clubs of selected schools

- The selected schools were VIMHSS Pallasana, GUPS Chathamangalam, GHSS Muthalamada, DMUPS Elevanchery, GUPS Ethannur, and AMMUPS Vadavannur.
- Four of these selected schools were government and two were government aided schools. All the schools were having functional school vegetable gardens and which are associated with clubs namely nature, seed, agri and newton. The number of volunteer members in these clubs ranged from 30-50.

- All the clubs were associated with vegetable development programme of department of agriculture development and farmers welfare. The gardens were established using the fund from this programme.
- The age group of member students ranged from 11 to 16 years.

5.1.3 Profile of selected School vegetable gardens

- All the schools were maintaining mixed cropped vegetable garden. The area used for gardening was five cents of land and 25 grow bags where as some schools followed 50 numbers of grow bag alone.
- All these schools were adopting organic practices for growing vegetable in the school vegetable garden. Plant protection by means of manual application of botanicals and management of weed by hand weeding were practised.
- The crops grown in school gardens were Chilli (100 %), Amaranthus (100 %), Brinjal (83.33 %), Tomato (83.33 %), Cauliflower (50 %), Cabbage (50 %), Cowpea (33.33 %), and Okra (16.66 %).
- Four out of the six schools were fenced. The fencing materials used by these schools were mesh and wire nets.
- The students attended garden works daily to thrice a week and the produce from the school vegetable garden were used for mid-day meals.

5.1.4 Profile characteristics of student respondents

- Students belong to the age group between 11 to16 years. There was 46 per cent male and 53 per cent female students with 100% of them hailing from rural background.
- All the students were maintaining garden at their homes. It was also found that 40 percent students had their parents with farming as major occupation.

- All the students were using seeds and seedlings as planting material. Organic manures were used. Weeding and irrigation were practised manually.
- The major vegetables cultivated at home gardens were chilli (84.44 %), vegetable cowpea (83.89 %), brinjal (70 %) and amaranthus (65).

5.1.5 Perception on the effectiveness of school vegetable garden

- Regarding the perception of teachers, it was found that improvement in environmental stewardship and development of life skills got highest index.
- Regarding the perception of extension personnel highest index for environmental stewardship and supply of agricultural inputs were observed.
- The students gave highest index for development of life skills and performance of intercultural operations.

5.1.6 Knowledge level and attitude of students on vegetable cultivation and its association between personal and socio-economic characteristics

- It was found that 17.77 per cent students possessed very high level of knowledge followed by 15.00 per cent of students with a high level of knowledge, 39.44 per cent of students had medium knowledge level, 7.2 per cent student possesses low and 20.5 percent very low-level knowledge.
- The results revealed that 13.88 per cent students possessed high attitude towards gardening and majority (63.33 %) of the students were having a medium attitude as a result of involvement in school vegetable garden activities whereas 22.77 per cent students who had a low level of attitude.

- Kruskal Wallis H test was employed to identify the group variability among schools for knowledge level, attitude and perceived effectiveness. The results indicated significant variation among schools with respect to knowledge and attitude while no remarkable difference was observed for perceived effectiveness.
- The knowledge and attitude towards school vegetable garden were at medium level for majority of the students. Among the personal and socio-economic characteristics studied, participation in extracurricular activities displayed the highest positive correlation with both knowledge and attitude. Age and social orientation had positive correlation with both knowledge and attitude while students' class of study and extent of volunteering were positively correlated with knowledge and achievement motivation with attitude.

5.1.7 Impact of the school vegetable garden on the food consumption pattern of students

- About the perceived changes in preference in food consumption of students it was found that preference towards leafy vegetable got the highest rank. The preference towards vegetable produced by self and positive changes in preferences and willingness to taste vegetables were ranked second and third respectively.
- It was found that all the students used to have some kind of cereal, pulses, vegetable, fruits and fat or oil based foods. Tropical tubers were the least consumed among all the food choices. The frequency of consumption of other items varied at different intervals.
- The frequency of uptake of different vegetables were conducted and it was found that potato, vegetable cowpea and amaranthus were most preferred by the students and least preferred vegetables were colocasia, yam and bread fruit. After the involvement in school vegetable garden

0.55 per cent students expressed an increase in consumption of amaranthus while 2.22 per cent students expressed an increase in consumption of solanaceous vegetables.

5.1.8 Perceived benefits of School vegetable garden as given by parents of student respondents

- The parents perceived that the greatest benefit as improvement in environmental stewardship followed by personal development and improvement in academic achievement.

5.1.9 Constraints faced by the institution and students while undertaking school vegetable garden

- There is a high degree of concordance among students to rank the constraints. The major constraints faced by students were that they did not have ample time to spend for garden and difficulty in maintenance during vacation.
- The major constraints experienced by teachers were inadequate fund and improper maintenance during vacation. The extension officials asserted that major constraints were scarcity of land for cultivation and improper maintenance during vacation.

5.2 Recommendations

- School vegetable garden should be continued for at least three years with adequate financial assistance under the Vegetable Development Scheme for studying sustainability and inculcating a sense of responsibility among students towards environment and ecosystem
- Awareness programme should be organized at school level for popularizing locally gowned crops and healthy food habits
- Syllabus can be modified by including basic agricultural lessons with comprehensive school garden interventions for encouraging students towards agriculture

- A manual for the detailed activities for vegetable garden can be prepared with suitable illustrations.
- Effective training sessions should be conducted to teachers and students at regular intervals
- Alternate arrangement for garden maintenance during summer vacation can be explored with the help of Parent Teacher Association
- For school gardens to be successful, the gardens need to be sustainable and well-managed. An initiative from the government to include few hours per week for vocational learning can be suggested. Multicomponent interventions can be effective in promoting a healthy diet in school children. Collaboration between the ministries of agriculture, education and health is key to the success of a school garden program. Integration of a school garden program in the state curriculum ensures sustainability of the activity.

5.3 Future line of research

- As the study has confined only to Palakkad district, generalisation of the inferences warrant replication of similar studies elsewhere
- Cases of successful school garden initiatives should be studied in detail to find out the factors contributing to success
- The influence of micro-environment of students involved in school gardens can be analysed

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CHAPTER VI

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Appendices

APPENDIX I

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR

Department of Agricultural Extension

Questionnaire for students

PG Thesis: *"Performance analysis of school vegetable gardens in Palakkad district"*

1. Name of Student: ……Class of study……Age…….
2. Gender (Male / Female):…….
3. Parent's Phone number:……..
4. Name of school with full address and contact details: …… ……
   ..……
   ……..
5. Family details:

Name of family members	**Age**	**Occupation**		**Total annual income**
		Primary	**Secondary**	

6. Dwelling place: Rural ☐ Urban ☐ ; Own house ☐ Rent ☐ ;
   If rented, do you have own house Yes ☐ No ☐
7. Distance to school from your home:……..Km.
8. Vehicle facilities: Own four wheeler ☐ Own two wheeler ☐ Auto rickshaw ☐ Bicycle ☐
   School bus ☐ Public transport ☐ By walk ☐ any other mode: ……
9. **Social orientation:**
   How often do you participate in community service or civic affairs related to school:

a) Regular ☐ b) Sometimes ☐ c) Never ☐

How often you have participated in community service or civic affairs related to non-school:

a) Regular ☐ b) Sometimes ☐ c) Never ☐

Familiarity with farming/ gardening

a) Frequently ☐ b) Sometimes ☐ c) Rarely ☐

10. **Extent of volunteering:**

How often do you volunteer for community service work in school?

Daily ☐ Twice a week ☐ Weekly ☐ Once in 15 days ☐ Never ☐

11. Civic engagement/Political orientation:

Have you participated in any politically oriented programmes? Yes No ☐ ☐

If yes, please choose any of the options given; Political campaign ☐ Boycott a product or service ☐

Environment protection campaign ☐ Food security programmes ☐ others: ……

12. **Participation in extra-curricular activities:** (please put a tick mark*)*

Sl. No.	Area of participation	Yes	No
1	Sports		
2	Arts		
3	Literary		
4	NSS/NCC		
5	School club's member: Name of club:		
6	School parliament		
7	Out of school activities: (Religious/cultural/social) Please specify:		

13. Knowledge on crops and cultivation practices

I. Awareness about major crops grown in Kerala (Please tick your option)

Paddy		Coconut		Jack		Pepper		Brinjal	
Banana		Mango		Papaya		Cardamom		Amaranthus	
Chilli		Cashew		Arecanut		Bitter gourd		Pumpkin	

II. Which is the monsoon season beneficial to agriculture in Kerala? Indicate with a tick mark

South West Monsoon		North East Monsoon	

III. Awareness about the basics of production, processing and plant protection aspects of crops

A. Crop characteristics, seeds/planting materials, and varieties

1. What is the planting material for chilly and brinjal?

a) Stem cuttings ( )

b) Root cuttings ( )

c) Seed ( )

2. Is it true that ladyfinger plants could be raised from ladyfinger seeds?.....

B. Land preparation and planting

1. Do you think that panthals could be used for growing pumpkin?.....

2. Is it true that cowpea can be grown in any season?.....

3. Name two crops raised in panthal?.....

4. Name two organic manures?.....

C. Manuring and intercultural operations

1. Do you know the reason for tying stone at the edge of snake gourd?

If yes, state the reason

2. Name two fertilizers used for cultivation:

3. What are the major elements essential for plant growth, name any two:

4. Do you think that weeding is unavoidable for the initial stage of crop establishment?

D. Pest and disease management

1. List any two diseases and pests of the following vegetables

Crop	**Disease**	**Pest**
Brinjal		
Chilly		
Cowpea		
Cucumber		
Amaranthus		

2. Name any predators seen in vegetable gardens

E. Harvesting

1. Is it advisable to apply pesticide before harvesting vegetables?

2. What is the duration of Bhendi crop?

F. Processing-post harvest

1. Whether vegetables are washed before cutting/after cutting?

2. What do you do with the harvested vegetable?

a) Consumption (Raw /Cooked) b) Sale (School/Outside)

3. Name any two vegetables from which pickles can be prepared?

4. Name one vegetable from which sauce can be prepared?

G. Nutritional aspect

1. Which among the following is a rich source of protein?

a) Grains ( )

b) Fruit crops ( )

c) Pulses ( )

d) Vegetables ( )

2. Identify the crop rich in iron?

a) Amaranthus b) Chilly c) Lady's finger d) Cucumber

3. Identify the crop rich in carotene?

a) Pumpkin b) Bitter gourd c) Carrot d) Cabbage

4. Identify the option pertaining to vegetables

a) Carbohydrates b) Protein c) Vitamins

14. Information Source Utilization

Rate the materials to be utilized for establishment and maintenance of school vegetable garden as a part of school curriculum. (Please tick your preferences**)**

Sl. No.	**Knowledge Materials**	A	NA	VE	E	NE
1	Library books					
2	Gardening catalogs /magazines					
3	Experiments					
4	Textbooks					
5	Internet					

A-Available; NA-Not Available; VE-Very Effective; E- Effective; NE-Not Effective

15. **Details of vegetable garden activities at home**

I. Do you have any of these garden in your home? If yes please do specify

a) Ornamental ☐

b) Kitchen ☐

c) Nutritional ☐

d) Indoor ☐

e) Terrace ☐

f) Others if any:

II. Which are the crops maintained in your home? (Please tick your option)

Lady'sfinger		Chilly		Brinjal		Tomato		Pumpkin		Bitter gourd	
Amaranthus		Cucumber		Ash gourd		Yam		Vegetable Cowpea		Others	

III. Vegetable cultivation practices followed

a) Planting material (Please tick your option)

Seed		Stem		Rhizome		Bulb		Tubers	
Others(Please specify):									

b) Fertilizers (Please tick your option)

Chemical		Urea		Potash		All 19		DAP	
Organic		Cow dung		Goat manure		Neem cake		Biofertilizers	

c) Weeding (Please tick your option)

and eeding		Herbicide		Biocontrol agents		Machinery		Others	

d) Irrigation (Please tick your option)

Flooding		Drip		Mist		Sprinkler	
Rose can		Others					

e) Harvesting

Handpicking		Machinery		Fruit drops		Others	

16.Level of motivation :

a) How excited are you to come to school every day?

Very excited ☐ Moderate ☐ Not excited ☐

b) Are you really excited to come to school for participating in vegetable garden activities?

Yes ☐ No ☐

c) How excited are you to participate in school vegetable garden activities?

Very excited ☐ Moderate ☐ Not excited ☐

d) Frequency of your participation in garden activities:

Daily ☐ Twice a week ☐ Thrice a week ☐ Weekly ☐

17.Level of eagerness

Sl.No.	**Statement**	**VR**	**R**	LR
1.	I will always want to be physically active			
2.	I am always happy when doing physcially involved in garden			
3.	I don't know; what this activity brings me			
4.	There may be good reason to do this, but personally i don't experience any			
5.	I do this activity, but i am not sure it is a good thing to pursue it			

18. The attitude of school students towards the vegetable garden

Please tick only one answer for each question

Sl. No.	**Attitude statements**	**SA**	**A**	**NA/ND**	**D**	**SD**
1.	Involving myself in school vegetable gardening activities helps to improve my self-esteem and positive attitudes					
2.	My participation in SVG activities helps to improve my awareness on nature/environment					
3.	My science achievement scores have increased significantly after joining the SVG activities					
4.	School garden activities helped to increase my sense of					

	responsibility					
5.	I believe that SVG activities should be included as a part of the curriculum					
6.	My interest in growing vegetable garden will increase if it turns successful					
7.	I believe that increased spending on agricultural activities in school is a waste of time and money					
8.	I am afraid that I will score low marks by being involved in school garden activities					
9.	I prefer not to maintain a garden because it involves hard work					
10.	I prefer not to get involved in SVG activities, because I get dirty					

SA-Strongly Agree; A-Agree; NA/ND-Neither agree nor disagree; D-Disagree; SD-Strongly Disagree

19.Mass media exposure

Items	**Regular**	**Occasionally**	**Never**
1. Newspaper			
2. Television			
3. Magazines			
4. Radio			
5. Mobile advisory service			

20.Perception on the effectiveness of school vegetable garden by students

Statements	**3**	**2**	**1**
1. Development of life skills a. Selection of crop was suitable to the area b. Season selected for vegetable cultivation was appropriate c. Varieties grown were also suited to the location			
2. Performance of intercultural operations a. Regular weeding was done b. Application of manure was done correctly c. Proper monitoring of pest and diseases were followed and suitable botanicals were applied			
3. Knowledge aspect a. Increased ability to identify various plants and vegetables b. Increase in knowledge and appreciation for the value of local food systems c. Improved knowledge on pests and diseases			

4. Participation and involvement a. Students were attending the gardening activities regularly. b. Decrease in sedentary behaviours and interested to involve without any hesitation c. Students were ready to carry out the works collectively			
5. Improvement in environmental stewardship a. Increased appreciation for natural environment b. Interested towards nature through outdoor activities c. Increased awareness on nature conservation and sustainable practices			
6. Selection of crop and season a. Selection of crop was suitable to the area b. Season selected for vegetable cultivation was appropriate c. Varieties grown were also suited to the location			
7. Supply of agricultural inputs a. Seeds were supplied at correct time b. Arrangements for manuring were appropriate c. Supply of botanicals for plant protection was proper			

Mostly felt (3); moderately felt (2); Less felt (1)

21.Career aspirations of students by involving in the SVG

I would like to become; **(**Please tick your preferences**)**

Plus Two level	VHSE (Agri)		VHSE (Computer science)			VHSE (Agribusiness)		Other(Please specify)
	HSE (Biology)		HSE (Commerce)			HSE (Humanities)		
			Higher studies					
Diploma	Engineering		Agriculture			Management		Others
Degree	Science		Social Science			Arts & Literature		Others
Professional degree	Engineering		Agriculture			Medicine		Others

22.Perceived changes in preference of food consumption

Self-efficacy	**SA**	**A**	**UD**	**D**	**SD**
1. Positive changes in willingness to taste vegetables					
2. Increase in quantity of vegetable consumption					
3. Increase in variety of vegetable consumption					
4. Decrease in fast food consumption					
5. Preference for healthy foods					

6. Preference towards vegetables produced by self					
7. Preference for leafy vegetables					

23.Food consumption pattern

1. Dietary habit: Are you a vegetarian / Non-vegetarian?
2. **Please tick mark the frequency in use of food**

Sl.No	**Food item**	**Frequency of use/ week**				**Monthly**	**Occasionally**
		Daily	**Thrice**	**Twice**	**Once**		
1	Cereals						
2	Pulses						
3	Vegetables						
4	Fats and oils						
5	Milk and milk products						
6	Fruits						
7	Meat						
8	Fish						
9	Egg						
10	Others						

24. **Kindly choose the vegetables of your choice. Do you feel any change in consumption of vegetable after involving in SVG activities? Please choose the option from the list.**

(Frequency: Daily/Weekly, how many times you take in the below mentioned vegetable)

Sl.No	**Food item**	**Before**	**After**	**Frequency**	**Quantity**
	Leaf Vegetable				
1	Amaranthus				
2	Cabbage				
3	Coriander				
4	Curry leaves				
	Other (Specify)				
	Roots & Tubers				
5	Beet root				
6	Carrot				
7	Colocasia				
8	Onion				
9	Potato				
10	Elephant foot yam				
11	**Cucurbitaceous**				

	Ash gourd, Bitter gourd, Bottle gourd, Snake gourd, Cucumber				
12	**Solanaceous** Tomato, Brinjal, Chilly				
	Other Vegetables				
13	Bread fruit				
14	Cauliflower				
15	Drumstick				
16	Ladies finger				
17	Papaya green				
18	Plantain green				
19	Peas				
20	Beans				
21	Vegetable cowpea				

4. **Mention the vegetable that you dislike?**

25. Constraints experienced by students towards school gardening

Please score your response to the listed constraints and suggest solutions

Constraints	**VR**	**MR**	**SR**	**I**	**Suggestions**
1. Lack of irrigation facility					
2. Scarcity of land for cultivation					
3. High input cost					
4. Inadequate fund					
5. Lack of student's interest					
6. Poor knowledge about gardening					
7. Poor storage facility					
8. Lack of teacher's involvement					
9. Non-availability of implements					
10. Time consumed					
11. Attack of wild animals destroy crop					
12. Lack of proper training/poor extension service					
13. Negative attitude towards physical work					
14. Theft of vegetables from school					
15. Improper maintenance during vacation					

VR: Very Relevant, MR: Moderately Relevant, SR: Slightly Relevant, I: Irrelevant

APPENDIX II

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR

Department of Agricultural Extension

Questionnaire for extension officers

PG Thesis: *"Performance analysis of school vegetable gardens in Palakkad district"*

1. Name of Extension officer :.....
2. Name of krishibhavan, Block:.....

   .....

   .....
3. Is there any programmes from government supporting school vegetable garden?

If yes, answer the following

a) What is the criteria for selecting school?

b) Whether any fund or inputs supplied by government? If yes, give details.

.....

c) How many schools can be selected per panchayath?

d) Land area requirement per school?

4. **Type of garden in the schools.** (Please indicate by marking a tick)

Sl.No	Types	Yes	No
1	Mixed cropped vegetable gardens		
2	Sole vegetable garden		
	Other types(Specify)		

5. Details of crops grown in vegetable garden

Sl.No	**Crop**	**Total area grown crop**	**Variety/hybrid**	**Duration of crop**	**Yield**
1					
2					
3					

4					
5					
6					

6. **System of farming: [Organic/Inorganic]**

Type of school vegetable garden land : [Wetland/Garden land/Dry land/Other specify.....]

Type of soil: [Laterite/Alluvial/Loamy/Sandy/Others Specify.....]

Fencing: (Yes/No) Fencing type:(Live/Wall/Wire/Mesh netting)

Frequency of irrigation: Daily/Twice a week/Thrice a week/ Others specify.....

Type of irrigation: (Hose/Sprinkler/Drip/ others (specify).....

7. **Water resources available in the school**

Type	**Yes/No**	**No./Area**	**Perennial Y/N**	**If N, Period of scarcity**
Well				
Pond				
Rain water harvesting				

Whether any financial support for purchasing implements and inputs.(Yes/No)

If yes, who supports (Government/ school management/NGO's/Commodity Boards/Scientific Institutions)

If No, How will school meet the expenses?.....

8. **Training**

a)Any training provided through agricultural department : Yes/No

If yes, please provide the following information

Sl. No	Name of the training programme	Organisation	Duration

b) What's your opinion, weather the teacher's need training from expert: Yes/No

If yes, please provide the following information

Sl.No.	Name of training programme	Very effective	Effective	Less effective
1	Production			
2	Protection			
3	Technology			
4	Marketing activities			
5	Other (specify)			

9.**School participation**

a. Does any school authorities come forward for practicing school garden?

b. What's the attitude of teachers involving school garden activities with students?

10. Perception on the effectiveness of school vegetable garden

Statements	3	2	1
1.Selection of crop and season a. Selection of crop was suitable to the area b. Season selected for vegetable cultivation was appropriate c. Varieties grown were also suited to the location			
2.Supply of agricultural inputs a. Seeds were supplied at correct time b. Arrangements for manuring were appropriate c. Supply of botanicals for plant protection was proper			
3.Performance of intercultural operations a. Regular weeding was done b. Application of manure was done correctly c. Proper monitoring of pest and diseases were followed and suitable botanicals were applied			
4.Participation and involvement of students a. Students were attending the gardening activities regularly. b. Decrease in sedentary behaviours and interested to involve without any hesitation c. Students were ready to carry out the works collectively			

5.Socioeconomic aspect a. Increased knowledge of societal issues like hunger ,poverty etc b. Improved knowledge and awareness of good agricultural and food safety practices c. Students could understand how the garden can generate income and provide food			
6.Institutional aspects a. School could arrange land preparation and other activities at the appropriate time. b. School could make arrangements for doing activities during holidays c. School organized the vegetable garden programme without compromising academic curriculum			
7.Knowledge aspects a. Increased ability to identify various plants and vegetables b. Increase in knowledge and appreciation for the value of local food systems c. Improved knowledge on pests and diseases			
8.Improvement in environmental stewardship a. Increased appreciation for natural environment b. Interested towards nature through outdoor activities c. Increased awareness on nature conservation and sustainable practices			

Mostly felt (3); Moderately felt (2); Less felt (1)

11.Constraints experienced by school as perceived by Extension officer

Please score your response to the listed constraints and suggest solutions

Constraints	SA	A	NA/ND	D	SD	Suggestions
1. Lack of irrigation facility						
2. Scarcity of land for cultivation						
3. High input cost						
4. Inadequate fund						
5. Lack of student's interest						
6. Poor knowledge about gardening						
7. Poor storage facility						
8. Lack of teacher's involvement						
9. Non-availability of implements						

10. Time consumed						
11. Attack of wild animals destroy crop						
12. Lack of proper training/poor extension service						
13. Negative attitude towards physical work						
14. Theft of vegetables from school						
15. Improper maintenance during vacation						

SA-Strongly Agree; A-Agree; NA/ND-Neither agree nor disagree; D-Disagree; SD-Strongly Disagree

signature:

Name:

Any other remarks and suggestions....

APPENDIX III

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR

Department of Agricultural Extension

Questionnaire for teachers

PG Thesis: *"Performance analysis of school vegetable gardens in Palakkad district"*

1. Name:.....
2. Name of school with address:.....

.....

.....

3. **Social orientation:**

How often do you participate in community service or civic affairs related to school:

a) Regular ☐ b) Sometimes ☐ c) Never☐

How often do you participate in community service or civic affairs related to non-school:

a) Regular ☐ b) Sometimes ☐ c) Never☐

Familiarity with farming/ gardening

a) Frequently☐ b) Sometimes ☐ c) Rarely ☐

4. **Extent of volunteering:**

How often do you volunteer for community service work in school?

- On average 'I volunteered.....hours each day'/ 'I volunteered.....hours each week'

How often did you do some volunteer for community service work out of school?

- On average, 'I volunteered .....hours each day'/'I volunteered.....hours each week'

5. **Civic engagement/Political orientation:**

Have you participated in any political oriented programmes? Yes No ☐ ☐

If yes, please choose any of the options given; Political campaign Boycott a product or service ☐

Environment protection campaign Food security programmes others: ……

6. Did your family have a garden at home before you started working in the school garden? (Yes / No)

If yes what type of garden do you have: [Ornamental/Kitchen/Herbal/Vegetable/Mixed farm/Other (specify.....)

7. **Club details**

a) Is there any club for garden activities like agri/nature/seed club?

b) If yes, Name of the club:

c) Number of members:

d) It started working from:

e) Criteria for membership:

f) Membership fee:

g) Is the club associated with any programmes (Govt./private/NGO):

8. **Type of garden in the schools.** (Please indicate by marking a tick)

Sl. No	**Types**	**Yes**	**No**
1	Outdoor garden		
2	Raised bed garden		
3	Indoor garden		
4	Container gardens		
5	Greenhouse gardens		
6	Mixed cropped vegetable gardens		
7	Sole vegetable garden		
	Other types(Specify)		

9. Use of land

Components	Building	Garden land	Play ground	Waste land	Others(Specify)
Area in cents					

10. Details of crops grown in vegetable garden

Sl. No	**Crop**	**Total area grown crop**	**Variety/hybrid**	**Duration of crop**	**Yield**
1					
2					
3					
4					
5					
6					

11. System of farming: [Organic/Inorganic]

a. Type of school vegetable garden land: [Wetland/Garden land/Dry land/other specify.....]

b. Type of soil:[Laterite/Alluvial/Loamy/Sandy/Others Specify.....]

c. Fencing: (Yes/No) Fencing type: (Live/Wall/Wire/Mesh netting/Mud wall)

d. Frequency of irrigation: Daily/Twice a week/Thrice a week/ others specify.....

e. Type of irrigation :(Hose/Sprinkler/Drip/Basin/others (specify).....

12. Water resources available in the school

Type	**Yes/No**	**No./Area**	**Perennial Y/N**	**If N, Period of scarcity**
Well				
Pond				
Pipe				

Whether any financial support for purchasing implements and inputs.(Yes/No)

If yes, who supports (Government/ school management/NGO's/Commodity Boards/Scientific Institutions)

If No, how will you meet the expenses?.....

13. **Given are the items under Knowledge Material**

Rate the materials to be utilized for establishment and maintenance of school vegetable garden as a part of school curriculum. (Please tick mark based on your opinion or preference)

Sl. No.	Knowledge Materials	A	NA	VE	E	LE
1	Library books					
2	Gardening catalogues/magazines					
3	Experiments					
4	Text books					
5	Internet					

A-Available; NA-Not Available; VE-Very Effective; E- Effective; NE-Not Effective

14. **Training**

a) Any training received from experts : Yes/No

If yes, please provide the following information

Sl. No	Name of the training programme	Organisation	Duration

b) Weather the teacher's need training from expert: Yes/No

If yes, please provide the following information

Sl.No.	**Name of training programme**	**Very effective**	**Effective**	**Less effective**
1	Production			
2	Protection			
3	Technology			
4	Marketing activities			
5	Other (specify)			

15. Perception on the effectiveness of school vegetable garden

Statements	**3**	**2**	**1**
1.Selection of crop and season a. Selection of crop was suitable to the area b. Season selected for vegetable cultivation was appropriate c. Varieties grown were also suited to the location			
2.Supply of agricultural inputs a. Seeds were supplied at correct time b. Arrangements for manuring were appropriate c. Supply of botanicals for plant protection was proper			

3.Performance of intercultural operations a. Regular weeding was done b. Application of manure was done correctly c. Proper monitoring of pest and diseases were followed and suitable botanicals were applied			
4.Participation and involvement of students a. Students were attending the gardening activities regularly. b. Decrease in sedentary behaviours and interested to involve without any hesitation c. Students were ready to carry out the works collectively			
5.Socioeconomic aspect a. Increased knowledge of societal issues like hunger ,poverty etc. b. Improved knowledge and awareness of good agricultural and food safety practices c. Students could understand how the garden can generate income and provide food			
6.Institutional aspects a. School could arrange land preparation and other activities at the appropriate time. b. School could make arrangements for doing activities during holidays c. School organized the vegetable garden programme without compromising academic curriculum			
7.Knowledge aspects a. Increased ability to identify various plants and vegetables b. Increase in knowledge and appreciation for the value of local food systems c. Improved knowledge on pests and diseases			
8.Development of life skill a. Selection of crop was suitable to the area b. Season selected for vegetable cultivation was appropriate c. Varieties grown were also suited to the location			
9.Improvement in environmental stewardship a. Increased appreciation for natural environment b. Interested towards nature through outdoor activities c. Increased awareness on nature conservation and sustainable practices			

Mostly felt (3); Moderately felt (2); Less felt (1)

16. Constraints experienced by school teachers

Please score your response to the listed constraints and suggest solutions

Constraints	SA	A	NA	D	SD	Suggestions
1. Lack of irrigation facility						
2. Scarcity of land for cultivation						
3. High input cost						
4. Inadequate fund						

5. Lack of student's interest						
6. Poor knowledge about gardening						
7. Poor storage facility						
8. Lack of teacher's involvement						
9. Non-availability of implements						
10. Time consumed						
11. Attack of wild animals destroy crop						
12. Lack of proper training/poor extension service						
13. Negative attitude towards physical work						
14. Theft of vegetables from school						
15. Improper maintenance during vacation						

SA-Strongly Agree; A-Agree; NA/ND-Neither agree nor disagree; D-Disagree; SD-Strongly Disagree

signature:

Name:

Any other remarks and suggestions....

APPENDIX IV

KERALA AGRICULTURAL UNIVERSITY

COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR

Department of Agricultural Extension

Questionnaire for parents

PG Thesis: "***Performance analysis of school vegetable gardens in Palakkad district"***

1. Name of parent : …….
2. Gender (Male / Female):…….
3. Parent's Phone number:…….
4. Name of school with full address and contact details: …… ……
   ……
5. Family details:

Name of family members	**Age**	**Education**	**Occupation**		**Total annual income**
			Primary	**Secondary**	

6. Dwelling place: Rural ☐ Urban ☐ ; Own house ☐ Rent ☐ ;
   If rented, do you have own house Yes ☐ No ☐
7. Distance to school from your home:……..Km.
8. **I. Do you have any garden in your home? If yes please do specify**
   a) Ornamental ☐
   b) Kitchen ☐
   d) Indoor ☐
   e) Terrace ☐
   f) Others if any:

II. Which are the crops you maintaining in your home? (Please tick your option)

Lady'sfinger		Chilly		Brinjal		Tomato		Pumpkin		Bittergourd	
Amaranths		Cucumber		Ashgourd		Yam		Vegetable Cowpea		Others	

9. Perceived benefits of school vegetable garden by parents

Sl. No.	**Items**	**3**	**2**	1
1	Improvement in food habits			
2	Active hands-on experience in vegetable cultivation			
3	Improvement in knowledge on vegetables			
4	Development of positive attitude towards learning			
5	Improvement in academic achievement			
6	Development of landscaping and design skills			
7	Improvement in environmental stewardship			
8	Progress in social relationships			
9	Recreation and enjoyment opportunities			
10	Interest in transferring skills and messages learned from school garden back to their homes			
11	Personal development			

Mostly felt(3); Moderately felt (2); Less felt (1)

PERFORMANCE ANALYSIS OF SCHOOL VEGETABLE GARDENS IN PALAKKAD DISTRICT

By

Ajit T. G.

Abstract of thesis

Submitted in partial fulfilment of the
Requirement for the degree of

Master of Science in Agriculture

(Agricultural Extension)

Faculty of Agriculture
Kerala Agricultural University, Thrissur

Department of Agricultural Extension

COLLEGE OF HORTICULTURE
VELLANIKKARA, THRISSUR - 680 656
KERALA, INDIA
2020

Abstract

A school vegetable garden is an educational strategy to attract students towards gardening activities. The garden engages students by providing a dynamic environment where they can observe, discover, experiment, nurture, and learn. It provides opportunities for young minds to understand the basic lessons of agriculture and develop an affinity towards it. Kerala state Department of Agriculture Development and Farmers' Welfare has been implementing school vegetable garden programme under 'Vegetable Development Programme' with the major objectives to mobilize the student community into the field of agriculture and to make them aware of safe to eat food production.

With this background, the present research was undertaken to explore the effectiveness of school vegetable garden as perceived by students, school authorities and extension personnel. The knowledge level and attitude of students were studied along with their association with personal and socio economic characteristics. The impact of school vegetable garden on food consumption pattern of students was also analyzed.

The study was carried out in Nenmara and Kollengode blocks of Palakkad district. One school each was chosen from the three selected panchayats of each block. The six panchayats were Nenmara, Pallasana, and Elavanchery from Nenmara block and Koduvayur, Muthalamada, and Vadavannur from Kollengode. Two stage random sampling procedure was adopted. The respondents included 30 students and one teacher each from six schools, three extension personnel each from six panchayats and 30 parents and thus making the total sample size to 234.

All the selected schools had functional school vegetable gardens and were practicing activities either through agriculture or nature clubs. The perceived effectiveness of school vegetable garden by teachers and extension personnel revealed that improvement in environmental stewardship was found to be the most important

outcome while the development of life skills was perceived as most significant by the students. The knowledge and attitude towards school vegetable garden were at medium level for majority of the students. Among the personal and socio-economic characteristics studied, participation in extracurricular activities displayed the highest positive correlation with both knowledge and attitude. Age and social orientation had positive correlation with both knowledge and attitude while students' class of study and extent of volunteering were positively correlated with knowledge and achievement motivation with attitude.

Kruskal Wallis H test was employed to identify the group variability among schools for knowledge level, attitude and perceived effectiveness .The results indicated significant variation among schools with respect to knowledge and attitude while no remarkable difference was observed for perceived effectiveness. Regarding the career aspirations of students, majority opted for science education.

The perceived changes in preference in food consumption were also studied. Preference towards leafy vegetables was perceived as the greatest felt change. Among the vegetables, potato was the most consumed one (97.98 %) and least consumed was colocasia (41.76 %).After involving in school vegetable garden, students showed a slight increase in consumption of amaranthus and solanaceous vegetables. It was found that all the students involved in school vegetable garden were maintaining a home garden with a few vegetable crops. The major vegetables in the home gardens were chilli, brinjal, vegetable cowpea and amaranthus.

The most important benefits perceived by parents due to the involvement of children in vegetable garden were improvement in environmental stewardships and personal development. The constraints faced by students were about the time spent for garden activities and difficulty in maintaining during vacation. While inadequate fund was the major constraint faced by the teachers, the extension personnel felt the scarcity of land for cultivation as the most important one.