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Research Article

Linking Agricultural Education and School Feeding Programs for Food Security in Rwanda's Basic Education System: A Competency-Based Approach

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About Article

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ABSTRACT

This study focuses on how agricultural education and the National School Feeding Program (NSFP) can be incorporated into Competency-Based Curriculum (CBC) in Rwanda as one of the ways of improving food security and experiential education in basic education. The purpose of the study was to establish the impacts of school-based agricultural learning and feeding programs on the agricultural knowledge of school students, their awareness of nutrition and food security practices at school and at home. The design was mixed methods and consisted of 213 respondents including students,teachers,parents, and school administrators from Gatsibo, Gicumbi, and Rulindo District. Descriptive statistics, correlation, and regression analysis were applied in the analysis of quantitative data, whereas thematic analysis was used in qualitative data. The results indicated that the incorporation of agricultural education and school feeding was very effective in enhancing students' knowledge of sustainable farming, healthy diets, and community-based food systems. Students used the skills gained at school in their homes, which helped to increase the nutrition at home and the variety of food. The teacher and administrators were critical in connecting the practical agricultural activities with the classroom lessons, and community cooperation was enhanced by the involvement of parents. The research concludes that agricultural education in relation to school feeding, as part of the CBC, is effective in developing agribusiness competencies and sustainable food security. The study also highlights the emerging role of e-learning and multimedia tools in supporting practical agricultural learning and strengthening knowledge transfer from school to home. To achieve maximum long-term effects on the educational and agricultural development of Rwanda, teacher training, institutional support, and the integration of digital learning are necessary.

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1. INTRODUCTION

Besides enhancing agricultural productivity, the Rwandan experience of integrating agriculture with school feeding is an example of experiential and participatory learning management (Nyamweru et al., 2025). It enables educators and policymakers to know how the delivery of the curriculum, the allocation of resources, and the coordination of stakeholders can affect the quality of learning as well as the behavioral outcome in nutrition and sustainability. The Competency-Based Curriculum (CBC), which was introduced in 2015, is one of the most remarkable reforms that emphasizes practical learning and problem-solving abilities rather than memorization (Otike & Nakitare, 2025). In this context, agricultural education in schools and the National School Feeding Program (NSFP) have come up as a supplemental approach to enhance the knowledge of pupils, their nutritional knowledge, and food security as a whole. The NSFP not only offers the children daily meals to improve their concentration and attendance but also promotes the use of local foods, which improves the involvement of the community and the agriculture sector (Mensah & Karriem, 2021). The emergence of research highlights that Information and Communication Technologies (ICT), such as e-learning platforms and multimedia tools, can enhance to a large extent the integration of agricultural education and school feeding into the Competency-Based Curriculum. Digital technologies like interactive videos, virtual demonstrations, mobile learning applications, and digital farm-record systems will assist the students in seeing the process of agriculture, training the decision-making, and finding nutrition information outside the classroom. Any introduction of ICT in school-based agriculture will thus facilitate experiential learning, assist teacher delivery, and increase the chances of the students to broaden their knowledge practices within the school and at home.

The primary source of livelihood in Rwanda is farming in over 70 percent of the households, and therefore, food insecurity and malnutrition have been witnessed, particularly in rural regions (Giller, 2020). The attempt of the government to relate agricultural education in schools to the nutrition-sensitive interventions like the school feeding program can be attributed to an increasing realization that education can become a potent means of effective long-term food and nutrition security (Bisht, 2021; Gillespie et al., 2019). By introducing new programs such as school gardens and clubs in agriculture, students are introduced to real-world farming methods, composting, and environmental sustainability, which is in line with the vision of the CBC of having competent, independent, and green individuals. These activities also facilitate experiential education as the pupils are given a practice of what they learn, and this knowledge is commonly applied to the home setting, which maintains healthy eating and agriculture within the family (Glazier & Bean, 2019). The decision to have school-based agriculture to improve the learning and nutrition outcomes of children is established in research conducted across the world. The research has suggested that agricultural education that is incorporated in the school curriculum not only increases the agricultural literacy of the learners but also promotes healthy eating habits and food security at the home level. Along the same line, improvement in the attendance, performance, and understanding of nutrition has also been reported on agricultural education programs that have been associated with feeding programs (Desalegn et al., 2021; Mohammed et al., 2023; Wall et al., 2022). However, in Rwanda, few empirical studies have been conducted on how these combined programs affect the skills of the students and those of their families. The issue of CBC-based agricultural education interacting with the School Feeding Program is thus of paramount significance in the process of ensuring that the educational policies are translated into practical gains community.

In spite of the policy advances, there are various implementation issues in schools. In most cases, they do not have enough space in their gardens, water supply, and professionally trained teachers to carry out agricultural lessons effectively (Mukute et al., 2020). School gardens are not being used adequately in certain instances because of competing academic demands or a lack of financial resources. Besides, the School Feeding Program focuses on the procurement of local foods, but its effectiveness relies on a strong collaboration between schools, parents, and local cooperatives (Chaves et al., 2023). This type of relationship between learning, nutrition, and local production should be reinforced to continue fulfilling the objectives of the program.

This research is embedded in the current educational and agricultural transformation of the state of Rwanda. It examines the contribution of agricultural education in schools, especially when supplemented with the National School Feeding Program, to the agricultural competency of pupils, their food awareness, and their involvement in agricultural activities within the family. The research also aims to pinpoint ways in which this integration could be improved to facilitate sustainable food systems and a resilient community.

This research places agricultural education in the wider context of education and learning management by reviewing how knowledge, skills, and attitudes to agribusiness are created, passed on, and handled under the agricultural programs in schools. It highlights the mechanisms by which the learners will learn and practice the agricultural competencies and connects the classroom teaching with the farm experiences, as well as with the local food production systems.

Regarding learning management, the research discusses how schools, teachers, and community stakeholders can organize the resources and learning tasks, and feedback systems to promote the engagement and performance of students learning the subjects related to agribusiness. Combining these educational and management aspects, the study will add to the knowledge about how organized learning settings can reinforce the agricultural productivity, innovativeness, and sustainability among young people in Rwanda.

1.1. Research Questions

1. How does school-based agricultural education, integrated with Rwanda's School Feeding Program, influence student knowledge, nutrition awareness, and attitudes toward food security?
2. How do students use the agricultural and nutrition knowledge learned at school to improve their families' food security and dietary diversity?
3. How do Rwandan schools implement and manage

agricultural and feeding programs under the Competency-Based Curriculum (CBC)?

1.2. Educational and Management Contribution

The research also contributes to educational management by suggesting efficient methods for structuring experiential learning experiences, where students learn through doing. It also explains what school leaders and teachers can do to incorporate agriculture and nutrition components into the CBC to achieve the holistic result of learning.

1.3. Significance of the Study

The research is in line with the Vision 2050 and the Education Sector Strategic Plan (2024-2030) of Rwanda, which puts value on the development of human capital to achieve sustainable growth (Gubic & Baloi, 2019). It also shows how agricultural education can influence the behavior of agriculture and diet throughout life by connecting it with the School Feeding Program. The study provides viable ideas on how schools can be turned into a centre of fostering local food production, environmental sustainability, and nutrition-sensitive education. Moreover, the current projects of Smart Classroom and ICT-in-Education in Rwanda are adopted to promote the use of digital tools in various schools to facilitate experiential learning and curriculum delivery (Barakabitze et al., 2019; Uwantege et al., 2021). The traditional agricultural teaching can be enhanced with simple technologies like multimedia lessons, digital farm records systems, and mobile learning platforms, which enhance the efficiency of learning management.

2. LITERATURE REVIEW

2.1. Conceptual Foundations of Agricultural Education and Food Security

This method fits the learning management schools of thought that focus on the use of teachers as facilitators and the school as a dynamic system that structures experiential learning using structured agricultural activities. The Food and Agriculture Organization states that by incorporating agriculture in basic education, learners can develop practice-oriented skills and values that will help them to attain better nutrition, food production, and environmental stewardship (Canton, 2021; Moratiel et al., 2020). Additionally, according to Agbedahin (2019) and Rodríguez-Zurita et al. (2025), in their research said that it is an important element of Education for Sustainable Development (ESD) that focuses on experiential learning and engagement with the community. Under this context, instead of being a technical instruction on farming, agricultural education incorporates nutrition literacy, environmental awareness, and social responsibility to ensure that learners are well-equipped to help in the realization of food security objectives.

According to Ingram (2020), food security is a state where everybody can access adequate, safe, and nutritious food to experience a healthy and active life. Education is a significant factor that allows fostering this result through changes in behaviors, the quality of diet, and the connection of the educational experience in schools with the production of household foods. It has been empirically proven that with the involvement of children in agricultural activities at school, they tend to transfer the learned activities and practices to their families, resulting in better nutrition and food practices at home (Roscioli et al., 2021; Visser & Haisma, 2021; Wei & Sun, 2023). Therefore, agricultural education is both a pedagogical and developmental approach to equip communities to attain food system self-sufficiency.

2.2. The National School Feeding Program and Its Educational Linkages

Rwanda National School Feeding Program (NSFP), introduced in 2021, is expected to feed all students of primary and secondary institutions at least once daily with at least one healthy meal, the main part of which is made from local farmers (de Mahieu et al., 2023). The program is in line with the Home-Grown School Feeding (HGSF) model advocated by the World Food Programme (WFP) that incorporates agriculture, education, and nutrition to enhance the economic well-being of local communities and learning outcomes among students (Barnabas et al., 2024). In sub-Saharan Africa, research shows that school feeding programs have an effect on attendance, retention, and cognitive achievement and promote agricultural production and civic engagement (George & George, 2025).

The NSFP in Rwanda is not only a nutrition program, but also a learning platform that facilitates the adoption of the Competency-Based Curriculum (CBC). The CBC focuses on practical learning, collaboration, and problem-solving, which are elements that match the concept of agricultural and nutrition education well (Sistermans, 2020). The feeding and school gardens serve the pupils by giving them practical learning opportunities, which enhance agricultural literacy, ecological consciousness, and healthy food habits. Nevertheless, as noted by Xu et al.(2021) and Nayak et al. (2022), differences in resources, education of teachers, and infrastructure have restricted the successful application of school feeding and agricultural education, in particular, in rural institutions.

2.3. Experiential Learning and the Competency-Based Curriculum (CBC)

Experiential learning theory focuses on the fact that learners obtain knowledge by direct experience, reflection, and implementation in real-life situations (Rossetti, 2023). It was developed by Dewey (1938) and formalized by Kolb (1984), according to which effective learning takes place when the students are involved in constructive activities that allow relating the theory to practical work (Chiu, 2019). In the Competency-Based Curriculum (CBC) in the context of Rwanda, experiential learning applies specifically since it provides the learners with problem-solving, cooperation, and practical skills required in sustainable development (Ndayisenga, 2025). The recent studies on education state that experiential learning can be improved through the integration of information and communication technologies (ICT) (Al-Rahmi et al., 2020; Asad et al., 2021). Additionally, Agricultural and nutrition education can be supported with the help of online media, online rallies, and two-way communication platforms where images, participatory, and factual learning are reinforced (Baba & Esfandiari, 2023; Charalampopoulos & Droulia, 2024; Shao et al., 2025) This connection aids in transitioning to

smart education and enhances the ability of students to use classroom-learned knowledge regarding practical agricultural and nutrition problems.

2.4. Empirical Studies on School Agriculture and Nutrition Outcomes

Learning management-wise, the programs also provide models of how the curriculum design, teacher support, and community partnership can be integrated to improve the quality and sustainability of learning in schools. In Kenya, India, and Sierra Leone, the agriculture projects in schools have enhanced agricultural literacy in children, vegetable production in families, and diversified dietary patterns among families (Ayamga et al., 2023; Boedecker et al., 2019; Singh et al., 2020). Likewise, Latin American school garden programs are showing that school gardens are effective in increasing appreciation of sustainable food systems and dietary variety among children (Chan et al., 2022). Additionally, Barnabas et al. (2023) in Nigeria discovered that schools that applied the feeding programs were supplied with provisions by the local farms, and their attendance and community participation were high.

2.5. Opportunities and Challenges in the Rwanda context.

Although the policies of CBC and the NSFP are aligned, there are a number of challenges that remain. To start with, the programs cannot be scaled due to resource limitations such as a lack of land to use in school gardens, inadequate irrigation, and untrained agricultural teachers. Second, there is the problem of curriculum overload and clashing academic needs that frequently decrease the time given to practice lessons in agriculture. Third, the community involvement is not uniform; some schools are very cooperative with parents and local cooperatives, whereas at others, it is hard to create a constant supply chain of domestic food. Nevertheless, opportunities are also remarkable. The decentralized procurement model promoted by the NSFP helps local farmers to be engaged in the program, which promotes the farm-to-school model (Mensah & Karriem, 2021). In addition, the continuous educational process of the CBC teachers and the district-level monitoring would offer a guideline to enhance the agriculture education results.

2.6. Identified Research Gap

Although past studies have emphasised the significance of agricultural education and school feeding as separate intervention methods, little literature has addressed both of them as a synthesised pedagogical and developmental intervention in Rwanda. Little empirical knowledge exists regarding the impacts of this integration on the agricultural skills of pupils, nutrition knowledge, and food security at the household level, especially with the CBC. Also, there is minimal information on how students put the skills gained in school on holidays to sustain their families in terms of farming and eating habits. The gap will also help address the issues concerning the sustainable school-based programs in educational theory as well as in national policy.

The theories presented, the Experiential Learning Theory, Social Learning Theory, and the tenets of the Competency-Based Curriculum, are the tools that will compose the analytical frame underlining this work. The Experiential Learning Theory describes the process by which agricultural and nutrition skills are learned by students in a hands-on activity like school gardens. The Social Learning Theory emphasizes the transfer of these skills and behaviors to the home via interaction with parents and members of society. The CBC framework relates these learning processes to competency development in practical situations. The combination of these theories influences the variables of the study, the design of questionnaires and interviews, and the interpretation of the impact of agricultural education and school feeding on knowledge, attitudes, and practices of students, teachers, and parents.

Summarizing, the literature demonstrates the increased global agreement regarding the importance of combining agricultural education programs and nutrition programs implemented in schools. Nevertheless, the Rwandan setting includes its own opportunities and limitations determined by the policy frameworks, the distribution of resources, and the involvement of the community. This paper is based on theoretical and empirical premises to examine the potential of school-based agriculture education coupled with the National School Feeding Program in improving learning, nutritional awareness of pupils, and their food security as a family under the Competency-Based Curriculum.

3. METHODOLOGY

3.1. Research design

This is because this mixed-method design was utilized in an assessment of the extent to which learning management practices in Competency-Based Curriculum, specifically in the agricural teaching and school feeding integration, demonstrated through the prism of experiential learning influence student competencies, student motivation, and applied learning outcomes. The methodology allowed examination of lived experiences in the educational settings of the students and teachers in-depth. The study, following the Experiential Learning Theory (Kolb, 1984), is based on the learning through active experience and reflection, between what was learned in the classroom and what is applied in real agricultural activity (Kim & Park, 2023). This theoretical perspective helps to comprehend those practical agricultural studies that develop the necessary skills, interest, and values of sustainability in learners, which leads to the agribusiness development and environmental consciousness in the long term in Rwanda.

3.2. Study Area and Participants

The research was done in three Rwanda districts, namely, Gatsibo, in Eastern Province, and Gicumbi and Rulindo in Northern Province. These districts were chosen selectively to satisfy the following categories of schools: public, private, and government-aided, and to obtain variation in the use of agricultural education in schools. The sampling was also based on the high agricultural potential of each district and on involvement in school farming and nutrition programs. Furthermore, the districts also indicate varying levels of achievement in the adoption of the Competency-Based Curriculum (CBC) and agricultural programs in the schools.

Gicumbi and Rulindi were among the first districts to implement the practical learning of CBC-aligned, in particular, school gardens and nutrition clubs, which made them appropriate for studying mature implementation. Conversely, Gatsibo has been enhancing its CBC implementation later, especially in incorporating agriculture with school feeding, which presents useful knowledge on the up-and-coming practice. The study included districts with varying implementation history, which allowed the study to obtain a wide range of experiences, challenges, and outcomes within the basic education system in Rwanda. The sample included students, teachers, school administrators, and parents, giving a wide range of opinions throughout the educational system, between the curriculum implementation and the home level of knowledge application. The study involved 213 respondents, where 71 respondents were sampled in each district. This allocation provided sufficient representation in the geographical areas and socio-economic settings and hence made the study more profound, valid, and contextual.

3.3. Data Collection Methods

In this research, both methods of quantitative and qualitative data collection were used in order to have a comprehensive knowledge of the role of agricultural education in encouraging the practice of agribusiness and its sustainability. Structured questionnaires were used to identify the quantitative data based on perceptions of the results of agricultural education, meaning skills development, environmental awareness, and agribusiness readiness in terms of a five-point Likert scale, where 1: Strongly Disagree to 5: Strongly Agree. Semi-structured interviews with the chosen school administrators were used to collect qualitative data, as they were required to provide more insight into the experiences of learning and the program implementation. Audio recordings and data triangulation were used to increase the level of validity and reliability (Craig et al., 2021).

3.4. Data Analysis

The data gathered in the form of quantitative data by the use of structured questionnaires were analyzed with the help of the Statistical Package of Social Sciences (IBM SPSS Statistics, Version 25). To summarize the perceptions of the respondents on the outcomes of agricultural education, the results were given in descriptive statistics such as frequencies, percentages, means, and standard deviations. Correlation and regression were used as inferential tests to determine the relationship between agricultural education, agribusiness participation, and sustainability awareness. In the case of the qualitative data, thematic analysis in line with Byrne's (2022) approach was used because it aimed to identify, analyze, and report common patterns and themes in the stories of the participants. This methodology focused on the lived experiences and contextual interpretations of the participants, which gives more insight into how agricultural education can build skills, values, and attitudes, promote experiential learning, and the development of agribusiness in Rwanda.

3.5. Ethical Considerations

The District Education Office provided ethical clearance for this study before the data were collected. Every subject was well aware of the study objective, methods, and voluntary nature because they were educated on the importance of the study and that they could withdraw anytime without any repercussions. Informed consent was taken among the adult participants through written form, and the data were secured from the participants. All transcripts, reports, and publications were done using pseudonyms to maintain the level of confidentiality and anonymity, and the data were treated under the ethical guidelines of research in the field of education.

4. RESULTS AND DISCUSSION

4.1. Demographic characteristics

The sample size of the study was 213 respondents selected in Gatsibo, Gicumbi, and Rulindo Districts, consisting of 71 each. Students, agricultural teachers, school administrators, and parents were included in the sample. The students and their parents were both taken into account to capture the knowledge transfer and the application of agricultural and nutrition education at the home level. Only the teachers who were directly involved in teaching the agricultural subjects were selected. The sample of respondents was used to capture the differences in curriculum implementation and school farming practices and consisted of private, public, and government-aided schools of Accredited Level 3, 4, and 5. This sample gave equal representation in terms of gender and socio-economic status, and consequently, this gave a comprehensive view of the relationship between agricultural education, school feeding, and experiential learning outcomes in Rwanda.

4.2. Students' Responses on Agricultural Knowledge, Nutrition Awareness, and Food Security Attitudes

Table 1. Descriptive Statistics of Students' Responses on Agricultural Knowledge, Nutrition Awareness, and Food Security Attitudes

Statement	N	SD	D	N	A	SA	Mean	Std. Dev
Knows how to prepare land and plant crops	90	1 (1.1%)	6 (6.7%)	7 (7.8%)	51 (56.7%)	25 (27.8%)	4.0333	0.85394
Understands compost/manure use	90	0	2 (2.2%)	8 (8.9%)	52 (57.8%)	28 (31.1%)	4.1778	0.68002
Knows pest management using safe/local methods	90	0	2 (2.2%)	8 (8.9%)	42 (46.7%)	38 (42.2%)	4.2889	0.72274
Understands weather effects on crops	90	0	2 (2.2%)	6 (6.7%)	41 (45.6%)	41 (45.6%)	4.3444	0.70569
Knows foods for health and strength	90	0	4 (4.4%)	1 (1.1%)	45 (50.0%)	40 (44.4%)	4.3444	0.72144

Learns a balanced diet from school feeding	90	0	1 (1.1%)	6 (6.7%)	43 (47.8%)	40 (44.4%)	4.3556	0.65875
Eats more vegetables/fruits since the feeding program	90	0	2 (2.2%)	12 (13.3%)	38 (42.2%)	38 (42.2%)	4.2444	0.76893
Shares nutrition knowledge with family	90	0	0	10 (11.1%)	38 (42.2%)	42 (46.7%)	4.3556	0.6756
Believes school gardens are important	90	0	1 (1.1%)	8 (8.9%)	35 (38.9%)	46 (51.1%)	4.4	0.69992
Confident to grow crops at home	90	0	1 (1.1%)	10 (11.1%)	35 (38.9%)	44 (48.9%)	4.3556	0.72377
School meals improve attendance	90	0	0	7 (7.8%)	41 (45.6%)	42 (46.7%)	4.3889	0.63058
Helps the family apply school farming techniques	90	0	1 (1.1%)	11 (12.2%)	35 (38.9%)	43 (47.8%)	4.3333	0.73439
The family started growing new crops due to the school	90	2 (2.2%)	3 (3.3%)	15 (16.7%)	39 (43.3%)	31 (34.4%)	4.0444	0.923
Valid(listwise)	90							

Source: Field data

The descriptive statistics of the responses of the students are provided in Table 1 above. On the whole, the students were highly knowledgeable about agriculture and nutrition, with an average score of higher than 4.0 when it comes to most of the indicators. Items with the greatest rating were knowledge of weather impacts on crops (M = 4.34), and the significance of school gardens (M=4.40). Students also expressed more confidence in using the school-based farming methods at home (M = 4.33) and in their understanding of healthy diets as a result of using the feeding program (M = 4.36). These findings suggest that agricultural education and school feeding are useful in increasing experiential learning and positive food security attitudes among the students.

4.3. Teachers' Responses on Agricultural Education and School Feeding Integration

Table 2. Summary of Teacher Responses on Agricultural Education and School Feeding Integration (N:30)

Statement	N	SD	D	N	A	SA	Mean	Std. Dev
CBC supports experiential learning	30	0	0	2 (6.7%)	9 (30.0%)	19 (63.3%)	4.5667	0.62606
Uses practical lessons/projects	30	0	0	2 (6.7%)	13 (43.3%)	15 (50.0%)	4.4333	0.62606
Links lessons to real-life farming	30	0	0	4 (13.3%)	10 (33.3%)	16 (53.3%)	4.4	0.72397
Students interested in agriculture	30	0	0	0	16 (53.3%)	14 (46.7%)	4.4667	0.50742
Uses practical assessment/projects	30	0	0	4 (13.3%)	18 (60.0%)	8 (26.7%)	4.1333	0.62881
Feeding uses produce from the school garden	30	0	0	1 (3.3%)	21 (70.0%)	8 (26.7%)	4.2333	0.50401
School collaborates with parents/farmers	30	0	0	1 (3.3%)	16 (53.3%)	13 (43.3%)	4.4	0.56324
Coordination between the Agri & feeding committees	30	0	0	1 (3.3%)	22 (73.3%)	7 (23.3%)	4.2	0.48423
Integration improves nutrition awareness	30	0	0	0	22 (73.3%)	8 (26.7%)	4.2667	0.44978
Integration helps students apply learning	30	0	0	1 (3.3%)	15 (50.0%)	14 (46.7%)	4.4333	0.56832
Adequate space/tools for agriculture	30	0	6 (20%)	1 (3.3%)	20 (66.7%)	3 (10.0%)	3.6667	0.92227
Received enough training for agriculture	30	0	0	2 (6.7%)	20 (66.7%)	8 (26.7%)	4.2	0.55086
Valid (listwise)	30							

Source: Field data

According to Table 2 above, teachers indicated a lot of support for the Competency-Based Curriculum on agricultural education. The majority of them agreed that CBC facilitates experiential learning (M = 4.56) and lessons associated with real-life farming experiences (M = 4.40). Again, teachers also admitted that agricultural and feeding programs enhance nutrition awareness of students and enhance collaboration between parents and schools (M = 4.50). These results imply that educators are

important in the implementation and administration of the agriculture-based experiential learning in schools.

4.4. Parents' Responses on School-Based Agriculture and Feeding Programs

Table 3. Summary of Parents' Responses on School Feeding and Household Practices (N = 90)

Statement	N	SD	D	N	A	SA	Mean	Std. Dev
Child talks about school agriculture	90	0	0	5 (5.6%)	44 (48.9%)	41 (45.6%)	4.4	0.59587
Child encourages home gardening	90	0	3 (3.3%)	16 (17.8%)	37 (41.1%)	34 (37.8%)	4.1333	0.8238
The family uses improved farming from the school	90	0	2 (2.2%)	18 (20.0%)	32 (35.6%)	38 (42.2%)	4.1778	0.82894
Child helps apply techniques at home	90	0	3 (3.3%)	2 (2.2%)	33 (36.7%)	52 (57.8%)	4.4889	0.70702
Noticed improved eating habits	90	0	0	10 (11.1%)	46 (51.1%)	34 (37.8%)	4.2667	0.64998
Feeding improves a child's health/learning	90	0	0	1 (1.1%)	54 (60.0%)	35 (38.9%)	4.3778	0.51007
The school encourages food contributions	90	0	3 (3.3%)	4 (4.4%)	32 (35.6%)	51 (56.7%)	4.4556	0.73685
The parent is willing to support the feeding program	90	0	1 (1.1%)	5 (5.6%)	50 (55.6%)	34 (37.8%)	4.3	0.62621
Feeding strengthens parent–school collaboration	90	0	3 (3.3%)	9 (10.0%)	44 (48.9%)	34 (37.8%)	4.2111	0.75691
Feeding supports local farmers/community	90	0	0	0	34 (37.8%)	56 (62.2%)	4.6222	0.48755
The family eats diverse foods each week	90	0	2 (2.2%)	7 (7.8%)	45 (50.0%)	36 (40.0%)	4.2778	0.70357
The family understands a balanced diet	90	0	2 (2.2%)	5 (5.6%)	46 (51.1%)	37 (41.1%)	4.3111	0.68112
School knowledge helps with meal planning	90	1 (1.1%)	10 (11.1%)	13 (14.4%)	42 (46.7%)	24 (26.7%)	3.8667	0.97381
The family has enough food most time	90	0	1 (1.1%)	8 (8.9%)	46 (51.1%)	35 (38.9%)	4.2778	0.67087
Valid(listwise)								

Source: Field data.

According to Table 3, the school-based agriculture and feeding programs were of great importance to the parents. The majority of them said their children would discuss agriculture at home (M = 4.40) and promote gardening at home (M = 4.30). The changes in the diet of their families were also considered positive by parents (M = 4.27) and greater cooperation with schools (M = 4.35). The findings indicate that the learning process goes beyond the school, and it impacts home practices and supports common responsibility towards nutrition and food security. Pearson correlation and linear regression inferential statistics showed that there were significant and positive relationships between agribusiness participation, agricultural education, and sustainability awareness.

The findings indicated that students who had more experiential agricultural education through Competency-Based Curriculum had higher chances of engaging in activities related to agribusiness and were more likely to exhibit a better degree of sustainability awareness. Regression analysis also showed that agricultural education was a good predictor of agribusiness participation ($b = 0.582$, $p < 0.001$) and sustainability awareness ($b = 0.410$, $p < 0.001$), with a substantial percentage of their prediction. These results indicate that agricultural learning institutionalized in the school system of Rwanda not only enhances the students in their practical and entrepreneurial skills but also the attitudes towards environmental sustainability and livelihoods in the long term. The findings have highlighted the importance of good educational management and experiential learning in the production of responsible and skill-based future citizens.

4.5. Discussion

4.5.1. Enhancing Student Learning and Awareness through Experiential Agriculture

The mean scores of students are high, which proves that the implementation of agriculture and nutrition activities at school leads to experiential learning and knowledge transfer. This is in line with the Experiential Learning Theory of Kolb, which focuses on experiential learning. The findings are also consistent with Chan et al. (2022), Cosby et al. (2022), and Stage et al. (2025), in their research concluded that school gardens enhance agricultural literacy and dietary awareness in the learners.

4.5.2. Teachers' Role in Managing School-Based Agricultural Learning

The high score by teachers concerning the importance of CBC in facilitating practical, real-life agricultural learning shows that learning can be seen as a process based on experience, as postulated by Dewey (1938). In line with this, teacher involvement and administration have been identified to be key elements in the effective implementation of agriculture in schools in Rwanda (Habiyaremye et al., 2024; Zickafoose et al.,

2024). This emphasizes the need in having capacity-building and systematic administration in maintaining the experiential learning.

4.5.3. Strengthening School–Community Linkages through Parental Involvement

Active involvement of parents and adoption of practices in the household in school also correlate with the Social Learning Theory offered by Vygotsky, as it focuses on learning as an interaction and cooperation. The outcomes are consistent with (Dos Santos et al., 2022; Doustmohammadian et al., 2022; Mainje et al., 2024), who noted that community-based involvement in school feeding improves the nutritional diversity and sustainability of their diets. This implies that school-based agricultural education is not only beneficial to the learner but also facilitates food security at the community level and the exchange of knowledge.

4.5.4. Qualitative Results: Insights from School Administrators

Three school administrators who represented a public, a private, and a government-aided school were interviewed to supplement the quantitative results by having their semi-structured interviews. Their answers were useful in giving a clue to the integration and management of the Competency-Based Curriculum (CBC) of agricultural education and the school feeding programme. Thematic analysis indicated four primary themes which are curriculum integration, agriculture and feeding linkage, stakeholder involvement, and implementation challenges.

4.5.4.1. Curriculum Integration and Experiential Learning

Every respondent affirmed that there is implementation of agricultural activities in accordance with CBC goals. As one administrator explained, "the school garden serves as a learning tool since students apply what they learn by preparing land, planting crops, and then correlating it with science and entrepreneurship lessons". Another said that "Agriculture is not merely a subject but a way of learning in which the students will relate their theory to practical life". Such reactions represent the experiential learning theories by Dewey and Kolb, with the focus on knowledge construction via active involvement (Morris, 2020).

4.5.4.2. Linkage Between Agriculture and the School Feeding Program

A close relationship between school gardens and the feeding program was always observed by administrators. According to the respondents, "part of the food that is served in the school meals, particularly the vegetables, beans and maize, is food that is obtained from the school farm". Another one emphasises the role of school gardens and the feeding program, "this allows students to know the movements of food in the garden to the plate, and helps sustain a feeding program that is sustainable". These results indicate that the combination of production/consumption with learning makes the process practical and facilitates the awareness of students of the food system (Hu & Chen, 2025; McDonagh et al., 2025).

4.5.4.3. Stakeholder Participation and Community Engagement

The three administrators emphasized the role of collaboration between teachers, students, and parents. The administrator shared that, "Parents bring seeds and occasionally accompany students when doing community work to keep the school garden alive". The other reason was explained, confirming that "Teachers control the schedule, whereas students are involved in agriculture clubs". This is the indication of the social learning theory by Vygotsky, in which learning happens in cooperation and social interaction, furthering the educational influence of school to the household and community level (Erbil, 2020).

4.5.4.4. Implementation Challenges and Recommendations

Despite the successes, several constraints were indicated. Interviews claimed that there is "limited land, lack of irrigation facilities, inadequate infrastructures, and insufficient tools" to promote effective agricultural education. Another said, "Teachers should be given more training on how to relate CBC training to farming". Also, they hinted that "digital learning tools, the usage of audio-visual form instructions, and mobile data collection applications may be used to improve the delivery of the lesson and data management". On another hand, both administrations said data "Simple ICT innovations should also be incorporated in accordance with the policy of Smart Education in Rwanda and could reinforce the effectiveness and monitoring of school-based agriculture programs". Some of the proposed options were to "increase its technical support, strengthen the teacher capacity, and improve its cooperation with the local agricultural officers". These views are consistent with (Kalimaposo et al., 2025; Kieu et al., 2024; Li et al., 2025), which also highlighted institutional support and professional development as the factors to maintain school-based agricultural programs.

Altogether, the interviews demonstrate that school administrators consider agricultural education and feeding programs as part of experiential learning and community-based learning. The integration enhances practical skills, food awareness, and more effective linkages in the school community, even though there are challenges in implementation. These observations are in addition to the quantitative findings, which indicate that successful management and stakeholder engagement are necessary in order to achieve the complete potential of agriculture-based learning in the Competency-Based Curriculum in Rwanda. More expansive incorporation of low-cost digital instruments (e.g., e-learning modules and farm management applications) in the future may further support the learning experience, reinforce monitoring, as well as encourage innovation in school-based agricultural education.

5. CONCLUSION

This study concludes that a combination of agricultural education and the National School Feeding Program (NSFP) in Rwanda has a major impact on the students and the level of their understanding of agriculture, nutrition knowledge, and food security perceptions. The results show that Competency-Based Curriculum (CBC), as an effective method of teaching

the necessary agribusiness and sustainability skills to learners by making them experience the lesson methods like school gardens and practical farming practices, is effective in teaching the intended skills to learners. Not only do students become confident in crop production and healthy eating habits, but they also spread this knowledge to their families to enhance the food security and dietary diversity of the household.

The teachers and school administrators are at the center of these experiences of learning programs as they make sure that the lessons taught in the classrooms are connected to the actual practices in agriculture. It is even more powerful when parents are involved and the community is involved in its efforts to create a sense of responsibility in food and nutrition outcomes. Nonetheless, the problem of poor land availability, resources, and the training of teachers are some of the obstacles that have been encountered in the full implementation.

In general, the research highlights the necessity to integrate agricultural education and feeding initiatives in the Rwandan educational and agricultural policies in order to develop resilient and food-secure populations. The sustainability of the benefits of the experiential, agriculture-based learning on the national development will be ensured by strengthening the institutional support, developing the capacity of teachers, and integrating digital learning tools to maximize the long-term benefits.

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