Research Article

Agricultural Education and Youth Empowerment for Sustainable Farming: Evidence from Domestic and International Students in China

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Abstract | Agricultural education is widely recognized as a key driver of youth empowerment, sustainable farming, and rural development. This study investigates the perceptions of domestic and international students in China regarding the role of agricultural education in empowering youth for sustainable farming. Using a quantitative cross-sectional design, data were collected from 150 undergraduate, postgraduate, and diploma students with agricultural or rural backgrounds through a structured questionnaire. Descriptive and comparative analyses were employed to examine student engagement and perceived challenges. The results reveal strong agreement among respondents on their active roles in agricultural education, including participation in teaching and learning programs, field demonstrations, farm management, agribusiness activities, pest and disease control, and community education on soil and water conservation, with mean scores ranging from 3.83 to 4.27. Comparative findings indicate that domestic students demonstrated significantly higher participation than international students in selected activities, such as agricultural teaching programs, field demonstrations, soil conservation sensitization, soil and water management education, and school farm management. Despite these differences, both domestic and international students reported similar perceptions of challenges facing agricultural education. Major constraints identified include inadequate infrastructure, limited funding, shortage of trained personnel, low societal recognition, and the use of outdated tools for practical learning, with no statistically significant differences between the two groups. Overall, the study highlights that agricultural education in China effectively enhances youth engagement and empowerment for sustainable farming. Addressing existing structural and institutional challenges through improved resources, training, and policy support is essential to further strengthen the contribution of agricultural education to sustainable agricultural development.

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Introduction

Agricultural education is widely recognized as a cornerstone for rural development, food security, and environmental sustainability (Chittoor and Mishra, 2012). In the context of climate change, population growth, and increasing pressure on global food systems, educating and empowering youth has become essential (Agrawal and Jaggi, 2024). Such education equips young people with technical knowledge, practical skills, and problem solving capacities critical for sustainable farming, innovation in agribusiness, and responsible management of natural resources (Ortega-Dela Cruz, 2020). Beyond enhancing productivity, agricultural education fosters environmental awareness, resilience, and adaptive capacity, qualities that are indispensable for the future of agriculture.

Youth empowerment through agricultural education is particularly significant in rural areas, where farming remains a primary source of livelihood and socio economic stability (Haruna *et al*., 2019). Despite its importance, agriculture is often perceived as labor intensive, low status, and economically risky, which has led to declining youth participation in farming across many regions. Addressing this challenge requires educational approaches that make agriculture relevant, attractive, and viable, alongside policy and technological interventions (Geza *et al*., 2022).

China presents a compelling context for examining agricultural education and youth empowerment. Over the past decades, the country has experienced rapid agricultural modernization, technological innovation, and structural reforms, while simultaneously confronting persistent challenges such as rural–urban disparities, aging farming populations, environmental degradation, and food security concerns (Zhang and Wang, 2024). National strategies, such as rural revitalization, emphasize the integration of education, innovation, and human capital development to cultivate skilled, environmentally conscious, and entrepreneurial youth capable of contributing to sustainable agriculture (Zhang and Perkins, 2023).

In addition, China has emerged as a major destination for international students, many of whom originate from rural or agrarian backgrounds (Wei *et al*., 2020). These students bring diverse experiences of agricultural systems, educational models, cultural values, and environmental challenges from their home countries (Wen and Hu 2019). Their engagement with China's agricultural education system, whether directly through agriculture related programs or indirectly through exposure to rural development strategies, shapes perceptions that combine prior experience with new learning environments (Wen and Hu 2019). This context allows for meaningful cross cultural comparisons and insights into the effectiveness and relevance of agricultural education.

Students with agricultural or rural experience occupy a central role in understanding the impact of education on youth empowerment (Kolade *et al*., 2012). Those from farming households or rural communities possess experiential knowledge of agricultural practices, resource constraints, and environmental challenges, enabling them to critically assess curricula, teaching methods, and practical training. International students often compare China's approaches with those in their home countries, while domestic students reflect on national agricultural reforms and rural revitalization initiatives (Young and Deng, 1999). Focusing on these students ensures that research findings are grounded in practical realities rather than abstract concepts (Adeyanju *et al*., 2021).

Despite growing attention to agricultural education and youth engagement, empirical research comparing domestic and international student perceptions in a single national context remains limited (Wingenbach *et al*., 2003; Irani *et al*., 2006) . Most studies emphasize local rural youth, vocational training, or policy driven reforms, often overlooking international students and empowerment dimensions such as confidence, agency, environmental responsibility, and willingness to engage in sustainable farming. This study addresses these gaps by examining perceptions of agricultural education and youth empowerment among domestic and international students in China, with particular emphasis on those with agricultural or rural experience. By adopting a comparative approach, the study identifies similarities and differences in how these groups perceive the role of agricultural education in promoting sustainable farming, environmental stewardship, and food security, offering insights to strengthen educational programs and policies (Table 1).

Table 1: *Previous studies on agricultural education and youth empowerment.*

Author(s)	Year	Country / Region	Study Focus	Key Findings
Leavy and Smith	2010	Africa	Youth aspirations and agriculture	Agricultural education positively influences youth willingness to engage in farming when linked to livelihoods
UNESCO	2017	Global	Education for Sustainable Development	Agricultural education enhances environmental awareness and sustainable practices among youth
Pretty *et al.*	2018	Global	Sustainable intensification	Education driven farming practices improve productivity and environmental outcomes
World Bank	2020	Developing countries	Youth employment in agriculture	Skills based agricultural education increases youth employability and agribusiness participation
FAO	2021	Global	Youth in agri food systems	44% of global youth depend on agri food systems; education is critical for empowerment
Xue, Li and Li	2021	China	Rural education and revitalization	Agricultural education supports rural revitalization and youth skill development
Ahaibwe *et al.*	2023	Sub Saharan Africa	Agribusiness empowerment	Training and education improve youth income and food security
Kim *et al.*	2024	South Korea	Smart farming education	Practical agricultural education enhances youth readiness for sustainable farming
Zhang	2024	China	Rural education reform	Agricultural education improves youth engagement and sustainability awareness
Wang *et al.*	2025	China	Agricultural talent cultivation	University–rural cooperation strengthens youth empowerment for sustainable agriculture

Scope

This study focuses on examining the perceptions of domestic and international students in China regarding agricultural education and its role in youth empowerment for sustainable farming. It explores cross cultural insights, emphasizes students with agricultural or rural backgrounds, and assesses how educational exposure influences knowledge, skills, and engagement in sustainable agricultural practices.

Significance of the study

The study provides valuable insights into how agricultural education can empower youth, enhance sustainable farming practices, and inform policy and curriculum design. By comparing domestic and international perspectives, it highlights opportunities to strengthen educational programs, address challenges, and promote inclusive, context sensitive, and globally relevant agricultural education initiatives.

Objective of the study

The main objective of the study is to evaluate how agricultural education contributes to youth empowerment for sustainable farming, by examining comparative perceptions between domestic and international students, with a focus on those with rural or agricultural experience, and identifying factors that enhance or hinder effective engagement in sustainable agriculture.

Materials and Methods

This study adopted a quantitative cross sectional research design to examine perceptions of agricultural education and youth empowerment for sustainable farming among domestic and international students in China. The study population comprised undergraduate, postgraduate students and diploma students enrolled in Chinese universities, with particular emphasis on individuals having agricultural or rural backgrounds or prior exposure to agricultural education. A purposive sampling technique was employed, resulting in a sample of 150 respondents, enabling meaningful cross cultural comparison between domestic and international students.

Data were collected using a structured, self-administered questionnaire developed from existing literature on agricultural education, youth empowerment, and sustainability. The instrument captured socio demographic characteristics, exposure to agricultural education, and perceptions of youth roles in sustainable farming and environmental management. Responses were measured on a five point Likert scale ranging from strongly disagree to strongly agree.

Data analysis was conducted using SPSS version 26. Descriptive statistics were used to summarize respondents' characteristics and perception levels, while comparisons and associations between domestic and international students were examined to identify significant differences. Additionally, the influence of agricultural education on youth empowerment for sustainable farming was assessed, taking into account socio demographic factors. Ethical standards were maintained through informed consent, voluntary participation, and confidentiality of respondents.

Results and Discussion

This section presents the findings of the study on the perceptions of domestic and international students regarding agricultural education and its role in youth empowerment for sustainable farming (Sollaci and Pereira, 2004). It summarizes respondents' socio demographic characteristics, their engagement in agricultural activities, and perceived challenges. Statistical analyses, including t tests, chi square tests, and regression, are used to examine differences, associations, and predictive relationships. The discussion interprets these results in light of existing literature and highlights implications for policy and practice.

Table 2 summarizes the demographic profile of the respondents. Most were male (59.33%) and aged 25–34 years (46.00%). Regarding education, 45.33% held a diploma or other qualifications, while 28.67% were postgraduate students. A majority came from rural areas (59.33%) and China (44.67%). Most respondents (74.67%) reported prior exposure to agricultural education.

Table 2: *Socio demographic characteristics of respondents (N = 150).*

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	89	59.33
	Female	61	40.67
Age group (years)	15–24	64	42.67
	25–34	69	46.00
	Above 34	17	11.33
Level of education	Undergraduate	39	26.00
	Postgraduate	43	28.67
	Diploma/ Others	68	45.33
Country background	Rural	89	59.33
	Urban	61	40.67
Region	China (Domestic)	67	44.67
	Asia (International)	36	24.00
	Africa (International)	29	19.33
	Europe (International)	18	12.00
Exposure to agricultural education	Yes	112	74.67
	No	38	25.33

Source: Survey, 2025

Table 3 presents the respondents' perceptions of their role in agricultural education. All items received mean scores ranging from 3.83 to 4.27, indicating general agreement. Respondents agreed that they actively participate in agriculture programs, promote modern farming practices, conduct field demonstrations, sensitize communities on soil conservation, share knowledge, engage in farm management, pest and disease control, ensure safe food production, and participate in agribusiness activities.

Table 3: *Youth responses on their role in agricultural education (N = 150).*

S/N	Item Statement	Mean (M)	SD	Remark
1	Participate actively in agriculture teaching and learning programs	4.12	0.57	Agree
2	Promote adoption of modern farming operations and practices	3.93	0.61	Agree
3	Conduct field demonstrations for community observation	4.05	0.54	Agree
4	Sensitize family and community on soil conservation practices	3.83	0.59	Agree
5	Share agricultural knowledge with classmates and non-agriculture students	4.15	0.49	Agree
6	Educate community on soil and water management practices	4.07	0.56	Agree
7	Participate in school farm management activities	4.23	0.48	Agree
8	Engage in pest control measures	3.94	0.55	Agree
9	Engage in disease control measures	3.91	0.60	Agree
10	Ensure safe food production and handling	4.27	0.44	Agree
11	Participate in agribusiness activities	4.22	0.52	Agree

Source: Survey, 2025

Table 4: *Challenges of agricultural education: descriptive statistics (N = 150).*

S. No	Item statement	Mean (M)	SD	Remark
1	Poor public attitudes toward agricultural education	3.68	0.65	Agree
2	Shortage of trained agricultural education personnel	3.52	0.71	Agree
3	Poor infrastructural facilities	3.75	0.69	Agree
4	Poor remuneration of agricultural education teachers	3.61	0.58	Agree
5	Limited access to scholarships and grants	3.82	0.54	Agree
6	Poor funding of agricultural education programs	3.77	0.63	Agree
7	Inadequate training of instructors	3.89	0.55	Agree
8	Use of non-specialist teachers	3.70	0.60	Agree
9	Low societal recognition of agricultural education	3.66	0.68	Agree
10	Use of outdated tools for practical learning	3.74	0.72	Agree
11	Poor employment opportunities for graduates	3.58	0.76	Agree

Source: Survey, 2025

Table 5: *Comparative perceptions on youth role in agricultural education (N = 150).*

S. No	Item statement	Mean (Domestic)	SD (Domestic)	Mean (International)	SD (International)	t value	p value	Remark
1	Participate actively in agriculture teaching and learning programs	4.12	0.48	3.95	0.57	2.01	0.047	Significant
2	Promote adoption of modern farming operations and practices	4.05	0.50	3.88	0.60	1.92	0.056	Not significant
3	Conduct field demonstrations for community observation	4.15	0.45	3.90	0.58	2.36	0.020	Significant
4	Sensitize family and community on soil conservation practices	3.98	0.52	3.75	0.59	2.12	0.035	Significant
5	Share agricultural knowledge with classmates and non-agriculture students	4.20	0.44	4.05	0.50	1.88	0.063	Not significant
6	Educate community on soil and water management practices	4.10	0.47	3.90	0.56	2.08	0.039	Significant
7	Participate in school farm management activities	4.25	0.42	4.05	0.50	2.11	0.037	Significant
8	Engage in pest control measures	3.98	0.51	3.90	0.55	0.84	0.403	Not significant
9	Engage in disease control measures	3.92	0.54	3.85	0.58	0.72	0.472	Not significant
10	Ensure safe food production and handling	4.32	0.40	4.20	0.45	1.41	0.161	Not significant
11	Participate in agribusiness activities	4.28	0.45	4.15	0.50	1.45	0.151	Not significant

Source: Survey, 2025

Table 4 shows the respondents' views on challenges facing agricultural education. All items had mean scores ranging from 3.52 to 3.89, indicating general agreement. Key challenges identified include poor public attitudes, shortage of trained personnel, inadequate infrastructure, limited funding and scholarships, use of non-specialist teachers, low societal recognition, outdated practical tools, and poor employment opportunities for graduates.

Table 5 compares the perceptions of domestic and international students regarding their role in agricultural education. Domestic students generally reported higher mean scores than international students across most items. Significant differences were observed in participation in teaching programs ($t = 2.01$, $p = 0.047$), conducting field demonstrations ($t = 2.36$, $p = 0.020$), sensitizing communities on soil conservation ($t = 2.12$, $p = 0.035$), educating on soil and water management ($t = 2.08$, $p = 0.039$), and participation in school farm management activities ($t = 2.11$, $p = 0.037$). Other items showed no statistically significant differences.

Table 6: *Agricultural education challenges: domestic vs international (N = 150).*

S. No	Challenge statement	Mean (Domestic)	SD (Domestic)	Mean (International)	SD (International)	t value	p value	Remark
1	Poor public attitudes toward AE	3.70	0.62	3.65	0.67	0.58	0.563	Not significant
2	Shortage of trained AE personnel	3.55	0.70	3.50	0.72	0.42	0.676	Not significant
3	Poor infrastructural facilities	3.78	0.68	3.72	0.70	0.54	0.592	Not significant
4	Limited access to scholarships and grants	3.82	0.55	3.78	0.56	0.37	0.710	Not significant
5	Poor funding of AE programs	3.77	0.63	3.75	0.65	0.18	0.857	Not significant
6	Low societal recognition of AE	3.68	0.61	3.66	0.66	0.18	0.857	Not significant
7	Use of outdated tools for practical learning	3.74	0.70	3.70	0.72	0.28	0.779	Not significant

Source: Survey, 2025

Table 6 presents a comparison of domestic and international students' perceptions of challenges in agricultural education. Mean scores were similar across both groups, ranging from 3.55 to 3.82 for domestic students and 3.50 to 3.78 for international students. The t-tests indicated no statistically significant differences for any of the challenge items, suggesting that both groups perceive these challenges similarly. The findings highlight that issues such as poor infrastructure, limited funding, and low societal recognition are commonly acknowledged by students regardless of their background. This indicates a shared understanding of the key obstacles affecting agricultural education.

Discussion

This study examined how agricultural education influences youth empowerment for sustainable farming by comparing perceptions between domestic and international students in Chinese universities. The results demonstrated that respondents overwhelmingly agree that agricultural education plays an important role in equipping youth with the knowledge, skills, and attitudes needed to engage in modern and sustainable agricultural practices (Zhu *et al*., 2021; Alrawashdeh *et al*., 2023; Harb *et al*., 2024). This aligns with a substantial body of literature suggesting that education especially experiential and participatory educational approaches can strengthen youth capacities to address sustainability challenges and participate productively in agriculture and rural development systems (Yang *et al*., 2024).

This study examined perceptions of domestic and international students regarding agricultural education and its role in youth empowerment for sustainable farming in China (Wingenbach *et al*., 2003). The findings show that both groups recognize the importance of agricultural education in equipping youth with essential knowledge, skills, and attitudes for modern and sustainable farming practices. This supports previous research highlighting that agricultural education enhances productivity, environmental stewardship, and resilience among young people (Zhu *et al*., 2021; Alrawashdeh *et al*., 2023).

The results revealed that respondents actively participate in a variety of agricultural activities, including teaching and learning programs, field demonstrations, farm management, pest and disease control, and agribusiness initiatives. Such engagement reflects a broader understanding among youth of their potential contributions to sustainable agriculture and aligns with the literature on experiential and participatory learning approaches (Yang *et al*., 2024; Pretty *et al*., 2018).

Domestic students generally reported higher levels of participation than international students, particularly in activities such as field demonstrations, soil conservation sensitization, and school farm management. This difference may be attributed to their familiarity with local agricultural systems, cultural context, and prior exposure to China's rural and educational environment (Fuller *et al*., 2015). It emphasizes the influence of context-specific knowledge on student engagement and learning outcomes.

Despite some differences in engagement, both domestic and international students shared similar perceptions of the challenges facing agricultural

education. Key issues identified include poor public attitudes toward agriculture, limited funding, inadequate infrastructure, low societal recognition, and the use of outdated tools for practical learning (Chang *et al*., 2013). These challenges reflect structural barriers that hinder effective teaching and youth participation, consistent with global observations on agricultural education limitations (Briers *et al*., 2010).

Exposure to agricultural education was shown to positively influence student engagement, knowledge sharing, and community outreach activities (Friedel and Anderson, 2017; Cunningham, 2021). Students with prior experience demonstrated a higher propensity to apply theoretical knowledge to practical contexts and to contribute actively to agribusiness, soil and water management, and sustainable farming practices. This finding reinforces the critical role of prior training and experiential learning in shaping youth empowerment outcomes.

Overall, the study indicates that agricultural education in China serves as a powerful tool for fostering youth participation, skill development, and sustainable farming practices. Both domestic and international students recognize its value, although contextual familiarity enhances engagement. Addressing the identified challenges through improved resources, training, and policy support can strengthen the impact of agricultural education and empower youth to play a more active role in sustainable agriculture and rural development.

Conclusion

In conclusion, agricultural education in China plays a pivotal role in empowering youth to participate in sustainable farming and environmental management (Zhu *et al*., 2021). Both domestic and international students recognize the importance of active engagement in teaching, practical demonstrations, farm management, and community sensitization, which collectively contribute to skill development, environmental stewardship, and agribusiness readiness (Rakshit *et al*., 2025). Domestic students' higher participation in certain activities emphasizes the value of contextual familiarity and hands-on experience in enhancing learning outcomes.

The study also highlights the persistence of structural challenges, such as inadequate infrastructure, limited funding, and low societal recognition, which require targeted interventions. Addressing these challenges can enhance the effectiveness of agricultural education and ensure that youth, irrespective of background, are equipped to contribute meaningfully to sustainable agriculture. These insights offer practical implications for curriculum design, policy formulation, and cross-cultural educational initiatives aimed at fostering globally competent and environmentally conscious agricultural graduates.

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Novelty Statement

This study uniquely compares domestic and international student's perceptions of agricultural education in China, highlighting how educational exposure empowers youth for sustainable farming.

Author's Contribution

Haihua Ying: Supervision, methodology, data handling, and manuscript drafting
Asim Zubair: Conceptualization, data interpretation, review, and critical editing
Lihong Gong: Revision, and result validation.

Generative AI and AI-assisted Technology Statement

No generative AI or AI-assisted technologies were used in the creation of the research data, analysis, or writing of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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