frontiers | Frontiers in Sustainable Food Systems

TYPE Perspective
PUBLISHED 16 September 2024
DOI 10.3389/fsufs.2024.1348167

OPEN ACCESS

EDITED BY
Albie F. Miles,
University of Hawaii–West Oahu, United States

REVIEWED BY
Frederick Ato Armah,
University of Cape Coast, Ghana
Muneta Grace Kangara,
Rothamsted Research, United Kingdom

*CORRESPONDENCE
Ngonidzashe Chirinda
✉ ngonidzashe.chirinda@um6p.ma

RECEIVED 01 December 2023
ACCEPTED 03 September 2024
PUBLISHED 16 September 2024

CITATION
Chirinda N, Abdulkader B, Hjortsø CN, Aitelkadi K, Salako KV, Taarji N, Mhada M, Lamdaghri Z, Romanova G, Assogbadjo AE, Chadare FJ, Saidi M, Sassi M, Mugonola B, Gogo EO, Ssekandi J, Okalany E, Egeru A, Mshenga PM and Chfadi T (2024) Perspectives on the integration of agri-entrepreneurship in tertiary agricultural education in Africa: insights from the AgriENGAGE project.
Front. Sustain. Food Syst. 8:1348167.
doi: 10.3389/fsufs.2024.1348167

Perspectives on the integration of agri-entrepreneurship in tertiary agricultural education in Africa: insights from the AgriENGAGE project

Ngonidzashe Chirinda[1]*, Bisan Abdulkader[1], Carsten Nico Hjortsø[2], Kenza Aitelkadi[3], Kolawolé Valère Salako[4], Noamane Taarji[1], Manal Mhada[1], Zidane Lamdaghri[5], Gergana Romanova[2], Achille Ephrem Assogbadjo[4], Flora Josiane Chadare[6], Mwanarusi Saidi[7], Maria Sassi[8], Basil Mugonola[9], Elisha Otieno Gogo[10], Joseph Ssekandi[11], Emmanuel Okalany[12], Anthony Egeru[12], Patience Mlongo Mshenga[7] and Tarik Chfadi[1]

[1]Mohammed VI Polytechnic University, Ben Guerir, Morocco, [2]Department of Food and Resource Economics, University of Copenhagen, Frederiksberg, Denmark, [3]Institut Agronomique et Vétérinaire Hassan II, Rabat, Morocco, [4]Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, Cotonou, Benin, [5]Ibn Tofail University, Kenitra, Morocco, [6]Laboratoire des Sciences et Technologies des Aliments et Bioressources et de Nutrition Humaine, Université Nationale d'Agriculture, Sakété, Benin, [7]Egerton University, Egerton, Kenya, [8]Department of Economics and Management, University of Pavia, Pavia, Italy, [9]Faculty of Agriculture and Environment, Department of Rural Development and Agribusiness, Gulu University, Gulu, Uganda, [10]School of Agricultural Sciences and Agribusiness, Pwani University, Kilifi, Kenya, [11]Faculty of Agriculture, Uganda Martyrs University, Kampala, Uganda, [12]Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), Makerere University, Kampala, Uganda

The underperformance of agricultural education systems in Africa is evident through various indicators such as increased unemployment among recent agricultural graduates, inefficiencies in agricultural product value chains, and a decline in enrollment in agricultural schools. The AgriENGAGE project, which included eight African universities, was supported through the Erasmus+ Capacity Building in Higher Education program funded by the European Commission to address these challenges. The project aimed to contribute toward revitalizing agricultural education systems to stimulate agricultural transformation and enhance the sector's competitiveness while meeting the labor market's demands. This article draws on lessons learned at eight universities to provide a perspective on agri-entrepreneurship education integration in African universities. We provide descriptions, experiences, and insights on agri-entrepreneurship education integration in partner universities in Kenya, Benin, Morocco, and Uganda. Based on these experiences, we provide perspectives on reducing youth unemployment and improving the effectiveness of agricultural education in contributing to the development of sustainable food systems.

KEYWORDS

agricultural education, enterpreneureship, sustainability, agricultural productivity and innovation, Africa higher education

Introduction

Agriculture can potentially promote pro-poor growth in Africa's rural and urban areas (World Bank, 2007). Unfortunately, African agricultural systems are often characterized by their vulnerability to climate change, in addition to poor soil fertility, which in turn induces low productivity and poorly performing agrarian value chains (Jayne and Sanchez, 2021; Vanlauwe et al., 2015; Poulton and Macartney, 2012; De Brauw and Bulte, 2021). This situation seriously affects food security and income-generating employment opportunities for rural communities (Crush et al., 2012; Odularu, 2023). Furthermore, increased pressure from cheaper imported agro-products that out-compete local produce and marginalize local farmers derails progress toward achieving the United Nations Sustainable Development Goals (Knößlsdorfer and Qaim, 2023).

As African societies transition from dependence on the extraction of natural resources to more complex economies, there is a renewed interest in the role of universities in contributing toward knowledge-based economies and decision-making in the agricultural sector (Al-Youbi et al., 2021). Universities play a crucial role in agricultural development in Africa by contributing to research, education and training, capacity building, and knowledge transfer [Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), 2017]. Despite this critical role, African universities often remain heavily theoretical and entrenched in Western ideology, theory and values, governance systems, and forms of scientific production that are largely misaligned with local societal needs and practices (Woldegiorgis and Doevenspeck, 2013; Bjornlund et al., 2020). Whereas African agricultural colleges and polytechnics offer more practice-based curricula, the quality of the training is constrained by limited financial investments. For example, a study by Farayibi and Folarin (2021) showed that African governments' spending had focused mainly on primary and secondary education to the detriment of tertiary education. African countries also have the lowest share of GDP spent in tertiary education and research and development (<1.0%), compared to North America and Western Europe, as well as East Asia and the Pacific, which spend the highest percentage of GDP on R&D (2.50 and 2.11%, respectively, in 2018).

Constraints such as inadequate research infrastructure, poor internet connectivity, and unreliable power supply, primarily due to funding constraints, create barriers to augmenting knowledge production and innovation in African educational systems (Mugimu, 2021). Many agricultural tertiary education systems across Africa are experiencing continuously shrinking budget allocations and a decline in student enrollments, hampering the provision of adequate agricultural education and training to local populations (Maguire, 2000; Cletzer et al., 2016). These challenges also hinder African universities' capacity to engage in third-mission activities such as university-industry collaboration, training entrepreneurs, supporting new ventures, and ensuring that innovations support value creation in the African context (Etzkowitz and Dzisah, 2012; Osiru and Adipala, 2016).

The misalignment between the quality and curricula of African education and societal needs is evident in African agricultural systems' low productivity and limited innovation (Kanu et al., 2014). Strategic investments are needed to develop education systems, improve graduates' skills and competencies, and innovate and adopt efficient technologies and organizing methods (Campbell and Aderinto, 2022). Despite growing awareness of the needs, limited system-level changes have materialized in recent years (Maka et al., 2021). Consequently, the resulting rise in unemployment is a major cause of concern as it has a bearing on the stability of African societies and contributes to economic rural-to-urban migration (Tulu, 2017), which can also lead to the abandonment of arable land in rural areas. Therefore, a significant challenge is modernizing the agriculture sector and making it more attractive to skilled young people with the potential to innovate and create viable enterprises. Despite these challenges, African governments are making efforts to transform the education sector; a case in point is the Government of Zimbabwe, which is reforming its tertiary education from Education 3.0, in which tertiary education focuses on three pillars, namely research, teaching and community service to education 5.0 that focuses on five pillars: research, teaching, community service, innovation and industrialization (Muzira and Bondai, 2020).

At the pan-African policy level, there has been a growing commitment to promote increased agriculture productivity and agribusiness as major development pathways. For example, in 2003, the African Union (A.U.) adopted the Comprehensive Africa Agriculture Development Program (CAADP); in 2014, they agreed on the Malabo Declaration on Agriculture and Postharvest Losses; and in 2017, they issued the Continental Agribusiness Strategy. This shift is due to the realization that for agriculture to constitute a development pathway, the continent's agricultural research and education must increasingly focus on improving the sector's innovativeness and competitiveness (Mupfasoni et al., 2018).

Research has shown that agri-entrepreneurship programs are crucial to infusing entrepreneurs and managers with skills and practices that benefit the agro-industrial sector (Singh, 2013; Bairwa et al., 2014). Despite the significant policy attention and increasing diversity of experiences, there needs to be more evidence of agri-entrepreneurship education development in Africa. This perspective paper aims to share lessons and experiences from contemporary agri-entrepreneurship education development at eight African universities involved in the Strengthening Agri-Entrepreneurship and Community Engagement Training in East, West, and North Africa (AgriENGAGE) project. In addition to the eight African universities, the AgriENGAGE consortium included the University of Pavia, the University of Copenhagen, and the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), which provided perspectives from lessons learnt in several initiatives it is leading to improve the agricultural education systems in Africa.

The AgriENGAGE project

The AgriENGAGE was a 3-year Erasmus+ Capacity Building in Higher Education (CBHE) project funded by the European Commission and implemented during 2020–2023. The project was conceived based on the observation that many African universities' curricula should better align with current agricultural practices, market demands, and emerging societal, environmental and economic challenges. The project's mission was to foster the evolution of an education system that stimulates agricultural transformation and enhances agricultural sector competitiveness while meeting job market demands. This mission was executed by developing the skills and competencies of university staff and students in

agri-entrepreneurship, business management, and community engagement to catalyze the transformation of farming communities and the agri-industry. Moreover, community engagement entailed establishing frameworks for collaboration with relevant actors in the higher education value chains, including university-industry collaboration, technical and vocational agricultural institutions and other value chain actors. Through the AgriENGAGE project, a higher education ecosystem has been nurtured to foster the training of competent and market-relevant agricultural graduates at various levels (certificate, diploma, and degree holders). The following section summarizes the experiences and lessons learned at the eight African partner universities that formed part of the AgriENGAGE project.

Institut Agronomique et Vétérinaire Hassan II, Morocco

Entrepreneurship is considered an essential theme at IAV, and over the past decade, IAV has integrated entrepreneurship into its curricula. IAV has engaged in several international projects related to entrepreneurship education and training of trainers, which have enhanced the capacity of IAV professors in entrepreneurship (Lamdaghri et al., 2023). Since 2020, IAV has engaged in the development of a comprehensive curriculum together with the Moroccan private business school ESCA Ecole de Management (Ecole Supérieure du Commerce et des Affaires) and the AgriENGAGE project to integrate entrepreneurship modules across IVA's different educations. The first entrepreneurship modules were officially accredited in 2021. Moreover, industry plays a vital role in entrepreneurship teaching at IAV, and industrial experts are invited to conduct entrepreneurship courses. For instance, the institute signed a memorandum of understanding with the Crédit Agricole banking group in 2021, aiming to involve their staff in entrepreneurship teaching. In summary, IAV has been active in entrepreneurship teaching in the last 10 years. Despite this progress, IAV lacks sustainable financial support mechanisms to maintain entrepreneurship training programs.

Mohammed VI Polytechnic University, Morocco

Mohammed VI Polytechnic University (UM6P) has launched several entrepreneurial programs focusing on agriculture, including the *AgriENGAGE Summer School, Innovation Hours, and the AgriChallenge* and *AgriFood Tech Incubator* in collaboration with IAV. The AgriENGAGE Summer School offered an intensive learning experience in agribusiness, emphasizing entrepreneurship and community engagement. The Innovation Hours program provides students with a hybrid experience of education and incubation. It enables students from various departments to learn and practice innovation and entrepreneurship and to nurture their creativity, teamwork, and effective communication skills while interacting with industry professionals. The AgriChallenge is a 2-day hackathon open to all Moroccan university students, where participants present creative and innovative startup projects to address the challenges faced by Moroccan farmers. Finally, the AgriFood Tech Incubator aims to advance agriculture and agribusiness in Morocco by supporting young entrepreneurs with innovative ideas to create sustainable and competitive startups. Participants benefit from practical support, training workshops, and advice and mentoring from qualified experts.

Pwani University, Kenya

Pwani University collaborates with various industries, and, as part of many courses, students are required to visit relevant sector industries to gain a practical understanding of what they have learnt in the classroom. The university engages with agri-entrepreneurship expert practitioners invited as guest speakers or part-time lecturers. In addition, industry experts are involved in co-supervision, co-authorship, and short capacity-building courses. In their final year, students are also sent to the industry for attachment or internship as part of the requirement for course completion. Through these collaborative initiatives and engagement with industry, students have the opportunity to cultivate their innovation and communication skills. Since 2022, as part of AgriENGAGE and in collaboration with other projects and enterprises, Pwani University has also established the *Entrepreneurship and Innovation Hub*, which significantly boosts business and employment opportunities for agricultural students and other disciplines. The Hub has supported the creation of more than 300 enterprises.

Egerton University, Kenya

Egerton University introduced the first undergraduate course on entrepreneurship in 2002. This course aimed to "teach" and inculcate an entrepreneurial mindset, intentions, and the ability to create self-employment among the graduates of the different programs offered by the university. The course was (and still is) highly theoretical, leaving the graduates with no practical experience or entrepreneurial skills. Realizing its limitation, the university later introduced a Master's degree program in Agri-Enterprise Development. This program combines the theoretical foundations of entrepreneurship and innovation with practical entrepreneurial skills through business proposal development. It also provides seed funding to students to enable them to establish and manage their startups. The program connects students to industry partners for mentorship and access to finance, equipment and facilities to further aid the learning process. Furthermore, the university provides space and facilities to student entrepreneurs through the university's Incubation Centers (AGLEAD and COELIB) and staff training to embed entrepreneurship in course delivery across various disciplines. The incubation centers provide training in business skills, including basic financial, human resource, and marketing management skills, mentorship by university staff, and linkage to industry partners.

University of Abomey-Calavi, Benin

The University of Abomey-Calavi (UAC) has established the UAC Startup Valley to promote graduate students' professional and socio-economic integration through self-employment. The UAC Startup Valley provides a collaborative workspace, business development advice, mentoring and resources to support the creation and growth

of agri-businesses (UAC Startup Valley, 2023). Students and alumni from various universities in Benin can apply. The UAC Startup Valley aims to foster fruitful cooperation between stakeholders in knowledge production and development, especially between the business, higher education, and research sectors, through its Program for Economic Valorization of University Research Results. Since its creation, UAC Startup Valley has supported the business projects of more than 1,000 students and graduates, approximately 75% of them in agribusiness. Despite the progress made in agri-entrepreneurship at UAC, important challenges hinder its full expansion, including limited financial support to youth, a limiting enabling environment, and difficulties transitioning from past educational programs to a new entrepreneurial paradigm.

Université Nationale d'Agriculture, Bénin

Université Nationale d'Agriculture (UNA), fully devoted to professional training and research in agriculture, conducted a tracer study in 2018, showing that 7% of its bachelor graduates became self-employed in the agricultural sector. Indeed, UNA students benefit from UAC Startup Valley's incubation process. In addition, some students receive specific business development training with the support of technical partners. Every year since 2019, UNA has organized entrepreneur's day, an extracurricular activity aimed at making students aware of the entrepreneur's experiences and providing them the opportunity to be motivated by practicing entrepreneurs. Despite these efforts, some challenges, such as financial support for youth entrepreneurship and a limiting enabling environment, still need to be addressed. UNA is working to address these issues to better support youth training and enterprise development and increase the number of self-employed graduates. To achieve this goal, UNA and UAC have developed a curriculum for a Master in Agribusiness Development. UNA lecturers and students have been trained in entrepreneurship and community engagement.

Gulu University, Uganda

Gulu University contributes to entrepreneurship training by pondering the pertinent questions of teaching *about* and *for* entrepreneurship as promoted in the literature (Blenker et al., 2011). When entrepreneurship was first introduced in the curriculum, the courses were highly theoretical, cross-cutting and mandatory for students. However, the approach has changed from teaching about entrepreneurship to incorporating teaching for entrepreneurial mindset and behavior change. Therefore, several practice-oriented entrepreneurial courses and modules have been developed to supplement the theoretical modules. The new modules allow students to engage with the communities from an agri-entrepreneurial perspective. This change in approach has resulted in the emergence of student-led businesses that continue to thrive even after students have graduated. Having entrepreneurship and community engagement embedded in the curricula and further entrenched in university processes guarantees successful implementation. First, the fact that entrepreneurship is a curriculum requirement enables students to embrace it fully, unlike when it was an extracurricular activity that did not attract any credits. Recently, Gulu University has enacted a Policy on Community Engagement that motivates a critical mass of academic and administrative staff to become entrepreneurial "change agents" who support the growth of community engagement and entrepreneurial mindsets in the university. Brokering partnerships through university-industry engagement enables Gulu University to broaden its influence. Further, it improves its relevance to the community, facilitates resource mobilization, and fosters the conduct of relevant scholarly inquiry and research that address actionable societal challenges.

Uganda Martyrs University, Uganda

Uganda Martyrs University (UMU) is a late adopter of entrepreneurship educational initiatives, and the AgriENGAGE project facilitated efforts in developing curricula and training models. UMU is focused on ensuring that graduates can identify a business opportunity, keep better records, and are comfortable conducting business transactions. The training modules included approaches that enhance entrepreneurial skills and the confidence to experiment. The goal is to help learners to recognize and take advantage of entrepreneurial opportunities in their environment. Early signs indicate that students and staff have embraced the entrepreneurship approach, and currently, more mainstream entrepreneurship courses are being integrated into Agroecology, Agribusiness Management and Agribusiness Innovation MSc programs. In addition, the UMU graduate school has been mandated to promote enterprise development to ensure that innovations can be implemented into real businesses.

While universities have similarities regarding entrepreneurship education, some differences exist. All AgriENGAGE participating universities recognize the importance of entrepreneurship education. The universities have embarked on staff training to inculcate an entrepreneurial mindset. Universities have similarly introduced entrepreneurship courses as part of undergraduate curricula. The differences in embedding entrepreneurship education in the universities revolve around the scale. Whereas some universities like Egerton, UM6P, Gulu and Abomey Calavi have made significant strides in developing incubation centers as well as policies and strategies, other younger universities are still in the inception stages of embedding entrepreneurship education into their curricula.

Regional universities forum for capacity building in agriculture

Regional universities forum for capacity building in agriculture was established in 2004 and is a consortium of more than 170 universities in 40 African countries. It is registered as an international NGO and operates from Makerere University in Kampala, Uganda. RUFORUM's core role is to develop and adapt new models to produce the next generation of skilled and competent graduates who spur development in the agricultural sector as employees or entrepreneurs and scale them out across the African continent.

In the AgriENGAGE project, RUFORUM facilitated the mobilization of resources and engagements for universities to develop and deploy new models of entrepreneurship education. RUFORUM also mobilized business development services (BDS) experts to train

staff that would train students in enterprise development and how to deliver BDS effectively. RURORUM was also instrumental in bringing curriculum experts from its vast network for curriculum development activities.

Perspectives of AgriENGAGE experience and insights in agri-entrepreneurship education

Based on the AgriENGAGE partners' experiences, we contend that educational managers must consider three dimensions: (1) institutional embeddedness, (2) education design, and (3) the entrepreneurial ecosystem.

Institutional embeddedness and sustainability

Institutional embeddedness refers to the inclusion of economic action in networks of social relations constrained by non-economic institutions (Polanyi, 1944; Granovetter, 1985; Oesch, 2006). High-quality education is usually embedded in an institutional and organizational fabric that enables involved actors to develop, deliver, and reflect on their teaching. This fabric may consist of policies, incentive structures, ways of organizing, and organizational units such as business incubators or external relations departments, forming an environment that reinforces students' learning outcomes (Clark, 1998; Scott, 2014). Developing such an internal environment takes time and requires attention from top management and staff commitment. While entrepreneurship received much consideration on AgriENGAGE African university leaders' agendas, the journey toward a more entrepreneurial university often starts with individual educators' commitment to integrating entrepreneurship into their programs (Neck and Greene, 2011).

Several of the AgriENGAGE participants have been engaged in developing entrepreneurship education and enterprise development opportunities in the last decade. These activities frequently depend on initiatives that foster collaboration between universities, partnerships with NGOs, and university-industry collaborations to enhance local entrepreneurial capacity (Guerrero et al., 2008). For example, Gulu and Egerton universities successfully obtained external funding that progressively helped them develop local capabilities in entrepreneurship. Once innovative extracurricular entrepreneurial activities such as hackathons, prototyping, business-plan competitions, and incubation programs have been embraced by the university community, they get top management support. This initiates a process of institutionalization that includes setting priorities, developing strategies and action plans, and establishing units to fortify existing and novel educational entrepreneurship activities (Kickul and Lyons, 2012; Neck and Greene, 2011). These dynamics form the ideal ground for attracting external funding, which is necessary for sustaining new university initiatives (Morris et al., 2011). Moreover, the consortium of universities under AgriENGAGE formed a community of practice for agri-entrepreneurship in Africa, to drive the agri-preneurship agenda. The AgriENAGE actors desire to deepen the linkage between this community of practice and the African centers of excellence in agri-entrepreneurial education. Therefore, finding the right balance between "grassroots" engagement and top management consensus is crucial for universities that want to develop more entrepreneurial ethos (Scott, 2014).

Education design

Educational design for enhancing entrepreneurial attitudes, skills and competencies among African university students poses a challenge due to the lack of consensus on the programs to be taught and the specific entrepreneurial competencies to be imparted (Mbeteh and Pellegrini, 2022). Yet a well-designed educational program can increase knowledge and understanding of entrepreneurship among various stakeholders, from students to policymakers, industry and the local communities (Hytti and O'Gorman, 2004). To stay pertinent amidst the swift social and technological shifts, education must demonstrate flexibility and adaptability by addressing the evolving demands of the local industries and communities (Wedekind and Mutereko, 2016; Muwaniki et al., 2022). Furthermore, educational considerations involve determining the optimal timing and method for introducing students to entrepreneurship, balancing theory and practice, and securing the necessary resources. This requires embedding curricular and non-curricular education and activities in the existing agricultural programs. Recognizing the weaknesses of the current agriculture curriculum, the authors have highlighted the importance of adapting to meet the changing needs of farmers, agricultural extension officers, and related institutions (Muwaniki et al., 2022). The experiences of the AgriENGAGE participants indicate that early introduction of entrepreneurship results in forming an entrepreneurial culture as students pursue opportunities to engage in entrepreneurship experiences throughout their studies.

The cross-country context of the AgriENGAGE project turned out to be cross-regional between northern, western and eastern Africa. Connections between experienced universities such as Egerton in Kenya, IAV in Morocco, University of Abomey-Calavi in Benin and Gulu in Uganda in student entrepreneurship and community engagement were valuable for younger universities. The latter mostly used the opportunity of the AgriENGAGE project to initiate or enhance entrepreneurship courses in curriculum and modules, develop new dimensions of community engagement, and advocate university leaders for the actual future transformation of agricultural training in African higher education institutions. In practice, all partner universities reviewed or developed entrepreneurship-oriented curricula or short courses that are expected to be scaled out and implemented. Blended entrepreneurship programs toward university actors in the project boosted all partners, university staff and students so that they continue to be or become change agents for actual mindset change in the universities.

The AgriENGAGE partner universities recognize the importance of balancing theoretical and practical agri-entrepreneurship education. Recently, they have revised their curricula to allocate more time and resources to practical courses. Experiences from the AgriENGAGE universities suggest that mandatory entrepreneurial education transforms agricultural education programs to equip graduates with the capacity to start agribusinesses. This development is most successful when various mechanisms are introduced to support students' entrepreneurial journey. Entrepreneurship practice education includes business plan competitions and

implementation exposure to actual production and market conditions, attachments and internships, prototyping services, access to professional business development, and support in agribusiness incubators.

The African university context provides a highly conducive environment for generating entrepreneurial experiences closely aligned with practice. Engaging in practical experiences enables the validation of imported theories within the African context, establishing a foundation for adapting the curriculum to suit African contexts. However, obtaining funding for entrepreneurship activities is challenging for most African universities. Most of the new activities in the AgriENGAGE universities were only possible through external funding. As part of the legacy of the project, developed educational activities and incubator programs were integrated into the universities' curricula and structure. However, not all universities emphasized the interconnectedness of education, entrepreneurship, and community engagement. In the African context, community engagement is vital. For example, Farmer Field School activities or student internships foster students' and farmers' entrepreneurial mindsets.

Entrepreneurial ecosystem

Communities of agents, social structures, institutions, and cultural values that produce entrepreneurial activity constitute the entrepreneurial ecosystem (Roundy et al., 2017). The relational capital of universities seeking entrepreneurial posture encompasses intangible resources associated with internal and external relations with public and private partners. This includes their position and image in (social) networks, brand strength, industry involvement in training activities, collaborations with international research centers, networking with professors, international student exchange, global recognition of the universities, and overall attractiveness, among other factors (Trequattrini et al., 2018).

In order to foster and support agribusiness entrepreneurship, entrepreneurship education should be integrated into a comprehensive entrepreneurial ecosystem that involves various actors at both the local and national levels. The limited collaboration and engagement between the African agriculture schools with the private industry, smallholder farmers, and rural communities hinder the opportunities for knowledge diffusion, technology transfer, entrepreneurship, and innovation (Egeru et al., 2023). Focusing on the industry's and farmers' needs is a precondition for creating partnerships. A successful mechanism involves establishing university-industry interactions centered around industry challenges. This approach compels students to address real-life problems specified by an industry host. Another crucial takeaway is that collaboration between universities within the ecosystem can facilitate the scaling of best practices, such as the organization of teaching and supervision. Additionally, it can offer resources through activities like sharing business networks, joint fundraising, and knowledge exchange. Furthermore, it creates opportunities for South–South capacity building, where more experienced universities share their knowledge with newcomers in the field. However, legal challenges and constraints related to intellectual property rights and profit sharing must be adequately addressed to foster the sustainability of entrepreneurship relations with industry partners.

Conclusion

A key observation from the AgriENGAGE experience is that superior educational outcomes were achieved by incorporating entrepreneurship and innovation within the broader curriculum instead of treating these topics as distinct disciplines in generic courses. This notion of integration is linked with a conceptualization of "entrepreneurship teaching" as a more comprehensive concept that extends beyond business plans and startups. It emphasizes fostering the development of entrepreneurial mindsets and behavior among students and other beneficiaries of university activities. Embedding entrepreneurship within the broader agriculture curriculum comes with its set of challenges. Nonetheless, considering the practical dimension of agricultural education, this educational approach offers significant opportunities for integrating entrepreneurship with other education activities such as community development, problem-based learning approaches, student attachments, and extension training. The AgriENGAGE experience underscores the significance of offering essential internal or external resources to fully leverage the potential benefits of integrating entrepreneurship throughout university education.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

NC: Conceptualization, Writing – original draft, Writing – review & editing. BA: Writing – original draft, Writing – review & editing. CH: Writing – original draft, Writing – review & editing. KA: Writing – original draft. KS: Writing – original draft, Writing – review & editing. NT: Writing – review & editing. MM: Writing – review & editing. ZL: Writing – original draft. GR: Writing – original draft, Writing – review & editing. AA: Writing – original draft, Writing – review & editing. FC: Writing – original draft, Writing – review & editing. MwS: Writing – original draft, Writing – review & editing. MaS: Writing – review & editing. BM: Writing – original draft, Writing – review & editing. EG: Writing – original draft, Writing – review & editing. JS: Writing – original draft, Writing – review & editing. EO: Writing – original draft, Writing – review & editing. AE: Writing – review & editing. PM: Writing – original draft, Writing – review & editing. TC: Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Acknowledgments

The authors are grateful to the European Commission, which funded the Erasmus+ Capacity Building in Higher Education (CBHE)

project. However, the European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Publisher's note

References

AI-Youbi, A.O., Zahed, A.H.M., Nahas, M.N., and Hegazy, A.A., (2021). The roles of universities in development. The leading World's most innovative universities, pp.1–8.

Bairwa, S. L., Kerobim, L., Saket, K., Lokesh, M., and Pravin, K. (2014). Agripreneurship development as a tool to upliftment of agriculture. *Int. J. Sci. Res. Publ.* 4, 1–4.

Bjornlund, V., Bjornlund, H., and Van Rooyen, A. F. (2020). Why agricultural production in sub-Saharan Africa remains low compared to the rest of the world – a historical perspective. *Int. J. Water Resour. Dev.* 36, S20–S53. doi: 10.1080/07900627.2020.1739512

Blenker, P., Korsgaard, S., Neergaard, H., and Thrane, C. (2011). The questions we care about: paradigms and progression in entrepreneurship education. *Ind. High. Educ.* 25, 417–427. doi: 10.5367/ihe.2011.0065

Campbell, O., and Aderinto, E. (2022). Human capital development and labour market outcomes in Africa: evidence from sub-Saharan African countries. *J. Econom. Sustain. Dev.* 13, 30–38.

Clark, B. R. (1998). Creating entrepreneurial universities: organizational pathways of transformation. *Issues High. Educ.* 49, 13–30.

Cletzer, D. A., Rudd, R., Westfall-Rudd, D., and Drape, T. A. (2016). Agricultural education and training in sub-Saharan Africa: a three-step approach to AET institution building. *Int. J. Educ.* 8, 73–87. doi: 10.5296/ije.v8i2.9196

Crush, J., Frayne, F., and Pendleton, W. (2012). The crisis of food insecurity in African cities. *J. Hunger Environ. Nutr.* 7, 271–292. doi: 10.1080/19320248.2012.702448

de Brauw, A., and Bulte, E. (2021). "The evolution of agricultural value chains in Africa" in African Farmers, Value Chains and Agricultural Development. Palgrave Studies in Agricultural Economics and Food Policy. ed. C. Barrett (Cham: Palgrave Macmillan), 59–81.

Egeru, A., Lindow, M., and Leresche, K. M. (2023). University Engagement With Farming Communities in Africa. London, United Kingdom: Routledge, 1–9.

Etzkowitz, H., and Dzisah, J. (Eds.) (2012). The Age of Knowledge: The Dynamics of Universities, Knowledge and Society. Paderborn (Germany): Brill Deutschland GmbH.

Farayibi, A. O., and Folarin, O. (2021). Does government education expenditure affect educational outcomes? New evidence from sub-Saharan African countries. *Afr. Dev. Rev.* 33, 546–559. doi: 10.1111/1467-8268.12588

Granovetter, M. (1985). Economic action and social structure: the problem of embeddedness. *Am. J. Sociol.* 91, 481–510. doi: 10.1086/228311

Guerrero, M., Rialp, J., and Urbano, D. (2008). The impact of desirability and feasibility on entrepreneurial intentions: a structural equation model. *Int. Entrep. Manag. J.* 4, 35–50. doi: 10.1007/s11365-006-0032-x

Hytti, U., and O'Gorman, C. (2004). What is "Enterprise educations"? An analysis of the objectives and methods of enterprise education programs in four European countries. *Educ. Train.* 46, 11–23. doi: 10.1108/00400910410518188

Jayne, T. S., and Sanchez, P. A. (2021). Agricultural productivity must improve in sub-Saharan Africa. *Science* 372, 1045–1047. doi: 10.1126/science.abf5413

Kanu, B. S., Salami, A. O., and Numasawa, K. (2014). Inclusive growth: An imperative for African agriculture. *Afr. J. Food Agric. Nutr. Dev*. 14.

Kickul, J., and Lyons, T. S. (2012). Understanding Social Entrepreneurship: The Relentless Pursuit of Mission in an Ever-Changing World. New York: Routledge.

Knößlsdorfer, I., and Qaim, M. (2023). Cheap chicken in Africa: would import restrictions be pro-poor? *Food Secur.* 15, 791–804. doi: 10.1007/s12571-022-01341-5

Lamdaghri, Z., El Kadi, K. A., Zebakh, S., Soulimani, A. A., Ettabi, M. I., and Imani, H. (2023). "The importance of internationalization in the promotion of innovation and entrepreneurship in Moroccan universities" in Erasmus Scientific Days 2022. eds. L. Daadaoui, D. Burgos, K. Berrada and A. Ghanimi (Atlantis Press), 341–350.

Maguire, C. J. (2000). Agricultural education in Africa: managing change. Presented at workshop 2000, Accra and Cape Coast Ghana. Accessed September 4–6, 2000.

Maka, L., Van Niekerk, J. A., De-Bruyn, M., and Pakela-Jezile, Y. P. (2021). Perceptions of agricultural postgraduate students on unemployment in South Africa. *Int. J. Soc. Sci. Humanit. Stud.* 13, 55–78. doi: 10.34109/ijsshs.202114003

Mbeteh, A., and Pellegrini, M. (2022). Entrepreneurship Education in Africa. A Contextual Model for Competencies and Pedagogy in Developing Countries. Leeds: Emerald Publishing Limited.

Morris, M. H., Webb, J. W., and Franklin, R. J. (2011). Understanding the manifestation of entrepreneurial orientation in the nonprofit context. *Entrep. Theory Pract.* 35, 947–971. doi: 10.1111/j.1540-6520.2011.00453.x

Mugimu, C. B. (2021). "Higher education institutions (HEIs) in Africa embracing the "new normal" for knowledge production and innovation: barriers, realities, and possibilities" in Higher Education-New Approaches to Accreditation, Digitalization, and Globalization in the Age of Covid. eds. L. Waller and S. Waller (IntechOpen).

Mupfasoni, B., Kessler, A., and Lans, T. (2018). Sustainable agricultural entrepreneurship in Burundi: drivers and outcomes. *J. Small Bus. Enterp. Dev.* 25, 64–80. doi: 10.1108/JSBED-03-2017-0130

Muwaniki, C., McGrath, S., Manzeke-Kangara, M. C., Wedekindv, V., and Chamboko, T. (2022). Curriculum reform in agricultural vocational education and training in Zimbabwe: implementation challenges and possibilities. *J. Vocation. Adult Contin. Educ. Train.* 5:22. doi: 10.14426/jovacet.v5i1.248

Muzira, D. R., and Bondai, B. M. (2020). Perception of educators towards the adoption of education 5.0: a case of a State University in Zimbabwe. *East Afric. J. Educ. Soc. Sci.* 1, 43–53. doi: 10.46606/eajess2020v01i02.0020

Neck, H. M., and Greene, P. G. (2011). Entrepreneurship education: known worlds and new frontiers. *J. Small Bus. Manag.* 49, 55–70. doi: 10.1111/j.1540-627X.2010.00314.x

Odularu, G. (ed.). (2023). "The introduction: pandemic preparedness and A-platonic policies for transforming Africa's Agri-food systems" in Agricultural Transformation in Africa: Contemporary Issues, Empirics, and Policies (Cham: Springer International Publishing), 1–7.

Oesch, D. (2006). Redrawing the Class Map: Stratification and Institutions in Britain, Germany, Sweden and Switzerland. London: Springer.

Osiru, M., and Adipala, E. (2016). Responding to key gaps in Africa's higher agricultural education: lessons from the regional universities forum for capacity building in agriculture. *RUFORUM Work. Doc. Ser.* 14, 1–13.

Polanyi, K. (1944). The Great Transformation: Economic and Political Origins of Our Time. New York: Rinehart.

Poulton, C., and Macartney, J. (2012). Can public-private partnerships leverage private investment in agricultural value chains in Africa? A preliminary review. *World Dev.* 40, 96–109. doi: 10.1016/j.worlddev.2011.05.017

Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) (2017). RUFORUM vision 2030: The African universities' agenda for agricultural higher education, science, technology and innovation (AHESTI)—abridged. Available online at: https://repository.ruforum.org/system/tdf/Ruforum (Accessed December 12, 2023).

Roundy, P., Brockman, B., and Bradshaw, M. (2017). The resilience of entrepreneurial ecosystems. *J. Bus. Ventur. Insights* 8, 99–104. doi: 10.1016/j.jbvi.2017.08.002

Scott, W. R. (2014). Institutions and Organizations: Ideas, Interests, and Identities. Los Angeles, CA: Sage Publications.

Singh, A. P. (2013). Strategies for developing agripreneurship among farming communities in Uttar Pradesh, India. *Acad. Int. Multidiscip. Res. J.* 3, 1–12.

Trequattrini, R., Lombardi, R., Lardo, A., and Cuozzo, B. (2018). The impact of entrepreneurial universities on regional growth: a local intellectual capital perspective. *J. Knowl. Econ.* 9, 199–211. doi: 10.1007/s13132-015-0334-8

Tulu, S. K. (2017). A qualitative assessment of unemployment and psychology fresh graduates' job expectation and preference. *Psychol. Behav. Sci.* 6, 21–29. doi: 10.11648/j.pbs.20170602.12

UAC Startup Valley (2023). UAC Startup Valley homepage. Available online at: https://uacstartupvalley.com/ (Accessed December 1, 2023).

Vanlauwe, B., Six, J., Sanginga, N., and Adesina, A. A. (2015). Soil fertility decline at the base of rural poverty in sub-Saharan Africa. *Nat. Plants* 1:15101. doi: 10.1038/nplants.2015.101

Wedekind, V., and Mutereko, S. (2016). Higher education responsiveness through partnerships with industry: the case of a university of technology programme. *Dev. South. Afr.* 33, 376–389. doi: 10.1080/0376835X.2016.1156516

Woldegiorgis, E. T., and Doevenspeck, M. (2013). The changing role of higher education in Africa: a historical reflection. *High. Educ. Stud.* 3, 35–45. doi: 10.5539/hes.v3n6p35

World Bank (2007). World development report 2008: Agriculture for development. The World Bank, Washington, DC.