

# International Journal of Management and Organizational Research

## A Sustainable Agribusiness Workforce Development Model: Bridging Agricultural Innovation and Economic Empowerment

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### Article Info

**ISSN (online):** 2583-6641

**Volume:** 02

**Issue:** 01

**January-February 2023**

**Received:** 13-01-2023

**Accepted:** 08-02-2023

**Page No:** 274-280

### Abstract

This paper presents a sustainable agribusiness workforce development model aimed at bridging agricultural innovation and economic empowerment. The model emphasizes the need for comprehensive workforce development strategies that integrate education, skill-building, and technological innovation to empower rural populations and enhance agribusinesses' productivity. The research examines the importance of aligning training programs with practical industry needs and the role of technological advancements, such as precision farming and digital market platforms, in fostering economic growth. The paper also explores the role of public-private partnerships in providing essential resources and infrastructure for workforce development initiatives. Key findings indicate that a successful workforce development model requires a multidimensional approach that includes curriculum development, skills training, and financial empowerment strategies, particularly for marginalized groups. Moreover, it highlights the challenges of measuring long-term outcomes and sustainability, emphasizing the importance of data-driven decision-making in refining workforce development models. The paper concludes with policy recommendations for strengthening workforce development, including government investment in training infrastructure, incentivizing technological adoption, enhancing financial inclusion, and promoting gender equity. The proposed framework aims to support the sustainable growth of the agribusiness sector while driving economic empowerment for workers, ultimately contributing to rural development and food security.

**DOI:** <https://doi.org/10.54660/IJMOR.2023.2.1.274-280>

**Keywords:** Agribusiness Workforce Development, Sustainable Agriculture, Economic Empowerment, Technological Innovation, Public-Private Partnerships, Rural Development

## 1. Introduction

### 1.1 Background on agribusiness workforce development

Agribusiness workforce development plays a pivotal role in the agricultural sector, particularly in addressing the challenges of a growing global population, limited natural resources, and changing environmental conditions (Ogundeji, Omowole, Adaga, & Sam-Bulya, 2023). With agriculture being a key driver of economic growth, especially in developing countries, the need for a skilled workforce in agribusiness has never been more critical. However, despite its importance, there remains a significant gap between the skills required by the modern agribusiness sector and the abilities of the workforce currently available (Onukwulu, Fiemotongha, Igwe, & Ewim, 2023).

This gap is primarily due to insufficient access to training and education, inadequate infrastructure, and outdated agricultural practices that fail to meet the demands of modern, sustainable farming. Furthermore, there is a notable lack of alignment between educational curricula and the actual needs of the industry. The rapid development of technologies, such as precision agriculture and biotechnology, has created new opportunities in agribusiness but also introduced new challenges in terms of workforce preparedness. This section discusses the importance of designing effective agribusiness workforce development programs that equip individuals with both the technical and entrepreneurial skills necessary to thrive in this rapidly evolving sector (Myllynen, Kamau, Mustapha, Babatunde, & Adeleye, 2023).

### 1.2 Importance of bridging agricultural innovation with economic empowerment

Integrating agricultural innovation with economic empowerment is essential for ensuring that agribusinesses remain competitive while improving the livelihoods of those working within the sector. Agricultural innovation, which includes the adoption of new technologies, farming techniques, and sustainable practices, has the potential to significantly increase productivity, reduce resource waste, and enhance resilience to environmental changes. However, their potential cannot be fully realized without a workforce capable of effectively implementing and managing these innovations (Fiemotongha, Igwe, Ewim, & Onukwulu, 2023).

Bridging agricultural innovation with economic empowerment involves creating a workforce that is proficient in modern farming techniques and equipped with skills in business management, financial literacy, and entrepreneurship. This approach fosters job creation, facilitates income generation, and stimulates local economies. For example, as smallholder farmers and agribusiness entrepreneurs gain access to innovation-driven tools, they can improve the efficiency of their operations, expand their market reach, and increase their income potential (Hassan, Collins, Babatunde, Alabi, & Mustapha, 2023). Moreover, economic empowerment through agribusiness development can alleviate poverty, particularly in rural areas where employment opportunities are limited. By focusing on a sustainable model of agribusiness workforce development, this framework ensures that the benefits of innovation are distributed equitably, fostering long-term economic growth and social stability (E. K. Jessa, 2023).

### 1.3 Research objectives and scope

This paper aims to explore the development of a sustainable agribusiness workforce model that integrates agricultural innovation with economic empowerment. The primary objective is to identify key components of an effective workforce development framework that not only addresses the skills gap but also enhances the ability of individuals to harness innovation in the agricultural sector. Specifically, the research seeks to investigate the various barriers to workforce development in agribusiness, such as limited access to training, lack of funding for innovation, and the challenges of integrating new technologies into traditional farming practices.

In addition, the study will examine how the collaboration

between public and private sectors, along with technological advancements, can contribute to more sustainable workforce development programs. The scope of this research includes an in-depth analysis of existing workforce development models within the agribusiness sector, as well as case studies demonstrating the effectiveness of integrating innovation and empowerment strategies. The paper will also focus on the policies and frameworks supporting agribusiness workforce development in different regions, particularly on developing economies. This research aims to provide a comprehensive roadmap for bridging agricultural innovation and economic empowerment through workforce development by highlighting successful examples and proposing recommendations.

## 2. Theoretical and conceptual foundations

### 2.1 Defining agribusiness workforce development

Agribusiness workforce development refers to the process of equipping individuals with the skills, knowledge, and competencies necessary to meet the demands of the agricultural and agribusiness sectors. It involves a range of educational, training, and capacity-building initiatives aimed at improving the productivity, efficiency, and sustainability of the workforce within this field. A key aspect of agribusiness workforce development is its focus on integrating modern technologies and innovations into traditional agricultural practices. This integration helps farmers and agribusiness professionals adapt to evolving market demands, environmental challenges, and technological advancements (J. O. Basiru, L. Ejiofor, C. Onukwulu, & R. U. Attah, 2023e).

Workforce development in agribusiness is multifaceted, encompassing vocational training, formal education, on-the-job learning, and entrepreneurship programs. It involves training individuals in areas such as sustainable farming techniques, business management, supply chain management, marketing, and financial literacy. A successful agribusiness workforce development program prepares individuals not only to work as skilled labor but also to become leaders, innovators, and entrepreneurs who can drive the sector forward. By enhancing the technical and managerial capacities of the workforce, agribusiness workforce development contributes to the overall growth of the agricultural industry, helping to address issues such as food security, rural poverty, and economic diversification (Olanrewaju Awoyemi, Attah, Basiru, Leghemo, & Onwuzulike, 2023; J. O. Basiru, C. L. Ejiofor, E. C. Onukwulu, & R. U. Attah, 2023d).

### 2.2 Key theoretical frameworks

Theoretical frameworks play a crucial role in understanding how agribusiness workforce development can be effectively implemented. One of the foundational frameworks is Human Capital Theory, which posits that investments in education and training lead to an increase in the productivity and capabilities of individuals. In the context of agribusiness, human capital theory suggests that a well-trained workforce is essential for the sector's growth, as it enables individuals to implement innovative agricultural practices and manage agribusiness enterprises more efficiently. This theory emphasizes the value of continuous learning and development as a means to enhance the workforce's ability to adapt to changing agricultural technologies and market demands (O Awoyemi, Attah, Basiru, & Leghemo, 2023).

Another important framework is Innovation Diffusion Theory, which examines how new ideas, technologies, and practices spread within a society or industry. In agribusiness, the theory highlights the process by which agricultural innovations—such as precision farming, sustainable farming techniques, and advanced biotechnology—are adopted and integrated into farming practices. According to this theory, the speed and success of innovation diffusion depend on factors such as the perceived relative advantage of innovations, the complexity of adoption, and the availability of resources for implementation. Understanding the diffusion of agricultural innovation is vital for designing workforce development programs that promote the adoption of cutting-edge practices and technologies (J. O. Basiru, C. L. Ejiofor, E. C. Onukwulu, & R. U. Attah, 2023b, 2023c).

The framework of Sustainable Development provides a crucial lens for evaluating agribusiness workforce development in the context of environmental, social, and economic sustainability. Sustainable development in agribusiness focuses on practices that not only meet present needs but also ensure the long-term viability of agricultural resources, reduce environmental impacts, and support rural communities. The inclusion of sustainable development principles in workforce training programs equips individuals with the tools to build resilience, conserve natural resources, and promote social equity in the agricultural sector.

### 2.3 Interdisciplinary Approaches

The development of a sustainable agribusiness workforce requires an interdisciplinary approach that integrates insights and methodologies from diverse fields, including agriculture, innovation, and economic empowerment. Each of these disciplines contributes unique perspectives and solutions that help to shape workforce development initiatives that are both effective and sustainable (Anyanwu, Dawodu, Omotosho, Akindote, & Ewuga, 2023).

In the agricultural domain, workforce development focuses on building skills in modern farming techniques, sustainable land management, and agribusiness operations. However, for agribusinesses to thrive in today's competitive and technology-driven world, innovation plays a critical role. Technological advancements such as digital farming, automation, and biotechnology require workers to possess not only traditional agricultural skills but also an understanding of these new tools and systems. Innovation in agribusiness can drive productivity gains, reduce resource consumption, and improve the quality of agricultural outputs, making it an essential component of workforce development programs (J. O. Basiru, C. L. Ejiofor, E. C. Onukwulu, & R. Attah, 2023a).

Economic empowerment is another critical element of this interdisciplinary approach. By integrating economic empowerment into workforce development, individuals gain the necessary tools to become not just skilled workers but also entrepreneurs and leaders who can drive change in their communities. Empowerment involves providing access to resources, financial literacy training, and entrepreneurial support that allows individuals to take control of their economic futures. The integration of innovation with economic empowerment ensures that the workforce is not only capable of adopting modern technologies but also equipped to use them to create wealth, stimulate local economies, and enhance food security. Thus, an interdisciplinary approach that includes these elements is key

to ensuring that agribusiness workforce development fosters both sustainable practices and economic growth (Adekuajo *et al.*, 2023; Adewale, Olorunyomi, & Odonkor, 2023).

## 3. Designing a sustainable agribusiness workforce development model

### 3.1 Curriculum and training program design

Designing a curriculum for agribusiness workforce development requires a balanced approach that integrates theoretical knowledge with practical, hands-on experience. The curriculum must be carefully crafted to ensure that learners acquire the technical skills necessary for modern agricultural practices, while also developing broader competencies such as critical thinking, problem-solving, and entrepreneurship. Key topics should include sustainable farming techniques, crop and livestock management, business planning, marketing, and supply chain management (Adefila, Ajayi, Toromade, & Sam-Bulya, 2023).

To make the curriculum more effective, it should be designed in collaboration with industry experts and agribusiness stakeholders to ensure that it aligns with real-world job market needs. Additionally, it is essential to incorporate practical training components, such as internships, fieldwork, and case studies, where students can directly apply their knowledge in real-world settings. By blending classroom learning with practical experience, students gain the confidence and skills necessary to thrive in agribusiness sectors. Furthermore, partnerships with local farms, agribusiness enterprises, and community organizations can provide students with valuable exposure to diverse facets of the agricultural value chain, making the training more relevant and engaging (Abbey, Olaleye, Mokogwu, & Queen, 2023b).

Moreover, the curriculum should be flexible and adaptable to changing agricultural trends and innovations. As new technologies and practices emerge, workforce development programs must continuously evolve to ensure that learners are equipped to meet the demands of the future agribusiness workforce (Abbey, Olaleye, Mokogwu, & Queen, 2023a; Otokiti, Igwe, Ewim, Ibeh, & Sikhakhane-Nwokediegwu, 2022).

### 3.2 Leveraging technological innovation and knowledge transfer in agribusiness

Technological innovation plays a crucial role in transforming the agribusiness landscape, and workforce development programs must integrate these innovations to equip workers with the skills necessary to thrive in an increasingly digital and automated agricultural environment. Advancements in technology—such as precision farming, automated machinery, drones, and data analytics—are reshaping how farming is done, making it more efficient, sustainable, and productive (Onukwulu, Fiemotongha, Igwe, & Ewim, 2022). To leverage technological innovation, workforce development programs must provide training that enables workers to understand and use these tools effectively. This could involve teaching workers how to use software for farm management, understanding data collected from sensors and drones, or learning to operate automated equipment. Additionally, agricultural technology is often complex, requiring workers to not only understand its technical functions but also the data and decision-making processes that drive its use (Oladosu *et al.*, 2022).

Knowledge transfer is equally important in this context. As

new technologies are introduced, there is a need for mechanisms that ensure the effective transfer of knowledge from innovators and experts to farmers, workers, and agribusiness entrepreneurs. Training workshops, extension services, and digital platforms can facilitate the dissemination of knowledge about the latest agricultural innovations, allowing workers to stay updated and enhance their productivity. Additionally, knowledge transfer can be bolstered through collaborations between academic institutions, research organizations, and the private sector, ensuring that the workforce is constantly learning and evolving in line with technological advancements (Elumilade, Ogundeji, Achumie, Omokhoa, & Omowole, 2022; Mustapha & Ibitoye, 2022).

### 3.3 Public and private sector partnerships for sustainable workforce development

The development of a sustainable agribusiness workforce cannot be achieved by any single entity. It requires collaborative efforts between the public and private sectors, with each playing a distinct yet complementary role. Government policies and initiatives can provide the regulatory frameworks, funding, and infrastructure necessary to support workforce development programs. On the other hand, the private sector—through businesses, agribusinesses, and agricultural tech companies—can contribute industry expertise, resources, and practical insights that are vital for aligning training programs with market needs (Abisoye *et al.*).

Public-private partnerships (PPPs) are essential for creating a sustainable workforce development model. For instance, governments can partner with agribusinesses to design training curricula that reflect the needs of the industry. These partnerships can also help establish training centers, develop job placement programs, and create internship opportunities that bridge the gap between education and employment. Furthermore, by collaborating with the private sector, governments can gain access to up-to-date technologies and tools, which can be incorporated into workforce development initiatives (A. I. Afolabi, Chukwurah, & Abieba).

In addition, the private sector's role in the development of a sustainable agribusiness workforce can extend beyond the direct provision of training. Agribusinesses and agricultural technology companies can also contribute by offering mentorship programs, professional development opportunities, and financial incentives that encourage workers to stay within the industry. These partnerships can foster a more dynamic, resilient, and competitive agribusiness workforce that is well-prepared to face the challenges of a rapidly changing agricultural landscape (Ahmadu *et al.*).

### 3.4 Financial inclusion and empowerment strategies for the agribusiness workforce

Financial inclusion is a crucial component of any sustainable agribusiness workforce development model. Access to financial resources and services enables workers and agribusiness entrepreneurs to invest in the tools, technologies, and infrastructure needed to succeed. Many individuals in the agribusiness sector, particularly in developing countries, face barriers to financial inclusion, such as limited access to credit, high interest rates, and a lack of financial literacy. Addressing these barriers is essential for

empowering workers and fostering sustainable development in the agribusiness sector (Ezeanochie, Afolabi, & Akinsooto).

To promote financial inclusion, workforce development programs must incorporate financial literacy training. This training should cover essential topics such as budgeting, saving, accessing credit, and managing cash flow. It can empower individuals to make sound financial decisions, increase their economic resilience, and build long-term wealth. Additionally, agribusiness workforce development programs can collaborate with financial institutions to provide affordable loans, grants, or subsidies to workers looking to start or expand their agribusiness ventures (Babatunde, Okeleke, & Ijomah; Basiru, Ejiofor, Onukwulu, & Attah, 2022).

Furthermore, empowerment strategies should also focus on building entrepreneurial skills and promoting access to markets. By training workers to think and act like entrepreneurs, these programs can encourage innovation, risk-taking, and self-sufficiency. Developing entrepreneurial capabilities in the workforce can lead to the creation of new businesses, job opportunities, and economic growth in rural communities. These efforts, combined with increased financial inclusion, create a more robust and resilient agribusiness workforce that is better equipped to thrive in a competitive global market (Ejike & Abbulimen).

## 4. Measuring impact and sustainability in agribusiness workforce development

### 4.1 Key performance indicators for workforce development success

Measuring the success of agribusiness workforce development programs is essential to understanding their impact and identifying areas for improvement. Key Performance Indicators (KPIs) are critical tools for assessing the effectiveness of these programs. KPIs in this context can be both quantitative and qualitative, measuring outcomes related to workforce skills, employment, and overall economic impact (S. O. Afolabi & Akinsooto, 2021; Ige, Chukwurah, Idemudia, & Adebayo).

Common KPIs for workforce development success include employment rates of program graduates, the retention of trained workers within the agribusiness sector, and the level of skill acquisition in key areas such as sustainable farming techniques, agribusiness management, and technology adoption. Additionally, KPIs should track the progression of workers from entry-level positions to managerial or entrepreneurial roles, which is indicative of the program's long-term effectiveness in fostering career growth. Training completion rates, learner satisfaction, and the number of certifications or qualifications awarded are also vital metrics for evaluating program quality (E. Jessa, 2017; Oladosu, Ike, Adeyemo, & Adepoju).

Beyond direct employment outcomes, KPIs should also measure broader community impacts, such as the development of local agribusinesses and improvements in food security, sustainability, and rural development. By monitoring these metrics, stakeholders can ensure that the workforce development program is not only addressing immediate skills gaps but also contributing to the growth and sustainability of the agribusiness sector as a whole (Elumilade, Ogundeji, Achumie, Omokhoa, & Omowole, 2021; EZEANOCHIE, AFOLABI, & AKINSOOTO, 2021).

#### 4.2 Economic empowerment metrics:

Economic empowerment is a core goal of agribusiness workforce development. Measuring economic empowerment involves assessing changes in income generation, employment rates, and entrepreneurial growth among program participants (Paul, Abbey, Onukwulu, Agho, & Louis, 2021).

Income generation is a primary indicator of success in workforce development, as it reflects the ability of individuals to earn a livelihood through their skills. This can be tracked by evaluating the average income levels of program graduates before and after completing the training. Employment rates are also critical, as they indicate whether individuals are able to secure jobs within the agribusiness sector or related industries. A high employment rate suggests that the program is effective in meeting market needs and preparing individuals for viable career paths (Hassan, Collins, Babatunde, Alabi, & Mustapha, 2021).

In addition to employment, the ability of program participants to transition into entrepreneurship is another key metric. Entrepreneurial growth can be assessed by the number of graduates who start their own agribusiness ventures, the success rate of those ventures, and their impact on local economies. Metrics like revenue growth, profitability, and job creation within these new businesses provide a comprehensive picture of the economic empowerment achieved through workforce development programs (Basiru *et al.*, 2022).

While short-term outcomes such as employment rates and income generation are relatively easy to measure, assessing long-term sustainability and impact presents a more complex challenge. Long-term sustainability involves evaluating whether program graduates continue to thrive in their careers and contribute to the agribusiness sector over time. This requires tracking the career progression of participants beyond initial employment, including job stability, income growth, and continued professional development (Elumilade *et al.*, 2022; Mustapha & Ibitoye, 2022).

Moreover, the broader impact of workforce development programs on the agribusiness ecosystem, rural communities, and regional economies can be difficult to quantify. For instance, it may take several years to observe the full effects of new farming technologies or sustainable practices that were introduced through training programs. Similarly, the societal impact—such as improved food security, environmental sustainability, and enhanced rural resilience—can be hard to measure, as these factors are influenced by numerous external variables beyond the workforce development initiative itself (Abbey *et al.*, 2023b).

Another challenge lies in the need for consistent data collection over an extended period. Long-term tracking of participants is crucial for assessing the lasting effects of workforce development programs, but this requires robust data systems and a willingness to invest in longitudinal studies. Additionally, measuring the social and environmental impacts of workforce development initiatives necessitates the development of specialized metrics that may not yet exist, making it more difficult to evaluate the full spectrum of benefits (Onukwulu *et al.*, 2023).

#### 4.3 Strategies for enhancing program sustainability and scalability

To enhance the sustainability and scalability of agribusiness workforce development programs, a number of strategies

must be employed. First, integrating community involvement in the design and implementation of the program ensures that it meets local needs and has the backing of the stakeholders who will benefit most. This community-centric approach increases the likelihood that the program will be embraced, leading to higher retention rates and better long-term outcomes.

Second, securing ongoing funding from both public and private sources is crucial for the long-term viability of workforce development initiatives. Partnerships with governments, international organizations, private agribusinesses, and financial institutions can provide the necessary financial support for scaling programs, reaching more participants, and expanding into new regions (Basiru *et al.*, 2023a).

Third, building a strong network of alums and mentors can enhance the sustainability of the program by creating a supportive community that provides guidance, resources, and job opportunities for new graduates. Alumni networks can also facilitate knowledge transfer and help ensure that the training provided remains relevant and up-to-date with industry trends.

Finally, incorporating technology and digital learning platforms into the workforce development model can increase its scalability. E-learning and online training modules allow for the expansion of the program to remote and underserved areas, making it accessible to a broader pool of potential participants. Leveraging data-driven approaches and automation in curriculum delivery and monitoring also ensures that resources are used efficiently and that programs can adapt to the changing needs of the agribusiness sector.

#### 5. Conclusion and policy recommendations

This paper has explored the essential components of a sustainable agribusiness workforce development model, focusing on the intersection of agricultural innovation and economic empowerment. Key findings highlight the critical role of a skilled and well-trained workforce in driving the success of agribusinesses, especially in emerging and rural economies. The integration of education, practical skills training, and technological innovations has proven to be pivotal in enhancing the capacity of workers to adapt to evolving industry demands and sustainable practices.

Workforce development models that emphasize the practical application of skills, including sustainable farming techniques, agribusiness management, and entrepreneurial training, offer the most promise for fostering economic empowerment. These models can create jobs, improve livelihoods, and empower individuals to contribute to food security and rural development. Moreover, partnerships between the public and private sectors are crucial for providing the necessary resources and infrastructure for effective workforce development.

However, challenges such as data measurement, long-term sustainability, and resistance to innovation persist. It is essential to continue refining data-driven approaches to assess both short-term outcomes and long-term impacts, ensuring that programs remain responsive to the evolving needs of the agribusiness sector.

To enhance the effectiveness and scalability of agribusiness workforce development programs, the following policy recommendations are proposed:

- Governments should invest in developing and refining curriculums that bridge the gap between education and

practical skills. Additionally, creating infrastructure that supports both on-site training and digital learning platforms would allow for greater reach, especially in rural areas.

- Collaboration between governments, private agribusinesses, and non-governmental organizations (NGOs) is essential for sustaining workforce development programs. These partnerships can provide funding, resources, and market linkages that increase the employability of graduates and ensure that training is aligned with industry needs.
- Policies should promote the integration of technological innovations in agribusinesses, such as precision farming tools and digital market access platforms. These technologies increase productivity and empower workers with skills that are highly sought after in the modern agribusiness landscape.
- Programs aimed at improving financial literacy and access to capital for agribusiness entrepreneurs should be a priority. Ensuring that workers have access to financial services and can scale their businesses is key to long-term economic empowerment.
- Governments and organizations should invest in data collection systems that track the success of workforce development programs. This data should be used to inform policy decisions and refine existing training models, ensuring they remain relevant and effective.
- Ensuring that agribusiness workforce development programs are inclusive and accessible to women, youth, and marginalized groups is vital. Policies should encourage gender-sensitive training programs, support for female entrepreneurs, and equal access to agribusiness resources.

In conclusion, a sustainable agribusiness workforce development model requires comprehensive policy support that integrates education, innovation, financial inclusion, and equitable access. These policies will strengthen the resilience of the agribusiness sector and ensure that its workforce is prepared to meet the challenges of the future.

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