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The Role of Higher Education Systems in the Development and Dissemination of Agricultural Technologies in Afghainstan

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Abstract

Agriculture plays a significant role in the economic growth of developing countries. Today, developing countries are facing problems such as climate change, hunger, and poverty. To solve these problems, the agricultural sector must be developed. For this purpose, some countries have partnered with the private sector and sectorial departments of the government for research and development of agricultural technologies. Policymakers in the Islamic Emirate of Afghanistan have introduced many programs for the intensive and extensive development of agriculture. These developments are run with the help of skilled, experienced, and specialized human resources trained in the higher education system. For this purpose, the higher education system has been reformed based on societal needs and requirements. The Ministry of Higher Education has always attempted to train human resources and develop agricultural technologies through higher education systems for the sustainable development of agriculture. This study aimed to explore the role of higher education in the development and dissemination of agricultural technologies. For this purpose, through a critical analysis method, we compared different valid, accurate, and reliable secondary data from popular online databases. We found that the agricultural higher education system should improve based on market needs and offer actual agricultural education to professionals during formal, informal, and non-formal education through research and development.

Keywords:. agricultural technologies, development, higher education, policy makers.

Introduction

Afghanistan is a less developed country; approximately 70 percent of the population inhabits rural areas, and agriculture is the main source of income (Muhammadi et al.,2023). However, the people of Afghanistan still do not have sufficient food and income for their livelihoods because of substantial agriculture (Gautam, 2023). Farming communities produce agricultural commodities, such as wheat, rice, corn, and other primary foods, for their own consumption. Most small farmers struggle to earn a living income from farming activities (Leao et al., 2018). In 2009, the FAO reported that global

food production must increase by 70 per cent in the first half of this century to meet the growing global demand of the world population (FAO, 2009).

Despite this, Agriculture and its associated value-added agribusinesses and services remain central to the achievement of many Sustainable Development Goals (SDGs), including important goals and targets toward zero hunger, poverty, and climate action by 2030 (FAO, 2018). Thus, development of the agricultural sector is required at the national and international levels.

The development of agriculture mainly involves two processes: the extensive development of agriculture and intensive development of agriculture (Parsa, 2014). In the extensive development of agriculture, new areas are cultivated through the utilization of water resources and irrigation systems, such as the Qosh Tipa Canal in the northern zone, Dr. Tetsa Nakamura Canal, Nanghar Canal, and many others constructed and under construction canals. In the intensive or knowledge-based development of agriculture, agricultural technologies are generated in research institutions and introduced to farming communities to increase their production and productivity.

In higher education systems, agricultural universities are generally established to develop agricultural technologies, innovations, and knowledge through research, training, and collaboration with the agricultural sector. (Kőmíves et al., 2019).

However, there is a lack of effective integration between higher education systems and the agricultural sector for the sustainable development of agriculture. Therefore, this study investigates the role of higher education systems in the development and dissemination of agricultural technology in Afghanistan. The aim of this study is to determine an effective method of collaboration between universities, research institutions, and the agricultural sector for the development and dissemination of agricultural technologies.

Significance of Agriculture

Agriculture is the backbone of Afghanistan's economy; the share of this sector in gross domestic product (GDP) is 26.82 percent. Approximately 70 per cent of the population live in rural areas, and agriculture plays an important role in their livelihoods (9). Agriculture has significantly greater potential for farm and off-farm job creation. Agriculture must grow by at least 6% per year to reduce poverty and food insecurity in rural areas. Afghanistan has the potential to irrigate an additional 2-million-hectare area, but this would require significant new investment in dams, water conveyance, and irrigation infrastructure and reach agreements with downstream riparian countries (Maletta, 2006). The agricultural sector of Afghanistan has potential in three sub-sectors: irrigated wheat, horticulture, and livestock; through production, value chain, and marketing of these three subsectors, the development of the country will be ensured (World Bank, 2014). For this purpose, the National Development Corporation (NCD) plans to establish a hairatan industrial agriculture complex through the use of modern agricultural methods after completing the first phase of the Qosh Tipa Canal, with 100,000 hectares dedicated to agriculture complexes and 50,000 hectares for industrial parks, and with the help of the Ministry of Higher Education, wants to establish agricultural universities for the development and dissemination of agricultural technologies for this complex and the entire country (NDC, 2023). Agricultural development is the only way to industrialize and develop Afghanistan. Unfortunately, due to political conflicts, climate change, soil degradation, and other reasons, Afghanistan's agricultural system faces several challenges, such as water scarcity, dissertations, low access to adequate agricultural technologies,

financial constraints, and market limitations, which cause low production and income (Zhu et al., 2024)

It is important to increase the productivity of agricultural systems to achieve sustainable development goals such as poverty reduction, no hunger, and climate action (Viana, 2022). Therefore, farmers must implement agricultural technologies and innovations for this purpose. The use of agricultural innovation and technologies depends on several factors, including economic, technological, demographic, sociocultural, and institutional factors (Tiwari et al., 2024). In the United States, public agricultural R&D funding improves productivity in the agricultural sector and has broad economic benefits (Dudley, 2002). The study found that every dollar spent on United state agricultural R&D has, on average, generated $ 20 in benefits for consumers and the broader economy, but it is a long-run investment (Baldos et al., 2019). Developed countries can spend seven times more public financing on R&D in agriculture than developing countries (Beintema et al., 2019).

Farmers require information, knowledge, skills, and education to adopt agricultural innovations and technologies. Agricultural institutions were established to help farmers by strengthening the relationship between research, extension, and farmers (Yokamo, 2020).

Material and Method

The purpose of this study was to discuss the role of higher education in the development and dissemination of agricultural technologies. During the writing process, we conducted a careful literature review of secondary data. Valid, accurate, and reliable secondary data were collected from important international organizations (FAO, World Bank, NSIA, etc.), articles, and websites.

We compare different published sources using critical analysis methods to determine the role of the agricultural higher education system in the development and dissemination of agricultural technologies.

Prescriptions of the international standards of scientific research were followed during the preparation of the article. With respect to these regulations and ethical norms, we cited all authors of the articles in the list of sources, as it has been accepted by the international scientific community.

Discussion

Higher education systems play a significant role in the development and dissemination of agricultural related information, knowledge, skills, and technologies in farming communities (Laurent et al 2006). Agricultural education systems provide opportunities to acquire basic agricultural knowledge and skills, occupational training and retraining, and professional growth and development (Movchan& Komisarenko, 2019). Agricultural education has two main objectives: first, to provide updated agricultural technologies and second, to disseminate these technologies among farmers (Jena et al 2014). To achieve these objectives, the education system in agricultural sciences began for the first time in the 1930s with the establishment of an agricultural vocational school in Kabul (Samady, 2001). Approximately 35 faculties and institutions have been established in different provinces of Afghanistan to achieve sustainable development goals. These agricultural faculties and

institutions have been awarded bachelor's, master's, and doctoral degrees, respectively. During the strategic planning of higher education, every country must decide what kinds of studies they want to finance (Government of Afghanistan, 2008). The quality of the educational system depends on several factors such as the knowledge and experience of academic staff, learning and teaching approaches, ICT, equipment and library resources, facilities and infrastructure, assessment methods, quality assurance and quality enhancement processes, and the economic and social relevance of higher education (Aturupane & Millot, 2009). Agricultural development is key to economic growth and development, and has the potential to create jobs. To realize this potential, strategic investments are needed in irrigation infrastructure, land tenure security, research, and market access to enhance agricultural productivity and resilience (Rafael, 2023). These efforts should be supported by investments in higher education. The Islamic Emirate of Afghanistan's policymakers has understood the role of higher education in the growth and development of the IEA (2024). This system awarded bachelor's, master's, and doctoral degrees within the country. The aim of a Bachelor's degree is to serve the basic needs of the market. The functions of the master's degree are to educate professionals with significant knowledge and leadership skills who are able to complete scientific and developmental training for the development of the agricultural sector, and the role of the doctoral degree is to train young scientists who can complete the most important basic research and develop agricultural technologies. However, it is not sufficient to achieve food self-sufficiency and the export of agricultural products (Kawasaki et al., 2012). However, the agricultural higher education system could not play a significant role in the development and dissemination of agricultural technologies among former communities of Afghanistan. This is because the overage yield of food, forage crops, and livestock production is as low as the potential. To solve these problems, the agriculture sector in Afghanistan requires an integrated and multidisciplinary approach. There is a need for collaboration between agricultural higher education systems, agriculture sectors, private sectors, and farming communities for the development and dissemination of agricultural technologies (Singh, 2008). So far, the higher education system has required some improvement and implemented many programs for positive changes, such as curriculum reform based on market needs, establishment of research and development departments, and capacity building of academic staff.

Training students with market-based knowledge is one of the most important aims of higher education. Practice-oriented programs must be started in every higher educational system and developed continuously (Cheng et al., 2022). The agricultural higher education system of Afghanistan offers bachelor, master, and doctoral degrees in the field of agriculture. The curriculum of the agricultural higher education system is designed to create a more relevant and effective educational system that meets the demands of modern agriculture. The main aim is to improve the overall productivity and sustainability of the agricultural sector and to ensure food security and rural development. There are some key strategies that are applicable in most standardized universities of the world for reforms, such as community engagement and practical training, skills development, entrepreneurship, and focus on sustainable practice.

Universities and colleges across the United States have developed community-university partnerships for sustainable agriculture education. This model is designed for the joint

engagement of communities and agricultural universities for the development of food security and agricultural sustainability (Niewolny et al., 2012).

Effective practical field training is also required for students of all programs in the field of agriculture education. In Nigeria, it is mandatory, and indeed a policy of the National Universities Commission, that agricultural undergraduates in the fourth year of the five-year degree are exposed to a practical farm year (Oladele et al, 2011).

For this purpose, some countries have partnered with the private sector and sectorial departments of the government for research and development of agricultural technologies, such as India, ICAR, and the Indian Council for Agriculture and Research, coordinating, supporting, and guiding various aspects of higher agricultural education. It provides funds for development and strengthening of facilities in vital areas, creation of teaching and learning facilities, capacity building of faculty, scholarships/fellowships to students, and national and international research projects for the development and dissemination of agricultural technologies (Rana, 2020).

In Afghanistan, it is also necessary to create partnerships with the private sector and sectorial departments to promote R&D programs. Through the Deputy Ministry of Research and Innovations, the Ministry of Higher Education linked universities with sectorial departments and private sectors to create opportunities for joint research and development work. The Ministry of Higher Education financially supported the research projects of the agricultural students and professors. For every climatic zone, research and development institutions should establish a master's doctoral degree based on research and development.

Conclusion

The development of the agricultural sector in every country depends on the higher education system. In developing countries, such as Afghanistan, farmer communities need up-to-date knowledge, skills, and innovations that are developed and disseminated through higher education systems. These are the requirements of modern agriculture. In this study, we analyzed the role of higher education systems in the development and dissemination of agricultural technologies. Higher education systems play a significant role in the development and dissemination of agricultural technology and innovation. The agricultural education system has two main objectives: first, to provide updated agricultural technologies, and second, to disseminate these technologies among farmers. For this purpose, the agriculture higher education system has to be reformed through practice-oriented programs and developed community university partnerships for sustainable agriculture education, but the pedagogical knowledge of teachers and academic staff members is also very important.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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