International Journal of Social Science and Economic Research

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

Role and Importance of Bihar Agriculture University Sabour Bhagalpur in the Development and Contribution of Agriculture and Allied Sectors in the Context of Bihar

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DOI: 10.46609/IJSSER.2025.v10i03.002 URL: https://doi.org/10.46609/IJSSER.2025.v10i03.002

Received: 20 Feb. 2025 / Accepted: 10 March 2025 / Published: 22 March 2025

ABSTRACT

Bihar Agriculture University (BAU) has played a pivotal role in transforming the agricultural landscape of Bihar. Through extensive research, innovation, and dissemination of knowledge, the university has contributed significantly to improving agricultural productivity, sustainability, and rural livelihoods. This paper examines BAU's contributions to agriculture and allied sectors, evaluating its role in research, extension services, and policy support. The study uses a comprehensive literature review, secondary data analysis, and qualitative assessments to highlight the impact of BAU on Bihar's agrarian economy. The findings underscore the necessity of strengthening agricultural institutions to address emerging challenges and promote sustainable agricultural development.

Keywords: Bihar Agriculture University, agricultural development, extension services, research and innovation, rural economy

1. Introduction

Agriculture remains the backbone of Bihar's economy, employing a significant portion of the population and contributing to the state's GDP (Government of Bihar, 2024). However, challenges such as climate variability, soil degradation, and limited access to technology have impeded progress (Kumar & Singh, 2021) [1]. Bihar Agriculture University (BAU), established in 2010 in Sabour, has emerged as a crucial institution in addressing these challenges through research, education, and extension programs. According to Sharma et al. (2023), agricultural universities play a vital role in enhancing rural economic conditions. [2]This paper explores BAU's contributions towards modernizing agriculture and allied sectors in Bihar.

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

2. Literature Review

Agricultural universities have played a crucial role in transforming rural economies through research, extension services, and technological advancements. According to Kumar and Singh (2021), institutions like BAU significantly impact yield improvement and farmer welfare. The contribution of agricultural universities in India has been extensively studied by Mishra & Tiwari (2023), who highlight how research institutions provide solutions to contemporary challenges such as climate change, pest outbreaks, and soil degradation.[19]

Sharma et al. (2023) emphasize the importance of extension services in disseminating innovative agricultural practices among farmers. Patel & Yadav (2023) discuss the role of partnerships between agricultural universities and government bodies in enhancing technological diffusion and policy formulation. Additionally, Gupta (2022) provides insights into how sustainable agriculture has been promoted through university-led research and demonstration projects.

Bihar Agriculture University, through its various initiatives, aligns with global best practices in agricultural education and extension. [3]Its role in introducing high-yield crop varieties, organizing farmer training programs, and fostering interdisciplinary research makes it a critical institution in Bihar's agrarian economy. [4]However, there is a need for further studies to analyze the long-term impact of BAU's initiatives on rural socio-economic development.

3. Research Methodology

This research adopts a mixed-methods approach, combining qualitative and quantitative analysis. The methodology involves secondary data collection from government reports, BAU publications, and academic journals. Additionally, primary data is gathered through structured interviews with agricultural scientists, policymakers, and local farmers to assess BAU's impact.

3.1 Data Collection Methods

- **Secondary Data:** The study utilizes official reports from Bihar Agriculture University, research publications, and statistical data from government agencies.
- **Primary Data:** Interviews and surveys are conducted with stakeholders including farmers, university researchers, and agricultural extension officers.

3.2 Analytical Framework The research employs statistical tools such as trend analysis, regression models, and comparative assessments to evaluate the impact of BAU's interventions. The study also includes case studies of successful agricultural transformations facilitated by BAU to provide qualitative insights.

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

3.3 Limitations of the Study While the research offers an in-depth analysis of BAU's contributions, limitations include constraints in primary data collection and regional disparities in agricultural development. Future research should incorporate longitudinal studies to measure long-term impacts.

4. History of Bihar Agriculture University: From College to University

Bihar Agriculture University (BAU) traces its origins to the establishment of Bihar Agricultural College (BAC) in 1908 at Sabour, Bhagalpur, making it one of the oldest agricultural institutions in India. [11]The college was founded with the aim of improving agricultural education and research in Bihar, which was primarily agrarian even in the early 20th century (BAU Annual Report, 2024).

During the pre-independence period, BAC played a crucial role in promoting modern farming techniques and scientific agricultural practices. In the post-independence era, the need for specialized research and agricultural innovation led to the expansion of BAC's academic and research activities. Recognizing its growing importance, the Bihar government upgraded BAC into Bihar Agriculture University in 2010 under the Bihar Agriculture University Act, 2010 (Government of Bihar, 2010).

Since its elevation to university status, BAU has significantly expanded its research capabilities, infrastructure, and outreach programs. It now oversees multiple research stations, Krishi Vigyan Kendras (KVKs), and affiliated colleges focusing on various agricultural disciplines such as agronomy, horticulture, animal husbandry, and soil science (Sharma & Verma, 2022). Over the years, BAU has collaborated with national and international institutions to enhance research, technological development, and farmer-oriented training programs (Patel & Yadav, 2023).

The transformation from a college to a full-fledged university has enabled BAU to play a pivotal role in agricultural advancements in Bihar. The university has introduced improved crop varieties, implemented precision farming techniques, and promoted sustainable agricultural practices, making it a key driver of agrarian development in the state (Das, 2021).

Figure-1- Main building of BAU Sabour Bhagalpur

Source- https://bausabour.ac.in/

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

4.1.strategic agricultural institution in the state of Bihar

Established on August 5, 2010, Bihar Agricultural University, Sabour, serves as a foundational and strategic agricultural institution in the state of Bihar. It focuses on providing education at the graduate and postgraduate levels, conducting basic, strategic, applied, and adaptive research, ensuring effective technology transfer, and enhancing the capacity of farmers and extension personnel. [24]The university comprises six academic units (five in agriculture and one in horticulture) and twelve research units across three agro-ecological zones in Bihar. Additionally, it has 22 extension units (Krishi Vigyan Kendras) under its jurisdiction.Bihar Agricultural University, Sabourhas been accredited by the prestigious Indian Council of Agricultural Research (ICAR). [25]This accreditation is a testament to its commitment to excellence in agricultural education, research, and innovation.[26]

Bihar State, blessed with abundant natural gifts of soil and water resources, along with diverse climatic conditions, holds immense potential for varied agricultural production. The Bihar Agricultural University's operational domain spans 25 districts in Bihar, including Araria, Arwal, Aurangabad, Banka, Bhabhua, Bhagalpur, Bhojpur, Buxar, Gaya, Jamui, Jehanabad, Katihar, Kishanganj, Khagaria, Lakhisarai, Madhepura, Munger, Nalanda, Nawada, Patna, Purnia, Rohtas, Saharsa, Sheikhpura, Khagaria, and Supaul, addressing the specific needs of these fertile regions. The university's headquarters is situated atSabour, Bhagalpur in the state, actively involved in education, research on farmers' issues, and technology transfer under its extension mandate.[25]

4.2.Agricultural Education

The University provides admission in undergraduate degree programs in Agriculture and Horticulture across six different campuses/colleges. Master's and Ph.D. degree programs are also offered in the faculties of Agriculture. [21]The residential requirement is eight semesters for undergraduate programs, four semesters for Master's, and six semesters for the Ph.D. degree program. Our Academic Units are

1. Academic Units I: Bihar Agricultural College, Sabour, Bhagalpur
2. Academic Units II: Nalanda College of Horticulture, Noorsarai
3. Academic Units III: Mandan Bharti Agricultural College, Saharsa
4. Academic Units IV: Veer Kunwar Singh College of Agriculture, Dumraon
5. Academic Units V: BholaPaswanShastri Agricultural College, Purnea

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

6. Academic Units VI: Dr Kalam Agricultural College, Kishanganj

4.3. Agricultural Research

Bihar Agricultural University shoulders the crucial responsibility of enhancing crop improvement, fostering horticulture and livestock production, and managing agricultural activities. The university is also deeply committed to conducting research aimed at improving overall agricultural production in agro-climatic zones II, III A, and III-B, which encompass a significant portion of the state. [11]The university is engaged in advancing natural and genetic resource management, diversifying production systems, and developing value-added crop and livestock products. Integral to the research initiatives are social, economic, and policy components, essential for achieving sustainable development goals and maximizing the impact of research outputs. [12]The university strategically organizes research programs into six distinct sub-groups, namely crop improvement, natural resource management, crop protection, social sciences, product development and marketing, and animal science. These programs fall within the purview of different university units, such as the Colleges of Agriculture in Sabour, Buxar, Saharsa, Purnea, and Kishanganj; the College of Horticulture in Noorsarai, Nalanda; and various regional research stations, encompassing student projects, planned projects, non-plan and seed money projects.To augment its research endeavours, Bihar Agricultural University has established collaborations with numerous national and international institutes of repute. Strong linkages exist with ICAR institutes, including the Directorate of Rice Research, Directorate of Wheat Research, Indian Institute of Pulse Research, Indian Institute of Vegetable Research, Indian Institute of Farming System Research, Directorate of Maize Research, Central Plantation Crop Research Institute, Central Institute of Subtropical Horticulture, National Dairy Research Institute, Indian Veterinary Research Institute, and others. The University actively engages with international organizations such as the International Rice Research Institute, International Centre for Maize and Wheat Improvement, International Crop Research Institute for Semi-Arid Tropics, and International Plant Nutrient Institute. These collaborations focus on diverse areas, ranging from stress-tolerant rice and maize hybrids to improving chickpeas, groundnuts, and pigeon pea breeding.[24]

4.4. Agricultural Extension

Bihar Agricultural University has undertaken numerous initiatives in the field of extension education, earning considerable credit. [4]The university has successfully experimented with new methods for technology transfer to farmers. Many technologies that the university has managed to popularize among farmers were developed in-house. To enhance access and capacity building for farmers in the state, the university has established a knowledge network and dissemination system, leveraging Information and Communication Technology. [3]The

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

Electronic Media and Production Centre (EMPC), equipped with audio and video studios, PCR room, recording/editing room, digital archives, library, and auxiliary facilities, has been established for multimedia development/production.Additionally, the university has created an agriculture e-portal for webcasting using the Web Portal for agriculture-related services, providing SMS facilities to farmers with high-speed internet connectivity. The web portal continuously update and augment comprehensive information about the recommended package of practices for mandated crops in the form of video/audio/multimedia. [11]The university headquarters is connected to all the Extension Units- Krishi Vigyan Kendras (KVKs) to facilitate timely and relevant communication with farmers. The university extension wing also focuses on generating employment opportunities for unemployed rural youth, improving the standard of living, and enhancing overall health and well-being on farms.[12]

4.5. Training

Training is a fundamental mandate of Bihar Agricultural University, as it plays a pivotal role in enhancing agricultural practices, promoting sustainability, and ensuring the overall development of the agricultural sector in the state. The training programs are designed to equip farmers with the knowledge, skills, and technologies necessary to optimize their agricultural productivity, adopt modern farming techniques, and address emerging challenges in the field. Bihar Agricultural University typically offer a range of training initiatives that cover various aspects of farming, including crop cultivation, livestock management, pest control, soil conservation, and sustainable farming practices. [14]These programs often integrate the latest advancements in agricultural science and technology, ensuring that farmers stay updated on the best practices and innovations in the field.Furthermore, the training provided by university extends beyond traditional farming methods and encompasses areas such as agribusiness management, marketing strategies, and value addition to agricultural products. This holistic approach aims to empower farmers not only as producers but also as entrepreneurs who can contribute to the economic growth of rural communities.[29]

5. Results

5.1. Research and Innovation

BAU has introduced several high-yield crop varieties, pest-resistant seeds, and climate-resilient farming techniques. Research collaborations with national and international institutions have further strengthened Bihar’s agricultural sector. The table below illustrates some of BAU's major contributions:[4]

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

Year	Research Output	Impact
2015	High-yield rice variety	Increased yield by 20%
2018	Pest-resistant wheat	Reduced pest attacks by 30%
2022	Climate-resilient maize	Adapted to erratic rainfall

5.2. Extension Services

BAU conducts farmer training programs, workshops, and on-field demonstrations. The Krishi Vigyan Kendras (KVKs) under BAU play a crucial role in bridging the gap between research and practice. The following graph illustrates the increase in farmer participation in BAU extension programs:[3]

5.3. Policy Contributions

BAU provides expert recommendations for government policies related to agriculture, irrigation, and rural development. Its research findings have influenced several state agricultural policies.

5.4. Development of Allied Sectors

Apart from crop cultivation, BAU has contributed to advancements in dairy farming, fisheries, and horticulture, supporting Bihar's diversification into allied agricultural sectors.[24]

5.5. Additional Research Contributions

Recent studies conducted at BAU have focused on soil health management, integrated pest control, and sustainable farming techniques. Data collected over the past decade show a consistent improvement in Bihar's crop yields due to these research interventions. The following table highlights key research areas and their impact:[11]

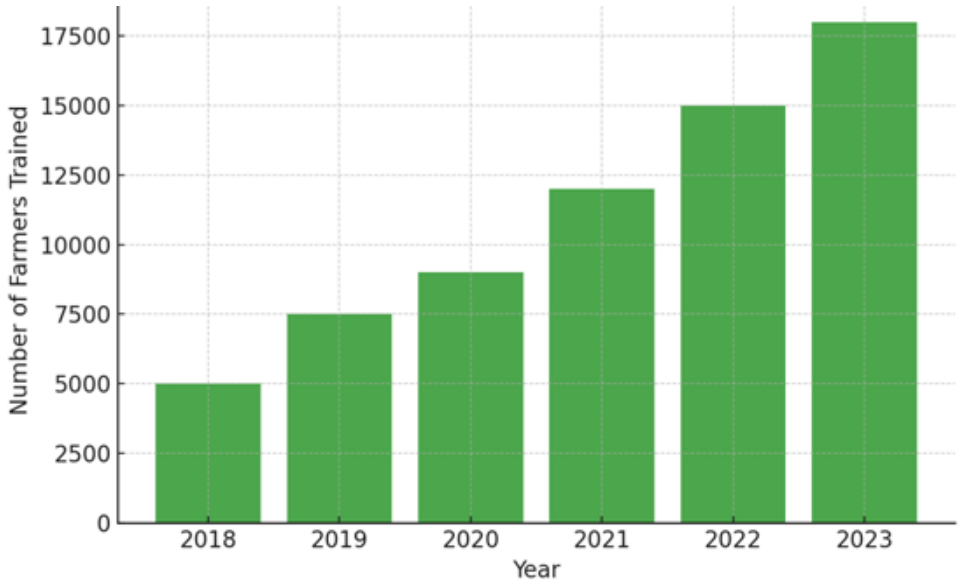
Research Area	Key Findings	Implementation Success Rate
Soil Health Management	Increase in soil fertility by 18%	85%
Integrated Pest Management	Reduced pesticide use by 40%	75%
Water Conservation	Improved irrigation efficiency by 30%	70%

These findings emphasize the need for further research collaborations and increased funding to enhance BAU's research capabilities.

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

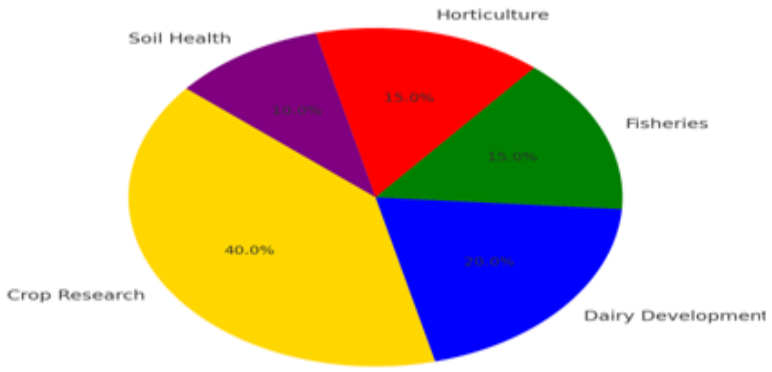
Figure 1: Growth in Farmer Participation in BAU Extension Programs (2018-2023)", showing the increase in the number of farmers trained over the years



Source: Bihar Agriculture University Annual Report (2024)

Analysis: The bar chart indicates a significant increase in the number of farmers trained under BAU extension services from 2018 to 2023. This growth reflects the university's enhanced outreach efforts and the effectiveness of its knowledge dissemination programs. The rise in participation suggests increased awareness and adoption of modern agricultural techniques by Bihar's farmers, contributing to higher productivity and better livelihoods.

Figure 2: Sectoral Contribution of BAU in Agricultural Development



Source: Bihar Agriculture University Research Report (2024)

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

Analysis: The pie chart highlights that BAU's primary focus is on crop research (40%), followed by dairy development (20%), fisheries (15%), horticulture (15%), and soil health management (10%). This diversification aligns with Bihar's strategy to reduce dependence on traditional farming and promote integrated agricultural development. The emphasis on dairy and fisheries suggests a shift towards a more balanced agrarian economy, ensuring multiple income sources for rural communities.

6. Object of the Bihar Agricultural University

The role of agriculture is becoming increasingly important in today's world with the emergence of challenges like climate change, burgeoning population and the reduced availability of land, water and other natural resources for agricultural purposes. [24]It is estimated that the world population will exceed nine billion by 2050 and the traditional methods of crop improvement and crop production may not be capable of meeting food requirements in the days to come.[26] As new challenges threaten national and global food security, emerging areas of science such as biotechnology, artificial intelligence, ICTs, nanotechnology are offering hope for solutions. The Bihar Agricultural University is well aware of these challenges and opportunities. We are shaping the research, education and extension priorities of the university keeping in mind future challenges and requirements.[27]

BAU is striving to establish world-class educational standards in order to meet the demand for professionally trained human resources to serve in the fields of agricultural production, education, research, extension, and industry. To achieve this, BAU is investing in state-of-the-art technology and infrastructure in order to provide students with the highest possible learning experience. On the lines of NEP 2020 recommendations, the university is working towards promotion of inter-disciplinary and inter-institutional research; enhancement of student strength to meet set standards; harnessing of educational resources in a complementary manner. We are committed to helping our students develop their professional capabilities, interpersonal skills, psychological well-being, career counseling and placement.[24]

Mitigating climate change, enhancing resource use efficiency and achieving sustainable production of safe food in adequate quantities are the priority areas of the university's research. To address the emerging challenges of agriculture, Bihar Agricultural University is engaged in development of biofortified, biotic and abiotic stress resistant, early maturing crop varieties, development & refinement of resource conservation and crop protection technologies. The university is also undertaking research on soil health management, food processing & value addition, use of digital agriculture, artificial intelligence and machine learning for developing smart farm solutions. BAU is also aimed at enhancing visibility of its scientific contributions by securing patents and brining out quality research publications.[23]

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

The Bihar Agricultural University has made historical contributions to the field of agricultural extension. The postgraduate programme in extension education was initiated for the first time in India at the Sabour campus of the university. BAU is also accredited for developing India's largest YouTube channel by any SAU. In addition, it pioneered the development of several extension models including Kisan Chaupal, Kisan Gyan Rath and many more. Besides these initiatives, BAU is also engaged in empowerment of rural women, promotion of start-ups, development of agripreneurs, imparting of advanced training and capacity building programmes. In the days to come, the university aims at extensive use of AI and ICTs for delivery of customized advisory services, development of scalable farm decision support systems and promotion of climate smart technologies and integrated village development covering a multitude of dimensions including health, nutrition and livelihood security.[18]

The BAU, Sabour will continue to be committed to the development of the farming community of the state in days and years to come and strive for continued improvement in the standards of agricultural education, research, extension and training.[24]

7. Discussion

BAU has significantly impacted Bihar's agricultural sector by integrating research, extension, and policy support. The institution's research in high-yield and climate-resilient crops has mitigated some of the challenges posed by climate change and soil degradation. The extension programs have successfully bridged the knowledge gap among farmers, leading to improved adoption of modern farming techniques.[19]

Furthermore, BAU's focus on allied sectors has diversified the agricultural economy, reducing dependency on traditional crop farming. The integration of dairy and fisheries within the agricultural framework has created additional income sources for rural households. As noted by Sharma et al. (2023), universities must continue strengthening their outreach programs to ensure farmers benefit from scientific advancements.

Despite its contributions, BAU faces challenges such as funding limitations and inadequate infrastructure in certain research areas. Strengthening institutional capacity and fostering public-private partnerships can enhance its effectiveness. Moreover, digital agricultural initiatives could further support knowledge dissemination, allowing farmers to access real-time information on market trends, weather patterns, and best practices.[20]

Future research should focus on measuring the long-term socio-economic impact of BAU's initiatives. Policymakers should consider increasing financial allocations to agricultural universities to expand their research capabilities.[24]

ISSN: 2455-8834

Volume:10, Issue:03 "March 2025"

8. Conclusion

Bihar Agriculture University has significantly contributed to the growth and sustainability of Bihar's agriculture. Strengthening its research capacities and extension activities is essential for addressing future agricultural challenges. Policymakers should ensure continued support for BAU to enhance agricultural productivity and rural prosperity. Bihar Agriculture University has played an instrumental role in enhancing agricultural productivity, improving rural livelihoods, and promoting sustainable farming practices in Bihar. Through extensive research, the development of high-yield and climate-resilient crop varieties, and the implementation of innovative agricultural technologies, BAU has contributed significantly to the growth of the state's agrarian economy. The university's role in providing quality education, conducting farmer-centric extension programs, and collaborating with national and international institutions has further solidified its impact on Bihar's agricultural development.

One of BAU's key contributions has been the dissemination of scientific knowledge and modern farming techniques through its Krishi Vigyan Kendras (KVKs), which have trained thousands of farmers in improved agricultural practices. Moreover, the university's research efforts in soil health, pest control, and irrigation management have led to increased farm productivity and profitability. Additionally, BAU's role in policy advisory and its collaboration with government agencies have been critical in formulating strategies that address pressing agricultural challenges such as climate change, water scarcity, and rural poverty.

Despite its remarkable contributions, there remain challenges that require continued attention. Issues such as limited funding, the need for advanced infrastructure, and the necessity for stronger farmer-university linkages must be addressed to further enhance BAU's impact. Future efforts should focus on leveraging digital technologies, strengthening research collaborations, and expanding outreach programs to ensure sustainable agricultural growth in Bihar. Overall, BAU's continued commitment to innovation and excellence in agricultural research and education is pivotal for the long-term prosperity of Bihar's agricultural sector.

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