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REVIEW ARTICLE

TEACHING, RESEARCH, AND EXTENSION AS AN INSTITUTE OF AGRICULTURE AND ANIMAL SCIENCE FUNCTION-LEGAL AND STRUCTURAL OVERVIEW

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ABSTRACT

For more than 25 years, the Tribhuvan University (TU) Institute of Agriculture and Animal Sciences (IAAS) has conducted numerous disciplines and system research projects, publishing the results in the IAAS Journal of Institute of Agriculture and Animal Science, IAAS research reports, and Nepalese Journal of Agriculture. The assessment notably draws attention to the structure of agricultural education, examines the significant issues, and makes various recommendations to strengthen Nepal's agricultural education institutions in preparation for the future. Academic institutions are encouraged to form creative partnerships and long-term research collaborations with a variety of national and international organizations after connecting with the agriculture and forest industries, and finally suggesting that students be more actively involved in action research projects with clear strategic plans and programs. These three areas are crucial for the success of educational institutions. The integration of research, education, and extension—along with producer input—leads to more relevant programs and resource usage that is more effective. Agencies involved in research, education, and extension realize that when they collaborate, their efforts produce win-win outcomes rather than win-lose ones. The financial self-sustainability of the technical institutions is not just a concern for the overall development of the provincial republican country; it also has to create synergy in multiple aspects with the non-technical faculties of the various Nepalese universities. It is also suggested that the country's Agriculture Councils be established as soon as possible to control the caliber, volume, and employment opportunities of agriculture graduates.

KEYWORDS

Agriculture Council, IAAS, Extension Education, Linkage, REE

1. INTRODUCTION

In order to provide instruction in the fields of agriculture, animal sciences, and veterinary sciences, Tribhuvan University established the Institute of Agriculture and Animal Science (IAAS). The institute's goals are to advance agricultural science and prepare people for careers in agriculture through teaching, research, and extension. The institute's primary goals are to develop and implement educational programs that appropriately balance the needs of the agricultural sector's established and emerging needs, introduce novel approaches to teaching, research, and technology dissemination, and advance research and studies that address the needs of the nation's farmers (IAAS, 2023).

The institute has a long history of fusing scientific projects with educational initiatives. Although this integration is essential and pertinent to the interests of the nation, the national government does not provide core funding for the institution to carry out its research programs; instead, the institute gives its faculties minor grants from its own internally generated revenues (FAO, 2019). The scientific program of the institute has been sustained through these awards. Additionally, major competitive research grants have been awarded to its faculties by national and international donor organizations. To address the nation's agricultural issues, the institute has continued to foster research in the fields of agriculture and animal sciences. To institutionalize and strengthen its research program, the IAAS created the Directorate of Research and Publication (DOR). The DOR provides scientific data via the IAAS Journal and IAAS Research Reports in addition to material produced by internally and externally supported research (Amgain and Timsina, 2005). The IAAS has amassed a large number of theses and related publications by starting the Master Programs in 13 Departments and the Doctoral Programs in 3 Departments (IAAS, 2011).

Agriculture's function has evolved over time and will likely continue to do so. Integrated agricultural systems are becoming more and more important in how we now view agriculture (Maalouf, 1988). A systems approach to agricultural knowledge aids in understanding the complexity of the knowledge process since it takes into account the connections between numerous players, the effectiveness of their interactions, and the relevant social and institutional boundaries. The systems approach recognizes the diversity of actors participating in the knowledge process, with each doing one or more functions that frequently overlap and are interdependent (McDermott, 1987). A fundamental paradigm for envisioning and creating agricultural knowledge systems for rural development was created by the World Bank in 2000. Higher education in

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the twenty-first century is facing new problems as a result of recent changes in the way that the world views higher education (MOEST, 2019). Higher education institutions are under increasing pressure to create a new breed of professionals with fresh perspectives and the skills necessary to support sustainable development. For sustainable growth, learning for transformation through systemic and critical learning has therefore become more and more important for higher education institutions (Bawden, 1989; ISON, 1990; Jiggins & Röling, 1994; Taylor & Fransman, 2004; Stackpool-Moore et al., 2006).

2. Methodology

It is thought that the conclusion gleaned from the literature review aids in setting the benchmark in creating the trustworthy and accurate forecast and making the diplomatic decision of any qualitative research activity. In this vein, it was expected that this thorough analysis would allow readers to understand the origins, development, and structural role of Nepal's Institute of Agriculture and Animal Science (IAAS) throughout the years. This article is mostly based on secondary sources of information collected from different printed research papers, reports of different organizations like the Department of Agriculture and other relevant websites. Major reports were studied and findings were summarized. Throughout writing this article, discussions were made with the professor and students of the Institute of Agriculture and Animal Sciences (IAAS), and Agriculture and Forestry University (AFU).

3. Results and Discussion

3.1 Teaching, Research, and Extension as a Function in Global Context

Agricultural extension has long been recognized as a primary state obligation since it is widely acknowledged to play a significant role in improving agricultural systems across the globe. Large public administrations were believed to retain a broad influence and equity in the treatment of customers while also offering a robust regulatory system. These administrations were hierarchically constructed, filled with permanent personnel fulfilling numerous responsibilities and functions. However, there is currently a perception in developing nations that these administrations are too rigid, ineffective, and inattentive to the unique circumstances of each situation to appropriately handle the requirements of farmers (Cary, 1993; Beynon, 1996). Lack of organizational and operational coordination, as well as links between research, extension, and educational institutions, are major contributors to many of these issues.

The idea of linkage suggests the development of a working connection based on regular interaction and increased productivity between two or more groups pursuing related goals. According to Havelock (1986), the term "linkage" refers to the connection of two systems by messages to create a larger system. According to this perspective, agricultural research and extension services are two systems that are connected through feedback and information flow. Researchers, extension personnel, and farmers must all play significant roles in identifying research problems, tailoring recommendations to local circumstances, and providing researchers with feedback on newly produced advances if agrotechnologies are to be relevant to local requirements. Linkage activities are often controlled at many administrative levels, including national, regional, state, and municipal levels, depending on the country. Farm families are the system's primary objective and the center of attention for extensionists and researchers working in agriculture. Farmers' agricultural output may be impacted by the barriers that prevent research-extension linkage, whereas good links will enable farmers to increase their output by making farming innovations more accessible.

In order to connect research and extension in the organization and execution of diverse activities in developing countries, a number of mechanisms have been devised. But maintaining strong connections across institutional barriers has proven to be a difficult task (Ewell, 1989). To overcome these obstacles, many developing nations implemented an integrated system of teaching, research, and extension in their agricultural higher education programs (Jaishi et al., 2020). In several nations in Africa, Asia, and Latin America, agricultural institutions were established on the same model with the backing of the United States Agency for International Development (USAID), reflecting the successful roles played by the Land-Grant Universities in the United States. These agricultural institutions have been built in Ethiopia, Malawi, Morocco, Nigeria, India, Indonesia, Thailand, Brazil, and the Dominican Republic. They have also been established in Mexico. This integrated approach to education, research, and outreach has been extremely effective in the United States, but many observers think that it did not result in the necessary socioeconomic reforms in the rural communities of developing nations that adopted the system (Key, 1996).

The lack of sufficiently clear research policies, insufficient research funding, and a high turnover rate of academic staff are the main obstacles to the university research and extension system in these nations. However, one of the biggest issues in the developing world is when technology transfer workers and researchers are unaware of one another's work. Additionally, in what should be a continuous process, research stops too early and extension starts too late in practice (Ewell, 1989). The study demonstrates that strengthening organizations, altering the institutional structure, and changing policy are necessary to improve research-extension ties in developing nations (Sadighi, 2005).

3. 2 Teaching, Research, and Extension as a Function in Nepalese Context

With equal access to higher education as one of the 17 indicators of the Sustainable Development Goals, or SDGs, and the development of lifelong learning opportunities for all as one of their four goals, education has recently gained greater significance and been given more attention (UNDP, 2015). In order to meet SDG 4 targets, Nepal recently created the Nepal National Framework of SDG4: Education, 2030 in 2019. In keeping with this, the nation has also put into effect the National Education Policy (2019), which aims to promote access to high-quality education and the relevance of higher education to societal needs and sustainable development. The expansion of higher education programs nationwide, with a particular emphasis on technical education, is also encouraged by this policy (MoEST, 2019).

Junga Bhadhur introduced one jersey bull, two cows, some clover grass seed from the United Kingdom, and began a cattle breeding program in 1851 during his reign (1946–1827). Additionally, he brought the Chinese tea plant to Nepal's eastern, hilly region. During the reign of Chandra Shamsher, Nepal's agricultural growth began formally in 1922 with the establishment of an agricultural office called "krishiAdda" at Singha Durbar (1901-1928). The primary objective of this agency was to inform farmers about contemporary agriculture. Later, in 1982, this agricultural office was promoted to departmental level and given the name Department of Agriculture. The first vocational agriculture school was established in 1994 with the goal of boosting agricultural extension. The Agricultural Council also started operating that year. The council chairman used to be the director of the Department of Agriculture. The early actions under the reign of Juddha Shamsher were the establishment of nurseries and orchards at Godavari and Balaju in the Kathmandu Valley (1932-45). A veterinary hospital also opened at the same time in Kathmandu. The establishment of sheep farms in Shivapuri and Chitlang marked the beginning of Nepal's livestock sector. Cattle named Red Shindhi were brought in from Pakistan. Juddha Shamsher is also maintaining a training program by sending Nepali students to India for agricultural training, which was started by Chandra Shamsher, to address the country's need for educated manpower in agriculture (Rokaya and Bhandari, 2021).

Two trial farms were built in 1948 at Parwanipur and Kakani after a plan for agricultural growth was approved. In 1956–1961, the Nepalese government unveiled its first five-year plan, with a focus primarily on increasing agricultural output through improved extension services and a greater supply of inputs, as well as on creating more jobs. The scarcity of skilled field employees became increasingly apparent as the extension service grew. In 1957, a school of agriculture was created in Kathmandu under the Department of Agriculture in order to meet this demand. The primary goal of this institution was to train village extension workers (Rokaya and Bhandari, 2078).

A system of educational, research, and outreach facilities exists in Nepal that has helped with agricultural education as well as the creation and adoption of agricultural technologies. Research-based technologies need to reach and be extensively implemented by farmers in order to reduce rural poverty by assuring food security and long-term improvements in people's well-being (Mwangi, 1998, p. 63). Long-term, fundamental research was the primary focus of Nepalese research organizations like the Nepal Agricultural Research Council (NARC) (need and research stages). Additionally, Nepal's extension organization, the Nepal Agriculture Extension Association (NAEA), served as a platform for the actual producer-level application of that research (diffusion stage). In order to prepare its students for a career in agriculture, IAAS, AFU, PU, and FWU served as both a short-term project research facility and an educational institution (Amgain & Timsina, 2005).

A communication network for exchanging knowledge and ideas was a crucial characteristic that institutions engaged in teaching, research, and extension shared. Communication networks are crucial for the diffusion of innovations, according to Valente (1999): "Social structure - who talks with whom - drives the spread of influence, ideas, and products" (p. 1). Several ideas had an impact on how groups communicated with one another, but the weak tie concept was particularly crucial (Valente, 1999). People could obtain information from sources outside of their typical circle of communication through these weak ties. These "bridges," or heterophilous interpersonal connections inside a system, are crucial for disseminating information regarding innovations, according to Rogers (2003). (p. 306). These institutions needed to cooperate in order to achieve their joint objective of raising agricultural production and profitability for Nepalese farmers, as in any agricultural education system.

3.3 Teaching, Research, and Extension as a function in IAAS context

The Ministry of Agriculture established the first school for Nepalese agriculture just after the revolution of the 1950s under the name "School of Agriculture" to train junior technical assistants (JTAs), who would work with farmers. Later, the College of Agriculture's two-year "Intermediate of Agriculture Science (I. Sc. Ag)" program was established, creating junior technicians, who are middle-level agricultural technical workers (JTs) (Basnyat, 2020). Under the auspices of Tribhuvan University, the college was improved in 1972 and given the name "Institute of Agriculture and Animal Sciences" (IAAS, 2021). The full-fledged 4-year B Sc Ag program at the Lamjung and Paklihawa campuses, as well as the 5-year B V Sc and AH program at the Paklihawa campus, were only introduced after Rampur Campus was merged into the Agriculture and Forestry University in 2070 BS, according to the history of IAAS (AFU) (AFU, 2023).

Prior to the 2 years of the I Sc Ag program being totally phased out from IAAS/TU in 2058 BS, the 4 years of the B.Sc. Ag program were still being taught on both the Lamjung and Paklihawa campuses. IAAS opened two more constituent campuses in 2075 BS at Gauradaha, Jhapa, and Rampur Campus at Khairahani, Chitwan after being compelled to move its B Sc Ag program to Lamjung and Paklihawa Campuses and Veterinary program to Paklihawa Campus in 2070 BS (Rampur campus, 2023). In a similar vein, the post-graduate program began in Kirtipur, Kathmandu, in 2070 BS, the same year as AFU was founded in Rampur Chitwan.

Although IAAS began post-graduate programs at IAAS, Rampur in 2055 BS, the B Sc Ag program was the only one and the highest degree available in Nepal prior to the start of the M Sc Ag program. In order to give the specialization on various disciplines of agriculture, elective systems with minimum of 9 credit courses were implemented. This practice continued until 2070 BS. The Under-Graduate Practicum Assessment (UPA) program was introduced by the IAAS in 2070 BS to help B Sc Ag graduates gain more experience in crop diversification and entrepreneurship while they "earn while they learn" (IAAS, 2021).

The quality of the roughly 150–200 B.Sc. Ag and B.V.Sc. and AH undergrads and close to 100 postgraduate agriculturists and veterinarians produced annually at IAAS during the tenure almost from the same number of professors and staff members returning mostly from renowned universities of India, the Philippines, Thailand, Europe, and America, among other countries, was remarkable. The outstanding history to be recalled was the financial, academic, and technical support provided by USAID, UNDP, Rockefeller Foundation, Winrock International, MUCIA project, ADB, and many other national and organizations (John Miller Associates and APROSC, 1995).

3.4 Challenges and Issues

3.4.1 Shortage of Highly Qualified, Competent and Experienced National Staff

The caliber and expertise of their workforce has a significant impact on the ability of agriculture and related industries to fulfill their missions. According to the current staffing situation at these schools, highly qualified and experienced professors and researchers leave the higher education system to work for the business sector, nongovernmental organizations, foreign universities/research centers, or NGOs. This issue is thought to have a number of root reasons, such as underpaying employees in comparison to commercial and non-governmental businesses, uncompetitive employment terms, subpar social services, and a lack of recognition for excellent research and teaching (Suvedi & Ghimire, 2015).

3.4.2 Shortage of Supplies/Equipment and Inadequate Facilities

To facilitate the work of instructors and synchronize the teaching-learning process, it is crucial to have access to basic resources and teaching aids including computers, photocopiers, and audio-visual aids. The majority of institutions currently lack the equipment and resources necessary for effective instruction, either severely or completely. Due to this, the existing facilities are being used beyond their capacity, which has caused class overcrowding and made it impossible to provide each kid the attention they need (Sarkar, 2013).

3.4.3 Shortage/lack of Library Materials

The achievement of the various goals of the institutes of higher learning depends on current, specialized literature and references. Most of the books and magazines that are now available in these institutions are quite obsolete, very old, and have little connection to the subjects being taught (Siwakoti, 2009).

3.4.4 Weak Practical Training Component

The majority of the agricultural curricula have not been updated to meet the changing needs and expectations for educated agricultural labor, according to a closer examination of Nepal's agricultural higher education system. Additionally, agriculture students are given a lot of theory and are not exposed to real-world agricultural issues or conditions that are comparable to those they would encounter after graduation. It is thought that as a result, graduates lack the technical skills and professional assurance necessary to function in the challenging and changing rural environment (Amare, 2004; Belay, 2000; Belay 2004; Mashilla et al., 2005).

3.4.5 Narrowly Focused Programs of Study

Governments and donors have increased their pressure on developing nations over the past 20 years to change the traditional disciplinary system, which concentrated on agricultural production and productivity, and adopt a more market-oriented, demand-driven multidisciplinary systems approach, taking into account the complex needs of agriculture and rural development as well as the changing needs and realities in the face of globalization (Willett, 1998; Lindley, 2000; Maguire, 2000). It is becoming more widely accepted that students need to take some crucial interdisciplinary courses in addition to those related to their areas of specialization in order to fully understand the broad principles of agricultural production and rural development and to best prepare them for the workforce.

3.4.6 Teaching Programs with Little Reference to The Nepalese Conditions

Recent research on the Nepalese agricultural higher education sub-system has revealed that traditional agricultural higher education has failed to adapt to the demands of the labor market and the realities of rural life because the curriculum is no longer relevant and no longer produces graduates who are capable of addressing the larger issues of rural development (Belay, 2000; Belay, 2004; Amare, 2004; Mashilla et al., 2005). Students as a result have not been exposed to the concrete reality of their nation and have no understanding of the fundamental reasons for its backwardness.

3.4.7 Weak Inter-Institutional Linkage

Due to their poor communication with other organizations and sister institutions, the majority of higher education institutions in Nepal today can be classified as introverts. As a result, this has negatively impacted the relationships between institutions. The exchange of professional (educational and research) information, staff exchange and sharing, collaboration in research projects, effective use of financial and material assistance, participation in curriculum development, etc. are all essential for addressing these drawbacks. They must also work closely with local or international academic and research institutions as well as development organizations (Crowder & Anderson, 1997).

3.4.8 Weak Connection with Other Parts of The Agricultural Education System

The country's existing agricultural education system is made up of disjointed programs and training routes that lead to various degrees and professions. The entities that provide these programs are governed by many ministries, and there is little to no cooperation and communication between them. As a result, it is necessary to move toward institutional frameworks and more integrated agricultural training programs that would allow graduates of lower training tracks to enroll in and continue their studies at higher training tracks. The various levels of agricultural education and training are also seen to be able to play complementary and reinforcing roles with the help of such an approach (Thapa, 2010).

3.4.9 Lack of Communication with Key Stakeholders

Regular communication with important stakeholders (employers and previous graduates) and periodic tracer studies are crucial components that aid in pinpointing the advantages and disadvantages of training initiatives. Strong connections with important stakeholders also aid in identifying changes in the external environment and enhance the programs' quality and relevance (Dhital, 2017).

3.5 Strategies to Improve the Linkage Between Teaching, Extension, and Education

3.5.1 Minimize the gap among Academics, Research, and Extension Stakeholders

A systemic issue in national agriculture systems has come from the division of agricultural education, research, and extension into many ministries and agencies with limited functional mechanisms, and calls for their effective mechanism for the development of the sector as a whole (ADS, 2014). Few research projects in the fields of agriculture and forestry are undertaken by students pursuing higher degrees (M. Sc. or PhD), and are typically conducted by the Nepal Agriculture Research Council and the Forest Directorate, respectively. However, these projects are hardly ever connected to national priorities or programs. IAAS/IoF/TU and AFU should collaborate more on academic and scientific matters. In order for the many national organizations to collaborate on academics, research, and extension, there must be a consistent and friendly climate.

3.5.2 Revitalization of New Curricula

Continuous upgrading of academic curricula is necessary to match the present requirements and difficulties, however, it is uncommon in Nepal. Furthermore, the curriculum frequently doesn't offer a variety of alternatives and tends to be more theory-based, making them inappropriate for the demands and difficulties faced by agricultural communities across the nation's many geographical and agroecological regions (Suvedi, 2019).

3.5.3 Management of Infrastructure and Financial Issues

The majority of Nepal's academic institutions are funded annually by the UGC and Ministry of Education, Science, and Technology (MoEST). This relies on the number of students enrolled, the prior funding levels, and the government's ability to support the institutions. Of the overall budget approved, salaries account for 85% of the budget (FAO, 2019). To better meet the needs of students and the farming community, agricultural and forestry institutions must expand their long-term partnerships with NARC, DoA, DoF, NGOs, and private businesses. For example, they should set up joint programs and courses and create pathways for students interested in careers in agriculture.

3.5.4 Policy of Encouraging Student from Rural Setting

Because there aren't as many +2 scientific colleges in rural areas as there are in urban areas, young people in rural areas are forced to compete with their better-educated urban counterparts (Acharya, 2008). In order to address the problems, scholarships will be given to agriculture and forestry students from rural areas, and government high school curricula will be improved. Students appreciate the programs started by the present agricultural universities and institutions because most of them have launched appealing and lucrative scholarship opportunities based on selection based on merit.

3.5.5 Retention of Skilled Human Resources in the Country

Of the total number of graduates generated each year, over 30% of young, passionate scientists and graduates in agriculture and forestry go abroad to study or work (Poudel, 2013). As a result, the average age of agricultural and forestry workers is high due to a lack of younger applicants; also, more than 40% of scientists are approaching retirement age, and 32% of positions are unfilled as a result of recruitment issues (IRIN, 2013). In Nepal, promotions are scarce, and there are little chances to share information or take part in short-term foreign training overseas (Pokharel, 2013). Therefore, in order to control the issue of brain-drain and the quality concerns of students and job holders, the MoALD/MoF, NARC, and agricultural and forestry-related academic institutions should cooperate under the Land Grant System Model.

3.5.6 Enhancing the Agricultural Value-Chain and Systems Research

One of the most important knowledge gaps in research, academia, and business is the lack of intervention and comprehension of the factors that influence consumer choice, as well as how to apply this knowledge to enhance the quality of food and medicines in the agricultural and forestry sector (Ghimire, 2011). Additionally, research money is scarce; only 0.4% of the GDP of the agriculture and forestry industry is allocated to research, which is woefully inadequate and impeding the nation's overall development (IRIN, 2013). As a result, funding will be provided to colleges and academic institutions to build a solid research foundation that will primarily develop entrepreneurs through reaching out to the agricultural community.

3.5.7 Quality Assurance and Accreditation by Establishment of Agriculture Councils in Nepal

Since the beginning of the long decade, the Nepal Medical Council (NMC), Nepal Veterinary Council (NVC), and Nepal Engineering Council (NEC) have been fully operational in the nation. University graduates in those fields are guided by the rules and regulations, and their quality is guaranteed and accredited. However, only a small number of people have lately advocated the idea of their own councils in agriculture, which must be quickly established to control the amount, quality, and employment opportunities of agriculture graduates in Nepal.

4. Conclusion

Many developing nations have merged teaching, research, and extension goals into their educational systems. Many observers have recognized the fundamental ideas behind this system. But in reality, a lot of these institutions haven't been able to make a big socioeconomic difference in the rural regions. The basis of extension as a field was based on providing an audience's demands through educational methods. The extension procedure must start from the ground up in order to be successful. The ability to pursue teaching-learning, research and development, and the extension of new technologies in the management of natural resources should be the ultimate strength of the institutions/universities offering education in agriculture and forestry. As recommended and mandated by UGC of Nepal, there is an urgent need to establish a consistent and ongoing monitoring and evaluation system for the frequent assessment and development of high-level agriculture and forestry education programs. The results of this study demonstrate that improving research-extension-education (REE) links in developing nations calls for improvements in institutional structure, institutional policy, and organizational strength.

5. Conflict of Interest

All the authors declare that they have no conflicts of interest.

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