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Agriculture and Forestry Education in Nepali Universities: A Conscientious Review

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Abstract

There is an uncontested view that higher education contributes to overall development of the nation, while higher technical education contributes to the deployment to the citizens. In consideration of the importance of natural resources as the means of national development, and for their conservation, promotion, preservation and proper utilization through the education, the Government of Nepal (GoN) established the formal system of agriculture and forestry education in 1960-1970's, which now has been spread throughout the country by the name of different academic institutes and national universities. This report conscientiously analyzed the past and present attempts of academic developments of higher level agriculture and forest education in Nepal and draws the attention to be taken in action by different stakeholders for the expansion and betterment of the current challenges and problems of higher level agriculture and forest education with SWOT analysis. The review specifically points out at the higher level of agricultural and forest education structure, analyzes the critical problems and offers several recommendations to build capacity of the higher level agriculture and forest education systems in Nepal for next steps. The academics, research and extension being vital for the prosperity of the educational institutes, the academic institutions are advocated to establish the innovative collaboration and long-term research relationships with diverse national and international organizations after linking with agriculture and forest based industries, and finally suggesting for increasing the involvement of students in action research works with concrete strategic plans and programs. For the overall development of the provincial republican country, the financial self-sustainability of the technical institutions is not only the concern, but it needs to provide synergy in several paradigms with the non-technical faculties of the different Nepalese universities. It is also advised that the Agriculture and Forest Councils in the country must be established at the prompt to regulate the quality, quantity and job opportunity of the agriculture and forest graduates.

Keywords: Agriculture and Forestry Graduate Education, Nepal, Plans and Policies, SWOT, Universities

Introduction

Human beings are the very knowledgeable creature amongst the living beings in the world, wherein the education provides them more wisdom. The development of any nation depends on the proper use of natural resources and for its scientific use,

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the society needs huge number of trained and skilled human resources produced from the schools of qualified vocational and technical education. There is univocal fact that the landlocked geography, rugged terrain, lack of studying centers in natural resources, poor infrastructure, and lack of access to education have directly contributed to Nepal's underdevelopment (HMG, 2001). To mitigate these pertinent issues, the Government of Nepal (GoN) launched several multi-dimensional projects in the field of education in general, and to the technical education in specific.

Presently, education has become more important and focused intensively when United Nations declared it as one of the most vital indicator with its equal access to higher education as part of the promotion of life learning opportunities for all as a goal (Goal # 4), among the 17 indicators of Sustainable Development Goals, SDGs (UN, 2015). These goals are adopted by all United Nations member countries by incorporating them in their development agendas for securing a sustainable, peaceful, prosperous, and equitable life on earth to everyone, now, and in the future. Recently, Nepal has also developed Nepal National Framework of SDG4: Education, 2030 in 2019 with the aim of achieving targets of SDG4. On this line, National Education Policy (2019) has also been implemented in the country to improve access to quality education and increase the relevance of higher education to national priorities and sustainable development. This policy also encourages to expand higher education programs across the country with special focus to the technical education (MoEST, 2019).

Emphasizing the importance of above mentioned statement, this conscientious review work was accomplished with the objectives to overlook the genesis, chronological developments of the higher level of agriculture and forestry education in Nepal, their strengths, weaknesses, opportunities, and threats so that the "prosperous Nepal and happy Nepali" could be formed after the proper utilization of the natural resource base of the nation and by adopting the sustainable and multi-dimensional educational strategies and academic programs.

Methods and Procedures

It is assumed that the epilogue drawn from the literature review supports to fix the benchmark in making the reliable and accurate prediction and taking the tactful decision of any qualitative research works. On this line, this conscientious review work was hypothesized to see the genesis, chronological history, organizational development pattern and problems of higher level of agriculture and forestry education over the past 70 years in Nepal. This epilogue was sketched after SWOT (strengths, weaknesses, opportunities and threats) analysis and, after then future strategies needed to be in action was suggested based on the facts of various published journals, proceeding papers, annual reports, university newsletter, profile books and websites. The comparison between the various academic indicators on quality of the academia and quantity of the students and program offered to under and post-graduate programs of agriculture and forestry education is presented in tables, depicted in figure and discussed rigorously in chronological order to

make it more readable and understandable. Several sub-topics have fixed under the discussion topic to present the review work in chronology so that the valid conclusion is opted to be more understandable.

Results and Discussion

Chronological History of Higher Level Education through National Universities in Nepal

The history of higher level education in Nepal is about a century old starting first in priority with their families by the *Ranas* to the general public as ascribed in chronological order (Table 1). The conceptualization and implementation of the various plans and policies in higher level of education in Nepal were launched from its first five-year plan (Upadhaya, 2008, Singh, 2008). Until 1990, higher education development was highly restrained as the country's gross enrollment ratio (GER) of only about 5% (Paudel et al., 2013; Maalouf, 1988). Nepal National Commission of Education emphasized the implementation of the Higher Secondary Education Board (HSEB) as the first step towards specialization in higher education in 1992. In 1993, the University Grants Commission (UGC) was established to promote, facilitate, and support development of higher education in Nepal. After the dawn of provincial republic regime in 2007/08, the then Constituent Assembly has proposed and opened 8 more universities and currently there are 12 different national universities operating in various parts of the country under the UGC (UGC, 2012), and several other universities are in pipeline by the name of Provincial level universities (MoF, 2021).

Table 1

Chronological History of Higher Level Education and National Universities in Nepal

S.N.	Education level	Year of establishment
1	Modern Education for the ruling families of <i>Rana regime</i>	1853
2	Modern Education for the majority after the dawn of democracy	1951
3	Tri-Chandra College in India in affiliation with Patna University	1918
4	Tribhuvan University (TU) and its constituent and affiliated colleges under GoN	1959
5	Mahendra Sanskrit University (MSU)	1985
6	Kathmandu University (KU)	1990
7	Pokhara University (PU) and Purwanchal University	1999
8	Lumbini Bauddha University	2005

9	Agriculture and Forestry University, Mid-West University, Far-Western University	2010
10	Nepal Open University	2016
11	Rajashree Janak University	2017
12	Manamohan Technical University	2020

Chronological History of Higher Level Agriculture Education in Nepal

The economy of Nepal is largely dominated by agriculture because about 65% of its population has been dependent on agriculture for their livelihood (MoALD, 2021). Since agriculture is contributing 1/3rd of the total national Gross Domestic Product (GDP), it is regarded as one of prioritized sectors for the economic development of the country (ADS, 2014). Similarly, the importance of forest and its large coverage with the wide spread high value timber and medicinal and aromatic plants (MAPs) and several wild resources, Nepal could not develop soundly and sustain for the long (NPC, 2056). Hence, for the proper conservation, utilization and promotion of natural resource base after creating the capable human resources the technical education in agriculture and forestry has been evolved. The brief history of agriculture education is presented in Table 2.

Table 2

Brief History of Higher Level Agriculture Education in Nepal

S.N.	Educational programme and level	Year of establishment
1	School of Agriculture under the Ministry of Agriculture to produce Junior Technical Assistants (JTAs) in Putali Bagaincha, Kathmandu	1957
2	College of Agriculture under the Ministry of Agriculture to produce Junior Technicians (JTs) in Jagadama Bhawan, Lalitpur	1968
3	Institute of Agriculture and Animal Sciences (IAAS)' under the umbrella of Tribhuvan University	1972
4	Relocation of IAAS from Kathmandu to Rampur in Chitwan with an area of 235 hectares	1974/75
5	Lamjung Campus, Sundarbazaar, Lamjung as satellite campus	1972

6	Paklihawa Campus, Paklihawa, Rupandehi as satellite campus	1975
7	B Ed Agriculture	1977/78
8	Three years of B Sc Ag targeting to the students coming from I Sc Ag service providers mostly from government offices	1984/85
9	Five years of B Sc Ag program and B Sc Animal Husbandry (B Sc AH) program were launched targeting mainly to the SLC level students	1988-1993
10	B Sc AH program was promoted to B V Sc. and AH program at IAAS Rampur	1990/91
11	Simultaneously, the 4 years of B Sc Ag program was introduced targeting to the +2 Science students coming from the wider spectrum of Nepalese	1992/93 to date

The first starting of Nepalese Agriculture education in Nepal was started only after the revolution of 1950's by the name of 'School of Agriculture' under the Ministry of Agriculture to produce *lower-level* technical manpower and to serve farmers called 'Junior Technical Assistants (JTAs)'. Later, the College of Agriculture with two-year 'Intermediate of Agriculture Science (I. Sc. Ag)' program was started, producing *middle-level* technical manpower in agriculture, known as Junior Technicians (JTs). In 1972, the college was upgraded to the 'Institute of Agriculture and Animal Sciences (IAAS)' under the umbrella of Tribhuvan University. The institute was then relocated from Kathmandu to Rampur in Chitwan district with an area of 235 hectares by 1974/75 (HMG, 2001). In reading the history of IAAS, we could see the full-fledged 4 years of B Sc Ag program at Lamjung and Paklihawa campuses and 5 years of B V Sc and AH program at Paklihawa campus were launched only after 2070 BS when Rampur Campus was amalgamated to the Agriculture and Forestry University (AFU). Earlier, both Lamjung and Paklihawa campuses were continued in teaching of 2 years of initial semesters of 4 years of B Sc Ag program when 2 years of I Sc Ag program was completely phased out from IAAS/ TU in 2058 BS. The IAAS forcedly shifted its B Sc Ag program to Lamjung and Paklihawa Campuses and Veterinary program at Paklihawa campus from 2070 BS, and later on IAAS opened another two constituent campuses at Gauradaha, Jhapa and Rampur Campus at Khairahani, Chitwan in 2075 BS. Similarly, the post-

graduate program was started at Kirtipur, Kathmandu from 2070 BS when AFU was established at Rampur Chitwan.

Before starting of M Sc Ag program, the B Sc Ag program was only single and the highest degree available in Nepal, and to give the specialization on various discipline of agriculture, the elective systems with minimum of 9 credit courses were implemented, which continued until 2070 BS, though IAAS started post-graduate programs at IAAS, Rampur in 2055 BS. To give the greater exposure to B Sc Ag graduates in crop diversification and entrepreneurship, the IAAS launched the Under-Graduate Practicum Assessment (UPA) program after 2070 BS to make them ‘earn while learn’. Over the 35 years of launching B Sc Ag courses from 2035-70 BS, the IAAS has produced about 15000 numbers of capable and well trained human resources so far under different category of Agriculture and Animal Sciences (Table 3). This scenario has created tremendous potentiality of higher level of agriculture education in Nepal (TU Today, 2077) by which several public and private organizations are motivating to open the higher level of Agriculture Institutions in different regions of the country.

Table 3

Types and Number of Human Resources Developed by IAAS upto 2010/11

S.N.	Human resources type	Approximate figure
1	Social Mobilizers and Village Animal Health Workers	2600
2	Non-academic JTAs in Agriculture and Animal Sciences	2000
3	Academic JTAs in Agriculture	4000
4	I Sc Ag (I Sc Ag Proficiency Certificate)	700
5	B Sc Ag Graduates	4500
6	B V Sc and AH Graduates	640
7	Post-graduates (M Sc/ PhD)	1000
Total		15440

During the history of IAAS, it has amended the courses various times (IAAS, 2011) to make it more suited to the national demand as envisaged by Ministry of

Agriculture and Livestock Development (MoALD) and other organizations providing direct employment, research and development, and education in the country and abroad (<http://www.iaas.edu.np>). Now, almost all agriculture institutes under different universities are providing B Sc Ag degree equivalent to 160±5-7 credit courses with about 1/3rd practical portions.

Meanwhile in 1999/2000, the concern of quality education and the relevance of higher education institutions in delivering quality and applicable education in the changing context were felt growing further with the increasing number of higher education institutes in Nepal. On the other hand, a substantive number of students were going abroad for higher education seeking better quality education devoid of post-graduate program in Nepal (Paudel et al., 2013). To address this issue, Institute of Agriculture and Animal Sciences (IAAS) has launched the post-graduate program at the first time in 1999 in Plant Breeding and Genetics, Horticulture, Plant Protection and Animal Sciences followed by several departments of Agriculture and Veterinary Sciences by 2005 and run the very qualitative manpower of higher level master and PhD degree program as an important aspect of reform in higher agriculture and veterinary education in Nepal. The Agriculture and Forestry University (AFU) has continued almost all programs of IAAS-TU and Purwanchal University copied some programs of TU both in under and post-graduate studies.

The quality standard of about 150-200 B Sc Ag and B V Sc and AH undergraduate students, and near about 100 post-graduate agriculturists and veterinarians producing annually at IAAS during the tenure almost from the same number of professors and staffs coming back mostly from renowned universities of India, the Philippines, Thailand, Europe and America and other countries was remarkable. The financial, academic and technical supports provided by USAID, UNDP, Rock-feller Foundation, Winrock International, MUCIA project, ADB and several other national and organizations were the remarkable history to be remembered (John Miller Associates and APROSC, 1995).

Table 4

Various Major Departments of Post-graduate Studies in Agriculture Science under Various Universities in Nepal

S.N.	Departments	PhD students		Master Students		
		IAAS/ TU, Kirtipur	AFU, Rampur, Chitwan	IAAS/ TU, Kirtipur	AFU, Rampur, Chitwan	HICAST, PU, Kalanki
1	Agronomy (Seed Science and Weed Science)	10	3	8	12	
2	Horticulture		4	8	14	
3	Agri. Extension and Rural Sociology		3	8	12	
4	Agri. Eco and Agri-business Management		5	8	12	
5	Genetics and Plant Breeding		3	8	15	
6	Agri. Botany and Agri. Ecology/ Conservation Ecology		2	8	12	
7	Entomology		2	8	12	
8	Plant Pathology		2	8	12	
9	Soil Science and Agri. Engineering		2	8	9	
10	Rural Sociology and Developmental Studies		3	-	6	
11	Plant Bio-technology and Tissue Culture		2	-	6	
12	Agri-business Management				6	20
Total		10	31	72	128	20

Source: IAAS, AFU and other university admission websites

Table 5

Various Major Departments of Post-graduate Studies in Animal Science, Aquaculture and Veterinary Sciences under Various Universities in Nepal

S.N.	Departments	PhD students		Master Students		
		IAAS/ TU, Kirtipur	AFU, Rampur, Chitwan	IAAS/ TU, Kirtipur	AFU, Rampur, Chitwan	HICAST, PU, Kalanki
	Animal Sciences/ Aquaculture/ Fisheries					
1	Animal Breeding and Biotechnology	5	15	8	10	
2	Aquaculture			8	10	
3	Aquatic Resources			-	10	
4	Livestock Production and Management			8	10	
5	Animal Nutrition and Fodder Production			8	10	
6	Meat Science and Technology			-		5
Total				32	50	5
Veterinary Sciences						
7	Veterinary Medicine and Public Health	5	15	8	10	
8	Veterinary Pathology and Clinical Health			8	10	
9	Veterinary Theriogenology			8	10	
10	Veterinary Anatomy, Physiology and Biochemistry			-	10	
11	Veterinary Micro- biology and Parasitology			8	10	
12	Veterinary Surgery and Pharmacology			-	10	
Total		5	15	32	60	-

Source: IAAS, AFU and other university admission websites

Evolution of Agriculture and Forestry University (AFU) and Agriculture and Forestry Education Programmes under other National Universities

Realizing the further importance of trained human resources in agriculture and forestry as a catalyst for overall national development, the cabinet decided to establish a new ‘Agriculture and Forestry University (AFU)’ in 2010 (<http://www.afu.edu.np>). The idea was to merge the IAAS and its affiliated campuses and the Institute of Forestry (IoF) to produce a more robust agricultural and forestry education system in Nepal. Accordingly, the then IAAS Rampur Campus and IoF Forestry Campus, Hetauda were merged to AFU in 2010, and started the undergraduate to PhD levels (Table 4, 5 and 6). The increasing number of students advertised for various program of post-graduate study in agriculture and veterinary sciences program in different universities on these years has further clarify the promising future scopes of higher level agriculture education in Nepal. There is only need to provide due care on quality education and cordial environment to continue the program in long-run.

The opening of several colleges by the name of constituent and private/public colleges of AFU, IAAS/ TU, and other national universities like Purwanchal University (PU), Far Western University (FWU), Kathmandu University (KU), and Mid-West University (MWU) really increased the number of agriculture graduates in Nepal. The 13 constituent and 6 private campuses by the name of “College of Natural Resource Management” at AFU, about 8 colleges of IAAS/ TU, about 4 colleges of PU, a college each with different number of students at KU, FWU, MWU and the pipeline campuses to be opened soon by the name of Provincial Level University like Madhesh Pradesh Krishi Bishwobiddhlaya at Rajbiraj, Saptari has increased the B. Sc Ag graduates significantly, about 500 % more than the students of the then at IAAS in 2010 (Table 6). In addition, nearly 100 students predicted to enter annually from Indian universities, and from abroad has also increased the number of agriculture and veterinary graduates in Nepal (Table 6). The figures of about 2000 B Sc Ag graduates producing annually forced the education planners and policy makers to think seriously to manage these precious human resources for the development of the country. Formulations of deployment plans in consultation with various stakeholders after forming the rigid national policy would create the prosperous future corridor in this line.

Table 6

List of Agricultural Colleges and Average Number of Graduate Student's Quota over a Year for Different Programmes under Different Nepali Universities

S.N.	Universities/ Campuses	Year of Establishment (BS)	B Sc Ag	B V Sc & AH	B Sc Fishery
1	Tribhuvan University (Constituent campuses)				
i	Rampur Campus, Rampur, Chitwan	2029	Stopped the admission after the establishment of AFU in 2013/14		
ii	Rampur, Khairahani	2075 (shifted to Khairahani from the first and premier campus of IAAS)	50	-	-
iii	Lamjung, Sundarbazar	2032	100	-	-
iv	Paklihawa, Bhairahawa	2035 (Agriculture), 2070 (Veterinary)	100	50	-
v	Gauradha, Jhapa	2075	50	-	-
vi	Army College, Lamjung	2078	50	-	-
	Total		350	50	
2	Tribhuvan University (Private/Public Campuses)				
i	Gokuleshwor, Baitadi	2068	50		
ii	Prithu, Lamahi, Dang	2070	50		
iii	MARI, Tulsipur, Dang	2070	50		
iv	Mahendraratna, Ilam	2069	50 (B Sc Horticulture)		
	Total		200		
	Grand Total of TU		550	50	
3	Agriculture and Forestry University (Constituent Campuses)				

i	Central Campus, Rampur, Chitwan	2069	221 (169 general) + 50 (UGC)	50	20
ii	Puranchaur, Pokhara	2072	50		
iii	Pakhribas Dhankuta	2073	50		
iv	Kapilakot, Sindhuli	2073	50		
v	Tikapur, Kailali	2073	50		
vi	Bardibas Mahottari	2075	50		
vii	Madichaur, Rolpa	2076	50		
viii	Khajura, Banke	2076	50		
ix	Dullu, Dailekh	2077	50		
	Total		621	50	20
4	Agriculture and Forestry University (Private Campuses)				
i	Gauradaha, Jhapa	2075/76	50		
ii	Itahari, Sunsari	2075/76	50		
iii	Valley College, Lalitpur	2075/76	50		
iv	Ramgram, Parasi	2075/76	50		
v	Gorkha Col. Kohalpur	2075/76	50		
vi	Birendranagar, Surkhet	2075/76	50		
	Total		300		
	Grand total of AFU		921	50	20
5	Puranchal University (Constituent)				
i	Gothgaun, Morang	2074/75	48		
6	Purwanchal University (Public/Private)				
i	NPI, Bharatpur, Chitwan	2068	96	48	-
ii	HICAST, Kalanki, Kathmandu	2060	96	48	-
iii	Ilam bazaar, Ilam	2078	48		
	Total		288	96	

7	Far Western- University (Constituent)				
i	Tikapur, Kailali	2075	100 (General quota) + 10 (in service quota)		
	Total		110		
8	Kathmandu University		2077	30	
	Total		30		
9	Mid-West University (Constituent)				
i	Birendranagar, Surkhet	2078	48		
	Total		48		
10	Other International Universities including India (predicted figures only entering Nepal after taking degree)		100	20	-
	Grand of Grand Total		2047	216	20

Source: Average no. of figures are available from different university websites and other published documents as latest of 2021 AD, however, 1-2% values may be fluctuating

Genesis and Chronological History of Higher Level Forest Education in Nepal

The genesis of forest education starts from 1947 and developed to Institute of Forestry (IoF), under Tribhuvan University in July 1972 (Table 7) with the mandate of producing forestry professionals in the area of forestry, bio-diversity conservation and natural resource management (Shrestha, 2013; IoF, 2019). Until the late 1970s, IoF was providing training only to the sub-professional or technical grade manpower (TCL forestry from 1970 to 2012, Rangers).

IoF has envisioned plans in producing technically sound and competent human resources, generating knowledge and developing technology to address the problems in the field of forestry, biodiversity conservation, and natural resource management. For this, it has continued strengthening its academic programs and evaluation system, research and outreach programs, infrastructure development, human resource development, and extra-curricular activities. At under-graduate program the basic courses in B Sc Forestry has been given from major eight departments namely: Basic Sciences and Humanities, Forest Products and Utilization, Natural Resource Management, Soil Conservation and Watershed Management, Ecology and Environment Sciences, Silvi-culture and Forest Biology, Wildlife and Protected Reserves, and Forest Survey and Engineering (Table 8). To look upon the strength of physical properties, academic institutions and programs, faculties, students and other output, the IoF under TU is found to be given the quality essence in the forestry academia of IoF/ TU (UGC, 2020, IoF, 2020).

Table 7

Brief History of Higher Level Forestry Education in Nepal

At now, there are about 500 students enrolled annually in B Sc forestry under different colleges under different universities in Nepal. As per the website records the number of students enrolled annually for B Sc Forestry at Pokhara and Hetauda constitutional colleges of IoF under TU are 80 each and 50 in its private college at Kathmandu Forestry College (KAFCOL). Under AFU, two constituent colleges Hetaunda and Katari are enrolling 90 and 54 students, respectively with about 50 students in its private collage named Siddhanta College in Nawalpur district. Purwanchal University at Gothgaoun is enrolling 50 students annually and about 50 students are assumed to be entered in Nepal after completion of B Sc Forestry from India and abroad (Table 8).

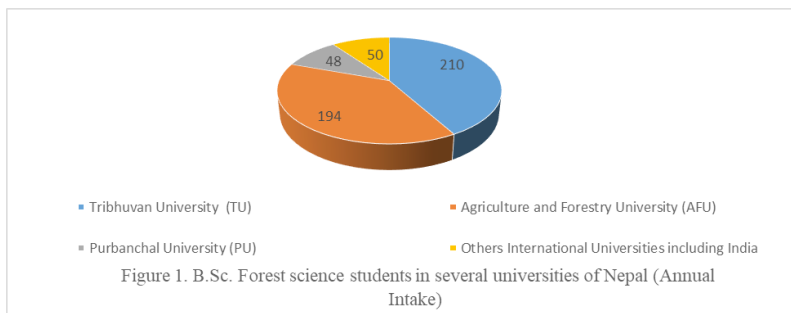
Table 8

Various Major Departments of Post-graduate Studies in Forestry Sciences with Annual Advertised Quota for Admission under Various Universities in Nepal

S.N.	Programme	Campuses under Institute of Forestry (IoF), Tribhuvan University (TU)				Campuses under Agriculture & Forestry University (AFU)
		Pokhara	Hetauda	School of Forestry & NRM (Dean's Office)	Kathmandu Forestry College (KAFCOL)	Hetauda
2	Post-graduate programme					
I	General Forestry	25	25	-	-	10
Ii	Wildlife Management and Biodiversity Conservation			20	-	10
Iii	Community Forestry	15		-	-	10
Iv	Watershed Management	15				10

v	Natural Resource Management & Rural Development	15	-	-		10
vi	Mountain Environment & Development Studies	-	-	20	-	10
vii	Geographical Sciences and Remote Sensing				10	-
	Total	70	25	40	10	60
	PhD in Forest Sciences	7				3

Source: Various website notices on admission of under- and post graduate students of different universities of Nepal



SWOT Analysis of High Level Agriculture and Forestry Education in Nepal

In support of the below mentioned bullet points of SWOT analysis (Table 9) of higher level agriculture and forestry education in Nepal, few justified evidences are discussed rigorously with authentic and published references and suggested a way to boost the qualitative education in agriculture and forestry through the 10-points strategic plans.

Table 9*SWOT Analysis of Higher Level Agriculture and Forestry Education in Nepal*

Strengths	Opportunities
<ul style="list-style-type: none"> • transformation to provincial and constituently republic political system (three tiers of local, provincial and central governmental body) in Nepal, • great scope to expand the agriculture and forestry education because about 65% people are still dependent to agriculture and agro-forestry is the major farming system, and about 30% people are under the line of poverty, • availability of different agriculture and forestry colleges under various national level universities and starting the higher level post-graduate and PhD degree programs in various domain of agriculture and forestry inside the nation, • till now the good faith of national and international organizations/ institutions/universities towards the quality of high level agriculture and forest products of Nepal, • adoption of Land grant model in different colleges of Agriculture and Forestry (Regmi, 2007), • the raising of increasing voices for the initiation of Agriculture Council like Nepal Veterinary Councils, amongst the Nepalese academicians and administrators, • raising interest of opening new private colleges in agriculture and forestry sectors 	<ul style="list-style-type: none"> • launching of National Education Policy, 2019 to meet the targeted agenda of SDG Goal # 4, and top priority of nation towards the technical education, • starts of agriculture and forestry education in class 9-12 and diploma courses at various CTEVT institutes established in remote villages targeting to 753 local governmental units of 77 districts in Nepal, • launching the prime-minster agriculture modernization project (PMAMP) to various crop commodity and initiation of internship program for the B Sc Ag students by different universities and OJT program by CTEVT at several blocks, pockets, zones and super zones of PMAMP, • increasing trend of the rural youth and migrants coming back from gulf countries towards agriculture entrepreneurship, • Inauguration of several academic institutes providing the bachelor and diploma degree in versatile subjects of agriculture and forestry sciences like floriculture, aquaculture, forest engineering etc., • provision of strong theoretical and practical bases in courses of higher level university courses <p>establishments of several agriculture and forest related forums of Nepalese professionals like NAPA (http://napaamericas.org) and NARES (https://nepafe.org.au) in abroad</p>

<p>Weaknesses</p> <ul style="list-style-type: none"> • very less equipped lab and minimum number of professors in to the dramatically increasing number of agriculture and forestry colleges in Nepal, • establishments of new colleges of agriculture mostly motivated with politics and private organizations with less care of regional and provincial development, • brain drains of well trained and skilled higher level agriculture and forestry graduates from the country, • the decreasing trends of rural youths towards the engagement in agriculture in Nepal, • the least investments of Nepalese government in teaching, research and extension of agriculture and forest related academic institutions, • less seats allocated to study higher level agriculture and forestry education to the majority of pupils coming from rural background, resulting more problems of brain drain or unemployment of skilled manpower, • lacking of umbrella organization to offer a strong tie up in between the organizations producing low-level, mid-level and high-level of agriculture and forest manpower in the country 	<p>Threats</p> <ul style="list-style-type: none"> • due interest of higher level agriculture and forest graduates towards the government jobs rather than teaching and research in the university profession, • the unhealthy and unfair practices of different universities towards the agriculture and forest education in Nepal, • the unintended and vested interest of public and private partners towards the higher education of agriculture and forestry institutions in Nepal, • the huge gaps between the agriculture and forest graduates and their posting jobs in governmental organizations (for eg. B Sc Ag. 18-20:1 and M Sc Ag 3-4:1), • very less practical knowledge with the recent graduates of agriculture and forest, the sophisticated lab utensils in various governmental institutions are uselessly thrown due to lack of technical hands, • fear of closing of the various constituent and private campuses of agriculture and forest education under different universities due to unavailability of quality and assured jobs in the national and international level
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Strategies to improve the higher level of Agriculture and Forestry Education in Nepal

1. Providing the qualified and demanded number of higher level human resources: The Ministry of Agriculture and Livestock Development (MoALD, 2021) has further reported that one agriculture technician is responsible for an average of 1,500 farmers in Nepal as in line with Pyakuryal (2013), whereas in developed countries this ratio is 1 technician/ 400 farmers (IRIN, 2013). It has also noted that Nepal requires 6000-7000 animal scientists/veterinarians, 18,000 forestry graduates, though there are only 624 registered veterinarians and 1800 forestry graduates, respectively, indicating that the supply is behind the demand. At now, with the increasing number of academic institutions in agriculture and forestry, the ratio of high level agriculture graduates and job opportunity reported is about 18-20:1 for the under-graduates and 3-4: 1 for the post graduates (Lamichhane & Chemjong, 2003). The half of the same scenario is looking over in forestry education.

A summary table of 5 years passed out bachelor students in forestry in their future career has been presented in Table 10 and found that many of our graduates also get opportunity for further study in the universities across the world and they have shown quite competent performance in the global job market. The regular advertisements in the service commission and other provincial level service commission has been stopped for the long and it would be suggested to initiate it promptly to create the job of the high level graduates of natural resource management.

Table 10

Summary of 5 Years Passed out Forest Bachelor Students of IoF/TU in their Job Career

Bachelor student batch	No. of student in Nepal Civil Service Commission	No. of student in NGO/INGO	No. of students passed international exam for study and work	Other	Total students
2070-74	32	10	10	27	79
2069-73	37	11	5	25	78
2068-72	47	5	10	22	84
2067-71	50	0	10	17	77
2066-70	32	4	7	4	47
Total	198	30	42	95	365

Source: Five Year Strategic Plan Report, 2019-2024, IoF, Pokhara Campus, Pokhara

2. Minimize the gap among Academics, Research and Extension

stakeholders: The separation of agricultural and forestry education, research and extension into different ministries and agencies with limited functional mechanism and to link them together has resulted in systemic problem in national agriculture and forestry systems, and urges for their effective mechanism for the overall development (ADS, 2014). In Agriculture and Forest Science, few research activities are carried out as part of a higher degree (M. Sc. or PhD) students, and mostly by Nepal Agriculture Research Council and Forest Directorate, respectively. but very seldom are related to national priorities or programs. The sharing of the academic and research experts between IAAS/IoF/TU and AFU is most needed. There must be coherent and cordial environment between the various national organizations to work together for the academics, research and extension. At present, the agriculture and forestry graduates are mostly engaged in Governmental high schools and Centre for Technical Education and Vocational Training (CTEVT) for their jobs, and the +2 agriculture and diploma products are entering to universities for their higher studies. Hence, the GoN should make special MoU with those institutes to make the more collaborative works. To add the employment to the agriculture and forest graduates, the launching of 1year B Ed courses in Plant and Animal Sciences and in various departments of Forestry education is advocated.

3. Revitalization of new curricula: To address the current needs and challenges, continual updating of academic curricula is imperative, but it is not something that happens frequently in Nepal. Furthermore, the curricula tend to be more theory-based and lacking in diverse alternatives, thus often inappropriate for the needs and challenges of agricultural communities in diverse geographical and agro-ecological regions throughout the country. As defined in UGC guideline, the new syllabus demands about 70% for global, 20% for local and 10% for national needs of the country.

4. Management of infrastructure and financial issues: The academic institutions in Nepal mostly operate on the basis of an annual budget released from UGC and Ministry of Education Science and Technology (MoEST). This depends on the number of students enrolled, levels of previous funding and governmental capacity to support the institutions, of which 85% of the total budget sanctioned is used for salaries (FAO, 2019). The agricultural and forestry institutions have to increase the long-term collaborations with NARC, DoA, DoF, NGOs, and private companies to better support the needs of students and the farming community, such as by establishing joint programs and courses and developing pathways for students pursuing careers in agriculture.

5. Branding new image of agriculture and forest education: In general, the family and social influence, almost every child growing up in Nepal aspires to go into either 'medicine' or 'engineering'. Overall, attitudes about agriculture and forestry are much more negative than positive, and a general ignorance about agriculture and forestry contributes to the poor perception of these disciplines and careers in this field. The decreasing trends of students entering in entrance exam of agriculture and forestry over the different Nepalese universities is the projection of this real scenario (various university websites) which need to be given a due care on time.

6. Policy of encouraging student from rural setting: The educational standards in rural areas are not often a priority of the government as like of the urban areas, which places rural youth in direct competition with better-schooled urban youth due to lack of +2 science colleges. This in turn leads to much fewer students with in-depth understanding of rural life and production of agriculture and forest products as extension agents. Providing scholarship opportunities to the agriculture and forestry students coming from rural base and government high school curricula will be enhanced therefore to mitigate the issues. The programs initiated by the current agricultural universities and institutes are appreciable to the students because attractive and generous scholarship opportunities based on selection based on merit has been launched by most of them.

7. Retention of skilled human resources in the country: About 30% young and enthusiastic agriculture and forest graduates and scientists of the total number of a graduates produced each year go abroad to study or work (Pyakuryal, 2013). The result of this is a high average age of agricultural and forest personnel due to the low intake of younger candidates; more than 40% of the scientists are nearing retirement age, while 32% of posts are vacant due to recruitment problems (IRIN, 2013). Promotions occur infrequently and there are very few opportunities for travelling abroad to share knowledge or to engage in short-term international training in Nepal (Pokharel, 2013). In a financial report of TU, it has been reported that the GoN invests about NRs 15000- 20,000/- to produce a graduates of humanities, management, education and law, while the same proportion is quite high in technical subjects costing nearly about 650,000-7,00,000/- in agriculture and forestry and about NRs 9,00,000-12,00,000 in the engineering and medicines (TU, 2018), highlighting to formulate the policy to stop the skilled manpower to go abroad permanently. To attract the higher level of agriculture and forestry graduates in universities and academic institutions, the Indian ICAR/ IARI model of job system

could be advocated in which, the entry of job starts from research stations until their first promotion, then entry to university for the teaching upto their second promotion and lastly at agriculture knowledge centers to serve the nation. Hence, the MoALD/ MoF, NARC and Agriculture and Forest related academic Institutions should work together in Land Grant System Model to control the problem of brain-drain and quality concern of the students and job holders.

8. Startup incentives to Agriculture and Forest Graduates to enterprises

establishment: Agriculture and forest graduates are reluctance to act as role models as entrepreneurs and desire to be more focused toward sophisticated jobs with NGOs or abroad was one of the resounding comments. The government's Agriculture Development Strategy Assessment (ADS) Report estimated 200,000 youth migrated abroad, especially in Gulf countries for employment in 2010, leaving mostly women, children, and the elderly behind. Female-headed agricultural households have increased from 12% in 1995 to 26% in 2010 and about 30-40% in 2020 and it is more prone to increasing due to COVID-19 infection (Adhikari et al. 2021). These figures are indicative of the fact that agriculture and forestry sector is far less appreciated today than in past generations. In our grandparents' age, being a farmer was one of the most honored professions in the country and provoked that 'uttam krishi, madhyam vyavasaya, adham nokari' is an old adage, which basically lauds 'farming' as the best option, over 'business' and 'jobs'. This theme should be promoted to follow strictly.

9. Enhancing the agricultural and forest value-chain and systems research:

One of the most fundamental knowledge gaps in research, academia and enterprise is that there is lack of intervention and understanding of the determinants of consumer choice and how to use this information to improve the food and medicines in the agricultural and forestry system (Ghimire, 2011). Also, there is limited research funding; only 0.4% of the agriculture and forestry sector's GDP is spent on research, which is largely insufficient, and is hampering the overall development of the country (IRIN, 2013). Hence, the universities and academic institutions will be financially supported in making strong research base to reach directly to the farmer's community mostly to create entrepreneurs.

10. Quality assurance and accreditation by establishment of Agriculture and

Forestry Councils in Nepal: The Nepal Medical Councils (NMC), Nepal Veterinary Council (NVC) and Nepal Engineering Council (NEC) are fully operating in the country from the long decade and the university graduates on those disciplines are

guided by the rules and regulations, and their quality is assured and accredited. But, in agriculture and forestry, the concept of their respective councils are proposed very recently only by few people which must be established at the prompt to regulate the quality, quantity and job opportunity of the agriculture and forest graduates in Nepal.

Conclusion

The concern of quality education and the relevance of higher education institutions in delivering quality and applicable education in the changing context are growing with the increasing number of higher education institutes in Nepal. The utmost strength of the institutions/ universities providing agriculture and forestry education should be able to contribute to society through the pursuit of teaching-learning, research and development, and extension of new innovations in the natural resources management. There is an immediate need to develop a standard and regular monitoring and evaluation (M & E) system for regular assessment and improvement of the high level agriculture and forestry education programs through a Quality Assurance and Accreditation (QAA) program as opined and ruled by UGC of Nepal. Our youths are grooming towards the international jobs, hence, making curriculum more relevant to the present national and international labor market would be innovative milestone which needs serious consideration. The formulation of Agriculture and Forest Council may help positively in making the quality and quantity produce of university education under agriculture and forestry in Nepal.

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