Stocktaking: Agriculture Degree Programs in Nepal

Introduction

Recently, there have been renewed calls for the integration of nutrition, health, and agriculture to improve the nutritional status of populations. Whereas these sectors previously operated in separate realms, various frameworks have been propounded to highlight the importance of a multi-sectoral approach and to establish links between the sectors to impact nutritional status. The 2008 Lancet Nutrition Series and the Scaling Up Nutrition (SUN) framework have provided evidence-based interventions that have largely guided efforts at an integrated approach to address maternal and child undernutrition. The Government of Nepal (GoN) has made a major commitment to improving the nutritional status of the population. It was one of the earliest countries to join the SUN Movement and has articulated a clear strategy for scaling up direct nutrition interventions as well as identifying multi-sector strategies for improving nutrition. To this end, in September 2012, the GoN released its Multi-Sector Nutrition Plan (MSNP) that will guide the government's investment for the period 2013-2017.

While the drafting and adoption of MSNP is a remarkable achievement, the work to realize the goals and outcomes starts now. It is a challenging, if not a daunting task, which will require various ministries to coordinate their efforts and work collectively toward the common goal of reducing undernutrition among women and children. For agriculture, this goal requires not only augmenting food production but also increasing the availability of diverse and nutrient rich foods that can improve the nutritional status of women and children. It also means building the capacity of the agriculture sector to develop agricultural professionals who understand the nutritional requirements and implications beyond their field of expertise. An initial step in developing a framework for capacity investment is the identification of undergraduate and graduate degree-granting programs in agriculture currently operating in Nepal. The Nutrition Collaborative Research Support Program (Nutrition CRSP) conducted a stocktaking of degree programs in Nepal. This information will feed into a longer term effort to support Nepal's capacity building efforts.

Stocktaking

The Nutrition CRSP team conducted a desk review of degree programs at the bachelor's and master's level in Nepal. The desk review was supplemented by verifications with key staff members at the different academic institutions.

A range of institutions are involved in degree granting in agriculture. These include:

- Tribhuvan University, Institute of Agriculture and Animal Science (IAAS)
- Purbanchal University
- Himalayan College of Agricultural Sciences and Technology (HICAST)

Undergraduate Degree Programs

Tribhuvan University's Institute of Agriculture and Animal Science (IAAS) is the oldest institution for formal training in agriculture in Nepal. It has a central campus in Rampur in Chitwan district and two branch campuses (Lamjung Campus in Sundar Bazar in Lamjung district and Paklihawa Campus in Bhairahawa in Rupandehi district) and offers a Bachelor of Science degree in Agriculture (B.Sc.Ag) as well as Bachelor of Veterinary Science and Animal Husbandry degree (B.V.Sc & A.H). The goal of the four-year B.Sc.Ag program is to develop technically competent agricultural graduates to apply their knowledge and skills to the established and emerging needs of the agricultural sector in Nepal. Students acquire knowledge in a variety of core subjects in the first three years following which elective courses in their areas of interest are offered. Courses range from science courses like biochemistry, crop physiology, agricultural microbiology, environmental sciences, agroecology, ichthyology, agronomy, horticulture, and animal science to production-focused courses on cereal crop production, commercial crops, vegetable and spice crop production, fruit and plantation crop production, pig and poultry production, as well as courses on management and conservation such as farm management, social mobilization and community development, soil conservation and watershed management, animal nutrition and feeding practices, animal breeding practices. Core courses also include agribusiness management and marketing, agriculture project planning, and biotechnology and biodiversity. It is worth noting that only one course, applied human nutrition, is related to human nutrition. Please See Table 1 for the curriculum and course listings.

Purbanchal University through its Faculty of Science and Technology offers a Bachelor of Science (Honors) degree in Agriculture (B.Sc.Ag). The four-year B.Sc.Ag program aims to provide knowledge on agricultural advancement and experience on indigenous technology used by farmers. It has a result-oriented approach to identifying production constraints and offer solutions while also familiarizing students with the developmental landscape, market forces, and agricultural activities. The focus in the early semesters is on introductory courses. Project works start from the third semester and students are required to take elective courses of interest starting from the seventh semester. Students are linked with research firms, agro-industries, NGOs as well as farms for an internship in the last semester to provide field experience. As with the IAAS, courses range from science courses (plant physiology, animal science, crop science, soil physics, biochemistry, microbiology, economics, rural sociology) to management (management of crop diseases and pests, soil management, irrigation and water management, animal production management) as well as production (livestock production, vegetable crop production, and use of technology), farm power and machinery, plant breeding and biotechnology, post harvest technology. However, unlike at the IAAS (which offers an Applied Human Nutrition course) there are no courses that are explicitly linked to human nutrition. Please see Table 2 for the curriculum and course listings.

Purbanchal University also offers a Bachelor of Food Technology degree and a Bachelor of Dairy Technology degree. These are specialized degrees that aim to improve food quality and safety. The focus is on preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome food and dairy products. Students are trained in the physical, microbiological, and chemical makeup of food and dairy products as well as business management and use of technology. Both degrees offer courses in Biochemistry and Human Nutrition and Nutrition and Dietetics. Please see Tables 3 and 4 for the curriculum and course listings.

Accredited by Purbanchal University, Himalayan College of Agricultural Sciences and Technology (HICAST) aims to develop academically and technically sound graduates to address the shortage of trained professionals in agriculture. It follows the curriculum and course offerings of Purbanchal University and has an emphasis on research and training forming various linkages with national and international institutions.

Master's Degree Programs

Tribhuvan University's Institute of Agriculture and Animal Science (IAAS) offers a 2-year Master of Science in Agriculture (M. Sc. Ag) program with a major in various specializations: Agricultural Economics, Agricultural Extension, Entomology, Horticulture, Plant Breeding, Plant Pathology, Conservation Ecology, and Soil Science. Students must take the core courses in statistical methods, crop physiology, general biochemistry, and technical writing, in addition to specialized departmental courses.

Purbanchal University has recently introduced a Master of Science degree in Dairy Technology (M.Sc.Dairy Tech.) and Master of Science degree in Meat Technology (M.Sc. Meat Tech.) offered through the Faculty of Science and Technology. The aim of these programs is to provide candidates with the technical expertise in food and dairy quality management and safety. Both are two year programs covering food and dairy chemistry, microbiology, processing and engineering as well as product design, development, and marketing. A course on Biochemistry and Nutrition covering the classes of nutrients, nutritional status, recommended dietary intake, problems and assessments of malnutrition in the context of Nepal, vitamin deficiency disorders, anthropometric and food consumption surveys is offered in both programs. Accredited by Purbanchal University, Himalayan College of Agricultural Sciences and Technology (HICAST) also offers a Master of Science degree in Dairy Technology (M.Sc. Dairy Tech.) and a Master of Science degree in Meat Technology (M.Sc. Meat Tech.). Please see Table 5 for the curriculum and course listings.

Challenges Going Forward

Agricultural advancement is now expected not only to increase productivity and income generation but to also be sensitive to nutritional improvement of the population. There has been increasing understanding that agriculture, health, and nutrition must progress synergistically to maximize the impact on health and development. Numerous programs are now adopting an integrated approach to alleviate nutritional and agricultural deficits. In Nepal, large-scale programs such as Suaahara, Feed the Future, Scaling up Nutrition, Global Agriculture and Food Safety Program, and the Sunaula Hazar Din, as well as the newly adopted Multi-Sectoral Nutrition Plan (MSNP) have collectively increased the need for staff trained in public health, nutrition, and agriculture. While there is already a shortage of technically-adept professionals in agriculture and nutrition, especially at the lower administrative levels, professionals with an understanding of agriculture-health-nutrition linkages, and expertise in linked outcomes, are in even shorter supply.

The MSNP, especially with its identified output of "capacity of national and sub-national levels enhanced to provide appropriate support to improve maternal and child nutrition" mandates that a whole new cadre of professionals be trained. The challenge lies in training and developing

professionals who are not only sectoral experts but who also possess the technical knowledge and skills to critically understand the agriculture-health-nutrition linkages. There is strong will across sectors and organizations to develop human capacity; the Government of Nepal, the donor community, and academic institutions are aligned to build this necessary expertise. This stocktaking exercise demonstrates that while the curricula at the bachelor's and master's level provides a solid background in agriculture, it can be augmented by including courses on human nutrition and links between agriculture and nutrition. While more institutions are required to offer degrees in agriculture, some are already seeking to expand their offerings to cater to this developing area. However, innovative short-term solutions (short courses, trainings, etc.) are also required. The Nutrition CRSP is one resource the government can rely on for this capacity building effort.

Table 1: Bachelor of Science degree in Agriculture, Tribhuvan University, Institute of Agriculture and Animal Science (TU IAAS)

Semester 1 Rural Sociology General Biochemistry Principles of Economics Principles of Agronomy Introductory Horticulture Fundamentals of Soil Science and Geology Introductory Animal Science Work Experience Program	**Semester 2** Introductory Crop Physiology Agricultural Microbiology Farm Management, Production Economics and Planning Cereal Crop Production Ornamental Horticulture Soil Fertility, Fertilizers and Integrated Nutrient Management Ruminant Production Work Experience Program
Semester 3 Environmental Sciences and Agroecology Agricultural and Environmental Economics Grain legumes and Oilseed Production Introductory Entomology Fruit and Plantation Crop Production Introductory Genetics Pig and Poultry Production Introductory Agrometeorology Introductory Ichthyology	**Semester 4** Commercial Crops Principles and Practices of Seed Technology Agricultural Statistics Vegetables and Spice Crop Production Introductory Plant Breeding Soil Physics, Genesis and Classification Farm Power and Machinery Fodder Production and Pasture Management Principles of Aquaculture
Semester 5 Medicinal and Aromatic Plants Fundamentals of Agricultural Extension Computer Application Principles and Practices of Insect-Pest Management Agroforestry Genetics of Populations Introduction to Plant Pathology Introductory Soil Conservation and Watershed Management Animal Nutrition and Feeding Practices Project Work	**Semester 6** Nepalese Agriculture Development and Policy Agricultural Communication Social Mobilization and Community Development Economic Entomology Post Harvest Horticulture Crop Disease and their Management Principles and Practices of Animal Breeding Project Work
Semester 7 Agribusiness Management, Marketing and Cooperatives Farming Systems and Sustainable Agriculture Introductory Biotechnology and Biodiversity Principles of and Practices of Farm Water Management Project Work, Electives	**Semester 8** Agriculture Project Planning Farm Structures and Surveying Introduction to Dairy Science Applied Human Nutrition Elective

Electives

Agricultural Marketing and International Trade
Survey Research Methodology
Agricultural Finance, Planning and Management
Program Planning in Agriculture Extension
Leadership Development
Post-Implementation Aspects of Social Mobilization
Case Studies on Social Mobilization
Weeds and their Management
Principles of Crop Management
Rainfed and Sustainable Agriculture
Selection and Mating Systems
Biometric Approaches in Quantitative Genetics
Animal Biotechnology
Animal Genetic Resources and their Conservation
Applied Animal Nutrition
Poultry Feeds and Feeding
Feeds, Fodders, and Feed Industries
Pond Construction and Water Quality Management
Fish Farming Systems
Fish Diseases
Fish Breeding
Insect Pests of Crops
IPM and Environment Protection
Disease of Field Crops
Diseases of Fruits, Vegetables, and Spices
Environmental Ecology
Biodiversity Conservation
Fundamentals of Ethnobiology
Ecological Research Methods
High Value Crop Production
Vegetable Seed Production
Nursery Management and Landscape Horticulture
Physiology of Horticulture Crops
Milk and its Properties
Milk Product and Processing
Cattle and Buffalo Production
Animal Health
Poultry Production
Sheep and Goat Production
Cattle and Buffalo Production
Pig Production
Introductory Cytology and Cytogenetics
Principles and Practices of Plant Breeding
Hybrid Seed Production
Biotechnology in Crop Improvement
Seed Pathology
Mushroom Cultivation
Diseases of Field Crops
Diseases of Fruits, Vegetables, and Spices
Soils of Nepal
Soil Classification, Mapping, and GIS Application
Soil Chemistry, Fertility, and Fertilizer
Soil Conservation and Watershed Management

Table 2: Bachelor of Science degree in Agriculture, Purbanchal University

Semester 1 Biostatistics and Computer Application Microbiology Introductory Soil Science Crop Science Economics Introduction to Animal Science Rural Sociology	**Semester 2** Plant Physiology General Biochemistry Farm Power and Machinery Crop Production I Principles and Practices of Horticulture Soil Conservation and Soil Physics Animal Production and Management Fundamental of Extension Education
Semester 3 Principles of Genetics Introduction to Plant Pathology Principles of Entomology Crop Production II Vegetables Crop Production Animal Reproduction and Reproductive Biotechnology Irrigation and Water Management Project Work on Plant Propagation and Nursery Management	**Semester 4** Animal Nutrition and Fodder Production Aquaculture Crop Disease Management Crop Pests and Management Fertilizers, Manure and Sustainable Soil Management Fruit Crop Cultivation Plant Breeding and Biotechnology Plant Clinic
Semester 5 Agroforestry Post Harvest Technology Integrated Pest Management Agricultural Resource and Marketing Management Research Methodology and Proposal Writing Livestock Product Technology Seed Production Technology Animal Biodiversity and Management Project Work on Livestock Production	**Semester 6** Animal Breeding and Genetics Social and Economic Development Sustainable Agriculture and Rural Development Project work on Mushroom Cultivation Ornamental Horticulture Animal Health and Hygiene Apiculture and Sericulture Agriculture Policy and Planning
Semester 7 (Electives) Sustainable Agriculture • Biointensive Farming Systems and Livelihood • Conservation and Sustainable use of Plant Genetic Resources • Agroecosystems and Environment • Project Work on Sustainable Agriculture Horticulture • Medicinal and Aromatic Plants • Entrepreneurship and Enterprise Development in Horticulture • High-Value Horticultural Crops • Project Work on Horticulture	**Semester 8** Internship Thesis Seminar

Plant Breeding • Applied Plant Breeding (Agronomical and Horticultural Crops) • Conservation and Sustainable Use of Plant Genetic Resources • Organic Agriculture and Product Certification • Project Work on Plant Breeding Plant Protection • Diseases of Field and Vegetable Crops • Insect Pests of Field and Vegetable Crops • Insect Pests and Disease of Fruit Crops • Project Work on Plant Protection Animal Science • Applied Animal Breeding • Feeds, Fodders, and Feed Industry • Sustainable Livestock Development and Management • Project Work on Animal Science Soil Science • Soil Chemistry • Soil Genesis and Classification • Bio-Fertilizers and Organic Farming • Project Work on Soil Science Ag. Economics and Business Management • Agricultural Finance and Business Management • Development Economics and Project Planning • Agricultural Marketing and Cooperatives • Project Work on Ag. Economics and Business Management Development Studies • Development Planning • Sociology of Development • Social Mobilization • Project Work	

Table 3: Bachelor of Dairy Technology degree, Purbanchal University

Semester 1 Applied Physics Applied Chemistry Applied Mathematics and Statistics Applied Microbiology Basic Engineering for Food and Dairy	**Semester 2** Agrobusiness Management Food Chemistry Food Extension Education Computer Application in Food and Dairy Industries Instrumental Methods of Food Analysis Food Process Engineering
Semester 3 Biochemistry and Human Nutrition Advanced Microbiology Biochemical Engineering Modern Biotechnology and Genetic Engineering Post Harvest Technology IT Based Management in Food/Dairy Industries	**Semester 4** Quality Control and Assurance Food Process Laboratory System Development Food Process Engineering II Nutrition and Dietetics Packaging Technology Industrial Microbiology Human Resource and Entrepreneurship Development
Semester 5 Dairy Chemistry Dairy Microbiology I Dairy Engineering I: Mechanical and Electrical Technology of Dairy Products I: Market Milk Technology of Dairy Products II: Indigenous Milk Products	**Semester 6** Dairy Chemistry Dairy Microbiology II Dairy Engineering II: Refrigeration and Air Conditioning Technology of Dairy Products III: Ice-Cream and Frozen Milk Products Technology of Dairy Products IV: Fermented Milk Products
Semester 7 Dairy Extension and Marketing Dairy Business Management Dairy Engineering III : Design of Dairy Equipment Technology of Dairy Products V : Dried and Condensed Milk Products Dairy Plant Operation and Instrumentation Quality Control in Dairy Research Topic Selection	**Semester 8** In-Plant Training Thesis

Table 4: Bachelor of Food Technology degree, Purbanchal University

Semester 1 Applied Physics Applied Chemistry Applied Mathematics and Statistics Applied Microbiology Basic Engineering for Food and Dairy	**Semester 2** Agro-Business Management Food Chemistry Food Extension Education Computer Application in Food and Dairy Industries Instrumental Methods of Food Analysis Food Process Engineering
Semester 3 Biochemistry and Human Nutrition Advanced Microbiology Biochemical Engineering Modern Biotechnology and Genetic Engineering Post Harvest Technology IT Based Management in Food/Dairy Industries	**Semester 4** Quality Control and Assurance Food Process Laboratory System Development Food Process Engineering II Nutrition and Dietetics Packaging Technology Industrial Microbiology Human Resource and Entrepreneurship Development
Semester 5 Advanced Food Process Engineering Technology of Food Products I: Fruits and Vegetables Technology of Food Products II: Cereal, Legumes and Oilseeds Technology of Food Products III: Fats and Oils Market Research and Consumer Behavior	**Semester 6** Technology of Food Products IV: Snack Foods Technology of Food Products V: Alcoholic and Non-Alcoholic Beverages Technology of Food Products VI: Spices, Tea and Coffee Technology of Food Products VII: Meat, Fish and Poultry Technology of Food Products VIII: Chocolate and Confectionery
Semester 7 Environmental Management Marketing and Exporting of Food Commodities Technology of Food Products IX–Indigenous Foods of Nepal Quality Management System and Application Food and Beverage Services Research and Development in Food Technology Research Topic Selection	**Semester 8** In-Plant Training Thesis

Table 5: Master of Science in Meat Technology and Dairy Technology degree, Purbanchal University

Semester 1 Applied Statistics Instrumental Method of Food Analysis Food Chemistry Dairy and Meat Microbiology Basic Principles of Engineering Refrigeration Engineering	**Semester 2** Research Methodology Environmental Management and Engineering Biochemistry and Nutrition Food Plant Organization and Management Total Quality Management Process Biotechnology
Semester 3 **Meat Technology Specialized Courses** Food Processing Meat Science Abattoir Practices and Meat Processing Technology Meat Hygiene and Public Health Meat and Poultry Product Technology	**Semester 3** **Dairy Technology Specialized Courses** Food Processing Dairy Chemistry Dairy Plant Management Technology of Dairy Products Technology of Market Milk Products
Semester 4 In-Plant Training Seminar Dissertation	