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Topics of dissertation thesis for academic year 2019/2020

Study Programme: Tropical Agrobiology and Bioresource Management

Topic:	**Impact of traditional processing and natural antioxidants on the quality and shelf-life of game meat**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☐Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Jan Banout, Ph.D.
Supervisor-consultant:	
Prospective funding:	Internal grant agency

Annotation:

The increasing demand for alternative meat sources leads to the invention of new meat products or to the effort to replace conventional meat (beef or pork) in traditional meat products. Moreover, the consumers' demand and their pressure to eliminate artificial substances in meat products open new opportunities to utilise natural substances as perspective antioxidants and antimicrobial agents. Since the visual appraisal of meat and meat products is critical for the consumers' purchasing decisions, as they relate colour to freshness, a suitable method to lower the amount of used chemical additives, added to meat products, seems to be the use of natural substances (e.g. spices and plant extracts). These substances are known to have a positive affect not only on the colour, but also on the shelf life of conventional meat products. Besides, they are a natural part of meat products and can also pleasantly affect the organoleptic characteristics of these products. The thesis will focus on the application and evaluation of natural substances and traditional processing (drying) and their impact on the sensory and technological properties of antelope meat. Aquatic vegetables such as Water spinach (Ipomoea aquatica), Water Mimosa (Neptunia oleracea), Cambodian mint (*Polygonum odoratum)* and others are intensively cultivated especially in South-East Asia. In this region they are important part of human diet. The same situation is in Cambodia. The numerous plots located around wetlands in peri-urban Phnom Penh, are important sources of edible aquatic vegetables for the city and other areas of Cambodia. Farmers in several wetlands near Phnom Penh make a good living by growing vegetables and selling them in local markets for human consumption. These vegetables, however, pose serious health hazards to consumers, since they are grown using wastewater, much of it polluted with heavy metals from industries as well as additional fertilizers and pesticides are also heavily applied. A cross- sectional study of pesticide handling practices and self- perceived symptoms of acute pesticide poisoning was conducted using questionnaire-based interviews with 89 pesticide sprayers in Boeung Cheung Ek (BCE) Lake, Phnom Penh, Cambodia. The study showed that 50% of the pesticides used belonged to WHO class I + II and personal protection among the farmers were inadequate (Jensen et al., 2011). Up to 80 % of Phnom Penh's domestic wastewater is pumped into the lakes of Phnom Penh, together with industrial and chemical effluents from a growing industrial sector. Thus the main objective of this research is to monitor the consumer behavior and growing practices of selected aquatic vegetables in peri- urban areas of Phnom Penh in Cambodia. Further a representative sample collection and analyses with respect to contamination by potentially toxic elements (PTEs) such as Cd, Cu, Ni, Pb, Sb, Zn and other pollutants such as pesticides will be done. Finally a human health risk assessment will bepublish based on key indicators such as the Target Hazard Quotients (THQ).

Topic:	**Macronutrient and micronutrient profile of processed Cambodian fish**
Study programme: * *tick/delete as appropriate	☒Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Jan Banout, Ph.D.
Supervisor-consultant:	
Prospective funding:	Internal grant agency (FTA, CULS)
Annotation:	

Fish and fisheries in Cambodia are essential for providing food security to the people. More than 85% of the population in Cambodia is strongly dependent on agriculture, of which freshwater aquaculture is one of the most important sources of food production. The annual fish meat and fish product consumption is about 33.8 kg per person. Average intake of animal protein from fish meat is 18.3 kg per year per person, which is around 80% of total animal protein intake for Cambodians. Despite the fact that fish and fish products such as smoked fish is highly nutritious and widely consumed in Cambodia, the Cambodian population still suffers from severe malnutrition. Fish fat content is unique as it contains some essential pre-formed long chain polyunsaturated fatty acids called DHA and EPA. These omega-3 fatty acids can't be provided as such by any other food sources. Similarly the fish products are sources of micronutrients frequently under-represented in standard diets such as iron, zinc, calcium, Vitamin A and iodine. These essential vitamins and minerals are especially available in small fish species eaten whole. Referring to scientific literature there is lack of knowledge on nutritional and particularly micro-nutritional profiles of fish and fish products consumed in Cambodia. Results of this research will have positive influence on food security of rural areas in the country.

Topic:	**Influence of drying method on capsaicinoids content from different Capsicum species**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Jan Banout, Ph.D.
Supervisor-consultant:	Ing. Klára Urbanová, Ph.D.
Prospective funding:	Internal grant agency

Annotation:
Chili peppers from different *Capsicum* species are used worldwide in foods for their pungent flavor, aroma, and to prolong food spoilage. With different capsaicin contents a different varieties offer a wide range of options for people all over the world. The food industry often relies on food additives to suppress microbial growth. Foods are commonly preserved by compounds such as nitrite, sodium benzoate, and sodium metabisulfite that have been tested and proven safe. However, there are occasional reports of allergic reactions. Natural preservatives such as essential oils isolated from some plant sources have been found to be effective antimicrobial agents. Similarly the research is underway to determine the potential for the application of chili pepper extracts in the food industry in place of artificial preservatives. As many other products the chilli papers are usually processed by drying for its preservation. A limited number of studies were focused on the influence of drying method on capsaicinoids content in chilli peppers. Furthermore up to now a limited number of *Capsicum* species and chilli varieties were subjected to the investigation of drying process and its influence on final capsaicinoids content. Thus the main objective of this research is to investigate the influence of different drying methods (cabinet drying, solar drying and freeze drying) on the final content of capsaicinoids in *Capsicum* species. More than 70 varieties of different *Capsicum* species will be subjected to the investigation in this study. The antibacterial effect of natural extracts from fresh and dried varieties of chilli peppers will be tested as well.

Topic:	**Influence of drying pre-treatments on final organoleptic and physical properties of dehydrated products**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Jan Banout, Ph.D.
Supervisor-consultant:	Ing. Helga Hernández, Ph.D.
Prospective funding:	Internal grant agency

Annotation:
Pretreatments, such as blanching, dipping and sulfating are common in most drying processes to improve product quality or process efficiency. The main objective of using blanching is to inactivate enzymes in products such as polyphenoloxidases (PPO) and peroxidase (POD) enzymes, which cause deterioration reactions, off-flavor and undesirable changes in color. Other purposes of blanching include the destruction of microorganisms,acceleration

of drying rate by expelling intercellular air from the tissues, softening the texture or by dissociating the wax on the products skin, and forming of fine cracks on skin of products. In recent years, exhaustive efforts have been made for an improvement in the quality retention of dried products by altering processing strategy and/or pretreatment. Thus the main purpose of this topic is to use modified dips and blanching pretreatments and investigate their influence on product quality and drying kinetics.

Topic:	**Toxicological assessment of selected pollutants accumulated in aquatic vegetables grown in peri-urban wetlands**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Jan Banout, Ph.D.
Supervisor-consultant:	
Prospective funding:	Internal grant agency, Czech development cooperation project

Annotation:
Aquatic vegetables such as Water spinach (Ipomoea aquatica), Water Mimosa (Neptunia oleracea), Cambodian mint (*Polygonum odoratum)* and others are intensively cultivated especially in South-East Asia. In this region they are important part of human diet. The same situation is in Cambodia. The numerous plots located around wetlands in peri-urban Phnom Penh, are important sources of edible aquatic vegetables for the city and other areas of Cambodia. Farmers in several wetlands near Phnom Penh make a good living by growing vegetables and selling them in local markets for human consumption. These vegetables, however, pose serious health hazards to consumers, since they are grown using wastewater, much of it polluted with heavy metals from industries as well as additional fertilizers and pesticides are also heavily applied. A cross- sectional study of pesticide handling practices and self- perceived symptoms of acute pesticide poisoning was conducted using questionnaire-based interviews with 89 pesticide sprayers in Boeung Cheung Ek (BCE) Lake, Phnom Penh, Cambodia. The study showed that 50% of the pesticides used belonged to WHO class I + II and personal protection among the farmers were inadequate (Jensen et al., 2011). Up to 80 % of Phnom Penh's domestic wastewater is pumped into the lakes of Phnom Penh, together with industrial and chemical effluents from a growing industrial sector. Thus the main objective of this research is to monitor the consumer behavior and growing practices of selected aquatic vegetables in peri- urban areas of Phnom Penh in Cambodia. Further a representative sample collection and analyses with respect to contamination by potentially toxic elements (PTEs) such as Cd, Cu, Ni, Pb, Sb, Zn and other pollutants such as pesticides will be done. Finally a human health risk assessment will be publish based on key indicators such as the Target Hazard Quotients (THQ).

Topic:	**Ecology of African ungulates**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Karolína Brandlová, Ph.D.
Supervisor-consultant:	
Prospective funding:	CIGA

Annotation:
Large variety of ungulates inhabits all suitable habitats in Africa, antelopes being the most numerous among them. The aim of the proposed dissertation is to explore viability of selected species in savannah ecosystem, especially in the context of spatio- temporal overlap with livestock and agricultural activities which are becoming one of the major threats for the savannah antelopes. The results of traditional (line and point transects, ground census, direct observations) and modern (camera traps, satellite collars, drones) methods will be compared and optimized for a routine use for antelope monitoring and conservation in African savannah.

Topic:	**Performance of the introduced population of white-tailed deer in the Czech Republic: comparison with other local Cervids and native populations in USA**
Study programme: *	☐Sustainable Rural Development

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*tick/delete as appropriate	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Francisco Ceacero Herrador, Ph.D.
Supervisor-consultant:	Ing. Radim Kotrba, Ph.D. Dr. Bronson Strickland (Mississippi State University)
Prospective funding:	ZEMĚ and INTER-ACTION (USA) programs.

Annotation:
According to the constant population growth and the high antler quality of the white-tailed deer (*Odocoileus virginianus virginianus*) ranging in the Dobříš area (Czech Republic), it seems that this introduced species is doing well. That is surprising, considering the very different conditions in the native area of this subspecies (from Mississippi to Virginia, USA; humid subtropical climate). On the other hand, it is well known the great adaptability of the species to very different habitats (40 subspecies ranging from Alaska to Peru), and great nutritional adaptability (from fully browser to fully grazer, depending of the area).
The main goal of this thesis is to clarify the reasons for such good performance in a double way: 1) understand differences with the local cervids, and 2) understand differences with the source animals (*i.e.*, adaptations to the conditions in the new ranging area). For the first goal, an exhaustive sampling will be done on hunted and road killed animals in the study area, including red, fallow, roe and white-tailed deer. For the second goal, similar samples will be collected on hunted white-tailed deer in Mississippi. Samples from captive individuals will be also available from both populations. The collection of samples in Czech Republic was already agreed with local hunters and land owners. The collection of samples from the original populations was already agreed with researchers from the Mississippi State University working with this species for long term.
Some of the samples to be collected include: Biometrics (body weight, measurements, condition), antlers (measurements, tomography, mineralization), digestive tract content (parasitic load, nutritional efficiency), ruminal content and fluids (nutritional efficiency, diet by microhistology, pH, microbes spectrum), blood samples (plasma biochemistry), fur (moulting patterns, diet overlap by isotopes, stress hormones), reproductive status (number of foetuses), liver samples (accumulation of heavy metals), external parasites, and a set of samples for the detection of some common diseases in wild cervids.

Topic:	**Agricultural intensification and biogeographical patterns of Tropical ungulates**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Francisco Ceacero Herrador, Ph.D.
Supervisor-consultant:	Prof. Raimundo Real (University of Málaga)
Prospective funding:	No funding needed.

Annotation:
This is a wide topic focused on understanding biogeographical patterns in tropical species, with special focus on Ungulates. Different techniques will be compared, using favorability functions, and software like Maxent or Infomap Bioregions. Key endangered species will be used to compare historical and current distributions and the effect of agricultural development. Central Asia and Sub-Saharan Africa will be the main areas where the studies will focus. The results will help to understand agriculture-wildlife conflicts, and thus, to improve wildlife conservation and potentially to propose management practices to mitigate damages to crops.
The studies will be conducted in cooperation with member of the Biogeography, Diversity and Conservation research team at the University of Malaga, specialist in these techniques for more than three decades.

Topic:	**Ecology of Mongolian large mammals**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Francisco Ceacero Herrador, Ph.D.
Supervisor-consultant:	
Prospective funding:	GAČR grants and support from conservation societies.
Annotation:	

Central Asia and specifically Mongolia is an important stronghold for the scientific activities of our department in the recent years. Given the large and increasing numbers of livestock in the country, the conflicts with wildlife are increasing. Wildlife numbers are decreasing for several reasons, like competition for resources, transmission of diseases, development of infrastructure, global warming (causing harder and more frequent *dzud* events – Mongolian term for a severe winter in which large number of livestock die, due to starvation or directly from the cold), etc.
Studying diet selection and competition between wild and domestic species, and interactions around waterholes are the main goals of this thesis proposal. Prezewalski´s horses (an species with already ongoing studies from our team), khulans, saiga, bactrian camel and Gobi bear are some of the species intended to be studied.
The National University of Mongolia in Ulanbaatar, The Khovd State University, WWF-Mongolia and Gobi A and Gobi B Strictly Protected Areas are partner local institutions with whom cooperation is ongoing or plans have been already coordinated.

Topic:	**Effects of routine handling in the husbandry of elands**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Francisco Ceacero Herrador, Ph.D.
Supervisor-consultant:	Ing. Radim Kotrba, Ph.D.
Prospective funding:	TAČR grants.

Annotation:
The husbandry of elands at the experimental facilities in Lány has been one of the strengths of our faculty for the last decade. These facilities were recently renovated, allowing the implementation of routine handling of the animals and opening new possibilities of research. This thesis proposal has a double aim:
First aim is to develop techniques for systematic monitoring. That includes the development and validation of a body condition score for the species; setting basal blood biochemistry values; compare methodologies for monitoring of sexual and stress hormones from different tissues (blood, feces, hair and saliva) and define basal values, seasonal and circadian oscillations and responses to stressful events; and characterize horn growth along the lifetime. Second aim is to evaluate the effect of routine handling patterns on the physiological values described before and some other behavioral syndromes. This will allow to determine handling routines maximizing the possibilities for the collection of samples for research without compromising animal welfare.

Topic:	**Induced polyploidization *in vitro* of selected medicinal plants**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	prof. Dr. Ing. Eloy Fernández Cusimamani
Supervisor-consultant:	doc. Ing. Pavel Klouček, PhD.
Prospective funding:	

Annotation:
Mitotic polyploidization in vitro is widely used method which allows getting various breeding goals (e.g. higher yields, change of chemical composition, equalizing of ploidy level etc.).The main objective of this PHD thesis is to get plants with new physiological, morphological, anatomical and biochemical characteristics. Induced polyploidization will be realized by oryzalin (antimitotic toxin) application on nodal (germinating plants) cultivated in in vitro conditions. The direct method (chromosome counting) and indirect method (flow cytometric assessment of nuclear DNA content) will be used as control of polyploids. Via mentioned mitotic polyploidization in vitro we can get a new breeding material.

Topic:	**Microspore culture, embryogenesis and doubled haploid induction in *Brassica carinata*, *B. juncea* and *Eruca sativa***
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management

Supervisor / promotor:	prof. Dr. Ing. Eloy Fernández Cusimamani
Supervisor-consultant:	Ing. Miroslav Klíma, Ph.D.
Prospective funding:	Project NAZV QJ1510172 and RO0417 (Crop Research Institute in Prague)

Annotation:
The family Brassicaceae is very diverse and includes many crops worldwide. Some of them are grown also in tropical and subtropical climate as important oilseeds, vegetables or spices. Such crops include, for example, Abyssinian mustard (*Brassica carinata* A. Braun), Indian mustard (*B. juncea* L.) or Rocket (*Eruca sativa* L. (Mill.)). New cultivar development through traditional breeding usually takes 7-9 years. Progressive biotechnological approaches, such as regeneration of completely homozygous plants from microspore embryos under *in vitro* conditions, can contribute to significant shortening of the whole process. By using the doubled haploid method, it is also possible to create such genetic combinations that are difficult to obtain by conventional techniques. The main aim of the Thesis will be to introduce, optimize and apply microspore culture technique in selected important members of the family Brassicaceae and the subsequent regeneration of genotypes with the required parameters.

Topic:	**Ecological Carrying Capacity for Large Non-Domesticated Herbivores in Semi-Arid Areas**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Prof. RNDr. Pavla Hejcmanová, Ph.D.	
Supervisor-consultant:		
Prospective funding:	Support from conservation societies	

Annotation:
Carrying capacity is the key for management of rangeland ecosystems, animal populations and resources for their survival and sustaining fitness. Ecological carrying capacity refers to populations of non-domesticated herbivores which are corner stone elements for vegetation structure, but dependent on its primary productivity, and represent also a resource for predators and for man. Plant-animal interactions form a complex functional system of productivity and the knowledge of carrying capacity helps to adequate decision-making in production and conservation management systems.
The aim of the proposed topic is to calculate ecological carrying capacity for wild herbivores in semi-arid areas and rangelands using the approach based on the grass x browse type diet composition and availability of food resources in the given area. Target species and areas will be specified with the interested candidate and according to available access to place of interest. The thesis will require combined interest in animal and plant ecology and interactions, field work and data processing in the GIS environment.

Topic:	**Habitat use and movements of large mammals in and out of protected areas**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Prof. RNDr. Pavla Hejcmanová, Ph.D.
Supervisor-consultant:	
Prospective funding:	Support from conservation societies

Annotation:
Biological diversity and other natural resources are primary concerns for ecosystem functions and services, and for human well-being. Habitat qualities and availability of specific natural resources shape the spatial distribution and behavior of large mammals. The knowledge of animal behavior drivers may substantially contribute to make their conservation effective by improvements in management measures. These are important within protected areas, but may also affect areas outside of protected areas, bringing thus to the fore human – wildlife interactions.
The aim of the theses will be to investigate habitat use and movements of selected species of mammals within and, where relevant, outside of protected areas to evaluate drivers of the animal behavior and potential wildlife-human conflict. Investigation may be based either on data from camera-traps or from collars on animals. Target species and areas will be specified with the interested candidate and according to available access to place of interest. The

thesis may be focused either on the animal ecology and behavior only, or to focus on human – wildlife interactions and potential conflicts in regard to natural resources exploitation, livestock or protected area management. This will be specified with candidates. The thesis will require interest in animal ecology and behavior, field work and advanced data processing in the GIS and R environment.

Topic:	**Biological activity and chemical composition of tropical medicinal plants**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Prof. Ing. Ladislav Kokoška, Ph.D.	
Supervisor-consultant:		
Prospective funding:	IGA	

Annotation:
Historically, plants have traditionally played an important role in discovery of biologically active natural products used in human and veterinary medicines as well as in food industry and agriculture. Besides the microorganisms, marine organisms and animals, plants remain a one of the best reservoirs of new natural products at the present time. The potential is evident especially in the case of tropical species, which have been less phytochemically explored and which synthesize a greater diversity of bioactive compounds than temperate species due to the stronger pressure of biotic and abiotic factors affecting plants in tropical ecosystems.
Biological activity of extracts, essential oils and their constituents derived from tropical medicinal plants will be evaluated for broth spectrum of *in vitro* biological effects such as antimicrobial, anti-inflammatory, antiproliferative, and wound healing activities using standardized biological assays. The chemical composition of biologically active plant-derived products will subsequently be characterized using advanced chromatographic and spectroscopic such as GC/MSD, GC-QTOF, UHPLC-QTOF and NMR.
The supposed results of the thesis can be used for development of new herbal-based pharmaceutical, veterinary, food and agricultural preparations. In both developing and developed countries, these products may contribute to low-cost and sustainable control of various human and animal diseases as well as in food and plant protection. In addition, the result will deepen the knowledge on chemical composition and biological effects of tropical plants.

Topic:	**Nutritional composition and antioxidant activity of tropical underutilized crops**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Prof. Ing. Ladislav Kokoška, Ph.D.
Supervisor-consultant:	
Prospective funding:	IGA

Annotation:
Underutilized crops are domesticated plant species used for centuries as foods, but their importance has been reduced over time because of various reasons such as poor shelf life, unrecognized nutritional value, poor consumer awareness and reputational problems (famine food or poor people's food). Rural areas across tropical Africa, Asia, Central and South Americas are typical centers of their agrobiodiversity. It has recently been proven that underutilized crops may contain higher amounts of specific health-beneficial constituents (e.g. antioxidants, vitamins, minerals, fiber, secondary metabolites, fatty and amino acids) than conventional agricultural crops. This suggests their potential to contribute to the elimination of nutrient deficiency, which become to be current worldwide health problem. Nevertheless, certain locally used crops may contain antinutrients, which can be toxic or cause undesirable physiological effects. In terms of safety evaluation of underutilized crops, the levels of these compounds and their toxicity must also be determined.
The standard nutritional and phytochemical analyses will be performed according to the Official Methods of Analysis of AOAC for determination of macro and micronutrients. The high-tech analytical instruments such as GC/MSD, GC-QTOF, UHPLC-QTOF and NMR will be applied for further evaluation of detailed phytochemical composition of underutilized crops. Antioxidant activity will be evaluated using standardized *in vitro* methods such as DPPH and

ORAC assays. OECD Guidelines for the testing of chemicals will be used to identify and characterize safety of underutilized crops using *in vitro* toxicological methods.
The supposed results of the thesis can be used for development of novel plant-derived food products such as dietary supplements and functional foods rich of antioxidants, vitamins, minerals, fiber, secondary metabolites, fatty and amino acids etc. In both developing and developed countries, these products may contribute to control of malnutrition. In addition, the result will deepen the knowledge on nutritional and chemical composition of tropical plants.

Topic:	**Genetic diversity of tropical agroforestry trees**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Doc. Ing. Bohdan Lojka, Ph.D.	
Supervisor-consultant:		
Prospective funding:	IGA, GIGA	

Annotation:
Tropical regions contain high tree species diversity, but most of these tree species were never intensively studied. On the other hand, high number of native tropical trees are used by local population for their useful products and services, such as fruit, timber, fuelwood, medicine, fodder etc. The sources of germplasm of those semi-domesticated multipurpose trees are usually unknown and their further domestication could help the farmers to increase their production. Moreover the genetic pool of the species can be narrow by selection by farmers and thus there is an urgent need to find useful strategies for conservation of their genetic diversity. In the last decade, there has been an enormous increase worldwide in the use of molecular marker methods to assess genetic variation in trees. These approaches can provide significant insights into the defining features of different taxa and this information may be used do define appropriate management strategies for species. The results from molecular marker research are very limited to date for tropical trees and especially for the tropical agroforestry species. The objective of this research is to evaluate morphological/chemical/nutritional and genetic diversity of selected agroforestry tree species. The specific objective is to investigate relationships and to characterize the level and structure of genetic variation of selected tree populations (e.g. differences among wild and domesticated populations of the species). The study will include on-site collection of morphological data, tissue samples of selected species and then laboratory analysis at the CULS molecular genetic labs. The marker techniques will be based on the polymerase chain reaction (PCR). The results could help us to identify appropriate strategies for selected species germplasm conservation and future domestication

Topic:	**Value of agroforestry for biodiversity conservation and livelihood of local populations**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Doc. Ing. Bohdan Lojka, Ph.D.	
Supervisor-consultant:		
Prospective funding:	IGA	

Annotation:
Tropical forests contain some of the highest biodiversity of flora and fauna in the world. However, biodiversity at all scales is increasingly threatened by a variety of human-induced structural impacts. Replacement of native forest through clearing for agriculture continues to be a major issue worldwide. The agroforestry, renowned for their high tree-species richness and complex vegetation structure, stands out as promising biodiversity conservation tools. A number of studies confirm that agroforestry systems are able to conserve biological diversity. The objective of the proposed research is to assess the potential impact of agroforestry on biodiversity conservation in selected tropical region. We focus on relating habitat and animal diversity (various taxa) in selected agroforestry systems as compared with primary and secondary forests and agriculture. To assess the vegetation structure and diversity, we will choose number of representative sites in agroforestry and other habitats. On each site one defined plot will be

located and vegetation structure (tree, low and high shrub and herbaceous layer) will be sampled and analyzed according the standard methods. The sampling of selected taxa of (in)vertebrate species richness and diversity will be conducted on the same sampling plots in all land-use systems, according to appropriate methodology that is used for catching and observing the different animals (e.g. insects, birds, mammals, amphibians, fish etc.). This research will increase our knowledge about biodiversity conservation in tropical agroecosystems and help determine the value of ecosystem services of these systems.
The other objective of this research is to investigate the ethnobotanical (medicinal, food, feed and ceremonial) uses and preferences of woody plants in selected agroforestry. We will investigate timber and non-timber products of plants in agroforests and potential income generation for improved household livelihoods of the local community.

Topic:	**Ecology of Arbuscular Mycorrhizal Fungi (AMF) in the domestication of edible plants in the tropical Andes**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Doc. Ing. Bohdan Lojka, Ph.D.	
Supervisor-consultant:		
Prospective funding:	IGA	

Annotation:
The Amazon region is an important source of biodiversity including numerous plant species nowadays utilized as food. However, plant domestication and changes in land-use systems has been one of the causes for decreasing biodiversity in these ecosystems, especially tropical rainforests. At present, conventional agricultural practice includes the use of monocultures, chemical fertilizers and pesticides with negative impact on soil quality. Agroforestry systems are less deleterious, but still lead to considerable losses in biodiversity and ecosystem services. Soil-dwelling Arbuscular Mycorrhizal Fungi (AMF) form association with the majority of plant species and, by facilitating plant phosphorus uptake as the main benefit, constitute a functionally important group of microorganisms especially in tropical soils. AMF communities are sensitive to vegetation structure and physico-chemical soil characteristics. Changes in AMF diversity and community composition may impact on the functionality of the symbiosis. However, studies addressing these two important characteristics of mycorrhizal symbiosis simultaneously are scarce, especially in tropical soils. The objective of the proposed thesis is to determine the effect of changes of land-use systems (with special focus on agroforestry) in the Peruvian Amazon on mycorrhizal symbiosis: the taxonomic diversity of root colonizing AMF communities and their functionality in terms of mycorrhizal effects on plant nutrient uptake and growth. At least two native plant species will be studied in primary/secondary forests, agroforestry and conventional agricultural systems. The methodology will include 1) analysis of prevalence and diversity of AMF in field-sampled root and soil samples by microscopy and NGS; 2) determination of the infectivity and efficiency of the AMF communities in greenhouse and in-situ experiment. The results will render essential background information for potential management of AMF communities in the agroforestry/agricultural systems, which is considered a promising strategy to increase crop phosphorus acquisition efficiency.

Topic:	**Potentials of coffee based agroforestry system in enhancing adaptive capacity of local people for climate change and variability: The case of Sidama Zone, Southern Ethiopia**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Doc. Ing. Bohdan Lojka, Ph.D.	
Supervisor-consultant:	Zebene Aswaf, Ph.D., Hawassa University, Ethiopia	
Prospective funding:	IGA	

Annotation:
The livelihood strategies of small-holder farmers in Ethiopia typically depend on rain fed agriculture and are vulnerable to climate events. Climate change models predict that coffee-growing regions will be affected due to

climate variability. Adaptation is central to many proposed strategies for reducing the negative impacts of climate change. Agroforestry integrates trees into the farming systems to increase agricultural productivity and enhances farmers' ability to adapt climate change. Few studies were conducted on the adaptation roles of agroforestry system in reducing vulnerability to climate change but hardly to coffee based agroforestry in eastern Africa. The overall objective is, thus, to assess the potentials of coffee based agroforestry system for enhancing local people's adaptation capacity to climate change in Sidama, Southern Ethiopia. Specific objectives: (i) to explore response experiences and strategies pursued by farmers to adapt to climate change (ii) to evaluate the contribution of coffee based agroforestry system for income and product diversification (iii) to quantify coffee yield, growth performance and evaluate the incidence of pest and diseases (iv) to assess native floristic diversity and their multiple functions in study system (v) to identify factors affecting the resilience of the system. We hypothesize that tree in agroforestry system enhances the resilience and adaptation of coffee to climate change and variability. Multiple methodological approaches including household surveys, key informant interviews, in-depth interviews, focus group discussions and field observations will be used. Sample based protocol will be followed for the empirical measurements (yields, pest and diseases, and growth of coffee) and for inventory of floristic diversity. Sample plots will be designed with and without trees and compare them. This project will generate empirical evidences on the potential of coffee based agroforestry for enhancing local people's adaptive capacity, and will inform and guide policy-makers to integrate agroforestry as part of climate change adaptation strategies in eastern Africa region.

Topic:	**Rhizobia-mycorrhiza-bean co-inoculation consortia: A novel approach for climate-smart beans**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Doc. Ing. Bohdan Lojka, Ph.D.	
Supervisor-consultant:	Milan Urban, Ph.D. – CIAT Colombia	
Prospective funding:	IGA	

Annotation:

Legumes are an appreciated component of global agroecosystems. A bowl of beans is the centerpiece of the daily diet of more than 400 million people in the tropics, providing protein, fiber, complex carbohydrates, vitamins, and micronutrients. Micronutrient deficiency affects approximately 2 billion people globally. In 2007-2017, CIAT's Bean Program has developed 20 successful genotypes of Fe and Zn biofortified beans via its banner program HarvestPlus. With collaboration to Pan African Bean Research Association (PABRA) these cultivars are disseminated to more than 25 African countries. CIAT's iron biofortified beans have been shown to significantly improve haemoglobin levels and lead to better memory of Rwandan woman aged 18 to 27. However, efforts are required to further improve yields of biofortified beans, especially in a limiting environment. While nitrogen (N) limitations are generally overcome by symbiotic N fixation of rhizobia (R), the amount of fixed N2 vary greatly, being site-dependent and influenced by a wide range of factors. Similarly, the efficiency of the uptake of other nutrients often depends on symbiotic relationship between plant roots and arbuscular mycorrhizal fungi (AMF) which transfer nutrients to plants in exchange for carbohydrates. Furthermore, the relationship between both rhizobium, mycorrhiza and host plant is genetically influenced and require further investigation. Unfortunately, bean N-fixation is very low and highly sensitive to many abiotic factors. Upon non-ideal agricultural conditions, beans require the presence of effective and efficient rhizobia for nitrogen fixation and mycorrhiza for phosphorus uptake and better water use efficiency. Then healthier plant status helps plants mitigate negative cultivation constraints (pH, low nitrogen, low phosphorus, drought, heat, fungal diseases, etc.). Rhizobia and AMF co-inoculation (RAMF) surely play an important role in the uptake of micronutrients (Zn) also. However, little is known about the rhizobia-mycorrhiza-legume (RAMFL) relationships in bean growing systems. In addition, RAMF consortia should be high competitive with resident native RAMF strains. Thus testing whether high yielding bean germplasms (and others) associate with specific RAMF strain combinations is worthy especially in terms of near-future climate changes and availability of fertilizers. The greenhouse work will take place at CIAT's headquarters in Palmira, Colombia, under co-supervision of Dr. Milan Urban. Several field trials with selected bean genotypes have been established throughout Colombia in order to study the abiotic effects on RAMFL functioning.

Topic:	**Would planting trees in the agricultural landscape improve soil health trough Arbuscural Mycorrhizal Fungi (AMF)?**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Bohdan Lojka, Ph.D.
Supervisor-consultant:	Prof. Robert L. Bradley, Ph.D., University of Sherbrook, Canada
Prospective funding:	University of Sharebrook, Canada

Annotation:

A Brassica rapa is a major oilseed crop in both the whole Northern Europe, but also Northern U.S and Canada. Distinguishing features of B. rapa are its non-mycorrhizal roots and tissues that contain glucosinolates. Both of these features, combined with continuous monocropping, are expected to decrease the abundance of arbuscular mycorrhizal fungi (AMF) in soil because: (1) AMF are obligate symbionts and, therefore, cannot grow and multiply in the absence of a host plant, and (2) glucosinolates that are released in soil may be catabolized to produce fungitoxic derivatives. While a decrease in AMF abundance should not pose a problem for B. rapa, it is expected to induce stress in other mycotrophic crops grown in rotation with
B. rapa (e.g. barley or wheat). In fact, most agronomic crops rely on the AMF symbiosis to enhance nutrient uptake, drought resistance and protection against root pathogens. Several fast- growing trees, such as poplars (Populus spp.), also form symbiotic associations with AMF. We hypothesize, that if intercropped with B. rapa, poplars roots could maintain a long- term presence of active AMF biomass. Hence, poplar roots could provide a "nursery" of AMF inocula in soils for mycotrophic crops grown in rotation with B. rapa. The research will attempt to demonstrate these phenomena through a series of field, microcosm and laboratory studies. The results are expected to provide strong science-based arguments for the implementation of tree-based intercropping systems in temperate climates.

Topic:	**Development of a Novel HACCP System Implementation to Improve the Management System of Dairy Herd**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Prof. MVDr. Daniela Lukešová, CSc.
Supervisor-consultant:	Doc. MVDr. Pavel Novák, CSc.
Prospective funding:	IGA FTA CULS Prague

Annotation:

In the last few decades, dairy farming system has changed dramatically. Despite an increase in the global demand for dairy products, increasing production costs have led to declining profit margins. Furthermore, food diseases occurred mostly from animal originated products, in developed countries have made the consumers lose confidence in food industry; and revealed the inadequacies of traditional methods on food production, processing and marketing and a system necessity for food safety. Production diseases and declining fertility associated with intensification has a negative impact on both profitability and welfare. Bangladesh is a low-lying agro-based country with huge pressure of population of which more than 80 percent of the people live in the rural areas and about 70 percent are directly or indirectly engaged in agricultural operation. Dairy farming play a pivotal role in national economy and fulfillment of nutritional requirement by providing food (milk and meat) for human consumption, draft power and manure for crop production, foreign exchange through export of hides and skin. It also generates employment and income; serve as a saving to poor households. In Bangladesh, bacterial and somatic cell number, fat and protein content in milk are used as important factors in the grading of milk. Therefore, by applying this novel HACCP system in dairy farms farmers strive to minimize bacterial and somatic cell number with higher milk quality to obtain higher raw milk prices from milk processing companies. Moreover, achieved results from this study and suggested approaches from different dairy cattle breeds will be easier to apply due to the identification of CCP in different climatic conditions of dairy cattle with different management systems.
Aims of this research: 1.Develop, implement and evaluate HACCP principles in dairy herd health and production management to clarify if this approach may yield better results than conventional methods in Czech and

Bangladeshi conditions. 2. To determine the CCPs associated with animals and different environments and distribution of the end products which can affect the quality for human consumption and 3. To suggest the control limits for the different CCPs based on the recommended international standards. Materials and methods in this research will be carried out through compare the quality of raw milk on Holstein cattle farms with a different management and identify critical control points (CCPs) at the risk of infectious pathogens. Data will be collected from state and private dairy farms of different regions of the Czech Republic, before and after the implementation of the HACCP system. Possible changes in the quality of raw milk at different seasons of the year and the impact of different management conditions will also be analyzed. The health status of the herd and compliance with the principles of biosecurity will be evaluated on a regular basis. From each farm, the following data and raw milk samples will be collected monthly basis for this study: milk production quantity (kg/head/day), breeding interval (day/head), weaning period (day/head), somatic cell count in raw milk (cells/mL), number of bacteria in raw milk (cells/mL), milk fat and milk protein content, and monthly expenses for antibiotics. Each milk sample will be analyzed by an automatic milk analyzer for somatic cell count, number of bacteria, and fat and protein content to monitor the effect of microbiological quality on its technological parameters that could increase the thermostability or taste properties of treated milk. The topic will be solved in cooperation with the Bangladesh Livestock Research Institute (BLRI) and Veterinary and Pharmaceutical Faculty in the Czech Republic.

Topic:	**The Geographical Distribution of Parasitic Zoonoses in Europe and Asia: the Role of Wildlife in the Transmission**
Study programme: * ***tick/delete as appropriate**	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Prof. MVDr. Daniela Lukešová, CSc.
Supervisor-consultant:	
Prospective funding:	IGA, CIGA

Annotation:
The changes in rural landscapes due to urbanization have a huge impact on the transmission of zoonotic parasites. Since many wildlife species are unable to adapt to these alterationsin their environment (decline of biodiversity in areas of urban development), in contrast, some wild animals are attracted to peri-urban and urban habitats (e.g. availability of an abundant food supply). In many areas composition of wildlife communities differs between rural and urban areas. Some of these highly adaptable species are also hosts for a number of parasites of public health and veterinary importance (e.g. toxoplasmosis, toxocarosis, alveococcosis, trichinellosis, taeniosis/cysticercosis etc.) More than 80% of human diseases are of zoonotic origin. It will be important to understand the dynamics between wildlife and domestic animal species and human population. The main objective of this thesis is focused on the risk factors for various helminths with zoonotic potential from contrasting types of urbanized areas. Ecological changes significantly contributed to these trends: the high wild animal population and the high density of freely roaming predators (Canidae, Felidae) maintain a permanent infection pressure of these and other parasites. The direct method (necropsy of animals) and indirect method (serological investigation) will be used due to close cooperation with the State veterinary institutes in the Czech Republic, where we have got a strong support to solve this problems (e.g. study of interactions of vectors, reservoir hosts, the transmission of pathogens to humans and/or domestic animals, prevalence of diseases, biosecurity plans, etc). The supposed results can be used by: veterinary authorities (planning and implementing of effective prevention strategies and a close collaboration between veterinary and public health professionals in a 'One Health' concept); veterinary and pharmaceutical industries (monitoring the effectiveness of suitable therapeutic animal products); public health professionals (knowledge of prevalence of antibodies in animal population and health risks for humans) in different regions of the Czech Republic and EU countries.

Topic:	**Study of cocona (*Solanum sessiliflorum* Dunal) genetic diversity**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Ing. Iva Viehmannová, Ph.D.	

Supervisor-consultant:	Ing. Vladimíra Sedláková, Ph.D.; Ing. Petra Hlásná Čepková, Ph.D.
Prospective funding:	IGA FTZ, IGA FAFNR

Annotation:
Cocona (*Solanum sessiliflorum* Dunal) is a solanaceous shrub native to the Amazon region. It produces edible fruits, rich in iron, niacin, citric acid, and pectin. The fruits are consumed fresh or as juice, jam, compote, or jelly. Cocona display remarkable morphological variation, especially in fruit size, colour and shape. However, diversity on molecular level in this species has not been studied yet. Therefore, the aim of this thesis is detection of chloroplast and nuclear DNA polymorphism using cpDNA and nuDNA microsatellite markers to reveal genetic variation and structure within and among cocona populations. Each step of the methodology will be optimized. The DNA will be extracted; primers originally designed for *S. tuberosum*, will be applied; and various conditions of PCR reactions will be tested. As a reference standard, genotypes of solaneceous species producing edible fruits (e.g. *S. lycopersicum*, *S. melongena*, *S. annuum*) will be used in order to detect interspecific distances. Plant material collected in 2012 in different regions of the Peruvian Amazon, and comprising ca. 250 individual plants belonging to 65 populations, will be analysed. The analyses will be carried out in the Laboratories of Molecular Biology at FTA and FAFNR of CULS Prague.

Topic:	**Study of abiotic stresses in yacon [*Smallanthus sonchifolius* (Poeppig & Endlicher) H. Robinson]**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Ing. Iva Viehmannová, Ph.D.
Supervisor-consultant:	Mgr. Pavel Vítámvás, Ph.D.; doc. Ing. František Hnilička, Ph.D.
Prospective funding:	IGA FTZ, IGA FAFNR

Annotation:
Climatic changes represent the major risk of damage of early stages of plant development by the drought and low temperatures. The aim of the study will be characterization of the stress response of young plants of yacon (*Smallanthus sonchifolius*). Yacon response to drought and cold stresses can be defined by growing plants under controlled conditions. Quantitative changes at physiological and proteomic level will be examined in this study. The youngest fully developed leaves of the various clones with different ploidy levels will be taken from control and stress conditions. All samples will be analysed using physiological techniques and proteomic techniques. Candidate proteins for protein phenotyping of the optimal state of the yacon plants, polyploidization and eventual resistance to abiotic stress can be studied by proteomic approaches. The research will be carried out in cooperation with the Crop Research Institute (CRI), Ruzyně, and Laboratory of Plant Physiology at the FAFNR of CULS Prague.

Topic:	**Polyamine metabolism in suspension cultures of *Nicotiana tabacum***
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Ing. Iva Viehmannová, Ph.D.
Supervisor-consultant:	Mgr. Kateřina Eliášová, PhD.
Prospective funding:	IGA FTZ, COST project LTC17036

Annotation:
Polyamines, low molecular mass polycations, are ubiquitous cell components that are implicated in a wide range of biological processes including cell division and growth, morphogenesis and differentiation and responses to biotic and abiotic stresses. In some organisms, they are able to prolong cell longevity by increasing the level of autophagy - process of recycling cellular content. The aim of this study is to prove connection of polyamines and autophagy in plants, namely in *Nicotiana tabacum*, on molecular, biochemical and anatomical levels. The polyamine metabolism will be monitored during autophagy induced by starvation using spectrometric methods, then the process of autophagy will be studied after exogenous application of higher polyamines in distinct tobacco lines. For this study, different microscopic techniques, including light and fluorescence microscopy, will be used. Microscopic observations will be completed with expression profile analysis of autophagy related genes (ATG). Results will provide us information about plant cell growth strategies under adverse conditions. This knowledge is applicable in the field and usable for cultivating tobacco plants.

Topic:	**Diversity, nutritive value and local preference of some tropical underutilized plant species**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	Dr. Luisa Custódio (Centro de Ciências do Mar, MarBiotech group, Faro, Portugal)
Prospective funding:	IGA FTZ, Christensen Fund, Erasmus plus programme

Annotation:
It is generally argued that neglected and underutilized crops can significantly contribute to secure qualitative as well as quantitative nutrition of millions of people. Tropical areas are great reservoir of plant resources, which are now under threat due to deforestation and subsequent degradation of the cleared land. Among these species several plants with significant nutritive value and intraspecific variability occur being utilized by natives in times of food scarcity or they are simply underutilized due to several reasons thus their diversity and nutritive potential remains unknown. The scientific neglecting of these species could lead to continual decrease of their genetic variability, which can limit their use potential for human nutrition as well as human medicine as a source of bioactive compounds. The study will include several cultivated as well as wild species, e.g. *Musa* spp. The plant material will be characterized from the point view of morphological and genetic diversity, nutritive value, and sensoric characteristics.

Topic:	**Ehnobotany among indigenous people Orang Asli in peninsular Malaysia**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	Shamsul Khamis, Ph.D. (UKM, Malaysia)
Prospective funding:	Erasmus credit mobility programme, Ekhagastiftelsen Foundation

Annotation:
Previous ethnobotanical studies from Malaysia demonstrates a remarkable significance of wild food plants as an intangible cultural heritage in the area where local flora has contributed to local people's dietary diversity. Seventy species of wild edible herbs and over 500 wild fruit species were documented in the area so far. However, none of the previous studies used quantitative analysis of ethnobotanical data neither the analysis of food medicine/medicinal food aspect. This study should contribute to the preservation of the traditional knowledge in the country, which continuously experience losses of folk knowledge due to increasing deforestation, integration into mainstream society and urbanization. It can be assumed, that people in this region still gather wild food plant species, predominantly wild fruits and vegetables. Although living in biodiverse-rich environment, people tend to use common wild plant species for food. The aim of this study is to conduct an in-depth ethnobotanical survey, aimed at documenting uses of wild food and medicinal plants among Orang Asli people living in different plant ecosystems in peninsular Malaysia, using modern ethnobotanical methods. The Royal Bellum Natural Reserve in

the north of the peninsula has been proposed as a main study site. It is expected to retain important reservoirs of ethnobotanical knowledge, bearing in mind its unique biological as well as cultural richness in the context of a relatively small, developed tropical country. Thesis aims (1) To record the traditional knowledge on wild food plants among Orang Asli in different plant ecosystems, (2) to determine the most culturally important plant species, botanical families and food categories, (3) To identify promising underutilized food species and medicinal foods, (4) To analyze collection patterns in the context of plant species conservation, (5) To compare the diversity of wild food plants and their uses between different biomes and ethnic groups.

Topic:	**Ethnobotany of migrant communities in the Czech Republic**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	prof. Andrea Pieroni (University of Gastronomic Sciences, Polenzo Bra, Italy)
Prospective funding:	IGA FTZ

Annotation:
It is often assumed that the demand for traditional plant resources will decrease with increasing welfare, because they will be replaced in time by modern cultivated and synthetic products. Moreover, the reliance on medicinal plants may decline in the long term as modern health care facilities become available. Recent studies on urban ethnobotany, however, contradict these assumptions. Research on the use of medicinal plants by ethnic minorities in EU and in the USA has shown that immigrants generally adhere to their culture and continue their traditional medical practices after emigration. Instead of being replaced by conventional medicine as part of the process of cultural adaptation, the demand for medicinal plants remains, even when modern health care facilities are available. Most immigrants in the Czech Republic have a health insurance so they are able to take full advantage of Czech health care facilities. However, they have probably retained their traditional concepts of health and illness, where also daily diet plays an important role. Consequently, the thesis should answer the following questions: Do these immigrants continue to use herbal medicine and traditional foods from their homeland? If so, for which ailments do they use these plants?

Topic:	**Ethnobotany of wild plant resources used by indigenous communities in tropics and subtropics**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	
Prospective funding:	IGA, International credit mobility, CDA project in Zambia, Bilateral Cooperation Scheme CZ-Peru

Annotation:
Previous ethnobotanical studies from different parts of the world demonstrates a remarkable significance of wild plants as an intangible cultural heritage in the area where local flora has contributed to local people's dietary diversity and material culture. Although few societies today depend on wild plants for more than 50% of their subsistence requirements, most of them show significant knowledge on wild plant uses. For example, seventy species of wild edible herbs and over 500 wild fruit species were documented within Orang Alsi in Malaysia so far. This topic should contribute to the preservation of the traditional botanical knowledge among hunter-gatherer peoples to prevent losses of folk knowledge due to increasing deforestation, integration into mainstream society and urbanization. The aim of this study is to conduct an in-depth ethnobotanical surveys, aimed at documenting uses of wild useful plants among communities of people living in different plant ecosystems. Thesis aims (1) To record the traditional knowledge on wild food plants within chosen community, (2) to determine the most culturally important plant species, botanical families and use categories, (3) to identify promising underutilized plant species, (4) to analyze collection patterns in the context of plant species conservation, (5) to compare the diversity of wild plants and their uses between different biomes and ethnic groups.

Topic:	**Historical ethnobotany of the Czech Republic: an archival research**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	Dr. Jiří Woitsch (Etnologický ústav AV ČR)
Prospective funding:	IGA FTZ

Annotation:
A valuable source of information for the study of ethnobotany is one of the archival collections deposited in the department of documentation and archival collections of the Centre of Scientific Information of the Institute of Ethnology of the Academy of Sciences of the Czech Republic. This neglected collection includes systematically structured information concerning in particular the importance of different plant species in folk culture. It is not only their therapeutic effects, but also their role in social anthropology, the family and the ceremonies or in folk magic. The collection includes local plant names in the dialects as well as links to related botanical collections. This archival study could tell us important information on historical use of plant resources especially in terms of their medical and veterinary applications.

Topic:	**Origin evolution and diversity of Cà Te *Afzelia* spp. (Leguminosae): implication for Vietnam forest conservation and sustainable management**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	Dr Tran Thi Hoa
Prospective funding:	Institute of Agricultural Genetics, Center for Biodiversity and Biosafety and local government in HLNR provide financial support on field trips an meals during the field trips in Vietnam.

Annotation:
Tropical Rain Forest Forests (TRFF) represent the most diverse terrestrial ecosystems on the planet. Despite the important services they provide, SE Asia TRFF regress in a context of global change. Understanding how TRFF woody species responded to past climate changes and currently meet the increasing human pressure, participate in the prediction of future evolutionary pathway/trajectory and the formulation of appropriate mitigation strategies. This project addresses the genus Afzelia and particularly a complex of species listed under the denomination "pod mahogany". The idea is to model test various hypotheses concerning the impacts of past climate changes (speciation in forest refuges) and current anthropogenic impacts (reduction of genetic diversity). Indeed, the distribution of "pod mahogany " on the continent suggests various adjustments according to ecological gradients, and the quality of their wood makes them priority species for the forest industry. By studying the genetic and ecology of the genus Afzelia, this project aims at:
(1) understanding more accurately the ecological factors involved in the mechanisms of speciation,
(2) testing the correlation between patterns of genetic diversity and supposed Pleistocene forest refuges
(3) assessing the impacts of selective exploitation of timber on intraspecific genetic diversity. Strategies for conservation and sustainable management can be deduced from the results of this study.
The investigation will be conducted in three national parks namely Chumomray, Cat Tien and Chuyansin.

Topic:	**Taxonomy, Ecology and Economic Botany of Neglected and Underutilized Plant Species of Tropics and Subtropics**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.	
Supervisor-consultant:		
Prospective funding:	IGA, International credit mobility, CDA project in Zambia, Bilateral Cooperation Scheme CZ-Peru	

Annotation:
It is generally argued that neglected and underutilized species (NUS) can satisfy the requirement for food and materials of millions of people. Tropical areas are great reservoir of plant resources, which are now under threat due to deforestation and subsequent degradation of the cleared land. Among these species several plants with significant nutritive value, different types of quality material and intraspecific variability occur being utilized by indigenous people in times of food scarcity or they are simply underutilized due to several reasons thus their diversity and nutritive potential or traditional material quality remains unknown. The scientific neglection of these species could lead to continual decrease of their genetic variability, which can limit their use potential for human nutrition, as ecological friendly materials as well as in human medicine as a source of bioactive compounds. The study will include several cultivated as well as non-domesticated species. The plant material will be characterized especially from the point of view of taxonomy, morphology, distribution and ecology, economic botany and cultivation.

Topic:	**Traditional botanical knowledge (TBK) of domesticated plants in the context of traditional agriculture in tropics and subtropics**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☐Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	
Prospective funding:	IGA, International credit mobility, CDA project in Zambia, Bilateral Cooperation Scheme CZ-Peru

Annotation:
At present traditional agriculture supports more than 25% of the world population. All traditional farming methods differ from the industrial agriculture by low reliance on use of agrochemicals and commercial seed and dependence on rainfed conditions. The traditional farmer therefore should optimize the use of locally available resources to minimize a risk of crop failure and maintain sustainability of their production systems. Within this topic especially ethnoecology and traditional agricultural practices will be studied with aim to uncover the resource availability – crop species inventories within traditional agricultural systems, e.g. homegardens, traditional agroforestry, including information on seasonality of ecological conditions, and characteristics of various crop cultivars. Traditional methods of crop husbandry and agrobiodiversity management (seed systems) and conservation will be also an important point of this topic leading to crop diversification increasing the resilience of traditional farming systems.

Topic:	**Urban ethnobotany in the context of plant use, migration and biological diversity conservation**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	
Prospective funding:	IGA, International credit mobility, CDA project in Zambia, Bilateral Cooperation Scheme CZ-Peru

Annotation:
Urban Ethnobotany studies, among other issues, the botanical knowledge characteristic of those pluricultural contexts that are the urban agglomerations. The botanical knowledge and beliefs guide the strategies of selection and consumption of plants and plant products in the context of urban homegardens as well as allotments, urban markets as well as botanical knowledge of different groups of migrant people with the aim to understand the composition and dynamic of urban botanical knowledge, based on the evaluation of the diversity of plant elements present in the studied area and their circulation. This topic will include the studies of continued use of medicinal plants in urban settings, the role of urban markets in maintaining access to and use of wild plants for food and

medicinal purposes, management of urban ecosystems in terms of agrobiodiversity, comparisons of local plant use by people in rural and urban settings.

Topic:	**Survey of *Dalbergia* spp. (Leguminosae) in Vietnam for identifying *Dalbergia oliveri* from a species complex for conservation)**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	Dr. Thran Thi Hoa
Prospective funding:	Institute of Agricultural Genetics, Center for Biodiversity and Biosafety and local government in HLNR provide financial support on field trips an meals during the field trips in Vietnam.

Annotation:
Most tropical ecosystems are characterized by a huge biodiversity that is presently endangered in many countries, hence the need for rapid, accurate and effective ways to document the biodiversity of tropical environments. Identification of Dalbergia sps. for monitoring timber trade (IDMTT) and conservation of species diversity in Vietnam forests has been highly debated. The IDMTT is moreover still not well characterized, particularly the spatial variation of community composition (beta diversity). Four specific aims had been defined: (i) Carrying out morphology-based as well as DNA-based studies and evaluate its statistical performance when the diversity is estimated by community samples; (ii) Quantify morphological analyses and sequences of ITS region and matK gene to describe a newly revised taxon (commonly known as the Cẩm Lai) and redefine D. oliveri; (iii) A description of a new-revised species will be presented. Vietnamese Dalbergia oliveri or Cẩm Lai Bông (vernacular name) is native to Vietnam and found in dense tropical evergreen or semi-deciduous forest. It is hard and heavy with a color that ranges from reddish -orange to a deep red, oftentimes with dark stripes. The species is a quite valuable timber in SE Asia and in the Indochina region. It is currently is listed in the IUCN Red List (A1cd) and meets the criteria for CITES category II Bi since it is at risk of extinction due to illegal logging and deforestation. However, the identification of this species remains problematic until now, hindering its conservation. The aim of this study is therefore to apply morphologyand DNA- based taxonomic identification methods to try to overcome this problem and to complete a taxonomic revision of the D. oliveri species complex. The student will: i) collect plants and making specimen vouchers; ii) morphological identification; iii) applying DNA- based taxonomic identification methods such as using sequences of ITS region and matK gene to describe a newly revised taxon. Study Localities: We concentrate our investigation on three national parks namely Chumomray, Cat Tien and Chuyansin National Parks.

Topic:	**The wild, indigenous, underutilized fruit tree species (Xerospermum noronhianum (Blume) Blume: Sapindaceae): Domestication, utilization and conservation**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	doc. Ing. Zbyněk Polesný, Ph.D.
Supervisor-consultant:	Dr. Tran Thi Hoa
Prospective funding:	Institute of Agricultural Genetics, Center for Biodiversity and Biosafety and local government in HLNR provide financial support on field trips an meals during the field trips in Vietnam

Annotation:
Buffer zone of Huu Lien Nature Reserve (BZHL) is among the poorest in the province (Lang Son) and food security problems are severe. Fruit trees are essential in the diets of rural people in these areas, providing: i) nutrients and vitamins to diets otherwise dominated by upland rice and maize; ii) food at times where stocks of annual crops are low; iii) sources of income through commercialisation. Despite the generally accepted importance of trees, most food security programmes focus on cereals. The potential of fruit trees is under-utilised. Xerospermum noronhianum, locally known as ké (leech's longan) is a multipurpose fruit tree species of high economic importance, native to the limestone forests of Vietnam. This species along with lychee (Litchi chinensis Sonn) belong to the Sapindaceae family. The fruits of X. noronhianum are edible, with a sweet and pleasant taste,

resembling those of Nephellium lappaceum, another Sapindaceae species that yields the commercially important rambutan tropical fruit. The fruit of X. noronhianum is too small to be of any commercial value, but the species is a source of medicines against diarrhea, stomach pains and Alzheimer disease. This project aims to: i) increase food security and livelihoods for people in BZHL through facilitating access to knowledge about and germplasm of fruit tree species with focus on X. noronhianum; ii) fully training marketing agricultural production including domestication of ethno-botanic productions adapted to environmental change, their product geographical indicator (PGI; iii) Conservation guidelines for conservation and sustainable use. We require a representative group of plants with well established in traditional cultivation and uses, rich in species occupying a wide range of terrestrial habitats. If this can be done for a genus that is part of an extensive continental flora, then inferences relevant to conservation and land management will be well grounded. The student will: i) collect data on the species, uses (medical and other uses), ethnobotanical data including traditional knowledge in cultivation in Nung, Dao and Kinh communities; ii) collect data on cultivation conditions (eco-agricultural data) for domestication; iii) collect data on conservation status of the species to promote conservation guidelines. We concentrate our investigation on two local landscapes within BZHL: 1) Huu Lien lime stone in Huu Lung commune; and 2) Yen Thinh buffer zone. These provide complementary case studies in distinct floristic regions differing in postglacial vegetation history, soils, climate and disturbance regime.

Topic:	**Evaluation of selected minor crop genetic resources**
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development
	☒Tropical Agrobiology and Bioresource Management
Supervisor / promotor:	Ing. Iva Viehmannová, Ph.D.
Supervisor-consultant:	Ing. Petra Hlásná Čepková, Ph.D.; Ing. Dagmar Janovská, Ph.D.
Prospective funding:	IGA FTZ, Národní programu konzervace a využívání genetických zdrojů rostlin a agrobiodiversity (MZe), Projekt Horizon - ECOBREED 2018-2022

Annotation:
Minor crops (buckwheat, quinoa, amaranth etc.) are grown or produced in small areas and quantities. Their main limitation to wider utilization is a limited number of suitable varieties available in the market because they have been neglected through the breeding activities during the last 70 years. All these crops have a big potential for the human diet as a nutrient-rich food. Therefore, the evaluation of genetic resources of these crops may help to fully exploit their potential and select the suitable genotypes for further breeding activities. The aim of this thesis is the evaluation of approximately 200 selected genetic resources of minor crops available from the gene banks. In the thesis, their genotypic diversity, selected nutrients, phenolic content, and any potential harmful/anti-nutritive components by using high-throughput profiling analysis and antioxidant activity will be investigated. This study will be carried out in cooperation with Gene Bank at the Crop Research Institute in Prague.

Topic:	***In vitro* production of secondary metabolites in *Pseuderanthemum palatiferum* using elicitors**	
Study programme: * *tick/delete as appropriate	☐Sustainable Rural Development	
	☒Tropical Agrobiology and Bioresource Management	☐Topic for ATS only
Supervisor / promotor:	Ing. Iva Viehmannová, Ph.D.	
Supervisor-consultant:	Ing. Olga Leuner, Ph.D.	
Prospective funding:	IGA FTZ	

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Annotation:
Secondary metabolites have been derived from plants and used by humans from time immemorial. A plant cell, tissue and organ culture has an inherent capacity to produce valuable chemical compounds as the prime plant does in nature. *In vitro* culture is a good source of secondary metabolite and elicitation can be used as one of the important tool in order to improve the synthesis of these compounds. *Pseuderanthemum palatiferum* (Nees) Radlk. is a medicinal plant belonging to Acanthaceae family. In traditional medicine of South-east Asia, the leaves of this plant are used to treat many health disorders - among other hypertension, diarrhoea, arthritis, wound, nephritis and diabetes. This plant, that has not earned lot of scientific attention, was reported to contain various biologically active compound such as β-sitosterol, stigmasterol, kaempferol, apigenin, phytol, triterpenoids saponin, and salicylic acid including essential amino acids such as lysine, methionine and threonine. This study (thesis) will focus on *in vitro* production of secondary metabolites (mostly catecholamines) from different tissue cultures of *P. palatiferum* using various elicitors and/or precursors in order to increase production of biologically active compounds with health benefits to meet market demands, for reducing production costs and for in-depth investigation of biochemical and metabolic pathways.