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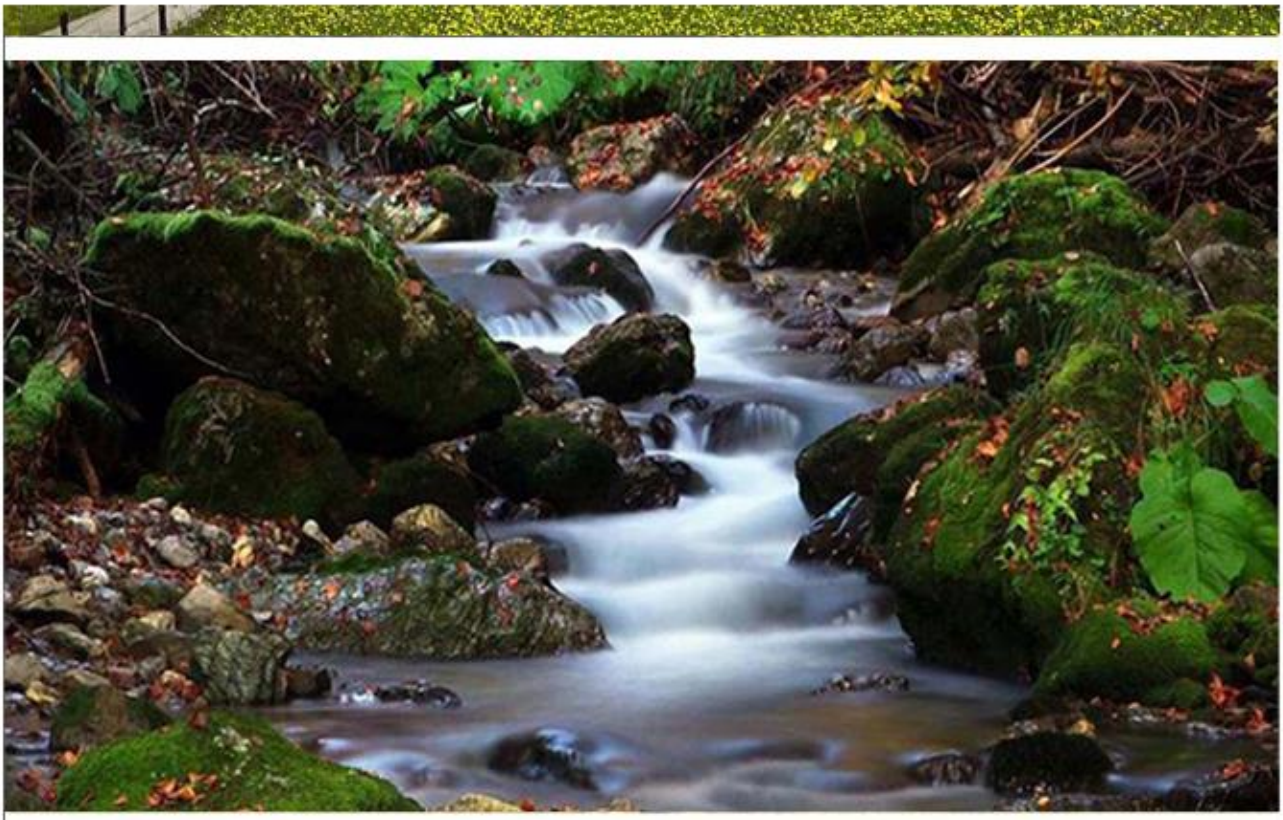
GEA (Geo Eco-Eco Agro) University of Montenegro

28 May 2020, Podgorica, Montenegro

GEA (Geo Eco-Eco Agro) International Conference

Book of Abstracts



Podgorica, Montenegro, 2020

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28 May 2020, Podgorica, Montenegro

BOOK OF ABSTRACTS

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FOREWORD

International GEA (Geo Eco-Eco Agro) Conference is envisaged as an event during which researchers from the areas of Geosciences, Ecology-Economy and Agriculture, as well as from areas of Eco-Architecture and Rural Architecture, will present their work to each other. The Conference aims to be a meeting point for international scientific discussion on various subjects of these sciences. The team of the International GEA (Geo Eco-Eco Agro) Conference is striving to bring together research and practices. The idea is to establish new bridges between researchers from the Region and wider; to meet each other and to stay connected.

At the end of May 2020 we would like to present the research results among colleagues on formal sessions and in informal communication on the adaptation and resilience to the impacts of climate change and on bringing closer natural resource management with agriculture, forestry, economics and ecology.

The young researchers will have a possibility to learn and to create networks and to participate in discussions. We will also offer them a possibility to present their student papers in the special session for promising young researchers.

This international conference will make all the participants a known name in academic circles of our Region, confirming at the same time that they are active members of the academic community. It gives them also the chance of listening to different points of view and learning new ideas and trends in selected field in a different environment.

All submitted Abstracts will be peer-reviewed and will be in the Book of Abstracts (with CIP, ISBN, COBISS.CG-ID). Full texts of papers will be presented in the Book of Proceedings (with CIP, ISBN, COBISS.CG-ID). Both books will be available online at the Conference web page: www.gea.ucg.ac.me

We hope that most of us, who participated at the GEA International (Geo Eco-Eco Agro) Conference, 28-31 May 2020, Montenegro, will come the next year to take the part at the GEA International (Geo Eco-Eco Agro) Conference, 27-30 May 2021, again here in Montenegro.

Velibor SPALEVIC

President of the Scientific Committee
Faculty of Philosophy, Geography
University of Montenegro

PREDGOVOR

Međunarodna GEA (Geo Eco-Eco Agro) konferencija zamišljena je kao događaj na kojem će istraživači iz oblasti geonauka, ekologije, ekonomije i poljoprivrede, kao i područja eko-arhitekture i ruralne arhitekture, predstaviti svoje radove. Cilj konferencije je da bude mjesto susreta jednog broja naučnika iz gotovo cijelog svijeta koji će razmjenjivati iskustva, mišljenja i ideje o temama koje će biti predmet rada konferencije. Tim Međunarodne GEA (Geo Eco-Eco Agro) konferencije nastoji objediniti istraživanja i prakse. Ideja je uspostavljanje novih mostova između istraživača iz regiona i šire; da se upoznaju i ostanu povezani.

Na kraju maja 2020. godine želimo predstaviti rezultate istraživanja među kolegama na formalnim sastancima i u neformalnoj komunikaciji, ali i o aktuelnoj inicijativi prilagođavanja i otpornosti na uticaje klimatskih promjena i približavanju upravljanja prirodnim resursima sa poljoprivredom, šumarstvom, ekonomijom i ekologijom.

Mladi istraživači regije imaće mogućnost sticanja novih znanja, iskustva, umrežavanja i učešća u diskusijama. Pružićemo im mogućnost prezentacije svojih studentskih radova na posebnoj sesiji za mlade istraživače.

Ova međunarodna konferencija učiniće sve učesnike poznatijim imenom u akademskim krugovima naše regije, potvrdivši istovremeno da su sami aktivni članovi akademske zajednice. Pruža se prilika za upoznavanje sa različitim gledištima i stavovima, kao i za upoznavanje sa novim idejama i praćnje aktuelnih trendova u jednom drugačijem okruženju od onoga koje imamo svakodnevno.

Svi predati sažeci su recenzirani (od strane po dva recenzenta) i predstavljeni u ovoj Knjizi sažetaka (sa CIP, ISBN, COBISS.CG-ID). Radovi u cjelini biće publikovani u Zborniku radova (sa CIP, ISBN, COBISS.CG-ID). Obje će knjige biti dostupne putem Interneta na web stranici konferencije: www.gea.ucg.ac.me

Nadamo se da će većina nas, koji smo učestvovali u pripremi, te izložili radove na međunarodnoj GEA (Geo Eko-Eko Agro) konferenciji, 28. i 31. maja 2020. godine, doći i narednih godina; učestvovati na nekoj novoj GEA (Geo Eko-Eko Agro) međunarodnoj konferenciji, ponovo s kraja maja ovdje u Crnoj Gori.

Velibor SPALEVIC

Predsjednik Naučnog odbora Konferencije
Filozofski fakultet, Geografija
Univerzitet Crne Gore

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Keynote speakers

Academic Champions
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Gully and waterway erosion in Ethiopian highlands

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Abstract: Gully erosion is an important sediment source and one of the main causes of soil loss and severe environmental degradation. Despite that most of the world renown models to predict soil loss do no include gully erosion among the main factors controlling the amount of soil erosion. Though gully erosion has been investigated for several decades all over the world and may many progresses have been made, our current knowledge about triggering conditions and rate of expansion is still rather poor. In order to contribute to fill this gap, IPDRE has been conducting field measurement on gully erosion during the last three years in three different areas which are representative of highland, midland, and lowland agro-ecologies in the Upper Blue Nile basin of Ethiopia. Average annual linear and volumetric headcut retreat rates were obtained from aerial photographs and very high resolution (0.5–1.5 m) satellite and images in a GIS environment, whereas field data were measured to investigate the morphological characteristics and topographic thresholds of gully formation, their main geometric characteristics and how their relationships. These studies were also complemented by a field investigation on the role of soil water table level in the formation and growth of gullies. Gullying, however, is not the only linear erosion process that contributes substantially to land degradation, soil loss and sediment supply to the drainage network. Another important source of sediment are the myriad of waterways that are typically present especially in cultivated land such as those of the Upper Blue Nile. They include dust roads, animal trail, farmers and woodsmen tracks, landslide areas and bare lands resulting from farming operations or other human activities. The density of these waterways was measured in the three representative areas of the IPDRE project in the Upper Blue Nile basin from Google Earth images. Results indicate that these bare soil lines and areas can account for the different sediment yield measured in the three study areas and led to presume that they may account for a large proportion (30-50%) of the sediment supply to rivers, which is instead attributed to sheet and rill erosion by classical coil erosion models. The results of these studies suggest that we need to deepen our knowledge on gully formation and development and to include gullies and waterways as a main source of sediment supply in the upgrading of soil erosion and sediment yield models.

Keywords: Gully erosion, waterway erosion, sediment source, soil loss, environmental degradation, Ethiopian highlands

Land Degradation Management through Watershed Health Assessment

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Abstract: During last decades, land capacity has been continuously declining due to overburdening anthropogenic activities. Through the evaluation of biotic and abiotic resources sustainability, it is indispensable to comprehensively strive for a methodology to properly depict the intensity, quality, and tendency of land degradation worldwide. Many approaches have been developed and applied to different parts of the world to assess the situation of land degradation. Nevertheless, the effect of land degradation on watershed has not been quantitatively reported. In this regard, the watershed health assessment would be of great help to show how far the watershed ecosystem is form the climax condition in which land degradation does not affect the proper functioning of the system. Many approaches have been introduced to evaluate the health condition of the ecosystem wholly focused on particular components of the system. However, a monitoring based assessment of the governing problems is strictly needed to picture the intensity, propensity and extension of the driving forces behind land degradation and to properly assess the watershed health. It facilitates sound and adaptive management of the resources for their optimal utilization without threatening the vulnerable resources. Such approaches are crucial for the developing countries where almost all natural resources are competitively consumed and destroyed quickly, aiming at a rapid cosial and economic growt. The aforesaid strategy has been practiced at field scale in some watersheds in Iran and other countries. The results of the methodology straightly prioritized the breakdown of the larg watershed into smaller sub-watersheds.In such way the managers and experts do know which particular influential factor requires more attention and which parts of the watershed need the implementation of more and faster managerial strategies. Moreover, the type of the strategy would also be recognized based on internal strengths and weaknesses as well as external opportunities and threats.

Keywords: Integrated Watershed Management, Land Utilization, Low Impact Development, Strategic Planning.

Soil Management for Sustainability: Present and Future Neccessity

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Abstract: According to the natural characteristics, Serbia is predisposed to erosion processes. However, both worldwide and in Serbia, a large percentage of erosion processes are contributed by anthropogenic factors. The activity of man can be both negative and positive, depending on the degree of awareness of the importance of using natural resources on the principles of sustainability. Preventing the degradation of torrential floods and erosion processes contained in the sustainable management of land resources, which includes the use of participatory methods? The paper presents the participation of the community in the management of natural resources (CBNRM – Community Based Natural Resources Management), according to which the community becomes the primary implementer, with the assistance and under the supervision of professional services. In the case of public participation in the sustainable management of land resources of Grdelica Gorge (South Serbia), shows the socio-economic and ecological approach of the local population. One of the significant participatory approach programme is WOCAT (World Overview of Conservation Approaches and Technologies) which was also implemented in Serbia. Within the WOCAT program in Serbia, the best conservation technologies and approaches were recorded, which were derived not only from experts but also from local farmers/villagers. These technologies and approaches have entered the world database, whose use can certainly act in the prevention of torrential floods. This paper also presents a model of sustainable management of land resources, adapted to the conditions of hilly areas of Serbia, which includes the planning of production on sloping terrain from the aspect of land resources, then the needs of the population for certain localities particular production, and profitability of planned production. Regarding ecological effects of the model of SLM, soil loss is reduced under the level of tolerance in the researched area. Economic effects of the established model of SLM, proved by Benefit-Cost Analysis, are on the satisfactory to significant level. These reasons are enabling people to stay and survive in these regions.

Keywords: land degradation, sustainable management, environmental effects, economic effects

Wild edible fruit diversity in Turkey: A good sample of carob trees (*Ceratonia siliqua* L.)

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Abstract: Three phytogeographical regions, Euro Siberian, Mediterranean and Irano-Turanian overlap in Turkey. Euro-Siberian Region stretches along most of North Anatolia and Europe. Historically Turkey has been a pathway for many civilizations and hosted many of them. Movement of communities contributed to enrichment of genetic diversity by transferring mainly the cultivated species, as well as the seeds of wild plants from one place to another. The topography of Turkey exhibits significant variety where ecological factors change frequently over short distance. Asian section is a large, roughly rectangular peninsula situated like a bridge between Europe and Asia. Turkey has a rich natural carob (*Ceratonia siliqua* L.) populations obtained from seeds; and trees thrive together with a number of other species of the maquis in the Mediterranean and Aegean regions. Carob has been a neglected specie and accepted forest tree in Turkey. The country does not have commercial carob orchards although some new ones have recently been established. Wild carob trees show great diversity on tree, leaf dimensions and pod dimensions and concentrate along the Mediterranean and Aegean regions. Present study describes morphological, biochemical and molecular diversity among wild edible carob trees.

Keywords: pod dimensions, leaf characteristics, seed content, SSR markers.

Urban and Physical Planning - A Tool for Preserving and Creating Places

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Abstract: Effective physical and/or urban planning results from common sense and orderly approach to finding out the community needs, setting goals and development priorities, taking actions to give some special meaning to space (land) occupied by the existing urban areas or the land planned for their spreading. Through that planning process, a planer has to comprehend what needs to be done now and what later, but all these decisions should be made concerning the preservation of Place Identity. To perform the appropriate planning methodology, the planer must understand the meaning of the meaning - ***Identity of Place***, ***Place***. Being able to distinguish Space from Place and understanding the attributes that help in distinguishing one Place from another, a planer will be able to prepare a "sustainable" plan. Only through this kind of a planning process approach will help in recognizing the local and regional values and need for changes, as well as the impact of proposed changes on the appearance, social life, and the economy of the Place. Physical and urban planning should be a process of finding out the needs, possibilities, and limits along with the proposal for the future development of a particular region, town, or any settlement, as it will reshape the physical appearance of the *Place*, but its curtilage, too. That is why a Study of natural and cultural identity elements are needed, a Study that would emphasize the real and necessary guidelines for preserving the existing values of the Place, but at the same enabling the economic progress and growth of the Place, for the benefits of the Place residents. As a result of understanding the meaning of the term Place, what attributes create the Place and Identity of Place, and the meanings of other related terms is a must to perform the planning process.

Keywords: Identity of Place, Place curtilage, Place Attributes, Urban and Physical Planning.

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Challenges of (Non)Sustainable Development

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Abstract: The author critically examines the concept of unsustainable development of economy and society, the numerous manifestations of such development, as well as the causes and consequences of this phenomenon (Pejanović, 2017; 2018; 2019). Contemporary concept of growth and development originated with the advent of capitalism. It is elaborated in economic theory and practice of economic development. It is based on a profitable economy, with positive and negative effects, which is why the concept of sustainable development is formulated. Recent literature has been consulted, analyzing initiatives globally. The paper specifically analyzes the indicators of unsustainable development, the problems of global poverty, the problems of ecology, climate change and energy, the problems of agricultural production and food security. The dangers of this concept are pointed out. Changes are needed in the direction of the new development trajectory, ie. new development paradigms. This requires a greater role for science, especially economic science. The new concept of economics implies new patterns of behavior in terms of eco-business, green economy and organic agriculture (Jesic, 2016). Therefore, a new socio-economic development strategy is needed, both globally and nationally. This implies consensus and compliance of measures and actions.

Keywords: unsustainable development, causes, consequences, new development paradigm, sustainable development, ecological business, green economy, organic agriculture.

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Breeding strategies to improve small grain cereals tolerance to drought

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Abstract: Climate change, more intense in the 21st century, has and will have a detrimental effect on food production and quality in many parts of the world. The adverse effect of climate change will be the consequence of increased incidence of abiotic stresses, such as high temperatures and water shortages, and increased incidence of biotic stresses, such as pests and diseases. Climate change is expected to cause a decrease in biodiversity, especially in marginal conditions. Drought, as a yield-limiting factor, has become a major threat to food security. Plant responses to drought are affected by various factors including growth conditions, physiology, genotype, development stage, drought severity and duration. Thus, drought tolerance mechanisms involve diverse gene expression patterns and as complex signalling pathways. The complexity of inheriting drought tolerance has limited the progress of small grain breeding by using only the classical breeding methods. To accelerate yield improvement, physiological traits at all levels of integration need to be considered in breeding. Physiological breeding increases the probability of achieving cumulative gene action for yield compared to crossing physiologically uncharacterized genotypes. In practice, it differs from conventional breeding by considering a larger range of traits, including genetically complex physiological characteristics and differs from molecular breeding by encompassing both phenomic and genomic information.

Plant breeding is a complex process related to changing the genotype and phenotype of cultivated plants, as well as their relation to abiotic and biotic stresses. The climate change adaptation strategy, where photoperiod-temperature response of the cultivated plant is used, seeks to synchronize more precisely the dynamics of plant phenology with the dynamics of available water in the soil. This method mainly influences the change in flowering time, which seeks to avoid predictable occurrences of stress at critical periods in crop life cycles. So far, breeding has done the least to alter the roots genetically, making modern high-yielding varieties less effective than their predecessors in absorbing nitrogen from the soil. Harvest index is a measure of success in partitioning assimilated photosynthate. An improvement of harvest index means an increase in the economic portion of the plant. In water-limited environments, biomass production is a function of the water used by the crop and the efficiency with which it is converted into biomass. Biomass production can be defined by the amount of radiation intercepted and the radiation-use efficiency, i.e. the efficiency of the conversion of this radiation to dry matter.

Keywords: conventional breeding, physiological approach, flowering time, root, harvest index, grain filling period

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Global distribution of ^{137}Cs and $^{210}Pb_{excess}$ in the reference soil due to annual precipitation and latitudinal zoning

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Abstract: Concurrent with the Chernobyl accident along the explosions caused by nuclear tests and advances in nuclear sciences, researchers around the world have been trying to examine the potential of fallout radionuclides for accurate estimation of soil erosion and redistribution. The inadequacy of the existence of radionuclides and the complexity of factors affecting the amount of these elements in soil are among the important limiting factors in usage of radionuclide materials in soil erosion studies. As the most widely used radionuclides in soil erosion studies, ^{137}Cs and ^{210}Pb come from two different origins of anthropogenic and geogenic, respectively. Since the ^{137}Cs and $^{210}Pb_{excess}$ reach the soil surface mainly through precipitation, the climate and latitude play important roles on the existence of radionuclides in the soil. Due to the location of the point sources of ^{137}Cs, the coordinates of the site under consideration and the wind regimes can also be very important to affect the precipitation and consequently, the inventories of ^{137}Cs. Awareness of the range of possible changes of ^{137}Cs and $^{210}Pb_{excess}$ in undisturbed soil is an important step to improve and validate soil erosion estimation results. Accordingly, the present research reviews the data of the mean annual precipitation and inventory of ^{137}Cs and $^{210}Pb_{excess}$ in undisturbed soil and presents some regression equations for different climates and latitudinal zones of the world. Based on the results, the inventory of ^{137}Cs in undisturbed soil can be estimated statistically acceptable only in two latitudinal zones of 16-25° N and 26-35° N. While due to the small amount of data and the impossibility of data separation for different zones and climates, the inventory of $^{210}Pb_{excess}$ can be estimated statistically acceptable given all the data without considering the latitudinal zones. The estimations of the inventories of ^{137}Cs and $^{210}Pb_{excess}$ in undisturbed soil is statistically acceptable in two temperate and continental climates and only temperate climate, respectively.

Key Words: Fallout radionuclides, Köppen-Geiger climates, Latitudinal zoning, Soil Erosion.

Water erosion and soil organic matter loss in a coffee organic farm

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Abstract: In tropical regions, water erosion is the process responsible for the redistribution and the loss of soil organic matter (SOM). Modelling can provide a diagnosis of the dynamics of SOM in agricultural production systems, and assist the proposing of conservationist measures. Therefore, this work aimed to estimate SOM losses due to water erosion in an agricultural production system, through the use of modelling techniques. The study area corresponding to the Municipality of Divisa Nova, south of Minas Gerais, Southeastern Brazil. The area of the farm is around 75 ha, and the main agricultural product is coffee (78%). The modelling was performed based on the SOM content of the area, and the estimated soil losses, according to the Revised Universal Soil Loss Equation. To the SOM determination, soil samples were collected at 20 points, distributed over the area, in the surface layer (0-20 cm), in March 2018. The parameter acquiring and the data analysis were performed using remote sensing techniques and a Geographic Information System, which was also used to interpolate the SOM content, through the use of the ordinary kriging. The organic matter content on the farm ranged from 1.20 to 2.46%, while the average soil loss was 25.70 Mg ha^{-1} $year^{-1}$, with higher erosion rates in steepest sites. The estimated loss of total organic matter at 31.87 Mg $year^{-1}$, with an average of 0.42 Mg ha^{-1} $year^{-1}$. The observed results reveal the need to implement conservationist management measures to reduce soil losses, and the consequent SOM losses.

Keywords: Soil conservation, Soil losses, RUSLE, Agricultural sustainability.

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Importance of plant genetic resources (PGR) and methods of their utilization in the NGS era

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Abstract: One of the major challenges that breeders face in improving yield of crop plants nowadays, is to find a new source of genetic variability and to detect novel alleles in order to cope with current climate change scenarios. Therefore, plant genetic resources (PGR) stored in gene banks are an important source of natural genetic diversity that provide a source of novel traits for sustainable crop improvement and conservation of natural variation. However, during last decades of the 20th century, landraces of majority of crop plants were gradually replaced with elite cultivars, bred for consumer demands and modern agricultural practices. Nevertheless, landraces, as a primary component of PGR, have been found to be more stable than elite varieties under variable environmental conditions. Agronomically important traits in landraces still show large variability that can be used to broaden the genetic variability in breeding programs.
The natural diversity of PGR has become now more accessible thanks to the advances in genomics, sequencing technologies and the use of genetic diversity for prediction purposes. For example, whole-genome sequencing will provide efficient breeding for many traits at the allele level/for many allele-level traits, thus contributing to a broader genetic basis of all breeding-relevant traits. In order to effectively manage and use PGRs, an increasing number of gene bank accessions are rapidly being characterized at molecular level by various marker systems. In this regard, the establishment of reduced representative collections from a large set of genotypes is a valuable tool that provides cost-effective access to the diversity present in the whole set.
Current genotyping and sequencing methods for characterization of PGRs and methods for selection of the most diverse and informative sets of accessions out of large PGR collections are presented.

Key words: plant genetic resources (PGR), landraces, molecular markers, SNPs, NGS, Core collections

Climate Change and Sustainable Agricultural Development (Egypt Case Study)

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Abstract: Global agriculture will be under significant pressure to meet the demands of rising populations using finite, often degraded, soil and water resources that are predicted to be further stressed by the impact of climate change. The ongoing build-up of greenhouse gases in the atmosphere is prompting shifts in climate across the globe that will affect agro-ecological and growing conditions. In addition, agriculture and land use change are prominent sources of global greenhouse gas emissions. The application of fertilizers, rearing of livestock, and related land clearing influences both levels of greenhouse gases in the atmosphere and the potential for carbon storage and sequestration. Therefore, whilst ongoing climatic changes are affecting agricultural production, the sector itself also presents opportunities for emissions reductions. This paper provides an insight into the different climate change-related challenges that the agricultural sector in developing countries will face and explores opportunities for emission reductions and adaptation. The study concludes that adaptation measures in the agriculture sector are highly significant for poverty reduction. It also highlights that agriculture in developing countries can play a significant role in mitigating greenhouse gases and that it is critical to work out incentives that are conducive to emission reductions in this sector. Specifically, it may be worthwhile to explore the potential contribution to mitigation and mobilize resources from the carbon market for investment in pro-poor and sustainable agricultural development. It also reconfirms that sustainable management of natural resources is key to both mitigation of emissions and adaptation in the agricultural sector. In this paper, the impact of climate change on production and opportunities for emissions reductions is reviewed with a focus on developing countries, including the implications for food security and livelihoods for the poor. In order to highlight specific on-farm and soil management practices, this paper will focus on emissions and impacts related to food production (mainly crop and livestock production), plus corresponding mitigation and adaptation strategies. Following the introduction, the impact of agricultural production on global warming and climate change is considered, including possibilities for mitigation. The second part considers how the release of carbon and greenhouse gases will impact the agricultural sector, drawing heavily on future climate projections. Part three discusses adaptation strategies for individuals and governments and their capacity to respond to increasing climate variability. Part four offers a conclusion. The objective is to provide a synthesis of the evidence relating to the impact of agriculture on climate change, as well as the impact climate change is projected to have on this sector. The intention is to provide a clear message for development practitioners and policy makers in order to enable them to cope with the threats, as well as understand the opportunities, presented by ongoing climate change.

Keywords: adaptation, climate change, greenhouse gases, mitigation, sustainable agricultural development, policy makers.

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Phacelia Honey Productivity in Relation to Locality of Cultivation

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Abstract: Phacelia is a very attractive crop in the field, with deep blue flowers and a strong, pleasant aroma. A single flower can give up to 4.5 mg of nectar, with a sugar concentration of 28%. With 1 ha can produce between 500 and 1200 kg of phacelia honey (Popović et al., 2016). Phacelia honey is from light beige to white, translucent glassy color. Mild and delicate aroma with a fine pleasant flavor; nice soft lemony scent and taste; Crystallization in slowly, into fine crystals making the honey finely creamy, because its fructose contain is higher than that of glucose (like acacia honey). Phacelia have a sweet and complete flower for the honey bees because it provides both pollen (for protein – needed for egg production) and nectar (for carbohydrates – needed for energy). Significant is the potential of Phacelia as bee forage, with a high potential for honey yield, a green manure, forage crop (either on its own or in a mix with peas or vetch to provide forage and honey production), aphid parasite host and have nematicidal properties etc. Phacelia has high energy and protein content, and have allelechemical properties of the plant. Phacelia honey – good for our health. Monofloral honeys are more expensive than multifloral honeys, and the price strictly depends on its botanical origin (Stanek et al., 2019). Phacelia honey is a very good diuretic, has an estrogenic action, helping in fixing calcium in the bones, in women favors the emphasizing of feminine features and has strong rejuvenating effect, helpful for the treatment of sinus problems, maintains the blood cholesterol level, has disinfectant and skin care effect and helping in treating burns.
The experiment was carried out in the two locality, in Bački Petrovac (L1) and in Zaječar (L2), in 2019, in an unfavorable year for the production of phacelia, with variety NS Priora. The locality had a statistically significant effect to the tested morpho-productivion and quality parameters of phacelia, $p>0.5$. Average plant height in both locality was 63 cm, average grain yield 810 kg ha^{-1} and average honey yield 750 kg ha^{-1}. The nitrogen content of grain varied 3.35% to 3.46%; protein content varied from 20.93% to 21.35%, cellulose content varied from 4.31% to 4.40% and ash content varied from 5.70% (L1) to 5.81% (L2). Research results have shou that variety NS Priora has excellent quality components of seed and potential for grain yield and honey yield.

Keywords: Grain yield, Honey yield, Phacelia, Locality, NS Priora.

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Relationship between Traditional Architecture and Tourist Traditional Residence in Rural Areas

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Abstract: Today, the urban lifestyle has led people away from nature. That is why the tourism industry is booming day by day for proximity to nature. Traditional residences in rural areas are of particular interest. Because citizens are looking for new places to experience the criterion of adaptation to geographic conditions. One of the most important principles emphasized by planners and tourists in these places is their indigenous architectural principles. Paying attention to the traditional architecture of these residences is indispensable for the tourists. Survey of Twenty Rural Residences in North Khorasan Province from Tourist Perspective showed that the physical structure and the native architecture had a great impact on the welcome of tourists. Foreign tourists also prefer to stay in places with indigenous architecture. The results show that there is a direct relationship between accommodation architecture adaptation and the number of visitors. Besides, modern structures in rural areas are less attractive. But tourists need modern side facilities like the Internet. Therefore, it seems that the housing strategy is based on native architecture and facilities and handicrafts in the rural regions have the most important role in attracting tourism in North Khorasan.

Keywords: Traditional Architecture, Eco-tourism, North Khorasan, Iran

”Estuarization” of small deltas along the Italian coastline (Adriatic, Tyrrhenian and Ionian Sea): A symptom of impoverished sediment supply

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Abstract: river systems in the Mediterranean have reflected the historical development of coastal zones and coastal basins since Roman Times. Prevailing factors were initially human population dynamics and land-use changes on catchments, notably deforestation and reforestation. Additionally, in some countries like Italy, the economic development after WWII required an unprecedented demand for aggregates (i.e. sand and gravel) for the construction of infrastructures as well as industrial and private buildings. Extensive river mining, especially in alluvial plains or piedmont reaches, satisfied this demand until it was halted, though with different timing, by national and regional legislation.. However, some bed mining is still taking place, justified as “maintenance” of channel hydraulic efficiency, to favour the channel conveyance and to protect engineering structures. Actually, there is no sediment conservation strategy, e.g. transfers of bed material from a depositional reach to a downstream section, therefore the maintenance works results in a definitive sediment loss and a negative sediment budget. Furthermore, in the past decades, dams have been built on many rivers and large volumes of water have been withdrawn for different purposes. Yet, marked changes in land use/cover, the extensive implementation of soil conservation and landslide control measures and urbanization have largely reduced the sediment supply to rivers. The presentation will initially examine the mouth of three rivers in the Emilia-Romagna Adriatic coastline region (Savio, Fiumi Uniti and Reno rivers) which currently have estuary-type mouths completely controlled by training structures or coastal protections to contrast coastal erosion and mouth migration. Evidence shows that these systems in the past had accretionary deltas, albeit of small size in both their sub-aerial and shallow water portions. The erosion crisis took place from the 1980s onwards and within a few decades the whole system reverted to an outflow channel which is most of the time controlled by tidal ingression up to kilometres from the mouth, despite the small tidal range (less than 1 m at Spring Tides). It is believed that this inversion in morphological trend was caused by the river control on the alluvial plain as well as the construction of engineering structures. The second part of the presentation will consider the River Magra, at the boundary between Tuscany and Liguria, on the northern Tyrrhenian Sea, exposed to a microtidal range of ~0.30 m. The mouth is a ria-type one, bounded on northern side by rocky reliefs and by the flood plain on the other side. Historical map analysis confirmed that in the past the river mouth had consistent sediment supply and a submerged delta. At present the river mouth is an estuary dominated by tides and saltwater ingression up to 6 km inland. It is believed that massive sediment mining of the alluvial plain in the upstream reaches and dredging in the river mouth caused this involution of the system. The last part of this presentation will examine the Simeto River, on the eastern coast of Sicily. Although it is one of the main rivers in Sicily and the tidal range is only 0.20 m, its mouth showed a natural regressive trend, which accelerated after the 1950s following the construction of dams and reclamation of the alluvial plain. Despite the previous existence of a submerged delta, the current system is at risk of disappearing and morphologically resembles the previous river mouths. In this case suspended load seems to remain constant, but bedload has decreased to values unable to sustain the supply to the mouth. It is concluded that this trend of “estuarization” of small river deltas is common to many systems along the Italian coastline and possibly of other Mediterranean countries in this context, where man has impoverished rivers of their natural bedload component.

Keywords: Small river deltas, Mediterranean Sea, river bedload, coastal erosion

Viticulture zoning in Montenegro and grapevine diversity – basis for mitigating climate change

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Abstract: Global climate change is one of the main environmental and socio-economic issues that viticulture and wine production facing with both country and regional level around the world. It is clear that vineyards in the world including Montenegro exposed by the negative impact of climate change and countries, which viticulture done taking into account it seriously. The new zoning of viticulture geographical production areas in Montenegro was completed in 2017 and represents the basis for the systematic implementation of all adaptation measures to mitigate the negative consequences of the climate change effects. Based on the analysis of climate, soil and orography in Montenegro, 4 viticulture regions and 15 sub-regions have been defined in which recommended and permitted grape varieties can be grown. Autochthonous grapevine varieties could be important against climate change because they are locally adapted varieties and populations survived as a result of natural human selection for centuries and represent not only the source of genetic diversity but also their genetic structure allows greater ability to adapt to the climate change. For this reason, the National Collection of Montenegrin grapevine varieties (with confirmed genotypes of autochthonous, neglected and domesticated varieties) was planted on Cemovsko polje and will be evaluated and will contribute to their conservation, further spread and to creation of potential for decades to come in response to mitigating the negative impact of climate change.

Keywords: climate change, zoning, diversity, autochthonous grapevine varieties

Wheat of future

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Abstract: History of mankind is divided in two uneven periods; six million years of biological evolution in which man was wild plants gatherer and hunter, and last 12,000 years of cultural evolution portraying rise of *Homo sapiens* of today. Adaptation of nature, animal domestication and plant cultivation, enabled transition from nomadism to sedentism. First civilization, Mesopotamia aroused around 4000 B.C.E, in the river banks of Tiger and Euphrates, where carbon-14 dating revealed that tetraploid wild emmer (*Triticum turgidum subsp. dicoccoides*) was grown in 9600 B.C.E. Today, wheat, maize and rice, are staple food for humanity. For centuries agricultural production was based on locally adapted wheat varieties of great genetic diversity. Agriculture completely changed its course in mid-XX century as a result of Green Revolution, introduction of high-yielding cereal varieties, chemical fertilizers and pesticides, irrigation and mechanization replacing traditional techniques. The flourishing of agriculture has drastically changed the course of agricultural development and global society. Improvement of agricultural techniques by integrating scientific advancements and knowledge to assimilate environmental factors has tripled wheat yields in last 50 years. In the XXI century, we are facing two extremes. In developed countries, food security is no longer an issue. The rise in living standards is directly proportional to rise of awareness and demand for high quality, safe agricultural products minimizing environmental pollution and mitigating climate changes. On the other side are underdeveloped countries still fighting hunger. Sustainable agriculture seeks for a long-term solution that will provide sufficient quantities of safe food and have minimal environmental impact. Modern wheat varieties show drawbacks in achieving these goals. Local varieties and wild relatives of agricultural crops are invaluable source of phenotypic plasticity and genetic variability. However, their contribution depends on capacities to identify, select and use these resources as response to the challenges of the future.

Keywords: wheat, agricultural evolution, wheat cultivation, genetic resources

Anti-evolution of the phenomenon of construction- Its relation to the environment

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Abstract: The phenomenon of construction, as an act of creation of a man-builder in the landscapes, is being discussed in this paper. Vernacular architecture is the creation of the epochal relation of man to the environment. The coexistence of man and nature has been transformed into architecture that still goes beyond the reach of contemporary construction. Evolutionary processes have been called into question, which justifies the concern of the international community regarding the protection of the so-called cultural landscapes, places of conflict between nature and man. What is the perspective of these creations and are the builders of today familiar with the postulates and laws of creating the dwelling architecture of their predecessors? The paper elaborates general principles of protection and emphasizes the importance of preserving the rarity of the traditional opus of construction related to the local examples that exist on the territory of Montenegro, which are the works of an unknown builder and which are currently under-researched and under-valorized**.** The current knowledge base on "ambient nuclei"* presented through the cases of villages in Montenegro does not grasp the complete essence of the architectural thought. Evolutionary processes of the permeation of natural processes with modus of construction and the current stagnation of processes demonstrated on the examples of villages Godinje and Gornja Brca, located on slopes not far from the water, have been considered in this paper. Man has affected the nature by the phenomenon of construction, creating the unique cultural landscapes. Man has used nature as a resource. The evolution of man in the natural environment implied the evolution of nature itself, natural processes flowed simultaneously. Balance is achieved through synergy. However, there was a point in time when nature continued its life without man, because natural forces have overpowered the human creation.

Keywords: evolution; creation; cultural landscape; dwelling; natural processes

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Rare earth elements tracing interrill erosion processes as affected by near-surface hydraulic gradients

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Abstract: Understanding interrill erosion processes is important for the development of a process-based interrill erosion model. The objectives of this study were to identify dominant interrill erosion processes and to improve interrill erosion predictive equations. Six rare earth elements (REEs) were applied in different slope segments and soil layers to track sediment movement and deposition in order to gain insights into the near-surface hydraulic gradient-affected (drainage, saturation, and seepage conditions) interrill erosion processes under three rainfall intensities of 30, 60, and 90 mm h-1. The results showed that the contributions of interrill soil loss from each tracer segment to the total soil loss first increased and then decreased along the slope under drainage/saturation conditions, while they continuously increased under seepage conditions. Transport by raindrop-induced and sheet flow-driven rolling, creeping, or sliding was the dominant transport mode. The dominant process of interrill erosion was transport-limited under drainage/saturation conditions and detachment-limited under seepage conditions. Under transport-limited conditions, raindrop-induced transport was more relevant than raindrop-impacted sheet flow-driven transport. However, the raindrop-impacted sheet flow-driven transport was more important than raindrop-induced transport under detachment-limited conditions. The response relationships of sediment transport capacity and soil detachment rate to the near-surface hydraulic gradient, rainfall intensity, slope gradient, and slope length could be described well via power equations ($R2 \geq 0.81$). The R2 values of the power equations were 2.5% to 1840.0% higher than those calculated with existing interrill erosion empirical equations and the average absolute relative error (RME) derived in this study decreased by 38.0% to 87.2%. In addition, interrill erodibility should be further divided into interrill sediment transportability under transport-limited conditions and interrill detachability under detachment-limited conditions.

Keywords: Interrill erosion process; Near-surface hydraulic gradient; REE tracing; Transport mode; Soil erosion mechanism.

The Use of UAV Systems in Cadastral Surveying and Technical Documentations

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Abstract: In the continuous expanding and densely populated Cluj-Napoca metropolitan area, land is one of the most important resources and the key to sustainable development. Under the constant pressures of urban sprawl and the need for fast and efficient land surveys in this area, the paper conducts towards a guideline and model for an effective use of Unmanned Aerial Vehicle (UAV) that accompanies the traditional and well-established GNSS and total station measurements needed in cadastral and technical documentations. UAVs are one of the fastest developing industries, with vast potential and future implementations. It revolutionized many industries, and the acquisition of valuable data from the field, combined with advanced photogrammetry techniques and the necessary processing power can yield great results in the cadastral field, by aiding topographers in the private sector and the local authorities for a better land management and land records. The current state of cadastre in Romania is supervised by the National Agency for Cadastre and Land Registration, a governmental organization subordinate to the Ministry of Regional Development and Public Administration. Although the cadastral and land registration situation is in a constant improvement process, with modernization and digitization in the last years, there are still room for improvements. According to the official regulations, measurements made from satellite or aerial images (that include orthophotos obtained with UAV systems) cannot be used in the documentations submitted to the agency. This regulation is in order to ensure the desired accuracy that is imposed by the agency, even though the required precision in cadastre for planimetric position is 20 cm. Given the numerous scientific research and experimentation in the field, the correct use of UAV systems in the optimal conditions and appropriate location can ensure precisions far greater than that. Although drones cannot entirely replace field measurements and investigations, the combined use of terrain and aerial data can ensure a complete solution. The present study aims to present a modern approach of combining both field and aerial survey in order to complete a cadastral documentation of a difficult to measure terrain in a developing area of Cluj-Napoca, respectively a steep hill that presents numerous challenges. Besides the cadastral survey and documentation, technical documentations that include topographic plans for the construction authorizations and complete measurements in CAD platforms are needed for the architects and civil engineers. This aspect can be achieved with the help of the aerial survey, by obtaining outputs in the form of 3D model (DTM or DSM), contour lines and longitudinal or transversal profiles of the terrain. This established workflow is fully integrable into similar situations, and presents the need of future UAV implementations.

Keywords: land survey, topographic plan, drones, 3D model, contour lines, longitudinal profiles

Land use distribution in relation to soil erosion vulnerability in Himalayan sub watersheds

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Abstract: Watersheds are important for stabilization of ecosystems and micro climates. Increasing human dependency on watersheds, their morphological and geological status and climate variability make a watershed vulnerable to soil erosion which leads to endangering the watershed. To conserve and maintain soil integrity in a watershed, it becomes necessary to identify the level of vulnerability of watersheds in order to plan strategies and prepare best management practices for their conservation and reclamation. Rapid assessment of watersheds vulnerable to soil erosion is important in order to take timely decisions and interventions. Soil erosion vulnerability revolves around components like morphological and hypsometric characteristics, land cover and land use of a region. A general belief regarding land cover is that an increase in vegetative land covers controls and checks soil erosion in the region. However, owing to different topological parameters, other factors may take precedence over land use in influencing the vulnerability of watersheds. In a study conducted in the lesser Himalayan region, a watershed of the Tons river, a major tributary of river Yamuna, consisting of 21 sub-watersheds, was taken. Soil erosion vulnerability of the sub-watersheds was assessed was assessed using morphological and hypsometric criteria. Since the sub watersheds of this watershed consisted of overlapping land uses in randomly distributed patches, the land use was not taken as the criteria while assessing the vulnerability status. The morphometric and hypsometric parameters of each were determined by ASTER DEM (30m) using ArcGIS 10.3. To assess susceptibility to soil erosion, Multi Criteria Decision Making (MCDM) tool was used to assign compound value (Cp) to each sub-watershed. Under morphological and hypsometry criteria, total twelve important parameters were taken in all sub-watersheds and based on the Cp values, the sub-watersheds were divided into three different categories i.e. High, Medium and Low. For assessing land use of the region, five land uses (Forest, Agriculture, Scrub, Barren and Settlement) classes were identified using LANDSAT images using Google earth engine. ANOVA was carried out in order to understand the distribution of land use across the sub-watersheds of different vulnerabilities. Results showed that seven sub-watersheds were in the highly vulnerable category, while nine were in the medium and five in the low vulnerable category. Results also suggested that the average area of each land-use was statistically not significant across each vulnerability class suggesting that in this region other criteria were more important to classify the sub-watersheds. Sub-watershed with highest rank (7) is the most vulnerable therefore, in need of management and conservation practices in both the cases. The study indicated that in hilly region influence of land use in assessing vulnerability status of a watershed is less dominating than morphological and hypsometry parameters. The importance of criteria other than land use is further underlined in assessing vulnerability of watershed apart from suggesting that MCDM provides a better and rapid approach to study processes that degrade a watershed.

Key words: Land use distribution, soil erosion vulnerability, watersheds, Himalaya

Application of IntErO model for studying soil erosion processes and peak discharge in the Western Rif Region, Morocco, North Africa

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Abstract: Soil erosion by water is considered as a serious environmental threat for human life, especially in the Mediterranean areas of North Africa. This process includes the detachment, transport and deposition of eroded materials and is causing serious socio-economic and environmental problems. This is decreasing agricultural production and is increasing risks of food insecurity. This study aims to assess and evaluate the effectiveness of the IntErO model based on the Erosion Potential Method (EPM) for evaluating the sediment production and deposition in North Morocco, in the region where the Atlantic Coast of Morocco meets the Mediterranean Sea; specifically Western Rif Region, Arbaa Ayacha basin. This area is covered by more than 70% of agricultural land and it is considered as a key resource for food production for the local population of this Region. Erosion processes are evaluated at the erosion production zones (Marly's Eocene) and sedimentation zones (Quaternary fluvial terraces). The outcomes of the research showed that the basin is strongly exposed to erosion due to the geological formations, slope and land use with average losses about 28.4 t $ha^{-1}year^{-1}$. Presented methodology with using the IntErO model, shown that such approach would be a useful tool for the analysis of soil erosion processes in the other Mediterranean river basins with similar Physical-geographical characteristics.

Keywords: Soil erosion, IntErO model, Erosion Potential Method, North Morocco.

Assessing the impacts of land cover change in soil erosion risk in the Nepal Himalayas

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Abstract: Soil erosion is a severe environmental problem, and Land Use Land Cover Changes (LUCC) have significant impact on it. Being a hilly country with undulating topography accompanied with heavy rainfall, Nepal is predisposed to natural hazards including soil erosion. We studied the LUCC in Sarada, Rapti and Thuli Bheri river basins of Nepal during 1995–2015 period using the remote sensing, and then calculated mean annual soil rates using the Revised Universal Soil Loss Equation. Our results suggest that an increase in the agricultural lands at the expense of bare lands and forests escalated the soil erosion through the years; rates being 5.35, 5.47 and 6.03 t ha^{-1} $year^{-1}$ in 1995, 2007 and 2015, respectively. Of the different land use, agricultural land experienced the most erosion, whereas the forests experienced the least. Our study confirms that the long term LUCC has considerable impacts on soil losses, and these results can be rapidly applied in similar river basins in other parts of the country.

Keywords: Agriculture, river basin, Revised Universal Soil Loss Equation, LUCC

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Evaluating the impact of land use land cover change on soil loss and sediment delivery ratio across the West Rapti River basin, Nepal

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Abstract: This study aims to evaluate soil loss and sediment delivery ratio (SDR) using Integrated Valuation of Environmental Services and Tradeoffs (InVEST) SDR model. We applied the InVEST SDR model in West Rapti River basin (WRRB), Nepal to map overland sediment generation and delivery to the stream. Sediment dynamics at any watershed are controlled by climate (in particular rainfall), soil properties, topography, vegetation, and anthropogenic factors. A shift of land use land cover (LULC) may significantly alter the amount of sediment detaching and running off the watershed. Understanding where sediments are produced and delivered allows planners to manage sediment with appropriate interventions. We used three different periods of LULC data (1990, 2000, and 2010) produced by the International Centre for Integrated Mountain Development (ICIMOD). Agricultural land (Forest) covers 26.7% (66.8%), 32.07% (61.9%) and 31.93% (62.15%) of the WRRB in 1990, 2000, and 2010 respectively. We found the decrease in forest area was compensated by an increase in agricultural land. Future LULC for 2030, 2040 and 2050 were projected using a land change modeler in TerrSet. It was projected that the percentage coverage of agricultural land (forest) of the study area may reach to 36.5% (58.8%), 38.5% (57.2%), and 40.2% (55.5%) in 2030, 2040, and 2050 respectively. The amount of soil loss was estimated using revised universal soil loss equation (RUSLE). A small rate of soil loss was produced from forest land. In contrast, a significantly huge rate of soil loss was produced from agricultural land. The projected increment of agricultural land in future periods showed accelerating soil loss under changing LULC. For estimating SDR, the InVEST SDR model computes the connectivity index (IC), a function of upslope area and flow path to nearest stream. The SDR at any point is then derived from the information of IC using Vigiak et al. (2012). The combination of RUSLE and SDR provides information on sediment export and retention. Assessment of sediment volume reaching the stream and deposited on the landscape, meaning not reaching the stream, and their spatial distributions can serve valuable information for sediment and LULC management.

Keywords: land use land cover, sediment delivery ratio, soil loss, West Rapti River basin

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Environmental modelling and computer-graphic simulation for the analysis of physical-geographical characteristics of watersheds: Case study Zim Potok, Montenegro

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Abstract: Global change refers to planetary-scale changes of the land, oceans, atmosphere, the planet's natural cycles and processes. These constituent parts of the Earth systems influence one another and now includes human society, so global change also refers to large-scale changes in society and the subsequent effects on the environment. This situation of environmental degradation should be stopped without further delays, with thinking and planning globally, but dealing locally. Every, even minor positive initiatives, we should count as worthwhile contribution to protecting natural resources from the degradation. Therefore, we need innovative theoretical and practical scientific approaches. The urgency of the problem poses a challenge to environmentally oriented informatics. Important methods and tools are modelling and simulation: a problem solving method where problems are solved not by experimentation with real world systems but by experiments using models of real world objects. This paper gives a short report on environmental modelling and computer-graphic simulation for the analysis of the physical-geographical characteristics of watersheds with the idea to offer guidelines for the protection on soil erosion process to this Region, but also worldwide, where possible to apply. From global to local, we offered to present soil erosion modelling approach in one small watershed in the North Montenegro: Zim Potok from the Polimlje Region. Application of some models for calculation of soil erosion intensity, earlier developed in Yugoslavia, afterwards in Montenegro will be discussed in this study: Erosion Potential Method (Gavrilovic 1988); River Basin Model (Spalevic, 1999, Spalevic et al, 2000); Surface and Distance Model (Spalevic, 1999); IntErO and WIntErO models (Spalevic, 2001). Requirements and approaches to the software tools for model description and simulation systems will be presented. The present research is based on the previous available data imported from the IntErO model (Spalevic, 2011) to the new WIntErO model, amending some specific inputs related to the land use that have changed in the last decade, what allowed the calculation of the soil erosion and runoff of the studied region. The value of Z coefficient was calculated on 0,243 in the previous research what indicates that the river basin in that time belongs to the 4th destruction category (of five). The strength of the erosion process was weak, and according to the erosion type, it was surface erosion. The present erosional condition is different with the research from 2010, where the value of Z coefficient is 0,429; 3rd destruction category, with the medium strength of erosion process and surface erosion within the basin. Production of erosion material in the river basin, Wyear, was 2000 m^3 year^{-1}, while for 2020 it was 4600 m^3 year^{-1}. The net soil loss for the studied river basin was 630 m^3 per year, 140 m^3 per square kilometre per year (2010); 1400 m^3 per year, 330 m^3 per square kilometre per year for 2020. According to both calculations (2010, 2020) there is a possibility for large flood waves to appear in the

studied river basin of Zim Potok Watershed. Comparing the previous and current calculations results, the soil erosion intensity increased significantly during the last decade. This result related to the stated increase could be accepted with strong reservations, because of the different teams processing approaches and estimations of the inputs on land use taken from the field, but also calculated from the maps. For this new calculation (2020) we didn't use validation of the model applied for the studied period, like we did it for the previous (2010), with applying bathymetry in the studied region (2010). However, the experience with using of the new WintErO model and the previous research experiences gained with the River Basins and IntErO models, all the models may be recommended for soil erosion modelling in the river basins similar to the studied watershed. New initiatives may be expected in relation to the WintErO model. Sustainable Integrated Watershed Management (SIWM) paradigm is becoming more important in terms of managing and protecting natural resources. The biggest problem is that the state organization and structure of the legislation are not appropriate for SIWM paradigm (Göl et al, 2017). There are incompatibilities in the shareholders' expectations and requests that make development of such approaches more complex. After these initial steps with establishing database and testing the use of models, further studies in this region should also investigate the administrative, legal, economic and ecological problems in terms of Sustainable Integrated Watershed Management, and establishment of the more detailed database, using the presented models as a good support to the decision making in relation to the subject analyses.

Keywords: Erosion Potential Method, Surface and Distance Measuring model, River Basin Model, IntErO model, WintErO model.

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Abstracts

Soil erosion modelling using the WIntErO model: Case study River Basin Pisevska Rijeka, Polimlje, Montenegro

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Abstract: The Polimlje region is a geographical entity that is covering territory of North-eastern Montenegro, western Serbia and eastern Bosnia & Herzegovina. This research demonstrates the use of the new computer-graphics model WIntErO, successor of the IntErO model of Spalevic, all based on the Erosion Potential Method of Gavrilovic, for calculation of runoff and sediment yield in the Pisevska Rijeka from the North-eastern Montenegro. The present research is based on the previous available data imported from the IntErO model, amending some specific inputs related to the land use that have changed in the last decade, what allowed the calculation of the soil erosion and runoff of the studied region. The value of Z coefficient was calculated of 0.414 in the previous research what indicates that the river basin in that time belongs to the 3rd destruction category (of five). The strength of the erosion process was medium, and according to the erosion type, it was surface erosion. The present erosional condition is slightly different with the research from 2010/2015, where the value of Z coefficient is 0.370; 4th destruction category, with the weak erosion process and intrusive erosion within the basin. The calculated peak discharge from the river basin was 253 m^3s^{-1} (2010-2015); nowadays 254 m^3s^{-1} for the incidence of 100 years. Production of erosion material in the river basin, Wyear, was 11031 m^3 $year^{-1}$, while for 2020 it was 13037 m^3 $year^{-1}$. The net soil loss for the studied river basin was 4903 m^3 per year, 372 m^3 per square kilometre per year (2010); 5795 m^3 per year, 439 m^3 per square kilometre per year for 2020. According to both calculations (2010, 2020) there is a possibility for large flood waves to appear in the studied river basin of Pisevska Rijeka River Basin. Comparing the previous and current calculations results, the soil erosion intensity increased for about 15% during the last decade. This result related to the stated increase could be accepted with slight reservations, because of the different teams processing approaches and estimations of the inputs on land use (Plough-lands: 2.6; Orchards: 1.69; Mountain pastures: 25.37; Meadows: 14.9; Degraded forests: 12.18; Well-constituted forests: 43.26 (2010); Plough-lands: 2.08; Orchards: 1.76; Mountain pastures: 26.39; Meadows: 15.5; Degraded forests: 12.67; Well-constituted forests: 41.61 (2020)). On the other hand, the experience with using of the new WintErO model and the previous research experiences gained with the IntErO model, both models may recommend for soil erosion modelling in the river basins similar to the studied watershed. New initiatives may be expected in relation to the WintErO model further development with the idea to become one of the standard tools for soil erosion modelling worldwide.

Keywords: Erosion Potential Method, IntErO model; Runoff; Soil erosion; WintErO model

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Biodiversity of subterranean waters: Redescription of poorly known Niphargus julius Stoch 1997 (Crustacea: Amphipoda: Niphargidae) from Italy

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Abstract: The subterranean waters of Europe, including Italy, have very rich subterranean fauna only partially known and discovered. As these waters are today under pressure of overexploitation and pollution, the subterranean fauna of these waters, including Amphipoda, can be partially or completely destroyed before its discovery and investigation. As the fauna of Amphipoda in the subterranean waters of Italy is very rich and highly endemic, one detailed research of these animals seems to be very urgent. The subterranean species *Niphargus julius* Stoch 1997 (Crustacea: Amphipoda: Niphargidae), known from Friuli-Venetia Giulia region in Italy, was only partially known, and this species is here redescribed and figured, and its taxonomical relation regarding other *Niphargus* species of Italy is discussed.

Keywords: Biodiversity, Crustacea, Amphipoda, Niphargidae, Italy

Diversity on physicochemical characteristics of wild apricots from inner Anatolia of Turkey

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Abstract: Wild apricot trees are distributed throughout apricot growing areas in Turkey and inner Anatolia region had valuable wild apricot trees, which shows high diversity in terms of plant and fruit characteristics. In this study, ten promising wild apricot genotypes pre selected in Gurun, Sıvas in inner Anatolia and morphological and biochemical analysis were done on those selections. The searched parameters included average fruit weight, flesh/seed ratio, soluble solid content, titratable acidity, antioxidant activity and total phenolic content. The results showed that wild apricot genotypes are very diverse. Fruit weight ranged from 17.22 g to 33.44 g and flesh/seed ratio ranged from 7.73 to 14.11, respectively. Soluble solid content and titratable acidity were between 13.44-24.04% and 1.01-2.19%. Total antioxidant capacity was determined by ferric reducing power (FRAP) assay and FRAP values varied from 3.69-5.88 mmol AA/l. The total phenolic contents ranged between 288-442 mg GAE/l. Results showed that all wild apricot genotypes had higher biological activity than cv. Hacıhaliloglu cultivar. This makes the utilization of wild apricots incredibly important for native populations both in terms of food security and economics.

Keywords: Wild apricot, phytochemicals, variation, bioactive content.

Production of grape and blackberry in unheated greenhouse at high elevation condition

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Abstract: Erzurum province is located 1900 m a.s.l and has very short vegetation period. Thus grape and blackberry production is not suitable in the province due to lack of heat summit and short vegetation period. In this study we aimed to attempt grape and blackberry production in summer months in unheated greenhouses. We used Karaerik and Narince grape cultivars and Bursa 2 blackberry cultivars in experiment. Fruit weight, fruit width, fruit length, the number of cluster per shoot, SSC (Soluble Solid Content), titratable acidity, vitamin C and pH of cv. Bursa 2 blackberry were 4.10 g, 19.73 mm, 21.06 mm, 5.43, 12.5%, 1.05%, 40 mg/100 and 2.3. For cv. Karaerik grape berry weight, berry width, berry length, cluster weight, SSC, titratable acidity, vitamin C and pH were 4.68 g, 17.81 mm, 21.58 mm, 276 g, 16.4%, 1.65%, 3.3 mg/100 g and 2.9. For cv. Narince Karaerik grape berry weight, berry width, berry length, cluster weight, SSC, titratable acidity, vitamin C and pH were 3.69 g, 18.17 mm, 18.37 mm, 362 g, 14.2%, 1.43%, 6.9 mg/100 g and 2.9, respectively. The results indicated that it is possible to growth blackberries and grapes economically in unheated greenhouse condition at 1900 m a.s.l.

Keywords: blackberry, grape, high altitute, production, greenhouses.

Diversity on horticultural characteristics of *Sambucus nigra* genotypes from Northeastern Turkey

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Abstract: Elderberry *(Sambucus nigra)* is one of the most important wild edible plants in Turkey's flora. In present study, black elderberry (*Sambucus* spp.) fruits sampled from 5 genotypes naturally found in Ardanuc town of Artvin province and evaluated for morphologically (shrub habitus, crown shape, trunk bark color, density of branches, inflorescences width and length, the number of berries per inflorescences and fruit weight). The inflorescences width and length were found between 11.15-14.07 cm and 8.68-14.56 cm. The number of individual fruits per inflorescence and fruit weight was in range of 143-202 and 0.10-0.16 g, respectively. The biochemical analysis included SSC (Soluble Solid Content), titratable acidity, juice yield, vitamin C, total polyphenol (TP), total monomeric anthocyanin (TMA), antioxidant activity (AA), specific sugars and organic acids in order to understand the variation among genotypes. Vitamin C content ranged from 22 to 32 mg per 100 g fresh weight. The TP concentrations of elderberry were greatly varied among different genotypes ranged from 413 to 456 mg gallic acid equivalent (GAE)/100 g fresh weight base (FW). TMA were in range of 350-401 mg cyanidin-3-glucoside equivalent per 100 g fresh fruit, respectively. Antioxidant activity was found between 5.80 and 8.06 mmol trolox equivalent per 100 g fresh weight basis. Citric acid and fructose determined as major organic acid and sugar for all genotypes. The results of the study indicate that wild edible elderberry fruits are nutritionally rich and high in phytochemicals, especially antioxidants and therefore can possibly play a significant and positive role in delivering a healthy and balanced diet.

Keywords: Less known fruits, elderberry, biochemical diversity, bioactive content.

The Effect of Altitude on Morphological and Biochemical Characteristics of Autochthonous Grape Cultivar 'Kabarcik'

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Abstract: The aim of this study to evaluate the effect of altitude (800 m, 900 m, 1000 m and 1150 m) on some important morphological and biochemical characteristics of autochthonous grape cultivar, 'Kabarcik' grown in Olur district in Turkey. Cluster weight, cluster length, cluster density, cluster stalk length, berry shape and berry skin color were investigated as morphological traits. Biochemical parameters included total phenolic content, total flavonoid content, phenolic acids, antioxidant activity, soluble solid content (SSC) and titratable acidity. Cluster weight and density are decreased with altitude increase but cluster stalk length is increased with altitude increase. Cluster weight were found between 192-281 g at different altitudes. Cluster length were determined as 19.82 cm, 17.56 cm, 15.16 cm and 14.88 cm at 800 m, 900 m, 100 m and 1150 m altitude, respectively. SSC and titratable acidity were increased with altitude increase. Total phenolic content, total flavonoid content, phenolic acids and antioxidant activity were found to be higher level at higher altitudes. The results indicate the importance of altitude of grape external and internal berry quality.

Keywords: Autochthonous grape cultivar, compositional change, altitude.

Diversity on carotenoids in wild apricot fruits

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Abstract: The apricot (*Prunus armeniaca* L.) fruit is considered as one of the most delicious temperate fruits and consumed because of its delicate flavor and high nutritional quality. Carotenoids are pigments which have a major impact on fruit color and nutritional value in apricot. Very little is known about the carotenoids' profile and the extent of its variation within different apricot (*Prunus armeniaca*) cultivars and in particular no reports has been published on wild apricots. In present study three yellow fleshed, three light orange fleshed and three orange fleshed wild apricots were analyzed. The hue angle, chroma color measurements and β-cryptoxanthin, γ-carotene, β-carotene, provitamin A and total carotenoides were determined. Total carotenoides increased from yellow fleshed to orange fleshed wild apricots. β-carotene was the dominant carotenoid pigment for all groups and all genotypes and followed by γ-carotene. β-cryptoxanthin and provitamin A almost equally presented in different color groups. The carotenoid content highly correlated with color measurements. and hue angle was found the most useful parameter with the best correlation (0.88 for flesh and 0.85 for peel).

Keywords: Wild apricots, carotenoid diversity, human health.

Stubble burning which may be the cause of wildfires and related legal regulations in Turkey

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Abstract: Stubble is the roots and stems of the crops harvested because of the agricultural production. Farmers use to burn stubbles for various purposes; however, burning stubble also has a negative impact on soil properties deteriorating soil quality and soil human health. In addition to the serious environmental pollution it creates, stubble fires can damage energy and communication lines within agricultural lands. On the other hand, stubble fires can also cause forest fires. For example, Mersin-Gülnar fire started on 07 July 2008 and 5037 hectares forest burned. Another example, 1228 hectares forest area burned with İzmir-Gaziemir / Gümüldür wildfire, which started on 20 July 2008. With the start of Turkey's EU integration process, it has begun to be a series of measures to prevent these malpractices. Penalties for stubble burning are implemented by the Turkish Republic of Directorate of Provincial Agriculture and Forestry, based on the Turkish Environmental Law published in the Official Paper dated 31 December 2018 and numbered 30642. In this case, according to paragraph I of Article 20th of Environmental Law No. 2872, farmers who burn stubble are punished with 60.11 Turkish Liras (approximately 9.25 Euros) per decare. If the stubble act is committed in places adjacent to forests and wetlands and in residential areas, the penalty is increased fivefold. In addition, this institution set out and follows some general provisions and responsibilities of harvester machine operators to prevent stubble burning. Global warming today threatens all ecosystems directly or indirectly. In order to improve the quality of life of human beings, it is necessary to fight against global warming and climate change in all areas. In this review, integrated information was given about harmful effects of stubble burning, laws applicable in Turkey against the stubble burning and some methods that can be applied instead of burning stubble.

Keywords: legal control measures; stubble; stubble burning; wildfires

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Official Paper (2018): Official Paper of Turkish Republic. Dated 31 December 2018 and numbered 30642.

Structural characteristics of the spruce – fir - beech forests: Case Study - Mountain Bjelasica, Montenegro

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Abstract: In this paper we compared the main structural characteristics of the mixed forest of beech (*Fagus moesiaca* (Domin, Maly) Czecz.), fir (*Avies alba* L.) and spruce (*Picea abies* L.) from the preserve area of the Biogradska Gora with similar managed forests from the same Mountain. Biogradska Gora National Park in Montenegro is part of the Bjelasica Mountain which belongs to the montane region of the Dinaric Alps is one of the largest long-term preserved forests in the south-east Europe. The results are confirmed the production potential of the studied mixed forests. Basic insight into the structural characteristics of forests of spruce, fir and beech was obtained by analyzing the two basic structural elements - number of trees and wood volume per unit area. The average quantity of standing volume in studied forests indicates that these are very valuable and productive forest ecosystems. The obtained data provides overview of the structural characteristics of these forests. Presented data shows that forest ecosystems of spruce, fir and beech in Mt Bjelasica are characterized by structurally irregular forests with presence of old trees with relevant growing stock, especially in the protected area of the National Park Biogradska Gora.

Keywords: mixed forest, Biogradska Gora, Bjelasica, Montenegro

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Viruses of Sour Cherry cv. Maraska in plantation "Vlačine", Croatia

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Abstract: Sour cherry var. Maraska (*Prunus cerasus* var. *Marasca*) is considered Croatian autochthonous variety dominantly produced in the region of Ravni kotari (North Dalmatia). Its origin dates to 14th century and is mainly used for liquor production (Cherry brandy, Maraschino) with big importance for local agriculture. In addition to its commercial value data about virus occurrence and frequency date back to 1980's. Two hundred trees from plantation Vlačine (200 ha) were selected and screened by enzyme-linked immunosorbent assay (ELISA) on the presence of 11 viruses: *Apple chlorotic leaf spot virus* (ACLSV), *Apple mosaic virus* (ApMV), *Arabis mosaic virus* (ArMV), *Cherry leaf roll virus* (CLRV), *Petunia asteroid mosaic virus* (PAMV), *Plum pox virus* (PPV), *Prune dwarf virus* (PDV), *Prunus necrotic ringspot virus* (PNRSV*), Raspberry ringspot virus* (RpRSV), *Strawberry latent ringspot virus* (SLRSV) and *Tomato black ring virus* (TBRV). Additionally, 17 ELISA-virus free trees were tested by reverse transcription polymerase chain reaction (RT-PCR) on four viruses: *Cherry mottle leaf virus* (ChMLV), *Cherry green ring mottle virus* (CGRMV) and *Little cherry virus 1* and *2* (LChV-1 and LChV-2). Samples of leaves were collected before harvest (June), while shoots were collected during dormancy (November) and used as a source of antigen. ELISA-results confirmed the presence of eight viruses: PNRSV (99 trees, 48,3%), PAMV and PDV (10 trees, 4.9%), RpRSV (7 trees, 3.4%), CLRV, ArMV and PPV (3 trees, 1.5%) and ApMV (1 tree, 0.5%). In six trees presence of LChV-2 was confirmed by RT-PCR. Symptoms observed in the field were necrotic ringspots on leaves (PNRV), yellowing and reduced growth (PDV), shoot tip deformations and bark cracking (PeAMV), leaf mosaic (PPV, ApMV), uneven fruit ripening (LChV-2). Significant number of infected trees were asymptomatic. Finally, 11 trees free of all 15 tested viruses were selected as potential mother plants for further pomological investigation and production of virus-free planting material.

Keywords: viruses; sour cherry; ELISA; RT-PCR, sanitary selection

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Prevalence of Phomopsis cane and leaf spot in the vineyards of Danilovgrad municipality

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Abstract: The grapevine is one of the most important agricultural crops in Montenegro. Many diseases make its cultivation difficult. Among them, Phomopsis cane and leaf spot caused by the phytopathogenic fungus *Phomopsis viticola* is of great significance (Latinovic and Latinovic, 2011). The disease occurs every year in vineyards in Montenegro and causes significant damages. The critical period for the infection establishment is the beginning of vegetation (Latinovic et al., 2008), which in our conditions is realized at the end of March and the beginning of April. Rainfall in this period is very important for the infection. In order to determine the prevalence of Phomopsis cane and leaf spot on grapevine in the municipality of Danilovgrad, ten vineyards were visited at the end of June 2019. There are six vineyards in the plain and four vineyards in the hills of the municipality. All examined vineyards have over 100 productive vines. In each vineyard five vines with all shoots were checked. Four basal internodes per each shoot were observed. The presence of Phomopsis cane and leaf spot symptoms on internodes is expressed as a percentage. The disease was recorded in each inspected vineyard. The disease intensity ranged from 5,1% to 67,3%. Higher intensity was noticed in the lowland vineyards in comparison to vineyards in the hills. The reason could be greater moisture accumulation during the critical period for realization of the infection in the lowland vineyards.

Keywords: Phomopsis cane and leaf spot, the disease intensity, Danilovgrad

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Some liverwort extracts suppress development of brown rot caused by *Monilinia laxa*

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Abstract: Bryophytes are unique group of plants, whose peculiarities are less known compared to vascular plants. There are many reasons for this: small size, small biomass, and identification problems, unknown biology of species and so avoidance of experimental approach to study their characteristics. It is widely accepted that a sub-group of bryophytes, namely liverworts, possess interesting chemical content but the biological activity tests are missing. With aim to overcome these disadvantages and search for environmental friendly control of fruit diseases, we tested three liverwort species (*Metzgeria furcata, Plagiochila porelloides* and *Chiloscyphus polyanthus*) extracts on the development of phytopathogenic fungus *Monilinia laxa,* causal agent of peach brown rot. *In vitro* laboratory tests were performed investigating the extract effects of Serbian liverworts accessions on Montenegrin peach fruit isolate of *Monilinia laxa.* The results obtained clearly showed that all tested extracts and their concentrations slow down the growth of fungal mycelium under *in vitro* conditions, but the two species extracts tested had limited effect for wider application. In contrast, the extracts of *Chiloscyphus polyanthus* clearly suppress the growth of *Monilinia laxa,* irrespective of extract concentration applied (5, 10 or 15 μl) compared to control treated with distilled water only (statistical significance $P<0.01$). This can promise the development of bio-treatment of brown rot disease in peach fruits, decreasing the economic damages and increasing the organic production. The obtained data are in accordance with the already achieved results of similar research (Latinovic et al., 2018; Latinovic et al., 2019).

Keywords: *Metzgeria furcata, Plagiochila porelloides, Chiloscyphus polyanthus, Monilinia laxa*

Acknowledgement

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Application of molecular biology tools for efficient and science-based microbial risk assessment in Food Safety area

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Abstract: The food is a global language, it is the primary form of cultural expression that joins people together. Food research is always something more than a profit, it has a significant impact on human health, economic growth and world sustainability. The globalization of food markets, climate change, changes in people's lifestyles are just some of the serious threats to food security and overall public health. Thus, the food safety area is facing intractable problems with many interdependent factors that require different approaches for their understanding and overcoming. Broader perspectives are needed to provide a better view for optimizing and employing emerging tools to identify and address key points of intervention. Today, production of safe food is a global challenge. According to the European Food Safety Authority (EFSA) the number of reported cases of infection due to consumption of contaminated food is increasing, despite the numerous measures taken at national levels in EU countries. The United States Center for Infectious Disease Prevention and Control (CDC) estimates that in the United States approximately 48 million people become infected with foodborne pathogens each year.
Risk assessment represents the globally accepted methodology for the provision of the structured information for decision making, public health improvement, regulatory actions and research initiatives. The four very distinct steps in the risk assessment process enable risk management and risk communication, namely the functioning of the food safety system. Identification, characterization and assessments of risks demands the application of scientifically- based, accurate and reliable methodologies in place. There are several different widely recognized approaches to risk assessment nowadays applied worldwide. In the area of microbial food safety risk assessment the ultimate standard for obtaining the accurate results are molecular microbiology techniques, enabling accurate identification of pathogens in the food production chain. Novel omics technologies are benchmarking the new era of pathogen testing, providing much more than just accurate identification. The science has now opened the door for more integrated approach that can enlighten transmission patterns and predictions of the transmission routes merging data on virulence, interaction of pathogens with different food matrices and the host, multiple data processing resulting in reliable and science-based responses to the forthcoming challenges.
This paper provides a structured outline of the contemporary approaches to microbial risk assessment in the area of food safety based on the application of the molecular-biology techniques and foodomics.

Keywords: food safety, microbiological risk assessment, foodomics

Organic pomegranate orchard establishment and management

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Abstract: Pomegranate as an ancient fruit, originates from Iran and surrounding areas. At the recent years, its popularity has increased due to its nutritional value and healthy ingredients. Consumer demand for healthier fruit and more environmentally friendly agriculture has led many producers to use integrated or organic management in orchards. This article examines the pomegranate orchard located in northern Iran, which has been established and managed on the basis of organic principles. Five years before the orchard was established, no chemicals were used on the land. Management is done with the exception of the use of artificial fertilizers, pesticides, fungicides, herbicides, growth regulators. Cultural practices include crop rotation, crop residues, animal manures, legumes, green manures, organic fertilizers, mechanical farming, mineral rocks and biological pest control aspects to preserve soil nutrients and productivity and control pests, diseases and weeds without disturbing environment and sustainability.

Keywords: Iran; Organic; Pomegranate; Sustainable agriculture

Effect of phosphorus fertilization on microelements content in lettuce

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Abstract: Lettuce (*Lactuca sativa* L.) is an annual plant of the Asteraceae family, which is grown as a leafy vegetable. Worldwide lettuce is mostly produced on soil. For its development during vegetation, lettuce requires essential macro and microelements, which uptake by root system. Microelements are present in lettuce in lower content than macroelements, but are essential for its development, as they contribute many physiological processes in the plant. There are many factors which effect content of microelements and one of the most important ones is fertilization. The goal of this research was to determine the effect of fertilization by different phosphorus forms on microelements content in lettuce. The field fertilization experiment was set up in Velika Kosnica (Zagreb County, Croatia) with lettuce cultivar 'Aquarel' according to the Latin square method with three fertilization treatments: T1 (control, without fertilization), T2 (500 kg/ha YaraMila Complex; phosphorus in polyphosphate form) and T3 (370 kg/ha Petrokemija NPK 15-15-15; phosphorus in orthophosphate form). Average lettuce leaves samples were cut up, dried at 105°C and homogenized. The samples were digested by nitric acid (HNO3) and perchloric acid (HClO4) in microwave owen. Iron, zinc, manganese and copper were determined by atomic absorption spectrometry-AAS. Nitrogen was determined by the Modified Kjeldahl method and dry matter was determined gravimetrically by drying until constant mass. The highest dry weight (DW) content was determined in T3 treatment (8.85 % DW). Microelements content in dry matter of lettuce leaves (mg/kg dry matter) ranged: Fe 1280-2373, Mn 54.1-87.6, Zn 36.0-48.5 and Cu 9.4-10.7, while in fresh matter (mg/100 g fresh matter) it ranged: Fe 10.5-20.6, Mn 0.30-0.41 Zn 0.45-0.76 and Cu 0.078-0.091. The highest values of microelements were determined in the treatment without fertilization (T1) because potassium, applied in fertilization treatments, probably had an antagonistic effect on their uptake.

Keywords: iron, *Lactuca sativa* L., micronutrient, polyphosphate, vegetable

What is the Smart Watershed Management?

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Abstract: Smart management (SM) in different aspects of our planet earth is an emergence tool for today's world. Since the watershed is a basic unit for all agricultural, environmental, and socioeconomic researches and developments, so SM practicing at the watershed scale is critical. In this sense, SM in a watershed scale could be introduced as the application of the modern Information and Communication Technologies (ICT) into watershed management practices to provide added value in the better decision making or more efficient exploitation operations and management. In this way, different ICT solutions such as precision equipment, the Internet of Things (IoT), sensors, geo-positioning systems, big data, unmanned aerial vehicles, and robotics need to be adapted by watershed stakeholders viz. the residents, farmers, experts, land planners, and managers, as well as the decision- and policy-makers. The smart watershed management (SMW) is associated with almost every luxury in our life and included all principles and concepts of smart water management, smart farming, smart city development, etc. It is essential to choose appropriate smart technologies that could be possible by comparing conventional technologies and new ones, balancing traditional infrastructures with green alternatives, mixing local and global knowledge, adapting alternatives from abroad to local conditions, dealing with environmental and social impacts of the alternative technologies. All these decisions require technology evaluation and assessment tools and good watershed governance so as to ensure transparency and inclusiveness. It is definitely challenging to ensure the proper utilization of watershed resources, but proper implementation of smart technologies in the watershed will surely make our lives convenient and conserve our valuable resources. SMW can provide great environmental and economic benefits.

Keywords: Intelligence techniques; Market dynamic; Precise adjustments; SMART data

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Identification of ground water potential zones and drainage basins for surface water identification using remote sensing in SRBC Area of Kurnool Region, Andhra Pradesh, India

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Abstract: The proposed study is an effort to map the ground water potential zones and establish a drainage map pattern for the region enclosed by the SRBC and the Kundu river to identify rain water discharge zones in the area between Kurnool and Nandyal in Andhra Pradesh. An extensive survey was conducted to identify the ground water logging conditions and similar data for the Kurnool basin for 2017. Using this data a map of ground water potential zone of the boundary of Andhra Pradesh was developed. The area is very significant as it lies in the Hyderabad to Ongole Highway. A topographic map of the area of the interest had been generated. We also created a slope map of the area; a TIN with Contour map with the area of interest and map to identify the stream order to identify the flow accumulation lines using Stroler Method. Watershed Dilineation Zone of interest was developed also including a Digital Elevation Map for the gradation of the contour stream points. With this approach we are able to identify the reservoir points to detect the rainwater potential zones and water movement within the reservoir.

Keywords: Groundwater prospecting, DEM, GIS, Remote Sensing, Srisailam Righ Bank Canal

Changes in physico-chemical characteristics of Beaten cheese during manufacture

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Abstract: In our country consumers' interest in traditionally obtained cheeses is increasing, and milk processing capacities are making efforts to industrialize their production process. The most commonly requested traditional cheeses include beaten cheese. Beaten cheese is a dairy product, whose technology of production and consistency approximates the technology of hard cheese, while according to the method of ripening and storing it is one of the types of cheeses that ripen in brine. The subject of our research was to determine the quantitative changes that occur in the ripening of industrially obtained Beaten cheese by analyzing the physico-chemical parameters (pH, titration acidity, percentage of NaCl, moisture and dry matter) characteristic of it. From the obtained results it can be seen that during the ripening there are notice changes of the analyzed parameters that condition the ripening process, i.e. the decrease in pH and the percentage of moisture content, and the increase in titration acidity and the percentage of dry matter, result in a decreased intensity of the ripening process. In addition, the continuous increase in NaCl content is a result of the salting mechanism.

Keywords: traditionally produced beaten cheese, acidity, NaCl, moisture, dry matter

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Effect of long-term application of mineral fertilizers on soil

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Abstract: Soil reaction is one of the basic characteristics of any soil, which has great importance on the growth and development of plants. The value of Ph is for virgin lands, within the same type is largely constant and makes a significant characteristic of a particular type of land. However, by bringing land to agricultural production, the response of the land is generally changing, and the speed and direction of this change depends most on the buffer properties of the land, as well as on the application of different agro-technical measures. The aim of this research is to show how long-term exclusive application of mineral fertilizers affects soil acidification. Experiments with the exclusive application of different doses of mineral fertilizers on two-field crop rotation (maize, wheat) were established in 1963 in the field experiment of the Institute of Soil near Mladenovac, (44 ° 24'58''N and 20 ° 10'34''E), on the land of the eutric cambisol type. To study the effect of the application of mineral fertilizers, soil samples from the soil horizon (0-25 cm) from the following treatments were analyzed for acidification of the soil relative to the initial state: 1. Control (without fertilization); 2. N1P2K2 (60/90/80 kg / ha kg ha-1); 3. N2P2K2 (90/90/80 kg / ha kg ha-1); 4. N3P2K2 (120/90/80 kg / ha kg ha-1); 5. N4P2K2 (150/90/80 kg / ha kg ha-1). All of these variants have 4 repetitions and from all 2019 average samples were taken from which the following chemical analyzes were determined: active and variable acidity, hydrolytic acidity, sum of adsorbed base cations, exchangeable aluminum, while the degree of saturation with base cations was determined by calculation. It has been stated that long-term application of mineral fertilizers on this soil has a significant impact on the process of acidification of the soil. Compared to the initial state of 1963, there was a marked decline in active and alternating acidity. At that time, the value of active acidity was 6.2 and the potential value was 5.2, while in 2019 these values ranged from 5.6 for active and 4.35 for potential acidity in the control variant to 4.6 for active and 3.6 for potential acidity in the soil with the highest amount of applied mineral fertilizer (N4P2K2). All fertilizer treatments had an increase in hydrolytic acidity compared to the baseline when this value was 9.5 cc 1 while the average for the fertilizer treatments was 14.4 9.5 cc 1 in our test. The content of exchangeable aluminum was increased in all treatments and there was a statistically significant increase in the amount of fertilizer applied. In the fertilizer treatments, the degree of saturation of the base cations decreased from the initial value of 74.3% to below 50%. Based on this research, we can conclude that many years of exclusive use of mineral fertilizers influenced the transition of this initially eutric soil to distric.

Keywords: soil reaction; mineral fertilizers; eutric cambisol.

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Influence of soil tillage systems and weed control strategies on soybean production under conditions of the Transylvanian Plain, Romania

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Abstract: Soybean is one of the most valuable agricultural plants, being useful for human nutrition, animal nutrition and industry. Soybean, being a leguminous, contributes substantially to the increase in fertility of the soil. The aim of the presented paper is to identify an integrated weed control strategy for soybean culture, starting from: (1) soybean culture requirements towards environmental and technological factors (soil tillage system) so that they can compete effectively with weeds ; (2) knowing the influence of the conventional tillage system, minimum tillage systems and no-tillage systems on soybean culture; (3) reporting the weed control strategy to new climatic conditions through specific adaptation measures; (4) research of chemical strategies with complementary herbicides as a spectrum of combat and application time. The soil type, soil tillage system influences the development of the nodosity, the productivity elements and finally the soybean production. Soybean is a plant with small-sized, belongs to the group of agricultural plants easily compete weeds which produce large production losses (30-80%), sometimes even compromising the culture. The most common weeds encountered in soybean culture are, in particular, late spring germination but not only: Echinochloa crus-galli, Setaria sp., Digitaria sanguinalis, Sorghum halepense, Agropyron repens, Solanum nigrum, Amaranthus retroflexus, Chenopodium album, Galinsoga parviflora, Xanthium sp., Abutilon theophrasti, Datura stramonium, Polygonum sp., Cirsium arvense, Convolvulus arvensis etc. Direct sowing system has had a positive influence on the accumulation of water in the soil. The average of the accumulated water supply, during the experimentation period (2017-2019), shows a value of 531 m3/ha at direct sowing, compared to 327 m^3/ha of the conventional system with plow. This difference is also found in the number of soybean nodes, being 102 nodes/10 soybeans to the conventional system and 143 nodes/10 soybeans, to the direct sowing system. The registered production represented 2745 kg/ha in the conventional system and 2862 kg/ha in the direct sowing system. Introducing soybean culture after crops which leaves the field weeds clean, rotation of crops and herbicides, proper performance of soil tillage systems, destruction of emerging weeds in the preparation of the germinating bed, and the choice of the optimal sowing period, contribute in a great measure to the reduction of soybean weed infestation. For the maintenance soybean crops without weeds, two chemical treatments, the first ppi/preemergence for annual monocotyledons and some dicotyledons, and the second postemergent treatment for dicotyledons are generally required.

Keywords: soil tillage system, weed control, production, soybeans.

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Real-Time Measurements and Analysis of Air Pollution Parameters

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Abstract: Air pollution is the fourth biggest killer in the world after smoking, high blood pressure and bad diet, according to World Economic Forum statistics. According to the United Nations, 55 percent of the world lives in urban areas. Around 98 percent of people in European cities are living with exposure to ozone levels way above the World Health Organization's recommendation. This is an important reminder why we need to reorganize the city experience around technology and IoT in order to make urban places a healthier and safer place for living. In order to provide continuous monitoring and real-time measurements of air pollution parameters we developed a modular Smart Environmental Monitoring and Reporting system. The aim of the system is to enable automated and online ecological air parameters monitoring and processing. In this paper we will present the electronic background of the system as well as the analysis of the on-field measurements' results collected at several pollution hotspots across Montenegrin territory.

Keywords: Air pollution; Air measurements; Internet of Things;

Detailed temporal and spatial topsoil moisture content changes in a small agricultural catchment in the Czech Republic

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Abstract: The spatial distribution of top soil moisture can provide information about the hydrological connectivity and runoff generation process within a catchment. However, detailed topsoil moisture spatial pattern and its variability in time has not been clear at the Nucice experimental catchment, the Czech Republic (0.53 km2), which is mainly covered by crops. This study aimed to investigate the spatial variability of moisture content in the topsoil of the Nucice catchment. To accomplish this, we conducted seven detailed field surveys with Hydrosense II probes (Campbell Sci., UK) to measure the spatial moisture distribution at the hillslope-scale, and field-scale. Among all the surveys, we applied geostatistical method (kriging interpolation) with the measured data to identify the spatial patterns of the topsoil moisture content across the field. Further, the spatial patterns were mainly compared with topography and hydrological connectivity index within the catchment. Also, we connected the measured soil moisture data with meteorological data to understand the changes of topsoil moisture content with the variation of precipitation and air temperature. Soil moisture monitoring at the field-scale will be strengthened by using remote sensing and Cosmic-ray soil moisture probes. Also, the identified soil moisture spatial pattern will be further applied in the hydrological modelling of the catchment. Future study will focus on the spatial-temporal changes of the soil moisture within the catchment with hydrological modelling process.

Keywords: Topsoil moisture, Agricultural catchment, Runoff, Czech Republic

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Impact of phytotechnological interventions on carbon sequestration in an organic vineyard

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Abstract: In modern viticulture crop and canopy growth are usually strictly regulated. This does not only influence yields but also the carbon cycle and carbon sequestration in soils which is studied in the Villány Wine District, SW-Hungary, as part of an international agroecological project. A phenometric approach is employed to follow changes in crop and biomass growth through the interpretation of segmented images. The distinction between grapevine and intercrop growth, however, requires further refinement in image analysis. In the laboratory TOC, Ntotal values were established for both the soil and the plant organs as well as for the eroded sediments. The analyses of carbon cycle also involved greenhouse gas emission and net photosynthesis measurements. Looking at the change of Leaf Area Index (LAI) over the growing period, image analysis pointed out the role of cut shoots from pruning in the C and N cycles. Maximum leaf area (at ripening) for guyot cultivation technique was extimated at 7,840 m2 ha-1. The removal of cut shoots ensures optimal C/N ratios (around 25:1) in the soil. In the middle term, the removal or recycling of the biomass produced by pruning and hedging as well as the mowing of cover crops and fallen leaves significantly influence C and N recharge of the soil.

Keywords: crop growth, organic vineyard, Leaf Area Index, C/N ratio, carbon sequestration, biomass, image analysis

Crop water productivity and economic return of rain fed potato-legume intercropping systems

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Abstract: Reliance on rain-fed potato-legume intercropping systems among resource constrained smallholder farmers is usually ineffective without considering their economic viability. A field experiment conducted at the University of Nairobi, Kenya, in the growing seasons of 2014 to 2016 evaluated the effect of intercropping potato with legumes on soil moisture content (SMC), evapotranspiration (ET), potato equivalent yield (PEY), net income and crop water productivity (CWP) based on PEY (CWP_{PEY}) and economic returns (CWP_E). The treatments comprised of pure potato (*Solanum tuberosum* L.) stand (PS), potato-dolichos (*Lablab purpureus*) (PD), potato-garden pea (*Pisum sativum*) (PG) and potato-bean (*Phaseolus vulgaris*) (PB). Results showed significantly higher SMC values at tuber initiation stage: 77, 69, 67 and 62 mm in PD, PG, PB and PS, respectively. Fresh tuber yield was highest in PS (36 t ha^{-1}) and PD (35 t ha^{-1}) and lowest in PG (29 t ha^{-1}). PEY was higher under intercropping than monocropping systems. The lowest ET values that were recorded in PS (630 mm) and PG (631 mm) differed significantly from those in PB (636 mm) and PD (642 mm). Potato-dolichos was the most profitable cropping system with a net income of 9,174 US$ ha^{-1} and a BCR of 5.7 compared to PS (7,436 US$ ha^{-1}) with a BCR of 5.1. CWP_{PEY} varied significantly between cropping systems in the order of PD (6.2 kg ha^{-1} m^{-3}) > PB (4.7 kg ha^{-1} m^{-3}) > PG (4.3 kg ha^{-1} m^{-3}) > PS (2.3 kg ha^{-1} m^{-3}). A similar trend was observed for CWP_E with values of between 1.3 US$ ha^{-1} m^{-3} for PD and 1.5 US$ ha^{-1} m^{-3} for PS. The study shows that dolichos is a viable legume crop that could be integrated into potato cropping systems to improve their CWP without compromising the tuber yield.

Keywords: Intercropping; evapotranspiration; potato equivalent yield; economic returns

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Silicon exerts additive effects on phosphorus acquisition by potato intercropped with chickpea

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Abstract: The role played by silicon (Si) and legume intercropping in nutrient acquisition by potato crop has been neglected in most studies. A field trial integrating potato (*Solanum tuberosum* L.) with chickpea (*Cicer arietinum* L.) in intercropping system was conducted over six (6) growing seasons in the upper midland (1552 m above sea level) agro-ecological zone of Kenya. The intercropped chickpea secreted enzyme phosphatase into the rhizosphere (5.1–27.1 mol g^{-1} fwt h^{-1}) thus mobilizing organic (4.2–18.9 mg kg^{-1} soil) and inorganic phosphorus (6.9–42.8 mg kg^{-1} soil). This increased phosphorus availability and acquisition by the intercropped potato. Chickpea took up more cations than anions, resulting in net proton efflux (43–105 mmol kg $soil^{-1}$) with a significant decrease in rhizosphere pH. This acidic medium enhanced Si solubilization, increasing Si^{+} ions, which competed with Fe^{3+} and Al^{3+} ions for specific soil phosphorus sorption sites. Provision of sustainable seed supply systems for chickpea and market linkages for water-soluble silicon are necessary for adoption of this innovation.

Keywords: Chickpea; carboxylate acid; enzyme phosphatase; intercropping; silicon.

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Unlocking legume intercropping technology in smallholder potato farming systems for climate change adaptation

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Abstract: A large portion of sub-Saharan Africa is situated in belts of uncertain rainfall and is characterized by low soil fertility with limited capacity to adapt to and mitigate the impacts of climate change. A study was conducted in semi-humid potato growing belt of Kenya to test the effect of legume intercropping and water soluble silicon (Si) on soil erosion control, and on use efficiency of light and water. Two forage legumes, Dolichos (*Lablab purpureus* L.) and hairy vetch (*Vicia sativa* L.), were intercropped with a heat and water stress tolerant potato (*Unica*) in a 2: 2 row arrangement. Silicon was applied to each cropping system in granular form at planting and as foliar at vegetative stage of potato growth and compared with no Si treatments. Intercropped potato subjected to Si application maintained significantly higher ($p \leq 0.05$) relative leaf water content, higher concentrations of chlorophyll and greater leaf area index. These treatments accumulated significantly higher proline content and thus alleviated heat load on potato. Intercropping reduced soil loss by up to 80% compared to sole potato. Yield measured in terms of potato equivalents was 2–3 fold greater in intercropping relative to sole potato. Productivity of water and light were 35–75% greater in intercropping than in sole potato and increased with Si application. Combined application of Si and legume intercropping is a novel technology to conserve soils, increase resource use efficiency, and thus adapt farmers to adverse effect of climate change.

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Spatial variability of soil properties in a 2-year field cultivated with potato-legume intercrops

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Abstract: Characterization of soil physical and chemical properties is a fundamental step in understanding soil fertility dynamics under potato-legume-based cropping systems. A study was conducted in a clayey subtropical Nitisol (Alfisol) at Kabete Field Station, University of Nairobi to assess the spatial variability of selected soil physico-chemical properties following a two-year cultivation under potato-legume intercropping systems coupled with ploughing back of crop residues. The experiment was laid out on a sloping land in a randomized complete block design with four replicates. The treatments were potato-dolichos (*Lablab purpureus* L.) (PD); potato-garden pea (*Pisum sativum* L.) (PG); potato-bean (*Phaseolus vulgaris* L.) (PB) intercropping systems; and a pure stand of potato (*Solanum tuberosum* L.) (PS). Under PS, PG and PB, clay and silt increased significant ($p \leq 0.05$) down the slope whereas, an opposite observation was made for sand and bulk density. Nonetheless, under PD, slope position had no significant effect on soil physical properties. In all cropping systems, a significant increase was observed down the slope for pH and cation exchange capacity (CEC). Similar observations were made for phosphorous (P), nitrogen (N) and organic carbon (OC) under all the cropping systems except PD. All the soil chemical properties were inversely correlated to sand (r = 0.33–0.39; $p \leq 0.05$) and BD (r = 0.45–0.84; $p < 0.001$) but positively correlated with clay (r = 0.38–0.49; $p < 0.001$). This study has established that PD is a viable intercropping system, which could be adopted by the smallholder potato farmers for higher tuber yield and improved soil fertility.

Keywords: Soil fertility; physico-chemical properties; slope position; crop residue incorporation.

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Aggregate breakdown and soil compaction processes in an agricultural marl soil as affected by rainfall events

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Abstract: The study was conducted to investigate temporal variations of the aggregate breakdown and soil compaction processes in an agricultural marl soil under simulated rainfall in 2010. The experiment was carried out as a completely randomized design with eight rainfall duration (time) treatments at three replications. Twenty four soil boxes with a dimension of 30×40 cm and 10 cm depth were filed with the aggregates (6-8 mm) and placed under a rainfall simulator at eight rainfall durations. The aggregate breakdown and compaction values were respectively obtained based on the comparison of the mean weight diameter of the aggregates and the soil bulk density before and after of rainfall events. The results indicated that there was a significant correlation between the rainfall duration and the both the aggregate breakdown (R^2= 0.92, $p<0.01$) and compaction (R^2=0.82, $p<0.05$) processes. The aggregate breakdown rate increased from the beginning time of rainfall to 37.5 min due to continuing raindrop impacts and increasing soil wetting. After this time, the aggregate breakdown rate gradually (nonsignificantly) increased in the boxes. Soil compaction remarkably increased accordingly with the aggregate breakdown to 45 min. At least time (60 min), soil compaction declined due to fulling soil pores with rainwater and declining the distance of the soil particles. There was a positive- significant correlation between the soil compaction and the aggregates breakdown (R^2=0.89, $p<0.001$).

Keywords: Rainfall duration, Soil moisture, Raindrop impact, Rainfall erosion

Changes of Annual and Monthly Precipitations of Probability Distributions for Different Climate Types of the Turkey

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Abstract: Probability density functions and precipitation frequency analyses play an important role in statistical precipitation models and climate change assessments. Especially heavy precipitations are used in design of hydraulic structures to minimize or prevent the damages in settlements along the river sides. Turkey has a diverse range of climates. Each region has specific climate characteristics. Therefore, change in precipitations should be assessed separately for each region. In this study, 52-year precipitation data covering the years 1967-2018 of precipitation stations in Trabzon, Ordu and Giresun provinces of The Black sea climate were used. Change and trends in precipitation data were assessed through the use of normal (N), log-normal (LN), three-parameter log-normal (LN III), Gamma (GAM), Pearson type III (P III), Gumbel, three-parameter Weibull (WE III) and logarithmic logistic (LLO) distributions and L-Moment analysis. Fit of these distributions to available data was checked with the use of various goodness of fit tests and Kolmogorov-Smirnov (K-S) test besides information criteria such as AIC, BIC. With the use of these goodness of fit tests, best fitting distributions were determined for monthly and annual precipitations of each station.

Keywords: Probability distribution; Kolmogorov-Smirnov Test; Anderson-Darling, Turkey

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Towards an Fate of Soil Climate under Global Changes: Modelled projections for Soils of Serbia

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Abstract: Over the few past decades climate changes in Serbia are characterized by higher temperatures and weather extremes. Climate change is significantly associated with changes in air temperature and precipitation influencing complex soil temperature and moisture feedback. The study area is Serbia, located between latitudes 41°and 47° N and longitudes 18° and 23° E. Time series used in this study were obtained by the downscaling of climate simulations from ECHAM5 general circulation model coupled with the Max Planck Institute Ocean Model. The dynamic downscaling was implemented using the EBU-POM regional climate model, based on Eta model coupled with Princeton Ocean Model. Soil temperature and moisture dynamics were calculated with NOAH land surface model using soil and climate data from 150 sites. Changes were analyzed for the periods 2021–2050 and 2071–2100 with respect to the reference period 1961–1990. Depending on soil type, emphatic increase of soil temperature from 2.8-3.5°C until 2100 year is projected for 0-40 cm layer. Also, a relative soil moisture decrease from 5.4–9.6% is observed for the same period. In the deep soils, layer 40–100 cm will be exposed to the highest water loss. Vertisols, Umbrisols and Dystric Cambisols proved to be less sensitive to climate change than Chernozems, Eutric Cambisols and Planosols. Projected higher temperatures and weather extremes will lead to inevitable changes of soil processes and evolution, biodiversity, vegetation cover and agricultural production. Expected human responses are switch in production zones, increased irrigation, land use change and sustainable intensification of agriculture.

Keywords: Soil, Land, Climate Change, Modelled projections, Serbia

Soil Conservation Guiding Tool for Smallholder Farmers across Sub-Saharan Africa: A Proposal for Malawi

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Abstract: Soil loss remains to be an important concern all across the World. Soil loss presents a robust threat to habitats of soil quality and eventually human agricultural systems. Especially in Sub-Saharan Africa where the majority of the population depends on farming for their day-to-day living, degradation of land resources presents several challenges. More commonly for local population is decrease in food supply, and this may lead to malnutrition and eventually increase conflicts related to land and food. On the other hand, there might be more over use of chemicals fertilizers which might affect chemical properties of soil and further degradation of land resources. Understanding where and the quantities of soils expected to be lost given different management practices is key towards soil conservation. As there exist tools for simulating soil loss, such as the SLEMSA model, USLE, IntErO model, etc., there are some challenges regarding its use. Especially in Sub-Saharan Africa where literacy levels are somehow lower, these models remain to be complex and unpalatable for use by smallholder farmers. Yet insights from these models can help them to make better choices for soil conservation. This means that, it is important to develop tools that can be easily used without need for complex information. This study proposes of using publicly available data on elevation, soil types, vegetation cover to make estimates of soil loss given the geographical boundaries of a piece of land. The proposed tool is targeted to be used at community level. By gathering information regarding proposed agricultural interventions, agricultural extension officers will be able to assess potential soil losses using interactive software that can help in assessing the impacts of decisions made by individual farmers make on soil loss in the entire community/watershed. The performance, usability and acceptability of the application will be tested on ground in Malawi. This tool has potential to be used for soil conservation planning across Sub-Saharan African Region to support implementation of efforts to conserve soil resources.

Keywords: Soil Conservation, Smallholder Farmers, Sub-Saharan Africa, Malawi, Soil loss

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Estimates of soil losses in watershed under tropical of altitude climate in Brazil

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Abstract: Water erosion is one of the main degradation processes of tropical soils. In steepest areas with coffee cultivation, the erosion rates are intensified and could reach levels above the Soil Loss Tolerance Limits (T). Thus, the objective of this work was to evaluate the susceptibility to water erosion in steepest areas under predominant coffee cultivation using the Revised Universal Soil Loss Equation (RUSLE) and compare the results to T limit. The research was carried out at the Ribeirão José Lúcio subbasin located in Conceição do Rio Verde Municipality and the Ribeirão São Bento subbasin located in Cambuquira Municipality, both in South of Minas Gerais State, Brazil. The parameters involved in the RUSLE and T calculations were determined from the physical and edaphoclimatic characteristics of the subbasins. The total soil loss of the Ribeirão São Bento subbasin was 1,032 Mg year^{-1}, while the Ribeirão José Lúcio subbasin presents an erosion rate of 5,014 Mg year^{-1} with 13.16% and 7.90% of the areas above the T limits, respectively. We found the highest losses in steepest and exposed soil areas, which should be prioritized in the adoption of conservation management practices, seeking to minimize water erosion, and ensuring the long-term sustainability of agricultural production. The RUSLE model is a fast, simple, and inexpensive tool that contributes to the assessment of soil conservation in hydrographic subbasins.

Keywords: Erosion Modelling, Soil Conservation, Water Erosion, Revised Universal Soil Loss Equation, RUSLE.

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Improvement of yield and phytochemical compounds of *Thymus vulgaris* through foliar application of salicylic acid under water stress

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Abstract: *Thymus vulgaris* is an important medicinal plant across the world that has been grown in Iran since ancient times. To study the effect of foliar application of salicylic acid (SA) on the yield and phytochemical compositions of *T. vulgaris*, an experiment was conducted in Qazvin in 2017. A factorial experiment based on a randomised complete block design was conducted with three replications. Treatments of SA (0, 100, 150 and 200 mg/L) were applied from the period before flowering until the early stages of flowering under well-watered and withholding irrigation conditions. The results showed that SA had a significant effect on the yield and phytochemical compositions of *T. vulgaris* under both irrigation regimes. SA foliar application led to an increase in total dry matter. The highest total dry matter (1958.83 kg ha^{-1}) was obtained by applying 200 mg/LSA under normal irrigation. The effect of foliar application of SA on the essential oil content of *T. vulgaris* was influenced by the irrigation regime. The highest essential oil content (2.66%) was obtained by applying a foliar spray of 100 mg/LSA under withholding irrigation conditions. Thymol, carvacrol, p-cymene, linalool and γ-terpinene were identified as the main essential oil compounds. The highest thymol content was obtained by foliar application of 200 mg/LSA under withholding irrigation conditions. Our results demonstrate that foliar application of SA reduced the negative effect of water deficit on *T. vulgaris* and increased yield and thymol content. SA foliar application is a simple, eco-friendly and relatively commercially viable method of increasing yield and the synthesis of phytochemicals; therefore, it may be used to improve the dry matter and quality of the essential oils of thyme plants.

Keywords: phytochemical compounds, *Thymus vulgaris*, salicylic acid, water stress

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Application of computer-graphic methods for analysis of the physical-geographical characteristics of the Vjestica River basin, Becici, Montenegro

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Abstract: The coast of Montenegro is about 300 km long. Unlike its northern neighbor Croatia, Montenegro has no large inhabited islands along the coast. A notable feature of the Montenegrin coast is Bay of Kotor, a fjord-like gulf, which is in fact a submerged river canyon. The narrow coastal plain with about 4 km wide in average is guarded from the north by high mountains of about 1,000 m high, which plunge almost vertically into the sea. The plain provided space for numerous small coastal settlements. The study area of the Vjestica (*the Witch*) watershed (4.24 km^2) is located at the Becici settlement that is a central part of the Coast of Montenegro. The springs of the River Vjestica are under the slopes of Siroka strana, near the village of Cerovica. The watercourse flows downstream the steep slopes with the direction from the north to the south. In parallel to the river Vjestica, the Boretska Voda stream, which is the left tributary to the Vjestica, flows into Vjestica two kilometers from the spring, below the slopes of Klepala, near the village of Mazici (altitude 160 meters above sea level). Down the Klepala and Kosljun, Vjetica is receiving the two smaller right tributaries and is inflowing into the Adriatic Sea below the settlement Boreti, near the Pennisula Zavala (42°16'49.4"N 18°51'51.1"E, 42.280388, 18.864181). For the Analysis of the physical-geographical characteristics of the Studied region we used the following software: AutoCAD 2020, Blender 2.80, Photoshop 2019, CorelDRAW(R) Graphics Suite X3, but also Military Maps of Montenegro (Budva, 159-2-3, Scale 1:25,000, 1979), Aero-recording (June 2007), Photogrammetric work (May 2012, December 2012) and the SRTM Digital Elevation Model (https://earthexplorer.usgs.gov/). Morphometric methods were used to determine the slope, the specific lengths, the exposition and form of the slopes, and other relevant parameters. The natural length of the main watercourse, Lv, according to our calculations is 4.23 kilometers; the total length of the main watercourse with tributaries of I and II class, ΣL, is calculated to be 6.63 km and is with the shortest distance between the spring and the inflow to the Adriatic Sea, Lm, of 3.85 km. Using the IntErO model (Spalevic, 2011); the program „Surface and Distance Measuring" (Spalevic, 1999) and the program "River basins" (Spalevic, 2000), we calculated Coefficient of the river basin form, A, on 0.51; Coefficient of the watershed development, m, on 0.58; and Average river basin width, B, on 8.70 km. (A)symmetry of the river basin, a, is calculated on 0.35, indicating that there is a possibility for large flood waves to appear in the studied river basin. Density of the river network of the basin, G, is calculated on 1.56 that indicates a high density of the hydrographic network. Using the listed specialized models we calculated Coefficient of the river basin tortuousness, K, on 1.10 and Average river basin altitude, Hsr, on 399.74 m. Average elevation difference of the river basin, D, is calculated on 399.64 m. The results of calculation by the IntErO shown that the Average river basin decline, Isr, is 43.84%. This value characterized, for example, the river basins of the Upper Polimlje region on the slopes of Prokletije in the northeast Montenegro (Bijeli Potok, 47.39 %; Novsicki Potok, 50.32 %), and is indicating that in the river basin prevail very steep slopes (!). The height of the local erosion base of the river basin, Hleb, is calculated on 1098.90 m; Coefficient of the erosion energy of the river basin's relief, Er, on 243.76. With this research we established a basic database with specialized maps based on the analysis of the physical-geographical characteristics of various environmental factors showed showing high susceptibility to flooding. These methods are useful and effective for zones with little or no hydrometeorological information, and they can provide a robust source of information for decision makers regarding urban planning - land planning to mitigate flood vulnerability and some other processes of land degradation.

Keywords: River basin, physical-geographical characteristics, computer-graphic methods, IntErO model

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Analysis of the physical-geographical characteristics of the Bojana River basin using the computer-graphic methods and the IntErO model

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Abstract: The Bojana (Albanian: Bunë or Buna) River Basin (361.04 km^2) is one of the Mediterranean watersheds located in the south-east of Montenegro (218.27 km^2) and West Albania (142.77 km^2). For the Analysis of the physical-geographical characteristics of the Studied region we used the following software: AutoCAD 2020, Blender 2.80, Photoshop 2019, CorelDRAW(R) Graphics Suite X3, but also Military Maps of Montenegro (Stari Bar, Vladimir, Tarabos, Ulcinj, Sasko jezero, Fraskanjel, Bojana, Scale 1:25,000), Aero-recording (June 2007), Photogrammetric work (May 2012, December 2012), SRTM Digital Elevation Model (https://earthexplorer.usgs.gov/) and ASIG Geoportal (https://geoportal.asig.gov.al/). Morphometric methods were used to determine the slope, the specific lengths, the exposition and form of the slopes, and other relevant parameters. Natural length of the main watercourse, Lv, according to our computer-graphic calculations (2020) is 42.39 kilometers; and the Moraca - Skadar Lake - Bojana system (5,190 km^2) is of about 185 kilometers long. The length of the main watercourse is changing through the time due to a rise in the level of the Skadar Lake, and the uppermost part of the river is currently under the lake's surface. The total length of the main watercourse with tributaries of I and II class, ΣL, is 406.17 km. The studied river is an outflow of the Skadar Lake (Ckla, Skadarsko jezero, 42°03'22.6"N 19°28'34.3"E; 42.056277, 19.476197) and flows into the Adriatic Sea (41°50'51.8"N 19°22'21.9"E; 41.847718, 19.372745), with the shortest distance between the outflow of the Skadar Lake and inflow to the Adriatic Sea, Lm, of 26.84 km (Ada Bojana, delta with two arms). The first few kilometers river flows from the west to the east; close to the city of Skadar (Shkodër) turns to the south, where Bojana receives its tributary, the Great Drin. After Tarabosh, Bojana is passing through the villages of Zues, Bërdicë, Tarragjat, Oblikë, Obot, Shirq, Dajç and Goricë. After 19 kilometres Bojana is becoming the border between Albania and Montenegro (24 km long) and flowing next to the Sasko Lake and Zogajsko Blato and is passing through the villages of Sveti Djordje and Rec (Montenegro) and Luarzë and Pulaj (Albanian side). Using the IntErO model (Spalevic, 2011; an integrated version of the program „Surface and Distance Measuring", Spalevic, 1999 and the program "River basins", Spalevic, 2000) we calculated Coefficient of the river basin form, A, on 0.45; Coefficient of the watershed development, m, on 0.63; and Average river basin width, B, on 8.71 km. (A)symmetry of the river basin, a, is calculated on 0.42, indicating that there is a possibility for flood waves to appear in the studied river basin. Density of the river network of the basin, G, is calculated on 1.13 that indicates a high density of the hydrographic network. Using the same IntErO model Coefficient of the river basin tortuousness, K, is calculated on 1.58; Average river basin altitude, Hsr, on 134.85 m; Average elevation difference of the river basin, D, on 134.75 m. The results of calculation by the IntErO shown that the Average river basin decline, Isr, is 10.93%. This value indicates that in the river basin prevail medium inclined slopes. The height of the local erosion base of the river basin, Hleb, is calculated on 1449.90 m; Coefficient of the erosion energy of the river basin's relief, Er, on 105.88. The Bojana ranks second place among all tributaries to the Adriatic Sea, measured by the annual discharge, after the River Po in Italy. Current study has potential to assist disaster managers, hydraulic engineers, and policy makers with receiving the physical-geographical characteristics data of the studied river basin that could be useful for the preparation of the location-specific effective flood risk reduction strategies and urban-rural planning in the studied region.

Keywords: River basin, physical-geographical characteristics, computer-graphic methods, IntErO model

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Analysis of the physical-geographical characteristics of the Sutorina River basin using the computer-graphic methods and the IntErO model

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Abstract: Sutorina is a village and a river located in Herceg Novi Municipality in north-western Montenegro. The village is located near the border with Croatia, some three kilometres northwest of the Adriatic Sea in Igalo. The surrounding region, including a short stretch of the Adriatic coast, was named after the little vale of the river Sutorina west of Herceg Novi. The 5 nmi (9.3 km; 5.8 mi) long coast on the west side of the entrance to the Boka Kotorska, from Cape Kobila to Igalo, known generally as Sutorina, includes the Sutorina valley including 6 settlements: Igalo, Sutorina, Sušćepan, Prijevor, Ratiševina and Kruševice, an area of 75 km². Sutorina was part of Bosnia and Herzegovina within Austria-Hungary and Yugoslavia between 1878 and the early 1950s when it became part of SR Montenegro. On 26 August 2015, governments of Bosnia and Herzegovina and Montenegro signed in Vienna a border agreement which gave sovereignty over Sutorina to Montenegro. For the Analysis of the physical-geographical characteristics of the Studied region we used the following software: AutoCAD 2020, Blender 2.80, Photoshop 2019, CorelDRAW(R) Graphics Suite X3, but also Military Maps of Montenegro (Scale 1:25,000), Aero-recording (June 2007), Photogrammetric work (May 2012, December 2012), SRTM Digital Elevation Model (https://earthexplorer.usgs.gov/). The slope in the river basin was defined using the morphometric methods, but also the specific lengths, the exposition and form of the slopes, and other relevant parameters. Natural length of the main watercourse, Lv, we calculated on 9.65 kilometres. The total length of the main watercourse with tributaries of I and II class, ΣL, is 34.01 km. The spring of the Sutorina is near Debeli Brijeg and is flowing downstream to the mouth in Igalo (42°26'53.9"N 18°30'17.2"E; 42.448304, 18.504770), and this region along the river bad, the Sutorina river is periodically flooding, damaging the agricultural land and the old road to Prijevor. Using the IntErO model (Spalevic, 2011; an integrated version of the program „Surface and Distance Measuring", Spalevic, 1999 and the program "River basins", Spalevic, 2000) we calculated Coefficient of the river basin form, A, on 0.48; Coefficient of the watershed development, m, on 0.55; and Average river basin width, B, on 2.48 km. (A)symmetry of the river basin, a, is calculated on 0.71, indicating that there is a possibility for flood waves to appear in the studied river basin. Density of the river network of the basin, G, is calculated on 1.37 that indicates a high density of the hydrographic network. Using the same IntErO model Coefficient of the river basin tortuousness, K, is calculated on 1.07; Average river basin altitude, Hsr, on 252.33m; Average elevation difference of the river basin, D, on 251.33m. The results of calculation by the IntErO shown that the Average river basin decline, Isr, is 30.92%. This value indicates that in the river basin prevail very steep slopes. The height of the local erosion base of the river basin, Hleb, is calculated on 909m; Coefficient of the erosion energy of the river basin's relief, Er, on 131.05. Presented results represents useful basis for further research on integrated watershed management and urban planning of this region. The used IntErO model had a good results in use in the watersheds of the Montenegrin coast and hence a tool that can be further used with confidence in scenario evaluation.

Keywords: River basin, physical-geographical characteristics, computer-graphic methods, IntErO model

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Impact of irrigation for Sustainable Food Production on Climate change

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Abstract: In general the area of Serbia and Montenegro, but also the Balkan Peninsula as a wider region, has favourable climatic conditions for crop production. However, the distribution of rainfall is often a limiting factor for high yields and stabilized crop production. The sum of rainfall varies from one year to another and variability is practically pronounced during the growing season. Droughts could be with short or long periods with insufficient rainfall occurring practically every year. Rainfall quantity and distribution rarely meet needs of plants for water grown under natural conditions. Water needs of plants vary and depend on the type and variety of plants, the age of the plants during the growing season, and the weather conditions. Therefore, irrigation plays a significant role in supplying plants with water to achieve high and stable yields of adequate quality. Irrigation also regulates out of water, the other necessary conditions such as air, thermal, microbiological and mineral regime of the soil, which ensures optimal conditions for plant growth and development in different periods of plant growth. Irrigation changes the direction and intensity of the natural processes of the environment and is decreasing the temperature and relative humidity of the ground layer of the atmosphere. As a result, the ecosystem gets more favourable properties. Soil moisture contributes to an increase in air humidity, especially in the summer when irrigation is most intense and humidity is very low. Irrigation can also be used as a means of protecting the fruit from frost in the autumn and spring, forming ice sheath around the buds or the fruits formed, thereby releasing heat. In the new conditions of climate change, primarily by rising air temperatures and long droughts, irrigation will play a very important role in the production of food needed for the world's rapidly growing population. It is estimated that by 2050 the population will grow to 9.6 billion. Production of food should be increased by more than 50%, compared to the current level of production. As a result of the increase in air temperature, there will be changes in the amount of precipitation and their distribution throughout the year, which will greatly affect food production. Snow cover and an increase in the length of the vegetation period are expected, leading to a decrease in water reserves in the soil. In addition, more frequent flooding is expected with catastrophic consequences. The expected changes in climatic conditions will lead to a lack of fresh drinking water and for irrigation. Food production is thought to depend on genetics and irrigation in the future.

Keywords: Climate change, water requirements, crop production, irrigation.

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Ameliorative measures aimed at prevention/mitigation consequences of Climate Change in Agriculture in Croatia

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Abstract: Climate change can be represented as a change in climate elements (temperature, precipitation, humidity, wind, insolation) relative to average values, or as a change in the distribution of climate events relative to average values. Climate change causes more frequent occurrences of floods and droughts, which can cause major damage to agriculture and the environment. Ameliorative measures in hydrotechnical amelioration include protection from flood and catchment waters, drainage of surplus water land and irrigation. Protection of a certain area from flooding and catchment water implies hydrotechnical measures and solutions aimed at preventing or diminishing harmful effects and consequences of surface runoff of large amounts of precipitation or torrents water from higher elevations to lower parts, as well as consequences of flooding events from watercources and other water bodies in the riparian and a wider area. Drainage of surplus water from a land area can be achieved by designing an adequate drainage system (hydro–ameliorative drainage system) consisting of different technical solutions and structures: pumping stations, channels/pipes for various purposes, of different dimensions and shapes, additional structures/equipment and infrastructures (roads, bridges). For the purpose of preventing or mitigating droughts as a natural occurrence that causes a shortage of water in the soil (rhizosphere), an amelioration measure of irrigation should be provide favourable soil moisture condition for plant growth and development where there is lack of precipitation in an area. Successful agricultural production can be achieved if there is a favourable water-air ratio in the soil during the growing season, as excess or shortage of water in the soil causes a decrease in yield. At aimed preventing/mitigation the consequences of climate change in agriculture and the environment, existing (built) hydro-technical facilities, surface and underground drainage systems as well as irrigation systems should be adequately used and maintained, and continue with activities for the construction of new hydro-technical facilities and drainage and irrigation systems.

Keywords: Ameliorative measures, climate change, agriculture

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New data of density of the river network in Montenegro

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Abstract: The landscape of Montenegro is very interesting; reach with its hydrographic features. In a relatively small territory, a great variety of hydrographic forms have been formed which resulted from the interaction of several elements. The complex geological composition, specific relief forms and climatic conditions are the main factors that caused the formation of the river network in the form it is today. In this rather complex structure, two watersheds stood out to approximately the same surface but with significantly different features. From the territory of Montenegro, the waters drain into two basins Adriatic and Black Sea. Comparing these two spaces, one can see a big difference in one of the most important elements that influence the formation of a watercourse. The catchment area of the Adriatic Sea receives significantly higher rainfall than the area belonging to the Black Sea basin. On the other hand, the number of streams and their length are significantly higher in the area of the Black Sea basin. The differences that are evident are due to the different background that has conditioned that, e.g. in the part of the Adriatic Sea basin area where rainfall has maximum values, even at European level there are no surface flows at all. This topic is not in principle presented in a large number of papers, and where it is mentioned, it is with the studies on small river basins. The paper deals with the presentation of cartometric analysis of the length and number of streams per the river basins, but also within them, in larger river basins. The paper is presenting data on the lengths of watercourses, calculated from the topographic maps with the scale of 1:25 000, and some other basic hydrographic analysis of the watersheds of Montenegro. Based on the aforementioned measurements, new data on values of the density of the river network have emerged.

Keywords: density, river basin, river network, cartometry.

Changes in soil water storages under cover crops

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Abstract: Cover crops provide a wide range of ecosystem services, but their impacts on available water levels in the soil depend mainly on weather conditions, soil and farm practices. Soil water storage (SWS) can be used as a good indicator of soil water status. The aim of this paper was to determine the effect of annual winter cover crops on soil water storage from the standpoint of available water levels. The 2-year experiment was conducted in northern Serbia, in the Vojvodina province, at locality Rimski Šančevi. It included three winter cover crop treatments in rain-fed production: common vetch (Vicia sativa L., cv. Neoplanta), triticale (Triticosecale Wittm. ex A. Camus, cv. Odisej) and their mixture. After plowing cover crops, silage maize was sown. The fallow control plot was plowed in autumn and left as a bare soil until the maize sowing. During the growing season, soil samples were taken per 30 cm soil layers to the depth of 120 cm in order to determine the SWS. Cover crops were supplied with a sufficient amount of readily available water at the end of winter due to sufficient amounts of winter precipitation in both investigated years. After termination of cover crops, SWS was reduced on all cover crop treatments, to the content below wilting point in layer up to 60cm. In the dry year, after the maize harvest, all available water was depleted from the 120 cm soil layer, and in relatively favorable year sufficient quantities of readily available water remained in the deeper soil layers. No greater effect of the mixture over single crop use was recorded. The cover crops limit water for the next crop, and if the water is not replenished their use may not be justified in all years in a moderate continental climate from the water consumption point of view.

Keywords: cover crops; water storage; silage maize

Evaluation of Garden Pea Genotypes by Main Morphological Parameters

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Abstract: Garden pea (*Pisum sativum* L., 2n = 2x = 14) is an important legume used as fresh vegetables and other drier food products. Peas are quite inexpensive and a readily available source of proteins, vitamins, minerals, and carbohydrates, making them a valuable food capable of meeting the global dietary needs of >900 million undernourished people (Mihailović *et al*., 2019; Lakić *et al*., 2019). World production of green peas in 2016 was 19.88 mt, and the major producers were China (12.21 mt), India (4.81 mt), and USA (0.31 mt), which accounted for >85% of the total production (FAO, 2016). Field trial was conducted to study the performance of different genotypes of garden pea under leached chernozem soil subtype at the Institute of Forage Crops, Pleven, Bulgaria. Thirteen garden pea genotypes were evaluated in terms of morphological characteristics of both, aboveground and root biomass. The plant height, fresh aboveground weight, dry aboveground weight, root biomass length, fresh root biomass weight, dry root biomass weight was assessed. In addition, some ratios as aboveground to root biomass length, aboveground to root biomass fresh weigh, aboveground to root biomass dry weight were assessed also. Suitable pea genotypes which are of interest to the selection were shown. They can be included in the next breeding programs.

Keywords: Garden pea, Morphological characteristics, Chernozem soil

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Agronomic Benefits of Intercropping Pasture System

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Abstract: Climate change shifts the distributions of a set of climatic variables, including temperature, precipitation, humidity, wind speed, sunshine duration, and evaporation. Climate change has created challenges for the agricultural sector, adding to pressures on global agricultural and food systems (Popović *et al.*, 2019). Consequent upon climate change, increasing frequency and duration of droughts strongly require adaptation of agricultural crops and their diversification under changed agro-pedological conditions. The permanent climate changes having occurred in the last decade requires to study species having pronounced resistance to unfavorable abiotic factors and good adaptive capacity towards the new conditions. Both, to develop and access new management practices in cultivation of plants are needed also. In this regard the mixed cropping is of importance and interest towards this system is rising in recent years. Mixed cropping has inbuilt advantage over certain environmental issues. They are more effective than pure grown in using environmental resources, better withstand adverse conditions, overcome weed problems and are more productive. Legume-supported cropping systems are particularly well-suited to building soil fertility and also provide assessment of positive environmental impacts and ensure development of a sustainable agro-ecosystem. Having in a mind the protein deficit is a fundamental challenge to the resilience, acceptance and performance of agri-food systems, legumes are essential to global plant protein supplies and many sustainable plant-based foods. The integration of both, annual and perennial legume crops (legume based mixtures) into the cropping systems is contribution to the high protein feed obtaining. In the work the agronomic benefits of legumes after their implementation into cropping systems was shown. Mixed cropping of agricultural crops is a contribution to the solutions to meet challenges related to climate change (e.g. extreme droughts in summers).

Keywords: Climate changes, Legume, Intercropping Pasture System

Impact of Row Spacing and Seed Rate on the *Lolium perenne L.* Production Characteristics

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Abstract: In this paper are shown the results of the production characteristics of the Perennial ryegrass (*Lolium perenne* L.) cv. Naki, which grown in rows with different row spacing and seed rate in the agro ecological conditions of central Serbia in the period 2012-2014. Four levels of two observed factors were used in the experiment: row spacing (12.5; 25; 37.5 and 50 cm) and seed rate (9, 16, 23 and 30 kg ha^{-1}). Due to the analyzes, the height of the tiller, the length of the spike and the number of spikelets per spike gave better results by sowing in wider rows (37.5 and 50 cm) using lower seed rate (9 and 16 kg ha^{-1}). Seed yield and harvest index responded favorably to sowing in rows at a wider row spacing (37.5 and 50 cm) in combination with a lower seed rate (9 and 16 kg ha^{-1}), while shoot dry weight gave better results by sowing in narrower rows (12.5 cm) with lower seed rate (9 and 16 kg ha^{-1}). Using the appropriate row spacing in sowing and the optimum of seed rate provides the highest results of the production characteristics of the Perennial ryegrass that can be applied to further production.

Keywords: Perennial ryegrass, row spacing, seed rate, seed yield, harvest index

Acknowledgement

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Occurrence of *Aletrnaria alternata* as causal agent of seed rot of *Matthiola longipetala* in Serbia

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Abstract: Night-scented stock (*Matthiola longipetala* L.) is the ornamental grown worldwide and in Serbia, it is mostly used for gardening. *Alternaria alternata* (Fr.) Keissl. is the most common pathogen infecting numerous crop plants and occurring in various climatic zones, rarely kill plants and seeds, but reduce their aesthetic quality and commercial value. *A. alternata* is known to be a common saprotroph, however, there are several reports of the pathogen causing disease on different hosts. The aim of the work was to determine the *A. alternata* species associated with *M. longipetala* seed in the Republic of Serbia. During a routine quality control of *M. longipetala* seeds, in 2018, fungal infection followed by seed rot, was noticed on an average of 17% (Mathur & Kongsdal, 2003). Seeds were covered by dark brown mycelium with brown to black conidia cohering in long chains. In order to isolate the pathogen, the infected seed was transferred onto potato dextrose agar (PDA) and incubated for 7 days at 20°C. For morphological identification, 22 isolates were single-spored and subcultured using PDA. Based on morphological characteristics, all isolates were identified as *Alternaria alternata* (Simmons 2007). Pathogenicity was confirmed using the *in vitro* agar slant method in the test tube. The pathogen was successfully re-isolated and found to be morphologically identical to the original isolates, fulfilling Koch's postulates. Molecular identification was confirmed by PCR and sequencing of the transcribed spacer (ITS) region using ITS1/ITS4 primers (White *et al*. 1990). BLAST analysis of the obtained sequence of sample 4089/1 (GenBank Acc. No. MK061539) showed 100% nucleotide similarity to sequences of three *Alternaria alternata* isolates Acc. No. MF380728 and MH820121. To our knowledge, this is the first report of *A. alternata* as the causal agent of seed rot of *Matthiola longipetala* in Serbia.

Keywords: *Alternaria alternata*; *Matthiola longipetala*; seed rot

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Analysis of trends of Soybean Production Worldwide

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Abstract: *Glycine max* L. Merril is originating from Asia but top producers today are found in the New World. Soybeans are legumes, oil-seeds, vegetables, or even fuel sources, depending upon how they are used. Soybeans are also one of the few plants that have a full array of amino acids in their protein compositions to be considered "complete" proteins, on par with meats, milk products, and eggs. Commercially important products commonly made from soybeans include protein powders, textured vegetable protein, soybean vegetable oil, edam, dry beans, sprouts, livestock feed, gluten-free flour, natto, tempeh, tofu, soy milk, soy cheese, and much more. Soybean products have also been shown to be beneficial in reducing the risk of certain disease, including heart disease and certain cancers. On the other hand, many individuals live with an allergy to this important legume. Soybean biomass can be used to produce briquettes and pellets, solid fuels suitable for use in smaller boiler plants, for example for heating of residential buildings. Biomass ie. soybean straw can be used and for the production of liquid biofuels (ethanol) because it has large amounts of carbohydrates (Popović et al. 2019). This study analyzes the production of soybeans worldwide. It is evident that a permanent increase in soybean area and production in the world. The largest area, production and yield of soybean, in tested period 2013-2017, in Word was in 2017 (123,551,146 ha, 352,643,548 t and 2.85 t ha^{-1}). 82% of world soybean production in 2017 it was concentrated in three countries (USA; Brazil and Argentina).

The United States and Brazil produces the most soybeans of any country in the world. Ukraine is the largest producer of soybeans in Europe, and the 8th largest in the world. Serbia has excellent conditions for soybean cultivation and a significant producer in the world.

Serbia's advantage is that which, in addition to conventional, has organically produced soybean. The largest area of soybean, in the tested period 2013-2017, in the Republic of Serbia was in 2017 (201,712 ha) and grain yield was in 2014 (3.54 t ha^{-1}). The largest production of soybean was 2016 (576,446 t). The largest area of soybean, in the tested period 2013-2017, in the Republic of Serbia was in 2017 (201,712 ha) and grain yield was in 2014 (3.54 t ha-1). The largest production of soybean was 2016 (576,446 t). In Serbia, the most common varieties 0, I and II MG (maturity group), but also very early and middle early varieties, 000 and 00 MG, you can sow the second crop.

Keywords: *Glycine max*, Production, Area, Yield.

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Stability of the Expression of the Maize Productivity Parameters by AMMI Models and GGE-Biplot Analysis

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Abstract: The objective of this study was to estimate genotype by locality, by year, by treatments (G×LxYxT) interaction using AMMI model, to identify maize genotypes with stable number of rows of grains performance in different growing seasons. The trials conducted during: with seven maize lines/genotypes, four treatments, two years and at the two locations. The results showed that the influence of genotype (G), year (Y), locality (L), and G×L, G×T, G×L×T, G×Y×T, G×Y×L×T interaction on maize number of rows of grains were significant ($p<0.01$). The genotype share in the total phenotypic variance for the number of rows of grains was 53.50%, and the interaction was 21.15%. The results also show that the sums of the squares of the first and second major components (PC1 and PC2) constitute 100% of the sum of the squares of the interaction G×L. The first PC1 axis belongs to all 100%, which points to the significance of the genotype in the total variation and significance of the genotype for overall interaction with other observed sources of variability. The highest stability in terms of expression of the number of rows of grains had the genotype L-6, followed by the genotypes L-4, L-5 and L-3. The lowest stability was demonstrated by the genotypes L-2 and L-1, which confirmed that these genotypes are not important for further selection in terms of the this trait.
Keywords: G×Y×L×T interaction, number of rows of grains, PCA1 and PCA2, *Zea mays*

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The influence of soil texture and organic matter on the retention curves at soil moisture in the Humic Calcaric Regosol of the Ovche Pole Region

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Abstract: This paper is a result of field and laboratory research of the soils (Rendzina Calcaric Regosol) in Ovche Pole region in Republic of North Macedonia. The field research of the soils has been done according to methods described by (Mitrikeski & Mitkova, 2013). In laboratory, the following analyses have been carried out on the soil samples: hygroscopic moisture, texture soil (mechanical composition), pH of the soil solution, humus content and content of carbonates. The soil texture and chemical properties of the soils have been determined by standard methods described by (Mitrikeski & Mitkova, 2013). The soil moisture retention at pressures of 0.33, 6.25 and 15 bars determined by Bar exstractor (Townend, et al., 2001), (ICARDA 2001), Marinčić, 1971). The average content of physical sand and physical clay fractions is 59.50% and 40.50% respectively. The average content of individual soil separates is: coarse sand 20.85%, fine sand 38.65%, silt 18,29% and clay 22.21%. The content of humus in horizon Ap ranges from 1.87 to 2.2 with an average of 2.1% and this percentage decreases with depth in all examined profiles. In horizon Amo is 1.36%, in AC horizon 0.89% and the smallest is in parent material C 0.69%. The moisture content of the soil at 0.33 bar is high in all horizons. The highest retention has horizon Amo 31.25% (higher content of humus and clay). The horizons AC, Ap and the parent material C have similar values (26.74%, 26.72 and 24.51%). The wilting point is not high (average 15,71% in Amo horizon). The results suggested a positive correlation in horizon Amo between the moisture retention at 0.33 and 15.00 bars and the content of physical clay and clay, as well as high negative correlation between the moisture retention at 0.33 and 15.00 bars and the content of sand. The retention curves in all horizons are almost horizontal at 2 bars in all cases. The greatest decline of the retention curves occurs at lower pressures (< 1 bar). Gradual changes in the retention forces can be noticed coming with the change of moisture without jumps. This shows that the division of the soil moisture in different forms cannot be justified with the retention curve because the decrease of the amount of water does not have big jumps under different tensions.

Keywords: Rendzina Calcaric Regosol, texture soil, humus content, retention curves

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The Use of the CORINE Land Cover (CLC) Database for Analyzing Urban Sprawl Municipality of Budva, Montenegro

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Abstract: The last decades of the twentieth century, throughout the world, characterized the expansion of urban land that surpassed the growth of urban population. The intense migratory flow of population from rural to urban areas has led to an unplanned growth of cities, which usually expand their geographic boundaries to accommodate more inhabitants. The same global trends we experienced in Montenegro and especially in its Coastal area, located in the southern part of the Adriatic coast, between the shores of Albania and Croatia. Continental coast of Montenegro is 335 km long and consists of six municipalities and their settlements, the largest of which is Bar (area 598 km^2) and the smallest is Tivat (46 km^2), while the other four municipalities of the Coastal Region are Kotor (335 km^2), Herceg Novi (235 km^2), Ulcinj (255 km^2) and Budva (122 km^2). There are 40 urban and 1216 rural settlements in Montenegro and according to the 1991 census, 15 villages were without permanent residents. The most dense network of settlements is in the coastal part of Montenegro with an average of 15 settlements per 100 km^2, and especially in Budva (27 settlements per 100 km^2) and Tivat (26 settlements per 100 km^2). According to the 2003 census, 20 more villages were left without permanent residents, of which in the municipalities of the Montenegrin coastal area: Budva, 5; Bar, 4; Kotor, 2. The studied area of this research is the municipality of Budva that covers an area of 12,243 ha, inhabited by 19,170 people, with a population density of 1.57 inhabitants per hectare. We analyzed urban sprawl in the Municipality of Budva using computer-graphic methods, the CORINE Land Cover (CLC) and other available spatial planning documentation. ArcMap 10.5 was used to calculate urban sprawl using CLC spatial bases. In the final calculation, we noticed that in the period from 1990 to 2018, there was an increase in discontinuous urban areas, in 1990 urban areas occupied 639 ha, and for 2018 we calculated the area of 1065 ha. The area is characterized with the current construction of 590 ha, and the planned of 2.600 ha (construction indicator 4.8%, planned construction 21.5%). The calculated utilization indicator of the construction area is 22.4%; the population density indicator of the construction area of the settlement is 7.3 inhabitants per hectare, and the indicator of consumption of the construction area of the settlement per capita is 1.371 m^2 per inhabitant. According to the available documentation, space reserves within the construction area of the settlement are 2,040 ha. Analyzing available documents and statistics, studied region is growing due to an increase in the total population, mainly due to the emptying of the surrounding area of the municipal center and of the northern underdeveloped area of Montenegro. It has been recorded that some suburbanized settlements are being formed as new agglomerations, mainly individual non-agrarian single family homes near the city center. Furthermore, structural transformations of former traditional villages and development of various forms of secondary housing have been recorded. According to our observation, overdeveloped and inorganic urbanism expanses lead to the loss of "the spirit of certain places" and the loss of the identity of some settlements. This topic is particularly relevant to the research area of Budva, a community that will continue with developmental ambitions in the field of tourism. There is a danger that the development of new dispersal communities may, to a greater or lesser extent, lead to a lack of social interaction, while existing urban units may experience atrophy, loss of economic

vitality and its permanent residents. In our opinion, there is lack of attention to environmental protection caused by fragmented expansion of construction areas that impair biodiversity, capacity of agricultural land, cause more pollution. The trend of rural to urban pressure and increased urbanization may lead to a reduced opportunity for capitalization of historical potentials, such as public spaces, unique cultural and historical landscapes, especially present in the studied area of Budva municipality. Considering all the above mentioned, we concluded that more thoughtful and systematic approach to spatial development policy should be applied for the future, focusing on rational management of resources to develop and increase the compactness of existing construction areas more than opening new ones. In this way, the causes or some of the basic drivers of urban sprawl would be eliminated, referring to an unplanned, uncontrolled and insufficiently coordinated policy of monofunctional spatial development that is not properly integrated into the context. To control the unplanned urban sprawl, the development of more sustainable land use policies is required. The aim of this research is to test applicability of the CORINE Land Cover (CLC) database to monitor the urbanization process, including the dynamic process of urban sprawl in the area of the Coastal Municipalities of Montenegro. The approach applied relies on the urbanization growth index calculated from the CLC database by using computer-graphic methods and the Geographic Information System (GIS). Study results show that urban areas have expanded dramatically transforming suburban and rural to urban. The different sprawl type patterns in the different study periods have transformed significantly, with their proportions altered both in terms of quantity and of location. The present research proves that urban sprawl quantification and pattern analysis can provide a clear perspective of the urbanization process during a long time period. Particularly, the present study on urban sprawl and sprawl patterns can be used by land use and urban planners.

Keywords: Sustainable Development; Land Cover, land use, Urban Sprawl, Budva, Montenegro

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Determination of erosion intensity in Brka watershed, Bosnia and Herzegovina

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Abstract: The Bosnia and Herzegovina (BiH) erosion map was made in 1985, however, over a period of 35 years, there have been a substantial change in the values of most erosion factors, resulting in change of the erosion intensity. Changes relate to demographics, urbanization and land use as well as climate. The increase of temperature and the occurrence of extremes caused significant environmental and economic consequences (May 2014 floods). This situation is more pronounced in the northern part of the country, especially in the lower parts of the larger basins. Risk assessment procedures using modern software and hardware solutions can help decision-makers to recognize sites where forest should not be cut down, certain crops should not be grown or soil conversation measures are necessary. Therefore, the aim of this research is to estimate the intensity of erosion processes in one such watershed in BiH - the Brka watershed, taking into consideration current conditions and using modern hardware and software solutions. To calculate erosion intensity the Gavrilovic method supported with GIS techniques was used. The soil protection (x), soil erodibility (y) and type and extent of erosion (ϕ) coefficients were calculated using digital maps: CORINA 2018 (grid size 100 m x 100 m) land cover, soil map of BiH and open-source satellite images. The slope was calculated from the BiH digital elevation model (25 m x 25 m). The Brka watershed area (184 km^2) was divided into four basins: Maočka Rijeka (51,56 km^2), Rahička Rijeka (24,26 km^2), Zovičica (75,30 km^2) and direct basin of Brka (32,94 km^2). The highest average erosion intensity was determined for Zovičica basin, where Z = 0,56. The calculated mean annual production of sediment per basin varies from 10,691 for Rahička Rijeka to 86,164 $m^3\ year^{-1}$ for Zovičica, with total Brka river watershed sediment yield of 2,465,664 $m^3\ year^{-1}$.

Keywords: Gavrilovic method; Erosion intensity; Brka watershed; CORINA; GIS

Influence plowed maize stalks on the dynamics of microbial indicators in soil

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Abstract: If the incorporation of organic matter from treated plots microbiological preparations can be significantly affected by changes in the microbial community of mineralization significantly bulky organic matter. The aim of the study was to determine the basic parameters of soil biogenicity before sowing soybeans on the parcels where the corn was pre-sown under the following fertilization variants: 1. Mineral fertilizer 100 kg N / ha; 2. Corn stalks; 3. Corn stalks + 80 kgN / ha; 4. Corn stalks + 80 kgN / ha +20 lit / ha EM Aktiv. At the beginning of vegetation, microbial soil characteristics up to a depth of 0-20 cm were determined according to the number of different physiological and systemic groups of microorganisms The total number of microorganisms as well as the number of tested microorganism groups had the highest values in variant 4. Given that the synthesis of humus is a long slow process, it can be concluded that the cultivation of maize and the introduction of different groups of microorganisms can affect significant processes in the soil.

Keywords: maize; microorganisms; nitrogen

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The influence of vegetation on the amount of organic matter in the sediment of small impounding reservoirs

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Abstract: The analysis encompassed four impounding reservoirs on the territory of the Republic of Serbia. Sediment from the accumulations and their main tributaries was sampled at several sites. Three of the four accumulations have a significant share of *dense forests and shrubbery* in the method of soil use in the watershed. Tall vegetation consists primarily of hardwood species from the genera *Fagus, Quercus, Tilia, Carpinus*, *Prunus* and others. In three cases, tall vegetation occurs on the left, steeper bank, along the accumulation itself. In the fourth case, tall vegetation is absent and the share of organic matter in the sediment is halved. It was established that a few interrelated factors have an impact on this phenomenon. The primary factor are dominant slopes on the watershed, followed by the absolute fall of the flow of main tributaries, as well as the percentage of vegetation representation on the watershed. This leads to the conclusion that, apart from its great protective and ecological function, tall vegetation can in this case produce a negative effect by causing increase of organic matter in the sediment. This is important because the decomposition of organic matter in anaerobic conditions causes release of compounds that significantly deteriorate the quality of accumulated water.

Keywords: Vegetation; organic matter; sediment; reservoirs

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Environmental protection: right and obligation

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Abstract: Conservation of the global climate system is a demanding, time-consuming and multidisciplinary process and is an obligation of all relevant national and international actors. The United Nations Framework Convention on Climate Change establishes common standards and objectives for the international community in the field of environmental protection. Climate and climate change are a particular challenge to the law, because the global characteristic of the impact of climate on the life of the entire planet creates the need for cooperation and commitment at international, regional and national levels. The right to a healthy environment belongs to the modern human rights corps. As rights and obligations are proportionate in their realization, it is our duty to contribute to this significant global challenge. Environmental law as a whole, and in particular the section on climate change, presents a complex challenge in various professional and scientific fields. The right of its instruments should help and improve solutions for overcoming the negative consequences of the complex problem of contemporary civilization in the field of climate change. Montenegro, as part of the international community, has defined its commitment to the Constitution, Article 23: "Everyone has the right to a healthy environment," as well as the possibility of "… influencing and deciding on matters of environmental and legal importance, protection of these rights, "which is confirmed by access to relevant international treaties in this area. The subject of this paper is focused on the analysis of legal regulations at local and national level with the aim of improving legislative processes in the implementation of relevant regulations, strategies and plans for the implementation of the Paris Convention on Climate Change, ratified by Montenegro on October 11th 2017, as well as harmonization national regulations with European legislation. The paper will also look at the possibilities of strengthening human resources and inter-sectoral linking of relevant institutions, with the aim of contributing to the efficiency of work of relevant national actors.

Keywords: climate, international regulations, Paris Convention

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Indicators of agricultural and rural development in the East Central and South-East European countries

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Abstract: Rural development is largely determined by the available resources and competitiveness of agriculture. The results achieved in agriculture are a significant factor that affects the improvement of the life quality in rural areas and the efficiency of the rural economy. Hence the indicators of agriculture and rural development are common and inseparable. The main purpose of the paper is systemic analysis of indicators of agriculture and rural development in the East Central and South-East European countries. The heterogeneous structure of the analyzed group of countries enables their further division into the European Union (EU) Member States and non-EU countries and consideration of differences in the results achieved in these two subgroups. The methods applied in the paper are descriptive statistics, benchmarking and cluster analysis. The results of the research enable evaluation of the relative position of the countries according to the analyzed indicators, identification of the countries of good practice, but also systematization of critical indicators by the analyzed countries that require improvement in the coming period and greater attention of the agricultural and rural development policy makers.

Keywords: agriculture, rural development, results, indicators

Effects of environmental factors on herbaceous plant diversity in an organic cultivation of sage *(Salvia officinalis L.)* In a typical Mediterranean climate

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Abstract: Sage *(Salvia officinalis L.)* is a perennial aromatic-medicinal plant that is commonly cultivated for pharmaceutical uses through Mediterranean basin. The purpose of this study was to examine the herbaceous plant diversity (plant species richness) and composition and their utilization as well the relationships between herbaceous plant species richness and driving factors (e.g. soil pH, organic matter, temperature, minerals etc) in the organic cultivation of Sage in central Greece. The results showed that the most frequently occurring species were: *Papaver rhoeas* L., *Chenopodium album* L., *Fumaria officinalis* L. and *Urtica dioica* L. Our data suggested that these plants constitute important soil indicators which could be used to monitor the state of soils and for assessing the role of soil in environmental interactions. According to Principal Component Analysis (PCA), herbaceous plant species richness was positively correlated to soil organic matter, temperature and moisture, P and K in the organic cultivation of Sage. The results of this study highlight the ecological value of the organic sage cultivation and how it can be a useful tool for the ecosystem's environmental protection, the wider scientific community and the general public during the current economic crisis.

Keywords: aromatic plants; environment; Greece; sage; utilization.

Application of zeolite to increase nitrogen use efficiency and yield in *Salvia officinalis* and *Ziziphora tenuior*

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Abstract: Nitrogen (N) is one of the most important nutrients for plant growth, and the application of N is playing an important role in agricultural productivity. The annual consumption of N in the world has reached 80 million tons, and Iran has an annual consumption of more than 3.5 million tonnes. The use efficiency of N is low, and loss is large. It is estimated that N loss in from agriculture soil in Iran is 40-60% N applied. Therefore, novel or at the very least, reasonable N management strategies must be explored in order to enhance N use efficiency (NUE) and agricultural productivity. Zeolite can successfully regulate the nutrient status in the root area of plants, thereby increasing N utilization, also the application of it in the soil useful in reducing water pollution. In order to evaluate the effect of zeolite and different levels of N on *Salvia officinalis* and *Ziziphora tenuior* medicinal plants, an experiment was carried out under field conditions. The experiment was included N fertilization at three levels 0 (N0), 75 (N1), 150 (N2), kg $ha^{-1}$and zeolite at two levels (without zeolite and 10 t ha^{-1})factorial experiment based on completely randomized block design with three replications was conducted at the experimental farm of Faculty of agriculture, Azerbaijan Shahid Madani University during the 2018 growing seasons. Results showed that zeolite could enhance the dry matter yield and N uptake. The highest dry matter yield (8.69 t ha^{-1})and NUE (11.56 kg/kg N) in *S. officinalis* and the highest of dry matter yield (1.12 t ha^{-1}) and NUE (7.5 kg/kg N) in *Z. tenuior* were obtained. These results suggest that the combined application of zeolite and N, improved NUE and dry matter yield in *Z. tenuior* and *S. officinalis*, and alleviated environment risk.

Keywords: Aromatic plants; nitrogen; yield; zeolite

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Increase essential oil and dry matter yield of Lemon balm with Pluramin foliar spray under water deficit-stress

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Abstract: Water deficit-stress is *one* of the major *stress* factors affecting the growth and yield of medicinal plants. The effects of water deficit-stress on crop can be alleviated by the foliar spray of amino acids. This experiment was done in the green-house conditions with the objective to alleviate the water deficit-stress against lemon balm yield. In this study, two treatments were applied involving three different Pluramin amino acid (PA) (control, 150 and 250 g/100 L) which were applied through foliar spray on lemon balm grown in two irrigation regimes (well-watered: 80% of the field capacity and water deficit-stress: 50% of the field capacity) conditions in the soil stuffed pots. Plants were harvested at flowering stage. The foliar sprays of PA amino acid significantly improved the dry matter as well as essential oil content of lemon balm when grown in the presence as well as absence of water deficit-stress condition. The highest content of essential oil was detected at 250 g/ 100 L^{-1} PA (3.54%). Total dry matter increased with PA application in both irrigation regimes. Moreover, result indicated maximum dry matter was obtained at 2500 g/100 L^{-1}PA (12.49 g per plant), whereas the lowest values (4.34 g per plant) of dry matter were observed without PA application under water deficit-stress condition. The recommendation assumed from this study showed that the foliar application of amino acids PA is a high value approach to alleviate the water deficit-stress effects on lemon balm to enhance the yield and essential oil content.

Keywords: Dry matter; foliar spray*; Melissa officinalis***;** water deficit-stress

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Evaluation of Accuracy of Split-Window Algorithm in Estimation of Land Surface Temperature (Yazd Plain-Ardakan)

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Abstract: Soil temperature and how it changes over time and space, are important factors that not only affect the exchange of matter and energy in the soil, but we can say that the amounts and directions of all physical processes of soil are dependent on the temperature, directly or indirectly. Since the weather stations measure temperature data only for specific areas, in this study, land surface temperature was determined by using Landsat 8 satellite images and Split-Window method. The present study was carried out in Yazd plain-Ardakan and by using remote sensing techniques and geographic information systems and then, land surface temperature was randomly measured at 16 points using a digital thermometer and the data were compared with the obtained temperature by using Split-Window method. Absolute error and the percentage of estimation error were determined as well as the correlation amount and equation using simple linear regression. In this method, the maximum absolute error was estimated to be 3 degrees Celsius, which this error is acceptable according to the area extent and the existence of different types of facies.

Keywords: Cartography, environment, Modelling, Temperature, Split-Window Algorithm.

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Preservation of agricultural land during hydropower plant construction

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Abstract: Construction of hydropower plants (HPP) transforms the landscape and hydrogeological system of the area. During the construction of HPP chain on the lover river Sava, mitigation measures were undertaken for preservation of agricultural land as well as natural habitats. Arable land on the river banks of the lower river Sava, Slovenia, was elevated and recultivated to prevent inundation as a consequence of hydropower plant dam construction. Top soil material was removed and stored. The area was filled with excavation material from the river channel and banks for elevation of the terrain. Recultivation begun immediately after filling layer surface has been leveled. The top soil material of the original layers was backfilled in two layers. After recultivation and four year of land reuse for the two cultures grass-clover mixture and corn soil physical characteristics were evaluated. Soil quality and production potential after land raising and recultivation were substantially different in the first year of land use. Mixing of topsoil with the second horizon during removal and during backfill with filling material resulted in uneven soil fertility, plant growth, and decreased yield, which in some areas persisted. Most persisting are the changes in the hydraulic characteristics of the soil. Driving on the refilled second layer with heavy machinery caused soil compaction in soil layers below 30 to 60 cm. Compacted soil layer is almost impermeable for soil water flow, which expresses as water logging and hinders soil tillage. Recultivation measures restored the agricultural land almost to the production potential prior to powerplant construction. Immediate intensive land use (corn) showed less favorable effect on soil characteristics.

Keywords: agricultural land; mitigating measures; recultivation; substitute habitats

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Effect of Locality and Environment on Productivity of Wheat in Chernozem Soil

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Abstract: Wheat (*Triticum* sp. L.) is one of the oldest and most important cultivated plants today because wheat bread is used by more than 70% of the Earth's population. Wheat had and will play in the future the most important role in the nutrition of the population for a long time (Rakaščan *et al.*, 2019; Rajičić *et* al., 2019). Worldwide, wheat accounts for about one-third of the sown cereals area, or about 26%. Wheat adapts well to the climate and soil, and has many species and varieties. There is winter and spring wheat so it is grown almost all over the world and is included in the euro-types (Dončić *et al.*, 2019).The aim of this study was to investigate the effect of the locality and cultivation year, and on the morphological characteristics and productivity of winter wheat: plant height (cm), 1000-seed weight (g) and seed yield (kg ha^{-1}.) of domestic winter wheat varieties. The experiments were conducted at three localities during three years, in the wider area of Belgrade. The most unfavourable year for wheat production was 2015/2016, the year in which the smallest amount of rainfall was recorded; only 335 mm. Cultivation localities had a statistically significant effect on grain yield. The average values for the yield for all three localities and three-year period were 5189 kg ha^{-1}. In Pozarevac place the average yields were higher by 10.2% compared to the locality of Mladenovac. The highest total yield, for the tested period, was at the locality Požarevac 5.583 kg ha^{-1}while the lowest average yield for all three years of investigation was recorded at the place Mladenovac 5.067 kg ha^{-1}. Wheat yields largely depended on weather conditions that prevailed during the vegetation period of wheat, agricultural practices used and the locality.

Key words: Wheat, locality, morphological traits, productive traits, environment

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Prediction of the firmness of the selected sunflower hybrid seed based on its technological characteristics

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Abstract: Sunflower seeds (*Helianthus annus* L.) are the most represented oilseed in Serbia. During the oil production process, the seeds are partially and/or completely dehulled. Sharma *et al.* (2009) found that, in addition to the moisture content of the seed, the effect of dehulling is also significantly influenced by seed firmness. The dehulling effect increases with decreasing seed firmness. This paper examines the technological characteristics of sunflower seeds of selected hybrids (bulk and true density, mass of 1000 seeds expressed on dry matter and content of hull in seeds), based on which a mathematical model for prediction of seed firmness was made. The tested samples are oily hybrids, grown on the territory of Serbia in 2017, namely: NS Horizont, Sumo 2 OR, NS Sumo Sjaj, NS Samuraj CLP, NS Smaragd CLP. Bulk and true density, mass of 1000 seeds expressed on dry matter and content of hull in seed were made according to Karlović & Andrić (1996), while seed firmness was made using Texture Analyzer TA.HD Plus (Stable Micro Systems, Godalming, U.K.). Firmness of the samples tested ranged from 5522.67 ± 765.40 to 6889.10 ± 1220.62 g, true density from 753.92 ± 18.23 to 877.33 ± 0.93 kg m^{-3}, mass of 1000 seeds expressed on dry matter of 48.83 ± 0.80 to 57.10 ± 2.52 g and a hull content of 47.54 ± 0.13 to 55.15 ± 0.87%. Model validation was also performed, and based on the statistical validation parameters, it is concluded that it is possible to predict seed firmness based on its technological characteristics.

Keywords: sunflower; dehulling; firmness; multiply linear regression

Aknowlegment

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Analysis of erosive winds distribution in the Khuzestan Province

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Abstract: Soil erodibility is an important information layer used by local planners in the prioritization of soil and water conservation measures. For this purpose, the aim of this study was to investigate and analyze the wind characteristics and erosive winds of Khuzestan Province. The basic information required for this research was collected from a report provided by the Ministry of Agriculture Jahad. In order to calculate the annual and monthly wind energy levels, hourly statistics analysis of wind speed and direction and erosive winds during the statistical period of 2009-2013 collected from country's meteorological organization were used. The wind erosion threshold was tested on the basis of 21 un-disturbed soil samples within a constant wind tunnel of the Iran-Research Institute of Forests and Rangelands. The results of this study showed that the most significant erosive wind occurs in the south to southeast regions (135 to 138 degrees). The results proved the presence of two dominant winds of northwest and west onwards to Khuzestan Province. Most of the erosive winds are blowing on the western edge of Khuzestan Province from neighbor country and from Ilam. Wind energy zoning in the Khuzestan Province and the western edge of Iraq and Ilam Province show that most of the wind energy is concentrated on the western margin of the province and on the Iran-Iraq boundary and then the southern regions of the province have moderate energy. While the regions of the north to northeast and east of the Province have low energy. This means that the dust and sand stabilization projects should focus on the western and southern areas of the province.

Keywords: Dust principle, Land degradation, Spatial distribution, Soil and water resources

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Up-to-date Assessment from Soil Erosion of Northwestern Iran

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Abstract: Maintaining up-to-date figures on land degradation vulnerabilities is essential for creating ecosystems resilient. Different watersheds have different land erosion vulnerabilities and capacities depending on many environmental factors. Soil erosion is stands as natural indicator of land degradation but actually it can be accelerated from human disturbances. Towards this, the present research practiced the program package Intensity of Erosion and Outflow - IntErO model (Spalevic, 2011) for a sub-watershed located in the close of main outlet of KoozehTopraghi Watershed, in Ardabil Province, Northwestern Iran. To this end, Sub-watershed 2 selected as a case study with area (F) and length (O) of 8.44 km^2 and 13.68 km, respectively. The highest (H_{max}) and lowest (H_{min}) elevations also are 1491 and 1387 m, in that respect. Besides, 97.63% of the sub-watershed is covered by agriculture land use. Average annual precipitation (Hgod) and air temperature (t0) are estimated as 330.33 mm and 9.16 °C, respectively. The results showed that the symmetry coefficient (A) has a value of 0.31 indicating a possibility for large flood waves to appear in the sub-watershed. The value of G coefficient (density of the river network of the sub-watershed) of 0.50, indicates there is low density of the hydrographic network. The value of Z coefficient of 1.289 indicates that the study sub-watershed belongs to I destruction category out of five. It means the strength of the erosion process is excessive, and according to the erosion type, it is mixed erosion (out of surface, mixed and deep). The calculated net soil loss from the sub-watershed is 1123.89 m^3 per year, specific 133.16 m^3 km^{-2} per year, what indicates, according to Gavrilovic classification (1972), that the river basin belongs to very weak erosion category. The present results are applicable for local and national policy frameworks in effect determining the potential hydro-meteorological hazards.

Keywords: Land use impact; Soil loss model; Threat assessment; Vulnerable watershed

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Understanding the function state of the KoozehTopraghi Watershed, Iran

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Abstract: A strong monitoring tool capitalizes on the principles for watershed stewardship to guide the sustention of watershed services. In the decision-making arena, strong watershed health assessment play an important role in establishing policy objectives. Furthermore, by maintaining watershed health, economic, social, and urban systems can be sustained. Towards this, we monitored the health of KoozehTopraghi Watershed located in the northwestern Iran through climatological, hydrological and anthropological lens to recognize sustainable strategies. The results affirm the presence of thresholds in the watershed health. When the study indicators of climatic, hydrologic and anthropologic exceeds those thresholds, the KoozehTopraghi Watershed becomes unsustainable. In addition, high spatial variability was found between health indicators through 36 study sub-watersheds. The southeast and northeast of the watershed had recognized healthier rather than other parts of the watershed. The function of the subject watershed recognized in the moderate state with total score of 0.55±0.26 out of one, generally. Around 22, 15, 23, 17 and 23% of the watershed respectively functioned as healthy, relatively healthy, moderately healthy, relatively un-healthy and un-healthy. By including our results early in the decision-making process of watershed planning, damage to the ecological system could be minimized.

Keywords: Adverse environmental change, Health assessment, Indicator-based monitoring, Natural resources

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Changes of ecosystem health pressures in the KozehTopraghi Watershed, NW Iran

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A**bstract:** Since the 20th century, due to the deteriorating ecological environment, worldwide land degradation has been increasing and worsening. Towards this, the present study aimed to investigate the dynamic changes of different pressures on the ecological health of KoozehTopraghi Watershed, Ardabil Province, northwestern Iran. To this end, we developed a monitoring system to derive three climatic criteria (i.e., mean annual precipitation, mean annual evapotranspiration, average temperature), five anthropogenic criteria (i.e., population density, area of agricultural land with slope > 25%, area under anthropogenic activity, environmental sensitive area index (ESAI), road density) and four hydrologic criteria (i.e., slope of contribution area in runoff generation, discharge, total length of stream, annual runoff height) and monitor sensitive areas to land degradation. The study results indicate that land degradation is affected by hydrological and anthropogenic and identifies potential areas of land degradation. The average, standard deviation, minimum and maximum values of pressure index for the study watershed respectively were 0.46, 0.13, 0.18, and 0.67. Therefore, the government's policy should be strengthening with new technologies to combat degradation and increase attention to watershed health and environmental sustainability.

Keywords: Degradation; Ecological fragile areas; Evaluation indicators; Win-win situation

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Phenotypic antibiotic resistance of *Escherichia coli* and *E.* coli O157 isolated from groundwater at the irrigated perimeter (Tadla-Morocco)

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Abstract: Dissemination of antibiotic-resistant strains of *Escherichia coli* and *E.* coli O157 in the water environment has become an increasing concern. It is a major public health problem in a rural area in Morocco, but little is known about *Escherichia coli* and *E. coli* O157 in groundwater. The study aims to pointe the wells water pollution in Beni Aamir and Beni Moussa, is located approximately 200 km southeast of Casablanca in the Beni-Mellal province in the center of Morocco, to investigate the profiles and abundance of resistant strains. To assess the contamination by *Escherichia coli*, 200 samples were collected for four seasonal campaigns between 2017 and 2018 within a rate of 43 samples per season in irrigated zone. The samples were analyzed to identify *Escherichia coli* and *E.* coli O157. Those detected were tested for susceptibility to 16 antibiotics. A total of (n=48/153) isolated strains were identified as *Escherichia coli* and *E.* coli O157 (n=11/153) representing 31.37 % and 7.19% of prevalence among total coliforms respectively. Antimicrobial resistance showed that 68.75% of them are multidrug-resistant, while12.50 % of strains resist at least to 7 antibiotics, 10.42% resist at least to 10 antibiotics, 8.33% resist at least to (12;8;5) antibiotics, 6.25% resist at least to (11;9;4) antibiotics and 2.08% resist at least to 15 antibiotics. The high-level resistance was observed with Amoxicillin (86.4%), Ceftazidime (85%), Ticarcillin (77.8%). Phenotypes of resistant strains al-lowed identifying 54.17% of ESBL, (10.42%) of ESBL+CASE, (8.33%) of AMPC, and 20.83 % wild type. The results revealed the high antibiotic resistance levels of *Escherichia coli* and *E.* coli O157 strains from well water samples. Therefore, these waters it is not adequate neither for consumption nor domestic uses, it could cause a health risk for the sedentary population.

Keywords: *E. coli* O157, *Escherichia coli*, Antibiotics resistance, Well water.

Influence of pumpkin seed cake on production and slaughter indicators for broiler chickens

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Abstract: The aim of the research was to determine the possibility of adding pumpkin seed cake (PSC) in feed mixtures for broiler chickens, as well as its influence on production and slaughter indicators. The experiment consisted of control and two experimental groups of broiler chickens fed for 6 weeks with feed mixtures containing different rates of PSC (0%, 7% and 14%, respectively). Statistically significantly higher body mass was determined in the E1 group compared to the E2 group ($P<0.01$) and in the E1 group compared to the C group ($P<0.05$). Regarding the percentage shares of different body parts in body weight, the C and E1 groups had statistically very significantly ($P <0.01$) higher values of wing shares compared to the E2 group. Regarding the skin colour, L value was statically significantly ($P<0.05$) higher in the C group, compared to the E1 group. From all of the above, it is to conclude that PSC in the rate of 7% in fodder mixtures can be recommended for feeding broilers in the period from the 1st until the 42nd day of age, with a potential to improve production and slaughter indicators.

Keywords: PSC, feeding, broilers, slaughtering indicators

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Agrotechnical Use of Medicinal Plants in Organic and Biodynamic Production

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Abstract: This paper presents the state of the use of medicinal plants in organic and biodynamic production in the Republic of Serbia. Most of the agrotechnical use of this type of plants is related to the preparations that producers themselves produce on their own farms. The second part of this use relates to commercial preparations to be found on the List of plant nutrition products and soil conditioners and the List of plant protection products that can be used in organic production by the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia. The third part of the the use refers to preparations that can be found on the market of the Republic of Serbia, but cannot be found on the mentioned lists. This paper will outline the medicinal species most used for preparing the above-mentioned types of preparations. The method of the production of the preparations will also be presented, as well as the method and purpose of using them. The last part of the paper will cover the species used in the process of composting plant waste that remains in the production of different plant species.

Keywords: medicinal plants, organic production, biodynamic production, preparations, composting.

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Organic Production – Protection and Increase of Biodiversity

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Abstract: An indigenous biodiversity is very important for ecosystem stability and productivity. In the last few decades biodiversity intensive degradation is predominantly the result of exhaustive agricultural production practices. Habitat destruction, efforts to achieve uniformity at all levels, the implementation of tight crop rotation and excessive use of synthetic substances (fertilizers, pesticides and other) in agriculture affected the loss of biodiversity in ecosystems (Ugrenovć et al., 2012).
In the beginning of the organic farming system development, biodiversity was considered one of the key issues, as important as soil fertility (Haas, 2012). Application of theorganicproduction methods protectsand enhancesbiodiversity: conserving local populations, introducingless representedspeciesin production,introducingwidercrop rotation(increase of biodiversityin time), using covercrops, intercropping andcavingfloralbelts.Compared to conventional farms, the increase in biodiversity at organic farms is about 35% (Gabriel et al., 2013). Important functional groups: plants, beneficial insects (pollinators, predators, parasitoids) and micro-organisms, are getting more prevalent in organic production, thus encouraging ecosystem services, such as pest control (Krauss, et al., 2011), providing nitrogen with symbiotic nitrogen fixation (Ugrenović & Filipović 2017; Popović et al., 2019). Such an understanding of biodiversity protection and promotion for the organic producer is a logical and economically reasonable approach, which makes it more competitive and more sustainable.
To prevent the loss of biodiversity and ecosystem degradation, the EU in 2011 published an „EU Biodiversity Conservation Strategy to 2020" aimed at „restoring lost biodiversity and accelerating the EU's transition to a resource efficient and green economy".

Key words: organic farming, biodiversity, bio resource conservation, ecosystem services

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Viticulture and enology as export potential of Croatia

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Abstract: This paper analyzes export potential of viticulture and winemaking in Republic of Croatia. Based on quantitative research methods applied by using Relative Trade Advantages (RTA) index, Export Competitiveness Index (XC), Comparative Advantage Index (RCA) and Relative Trade Advantage Index (RTA) in relation to EU countries. The 2015.-2016. study provided by the National Bureau of Statistics. The research results show negative macroeconomic indicators related to the potential of wine exports and lack of comparative advantage (0.25020853), negative trend of export competitiveness (0.753189), lack of export specialization (0.103778589) as well as negative trade advantage (-2.0).

Key words: viticulture, winemaking, exports, imports, index, Croatia

Contribution to the study of the climatic influence on dieback of the Cedar of Atlas Cedrus atlantica Manetti in the Theniet El Had National Park (Algeria)

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Abstract: The purpose of this study is to investigate possible causalities of the decline of Atlas cedar in Theniet El Had National Park. This is to highlight the rates of dieback recorded through recorded densities and distribution of stems. The study is carried out through forty (40) concentric plots of 2, 5 and 10ares in addition to those rectangular of 2 ares in the northern slope of the cedar grove. From soil samples and collection of climatic data to physical-chemical analyzes were carried out in each of the study plots. The dendrometric measurements are carried out on all the stems of the plots of 2, 5 and 10 ares. It appears that the decline, through the analysis of variance and the Spearman test, is linked with dendrometric characteristics indicative of competition. We used the geographic information system and the remote sensing to analyses climatic changes and the distribution of the trees for the recent period of time.

Keywords: Atlas cedar, dieback, density, distribution of stems, Theniet El Had.

Study on agro-environmental indicators for determining land degradation and their physical, chemical, biological impact on land degradation

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Abstract: In the area of the town of Tissemsilt, the techniques of tillage those are mechanized have shown their limits for the sustainable management of soil resources for two reasons, the insufficient matrix of the erosion and the loss of the stock in soil organic matter. In other words, these techniques aren't adapted to the pedo-climatic constraints of our study area. The techniques of mechanized tillage causing excessive fragmentation, soil compaction, initiating erosion processes, but also runoff, and in principle is not supporting sustainable agricultural development. The challenge is double; the culture system should permits the productions amelioration and at the same time the preservation of natural resources in the soil and the environment. This challenge can't be completely satisfied unless the no-tillage is performed at a high technological level. This technological development must concern to the management of harvesting residues and at the seedling time, the crops implantation, the fertilization of fundus and the weeding practices (type of herbicide, dose and application). The direct seeding preserves the environment by reducing the soil loss and nutrient elements and practices the treatment products for the improvement the quality of the water and the air. No-tillage practices are recommended way of to combat water and wind erosion.

Keys words: Water, soil, land degradation, Tissemsilt, agricultural development.

Mapping the risk of forest fires in Algeria: Case study of the forest of Guetarnia (Western Algeria)

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Abstract: The methods applied in Algeria for the prevention and fight against the fires remain fairly traditional and have proved to be ineffective in reducing the disastrous impact of this phenomenon. However, the aim of this work is to analyse a forest ecosystem that is fairly representative of the whole of the forests in Algeria, on plan risk and vulnerability of the environment for a better control of risk. We used geomatics techniques to map the degree of risk of fires and for the analysing of the space we used satellite imagery and spatial data of the Geographic Information Systems (GIS). The Guetarnia forest is located in the Western Algeria. Seven thematic maps have been developed and have helped to develop a sensitivity map to depict the fire risk. The establishments of the map of vulnerability of forests to fires in fact appeal to the application of a model established by Dagorne and Duche (1994) and tested for the mountainous forest Mediterranean region. The basic data, exploited by a series of specialized software, allow the establishment of different maps (layers of useful information). The tools implemented for the development of the map of the fire risk are ENVI 3.4 and MAPINFO 7.0. The floristic composition of the forest of Guetarnia is diversified. Vegetation density is strong with woody species. The combustibility and flammability, in terms of vulnerability to fire risk, is classified in the range between medium and high and is covering 57% of the total surface of the forest. The low risk remains fairly high with a rate of 20%; and the rest of 23%, is with great danger rates (Belgherbi et al, 2018). This index of risk of lights is high enough for the forest of Guetarnia. It is the result of almost total absence of forest management planning.

Keywords: Forest fires; risk map; remote sensing; GIS; Guetarnia, Algeria.

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Influence of THI on the zoo technical parameters of dairy cows in the semi-arid conditions of western Algeria

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Abstract: Roeleveld and Van den Broek (1996) emphasized the important role for livestock performances diagnosis, as preliminary step to any promoting project, especially in underdeveloped countries. The welfare of dairy cows can be evaluated as a basis for THI values. In the warming to a critical range of THI of 70-72, performance of dairy cattle is inhibited and cooling becomes desirable. At THI of 72-78, milk production is seriously affected. In the dangerous category at THI of 78-82, performance is severely affected and cooling of the animals becomes essential (Du Prezz et al., 1990). The aim of our study was to determine the effects THI on zootechnical parameters of pie noir dairy cows: heart rates (HR), respiratory rates (RR), daily milk production (DMP), dry matter intake (DMI), under semi-arid climate of Algeria. This study was carried out in 2019, in the West Algeria using 50 pie noir cows in mid lactation. The experiment was performed in spring and summer periods. On each control day, temperature-humidity index, THI, RT, HR, RR, DMP, DMI, were determined. All this parameters were affected ($P< 0.05$) when the THI increased from 67.7 to 84.3. Statistical analyses were carried out between THI index and some controlled parameters (RT, HR, RR, DMP and DMI). The results indicate that RT is an indicator of thermal balance and may be used to assess the difficulty of the thermal condition which can affect the daily milk yield, and the economic profitability of dairy farming. The daily milk production and feed intake are linked with metabolic heat production. At higher ambient temperature, increases of RT could proceed as a factor restrictive milk production. Though, in a challenge to reduce body temperature, dairy cows reduce heat production from fermentation, digestion and other metabolic processes.

Keywords: Climate change; Heat Stress; THI index; Performance; Dairy cow-Algeria

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Analysis of Land Surface Temperature at Sarajevo Canton using Landsat 8 data

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Abstract: Land Surface Temperature (LST) varies depending on geographical location, season, time of day, etc. However, even local microclimatic conditions can cause significant temperature changes over relatively small distances. The paper analyzes the LST by seasons at the Sarajevo Canton, which is specific as an urbanized basin surrounded by high mountains. The aim of this paper is to determine the minimum and maximum temperature variations during different seasons, depending on altitude, aspect, land use, land cover types, and other local factors. Landsat 8 satellite imagery for the period 2015-2020 was used for calculation of LST data. One of the conditions was to have the images with less than 10% cloud coverage in order to avoid inaccuracies that cloudy weather can cause. The method used to obtain a raster maps is an automated six-step image-processing algorithm. Bands 4, 5 and 10 was used as main input parameters for calculating LST. Band 10 was the most important for obtaining thermal data, while bands 4 and 5 were necessary for the calculation of the Normal Difference Vegetation Index (NDVI). Using two-way analysis of variance (ANOVA) and Tukey HSD test we examined LST variations depending on local geographic factors and land cover types. Comparing temperatures in urban areas and mountain environments, the results show that, during the summer, temperature amplitudes are significantly higher than in the winter season. At 1000 m altitude differences in amplitude are generally above 10 ^{o}C in summer and below 10 ^{o}C in winter season. Beside the altitude, the most influenced factors are urban heat islands, vegetation (especially in areas with dense coniferous forests) and aspect.

Keywords: LST; Sarajevo; mountains; correlation, seasons

Diversity of local genetic resources of '*Castanea sativa* MILL.' in Northern Morocco: Interactions between agromorphological diversity and peasant practices

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Abstract: Morocco is a country in North Africa that enjoys a great climatic, geographical and topographical variety. This gives it a great floristic diversity. However, many of its local species have been under-used, neglected or even abandoned in favor of others that have become the basis of intensive agriculture. In fact, for decades, we have been witnessing a large-scale replacement of local and traditional species well adapted to the conditions of the environment by industrial and improved species. This genetic erosion further weakens and degrades local ecosystems. The chestnut tree, "*Castanea sativa* MILL", one of the oldest species in the country, is no exception to the general trend. It is a victim of oblivion and neglect of science and economics. It is worth noting that Moroccan varieties, present only in a small area in the north of the country, which still unknown to science, have escaped the two scourges that caused the collapse of castanea cultivation in the world, namely the two cryptogamics diseases: blight and ink. Our study fits into this framework, and focus on the diagnostic of the local chestnut populations through a multidisciplinary approach. The ethnobotanical approach, through appropriate surveys of 389 farmers, has made it possible to explore and analyze local knowledge and skills and to highlight a rather timid peasant classification. The agromorphological approach, corresponding to the evaluation of diversity by morphological parameters of 6200 leaves (length of the petiole, length of the blade, width of the blade, distance from the base to the width of the blade, etc...) and 14600 fruits (length of the fruit, width of the fruit, length of the helium, width of the helium, thickness and weight of the fruit, etc...) from 31 populations constituted by 310 trees, has made it possible to draw up an inventory of several varieties. Based on the results obtained, it is stated that there is a great diversity between the different populations on one side, and between environmental and organizational aspects of the production system and activities linked to local ecosystems on the other. This observation will strengthen the prospects for preserving, maintaining and promoting the genetic resources of these populations of chestnut trees with heritage, economic and cultural values.

Keywords: Chestnut tree, genetic resources, peasant classification, local varieties.

Physiological parameters of maize cultivate with sewage sludge

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Abstract: The use of sewage sludge as a source of nutrients and organic matter for agricultural soils is a well-established practice. However, few reports highlight the effect of the nutrients and potentially toxic elements provided by organic wastes application on the plant physiological parameters, such as photosynthetic activity and stomatal conductivity. We perform a greenhouse experiment with maize exposed to a dystrophic red Latosol amended with mineral fertilizer and different rates of sewage sludge with the following objectives: i) assess the nutrients and metal uptake translocation and distribution in plants and ii) evaluate the relationship between plant physiological parameters and yield indicators under the study conditions. The application of sewage sludge increased the soil organic matter, pH, and the amounts of available Ca, S, and Mg, comparing to the mineral fertilizer treatment. The plants promote a higher translocation of macronutrients to the shoots in the sewage sludge treatments, which results in higher photosynthetic activity, stomatal conductivity, and maize yield parameters. Moreover, the trace elements, which can cause toxicity in small concentrations, were founded mainly in the root, which indicates a plant defines mechanism.

Keywords: Biosolids, Zea mays, Agricultural production, Heavy metals.

Morphometric and Hydrological Characterization of Sapucaí River, South of Minas Gerais

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Abstract: Hydrographic basins morphometric characterization is essential for hydrological and environmental analysis. We aimed to assess hydrological and relief behavior to cooperate with natural resources' management. We analyzed morphometric and hydrological characteristics of Sapucaí River basin upstream area to provide technical support for proper management of its water resources. River density's parameters, drainage density, relief ratio, roughness index, compactness coefficient, form factor and maintenance coefficient were calculated. Flow data were obtained by fluvial monitoring station 61410000 of National Water Agency and organized by Computational System for Hydrological Analysis and Excel application to obtain the average annual flow, long-term average flow, maximum long-term flow, long-term minimum flow from 1994 to 2013 and deviations from average. Precipitation data were obtained by Climate Hazards Group Infrared Precipitation with Stations, and gathered in average monthly precipitation and average annual precipitation for the period. Data allowed us to infer that Sapucaí River basin is prone to floods, appear average flows at 174.06 $m^3 s^{-1}$ and average monthly rainfall at 122.22 mm.

Keywords: Hydrology, Fluviometry, Rainfall, Water Resources.

Summer of 2020: Rainy floods with tragic consequences in an area of high population density in Brazil

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Abstract: The most populous area of Brazil, the southeastern region, was affected by **f**loods and landslides from January 17, 2020. According to data from daily newsletters, more than 20,000 inhabitants was directly affected by tragic disasters caused by floods in the States of Minas Gerais, São Paulo, Rio de Janeiro and Espírito Santo. The impacts of floods and landslides are associated with hydrometeorological events and mainly due the lack of urban planning. This fact, combined with the climatic seasonality of tropical regions, promotes calamity situations in Brazilian southeastern region. The management of risk areas must be carried out based on physiographic characteristics of the landscape combined with climatic and socio-environmental features. Thus, we suggest conducting morphometric analysis as a basis for mapping, planning and management of the risk areas. The application of the drainage density and bifurcation indexes, linked with geostatistical techniques, allowed to measure of risk areas in the Machado, Mandu and Sapucaí Rivers, at Rio Grande Basin, southern Minas Gerais. It was found that the problems caused by floods and landslides are promoted by the irregular occupation of fluvial floodplains areas, which occur naturally associated during the summer at southeastern Brazil. However, many human deaths could have been saved and many material losses avoided if there were public policies that favored human lives and, therefore, promoted structural urban reforms that prevent the occupation and remove the people installed in areas subject to natural disasters. Thus, it is necessary and urgent that public authorities comply with their legal obligations and do as essential urban reforms to guarantee the life of the population. They must therefore remove and prevent citizens from inhabiting areas of natural risk.

Keywords: Natural Disasters; Heavy Rains; Southeast Brazil.

Monitoring of Native Forest Regeneration Impacted by Fire Using Unmanned Aerial Vehicle

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Abstract: Brazil has registered several fire outbreaks events recently, and 236.371 hot spots were registered by National Institute for Space Research in 2015. To minimize impacts, new technologies must be developed for fighting and monitoring fires. Thus use of unmanned aerial vehicles (UAV) is new tool to be applied for monitoring fire outbreaks and assessing regeneration of native vegetation fire impact. We aimed to monitor the regeneration of native vegetation in Permanent Preservation Area (APP) of Federal University of Alfenas (UNIFAL-MG)impacted by fire at July 30, 2019, using images obtained by UAV, in RGB. UNIFAL-MG is located at southern region of Minas Gerais, in transition zone Atlantic Forest-Cerrado, with two well-defined climatic seasons: hot and humid summer, and cold and dry winter. Climatic characteristics of winter boosts dispersion of fires, often promoted by local population. A flight was performed on July 31, 2019 with UAV DJI Phantom 4 - Advanced, loaded with Sony EXMOR ½.3 ”RGB sensor and Near Mapir Survey 2 Infrared sensor, at 100 m height. Subsequently, the images were processed in Agisoft Photoscan software to make georeferenced mosaic, Digital Surface Model and reflectance maps. Then, using ArcGIS 10.5 software, source and drainage was identified, and APP was delimited using Buffer Tool. Degraded area within APP was also calculatedas three hectares of fragment impacted by fire.

Keywords: Natural disasters; Resilience; Epidemiology of Disaster.

Modeling of water erosion in a tropical watershed

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Abstract: Water erosion is the main process of soil degradation in Brazil. In this context, the objective of this work was to estimate soil losses by water erosion through the application of two prediction models and compare their results. The Revised Universal Soil Loss Equation (RUSLE), which is the most commonly used model in Brazil, and the Erosion Potential Method (EPM) were used. The study was carried out in 2019 in the Ribeirão José Lúcio watershed, located in Conceição do Rio Verde Municipality, south of Minas Gerais, Brazil. The soil losses estimated by EPM and RUSLE were validated using data of the total sediments transported in the water discharge, used to calculate the observed sediment. The validation was done based on data of a hydrosedimentological station near the defluvium area of the watershed. The RUSLE and the EPM estimated average soil losses of 1.56 and 1.17 Mg ha-1 year-1, respectively. When compared to the observed sediment (1.31 Mg ha-1 year-1), EPM underestimated the result by 15.27%, while RUSLE overestimated it by 19.08%. Considering the entire watershed, both prediction models indicated the predominance of low erosion rates (<1.0 Mg ha-1 year-1). RUSLE indicated that 4.60% of the area presents severe soil loss (> 7.5 Mg ha-1 year-1), while EPM did not detect sites with severe erosion (0%> 7.5 Mg ha-1 year-1). In general, both methods had the advantage of simulating the erosion process quickly, with low investment, and with easy input data obtaining.

Keywords: Water erosion; EPM; RUSLE.

Sensitivity of the Flood Risk Maps to the Different Digital Elevation Model's Resolutions

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Abstract: Flood is considered as one of the most devastating and destructive type of natural disaster, causing significant damages in terms of livelihood, properties, social and economic assets as well as a strong environmental degradation. Indeed, an accurate flood modelling is important to identify the flood prone areas in order to prevent and/or decrease the flood damage. Lower resolution of the Digital Elevation Models (DEMs) are usually used because of their availability but they have a considerable limitation in providing accurate results related to the flood inundation areas and flood risk maps. This research aims to test the sensitivity of the flood model results to the different DEM's resolution taking into account two different case studies in Bosnia and Herzegovina: (A) a large and long river section on Bregava River, 33.5 km located in Adriatic River Basin District and (B) a small and short river section on Joševica River, 7 km located in Sava River Basin District.
Eight 1D flood models are created using HEC-RAS model in GIS environment, the same input data in terms of cross sections, river structures, hydrology (Q 1/100 return period) roughness were considered. In addition, four different DEM resolutions were introduced respectively to the models; LiDAR 1x1m which is the most accurate DEM dataset and it is considered as the flood model reference in this study, DEM 5x5m, DEM 20x20m and the open source EU DEM dataset Copernicus 25x25m. The sensitivity analysis is produced, an error index (RMSE) is calculated for each case study and the Flood Risk Maps are created to investigate either the flood inundation as well as the flood risk are over or under estimated. The analysis of these specific study areas demonstrate that lower resolution DEM dataset is overestimating water surface elevations and flood inundation results, and it seems to overestimate the flood risk as well. Therefore, using an available low-resolution dataset could be misinterpreted to the planning process.

Keywords: Flood risk, inundation areas, HEC-RAS model, DEM Resolution, sensitivity analysis.

DNA barcoding of hoverflies (Diptera Syrphidae) – new species discovery in the *Merodon aureus* species group

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Abstract: *Merodon* is the richest genus of hoverflies in Europe with 120 recognized species. The adult species of this genus are important pollinators of diverse plants, while larvae are phytophagous and they develop in geophytes. Species discovery within genus is facilitated by the application of DNA barcoding approach in almost all recent studies. DNA barcoding is based on the analysis of sequence divergence of the short fragment on 5′ end of mitochondrial cytochrome c oxidase subunit I gene (COI), although, in hoverflies, both 5′ and 3′ COI sequences are equally used and often combined. The aim of this study was to identify hoverfly specimens collected in Morocco, Italy, Turkey and Georgia to a species level within the *M. aureus* species group. In order to achieve this, we analyzed 5′ COI sequences of aforementioned specimens. The sequences were blasted against the NCBI nucleotide database and used for Maximum parsimony and Maximum likelihood trees construction. Three new candidate species are discovered: *M.* sp. nova 1, *M.* sp. nova 2 and *M.* aff. *bessarabicus*. The three species are resolved as reciprocally monophyletic clades with strong branch support on both trees. In order to verify and describe the three species, additional examination of morphological character states is needed.

Keywords: COI gene, new species, molecular taxonomy

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Quality of Marigold (*Calendulae flos*) in environmental conditions of Northern Montenegro

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Abstract: Phenol content was determined with Folin Ciocalteu regen. The highest content of total phenols was detected in sample number 12 from the locality Rakonje (51.6 +/- 0.07 mg GAE / g flower) as well as samples number 13, also from the same locality of the variety Doppia Fiesta (50.3 +/- 0.12 mg GAE / g flower). as well as sample 9 of the same variety but from Kostiće locality (50.7 +/- 0.20 mg GAE / g of flower). Using the modern analytical techniques, the flavonoid drug complex of Marigold (*Calendulae flos*) was analyzed. Modern microscopic techniques have confirmed the identity of the cultivated drug in accordance with a valid, European pharmacopoeia. HPLC analysis identified all major carriers of the flavonoid complex responsible for biological activities appropriate to the calendula flower (epithelial, anti-inflammatory, antibacterial, precancerous, etc.). The presence of three flavonoid dominants was confirmed, named: Typhenoside, Narcissin, and Kalendoflavoside, detected by LS-MS technique in material from our area, and the results are in complete agreement with the literature. The general conclusion is that the area of northern Montenegro, can give quality medicinal raw material Calendulae flos flower in the current climatic and pedological conditions, when it comes to cultivation.

Keywords: marigold, flower, phenols, flavonoids

Chemical composition of *Origanum dictamnus* and *Origanum vulgare* ssp. *hirtum* from Greece

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Abstract: Most of the *Origanum* species are locally distributed within the Mediterranean region where they grow in the mountainous areas on the islands. Due to this, the rate of endemism is high, as in case of dittany of Crete (*O. dictamnus*). *O. vulgare* possesses the largest distribution area and can be found throughout the Mediterranean region, however, the yield and quality of the essential oil is controlled genetically and strongly affected by the environmental influences. *Origanum* essential oils predominantly containing carvacrol, are generally of superior quality and highly valuable raw material for food as well as in pharmaceutical industry. Essential oil of *O. dictimus* contains 70.8% of carvacrol, while *O. vulgare* ssp. *hirtum* essential oil contains 78.5%. This study indicates the high quality of investigated *Origanum* species from Greece, and indicates it to be highly valuable raw material for food and in pharmaceutical industry.

Keywords: Greek oregano, dittany of Crete, essential oil, GC-MS, carvacrol.

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Effects of varieties on bean yield in organic production

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Abstract: Organic production requires bean varieties that are specially adapted to a low level side-dressing system. Badly adapted varieties can be responsible for yield disproportions between organic and conventional ways of farming, because the majority of varieties is intended for conventional production. Varieties specially grown for organic agriculture do not exist for the majority of crops, including bean (Tissi *et al.* 2014). As a nitrogen fixing plant, after bean significant amounts of nitrogen are left in the soil, which favours the following crop, and if plant residue is ploughed in, soil structure is enhanced (Cvijanović *et al.* 2016). The reasearch has been conducted during a three-year period to determine the grain yield of bean grown by organic principles and to choose the variety which is more suitable for farming in organic production. The field experiment was placed by split-plot design in 4 repetitions on calcareous chernozem. Large plots were varieties (Maksa and Zlatko), and subplots were control and agrotechnical treatments permitted in organic production. In the research, the starting hypothesis was that the yield will depend on variety and applied agrotechniques in organic bean growing technology. Bean yield depended on agroecological conditions during the year of production. Bean grain yield depended on the veriety. Using variety Maksa a statistically very significantly higher yield was achieved compared to variety Zlatko. The influence of the treatment with pelleted fertilizer and the use of microorganisms was significant.The highest yield was given by the pre-sowing fertilization treatment with pelleted fertilizer (Guanito) along with the combination of foliar treatment with effective microorganisms (EM-aktiv). Correlative dependance between yield components and yield per hectare was not significant, while between yield components it was on the level of statistical significance. For the production of bean by organic principles, variety Maksa is recommended.

Keywords: bean, yield, variety

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Climatic Change and Agricultural Production

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Abstract: Climatic extremes have demonstrated the sensitivity of agriculture to climate change. Climate changes shifting climate variables: temperature, precipitation, humidity, evaroration, sunlight, wind speed, etc. Climatic change has created challenges for the agricultural sector, adding to pressures on global agricultural and food systems (Popovic et al., 2019). Many crops have negative impacts from extreme weather, droughts, floods, higher temperatures and season shifts that climate change brings. Rising temperatures and water stress have already led to lower crop yields for maize, wheat, soybean, sunflower, buckwheat, flax and other crops which typically relies on precipitation instead of irrigation. The rising temperature has adverse effect on flowering and leads to pests and disease buildup. Flood and excess rain over a short duration of time cause extensive damage to crops. Interestingly, potato production may be positively impacted by elevated CO_2 concentration, as reported by the experts at the Central Potato Research Institute, where they claimed that potato yield will increase by 11.12 per cent at elevated CO_2 of 550 PPM and 1°C rise in temperature. However, further increase in CO_2 with a likely rise in temperature by 3°C will result in decline in production by 13.72 per cent in the year 2050 (Ranadive, 2017). The soybean yield and biomass increased for all treatments in the 2030s with positive correlation with the climatic variables. The maximum temperature represented the most significant correlation with yield and biomass for almost all treatments. Finally, soybeans might achieve an optimal threshold temperature in the future, leading to yield increases in the 2030s. Climate change impact assessment can facilitate selection of better adaptation strategies related to irrigation water management and agricultural practices in the future (Ahmadzadeh Araji *et al.*, 2018). Many studies show that global maize yields were 3.8 percent smaller than they would have been without warming and that wheat yields were 5.5 percent smaller. A study projected that global wheat yields could drop between 4.1 and 6.4 percent for each global temperature increase of 1 °C. For every country, a decrease like this has a high fall in production and thus a reduction in budget and economic decline. Climate change threatens global food supply as certain crops become more expensive due to reduced production and supply. Increasing frequency and duration of droughts strongly require adaptation of agricultural crops and their diversification under changed agro-pedological conditions. In such situations, alternative crops like sorghum and millet should be sown, because they have pronounced resistance to unfavorable abiotic factors and good adaptive capacity towards the dry conditions which prevails during the growing season. For one country a decrease like this has a high decline in production and therefore reducing the budget i.e. economic weakening. Climate change therefore threatens global food supply as certain crops become more expensive due to a decrease in production and supply. In such situations, should be introduced into production alternative crops like sorghum and millet, who excel at conditions where the dry season prevails during the growing season of the crop. The agriculture has to take place and in adverse climatic conditions and enough food will be produced, sowing tolerant varieties to changed environmental conditions.

Keywords: climate change, temperature, precipitation, agricultural production.

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Climate Change as a Threat to Global Economy

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Abstract: Climate change refers to the new weather patterns (especially in precipitation levels and global temperature) that occur over several decades with strong potential to decrease centuries of global progress. According to the World Economic Forum's Global Risks Report climate change disaster is the biggest threat to global economy nowadays, so it is more than clear that awareness of this issue must be increased. Climate change is increasingly affecting every aspect of people's lives together with species, communities, industries, as well, consequently obstructing global economic stability (Simunic et al, 2019; Cadro et al, 2019). The interaction between economic development and climate change on a global scene is evident and many companies have already felt the impact of extreme weather events on profits. In addition to that, there is a growing demand from different shareholders who are concerned about how the business activities reflect on the environment. From this perspective, we can expect that natural disasters will be intense and more frequent in the upcoming years which is the reason why most scientists and economic analysts agree that "the most expensive thing we can do is nothing" (USC, 2011). This burning issue imposes the need for a multistakeholder approach and public-private sector collaboration to find the most appropriate model for obtaining sustainable economic growth.

Keywords: climate change; global economy; extreme weather events; economic development.

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Influence of Some Ecological Factors on the Number of Soil Actinomycetes in Different Physiological Phases of Development of Maize

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Abstract: Maize (*Zea mays* L.) is one of the biggest profits in 20th-century agriculture. Strategically, it is important agricultural species that occupies the third place in the world's widespread distribution (143 mil. ha), after wheat (215 mil.ha) and rice (151 mil. ha) (Božović et al., 2018). On successful production affect in addition to genotype, abiotic factors and biotic factors. Microorganisms are the most important factor in forming of soil fertility. The number and enzyme activity stand for the current state of microbiological soil activity (Šarčević et al., 2016). Microorganisms that participate in the processes of soil matter circulation, encompass representatives of different ecophysiological groups and are a very significant indicator of soil fertility. Among the microorganisms mentioned are actinomycetes, which are phylogenetically belonging to the group of *Gram - positive* bacteria, and ecologically represent aerobic organotrophic groups of microorganisms. Forms with developed mycelium have a structure similar to eukaryotic fungi, but in the soil live simple forms of actinomycetes, which do not produce mycelium, and develop in the form of microcolonies. Although they represent soil microorganisms, which primarily participate in the processes of soil matter circulation, some types of soil actinomycetes also possess pathogenic properties. In this paper, the influence of environmental factors on the number of actinomycetes in the soil type "cernozem", at different physiological stages of maize development, was determined. The analysis of variance was found that the examined factors influenced the number of this group of microorganisms.

Key words: ecological factors, soil, microorganisms, actinomycetes, maize.

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Nutrition Effect to Productivity of Bioenergy Crop Miscanthus x giganteus in different environments

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Abstract: Miscanthus x giganteus Greef et Deu is a perennial C4 grass, originally from East Asia. It has high production potential and is ecologically very acceptable species suitable for the production of solid biofuels (Živanović et al, 2014; Đurić et al., 2019). Generates high biomass yield, in the period to 20 years, has good energy performance and relatively low investment in production.
The subject of the research is a mischantus, a clone imported from Germany for introduction to energy crops production. The aim of this research was the study of the influence of the environment and nutrition on the morphological and production properties of miscanthus in the Surduk, in chernozem type soil. The crop is at the beginning of the research was seven years old, and was in years to achieve maximum yield for commercial production. In period 2018-2019 were tested two variants – control, V1, and variant with nitrogen top dressing, V2. Morphological productive characteristics of miscanthus were analyzed in this study: plant height in the tasseling period, number of leaves on stalk in the tasseling period, number of stalk in tiller, number of stalk with tassel, dry plant yields, stalk moisture in harvest time and cellulose content. The Miscanthus achieves high yields and excellent performance in summer drought conditions because it has a well-developed root system. In the period April-October 2018-2019 there was less precipitation (428 mm and 431 mm) than the optimal needs of the plants (550 mm). In the two-year average the miscanthus had a stem height of 342.4 cm and achieved a yield of 31.4 t ha^{-1}. To these morphologically productive traits significantly affected weather conditions, nitrogen nutrients as well as the interaction of the factors studied. Miscanthus (or Elephant Grass) is a popular choice for bioful production, because it produces a crop every year without the need for replanting and due to the rapid growth, low mineral content, and high biomass yield, outperforming maize and other alternatives. It is an excellent choice for our environment, our economy, and our future security of energy supply. It also complements forestry as it sits easily alongside to help even out supply chain needs.

Key words: Miscanthus, nitrogen top dressing, morphological and productive traits, environments

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Production potential of soils for organic agriculture: Case study of the Polimlje Region, North Montenegro

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Abstract: The combination of degrading natural conditions and resources, climate change, growing population, urban development, and competition in a global market complicate optimization of land for agricultural products. The use of pesticides and fertilizers for crop production in the agricultural fields has become excessive in the recent years worldwide, but also in the Studied area of the Polimlje Region, North Montenegro. Sustainable agriculture is a production system that, over a period of time, is improving the quality of the environment and the resources on which production is based, satisfying needs in food, economic cost-effectiveness and improving the quality of life of farmers and the whole society. The technology of plant cultivation in such a system relies on the application of organic fertilizers, as the most important source of plant nutrients. Good agro-ecological conditions, uncontaminated arable land and water are significant advantages that the Polimlja region can use as the opportunities for the production of healthy-safe food. The number of producers and areas under organic production in the municipalities that belongs to the Polimlje Region (Bijelo Polje, Berane, Andrijevica, Plav) are increasing, and the market for organic agricultural products also has a pronounced upward trend, both globally and localy, in th studied region of Polimlje. Subsidies from the Ministries in charge also play an important role in the development of organic agriculture. Analysis of the application of agro-technology in agricultural production indicates that the use of artificial fertilizers and chemical agents in Montenegro is relatively small. Agricultural households are mostly small and traditionally extensive, meaning that they minimally use a variety of chemicals (for protection and fertilization). The economic crisis of the last twenty years has also contributed to the reduction of this consumption. All of this has contributed to a great deal of conservation of land and water resources from contamination caused by the use of synthetically synthesized chemicals in agricultural production, so that it is much easier for farmers to deal with organic farming. Organic production is possible to be organized in this region, but it is necessary to take care of the site itself in such a way that any existing or potential sources of its pollution would be avoided. The physical-geographical conditions, climate and soils of the Polimlje region, land use would correspond to a more ecstatic way of production of food according to the principles of organic agriculture, so we can use this space for the possible production of: crops (buckwheat, potatoes, barley, oats, rye), continental fruits: raspberries, blackberries, blueberries, apples, pears and plums, and the production of certain types of cabbage feed (hay, hay, silage) for animals in the organic farming system. Based on the results of these surveys recommendations are made for the implementation of appropriate agronomic procedures, in order to prevent or stop erosion, increase the biological productivity of the land and assimilate the same purpose - for agriculture, plant production and cattle breeding, and especially organic agricultural production. For this region, but also to the regions similar to the studied area, there is a need challenging the policies related to the improvement of the ways agriculture productin and the management methods of both: plant and livestock production.

Keywords: Production potential, Soils, Organic agriculture, Polimlje Region, North Montenegro.

Causes and consequences of pollution of the Great Bačka Canal, Serbia

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Abstract: The excavation of the Great Bačka Canal at the end of the 18th century played a large role in the cultural and economic development of the whole Bačka. With the rapid development of industry on the banks of the canal, the use of water resources increased, and because of that the Great Bačka Canal was transformed into a so-called the black ecological spot of Europe. The 118 km long stream from Bezdan to Bečej connects the Danube and Tisa and passes through the settlements Bezdan, Sivac, Crvenka, Kula, Vrbas, Srbobran, Turija, Bačko Gradište, and Bečej. The main causes of this canal pollution are untreated wastewater that flows into the canal uncontrollably from the oil mill, sugar mill, meat factory, tannery, metal industry, etc. Numerous activities to find an adequate solution to this problem began in the 1990s. The construction of the Central waste water treatment plant, as the most rationally chosen solution, was funded by the European Union and completed in 2018., but the conditions for its full implementation remain unfulfilled. The impression is that activities of the competent authorities over the years have been more focused on eliminating the consequences rather than the pollution causes. As it seeks to join the European Union, in its integration process and harmonization of its domestic regulations with those of the European Union, first of all Serbia should work to implement its laws more effectively and enforce their penal provisions not only for joining the European Union, but primarily for environmental protection and protecting health of the citizens.

Keywords: pollution, Great Bačka Canal, sustainable development, environmental protection

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Genotype and Environment Effect of Soybean Production and Biogas

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Abstract: *Glycine max* L. Merril is important legumes, because is high protein and oil plants. Biomass i.e. soybean straw can be used and for the production of liquid biofuels (ethanol) because it has large amounts of carbohydrates (Popović *et al.* 2019; Milanović *et al*, 2020). Field trial was conducted to study the performance of two soybean genotypes, different maturity group, MG: early genotype, G1 - 0 MG and late genotype, G2-II MG, on chernozem soil, at Pancevo, Serbia. They were examined morphological and productive characteristics of soybean genotype: plant height, number of pods, absolute mass, volume mass, yield of grain and biogas yield. Year, genotype, and G x Y interaction they had statistically very significance on the plants height and number of pods per plant. The average value for plant height, it was 89.42 cm. Statistically significantly higher values for plant height had an early genotype, 93 cm, compared to late genotype, 87 cm. In 2018 the plants were statistically significantly higher (93 cm) compared to 2019. The year had a statistically significant effect on grain yield and biogas yield. In 2018 were realized statistically significantly higher values for grain and biogas yield (3.54 t ha^{-1}; 612 m^3 ha^{-1}) compared to 2019. Achieved is a difference of 660 kg ha^{-1} and 77 m^3 ha^{-1} respectively from 22.50% and 13.44%. Soybean production is the result of the interaction between the genetic potential of a genotype and the biotic and abiotic factors that reduce that genetic potential. The results showed that soybean can be successfully grown and for biogas production.

Keywords: *Glycine max*, grain yield, biogas yield, bioenergy.

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Analysis of genetic variation in bread wheat by grain yield components

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Abstract: The aim of this research was to evaluate the genetic variability of 18 wheat (*Triticum aestivum* L.) genotypes by quantitative agro-morphological traits, and to identify factors affecting the cultivars grain yield**.** A two years study (2017-2019) was conducted at the Experimental Field of the Agricultural University of Tirana (altitude of 40 m above the sea level, Latitude 41°24'6.14"N and Longitude 19°44'9.93"E). Plant material used, is part of the 270 accessions of the base collection of the Institute of Plant Genetic Resources. During the growing crop years, the accessions were evaluated for different quantitative characters and morphological characterization of the accessions was conducted according to international standards (IPGRI, 1985). ANOVA, principal components and cluster analysis were carried out involving nine quantitative traits, such as tiller capacity, plant height, spike length, number of spikelet per spike, number of seeds per spikelet, number of seeds per spike, weight of seeds per spike, weight of 1000 seeds and grain yield. According to PCA, three components exhibited about 75.51% of the variability within 18 wheat genotypes. Accessions were grouped into three major clusters based on Euclidean distance, suggesting that wheat genotypes with major level of dissimilarity between them were "Generozo" and "Ejesh". The results revealed that tiller capacity, number of seeds per spikelet, weight of seeds per spike/g and weight of 1000 seeds/g were the most important characters in differentiating the genotypes. Wheat genotypes used in this study reacted differently in the two growing seasons, giving high results in most of the traits that contribute directly in grain yield during 2017-2018 crop year. The use of principal component and correlation coefficient analysis in the wheat germplasm, simplify dependable classification of bread wheat germplasm, the identification of the superior genotypes and their relation with bio morphological traits with possibility expenditure in future breeding programs.

Keywords: variability; traits, grain yield; PC analysis

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Influence of bio-fertilisation with Arbuscular mycorrhizal fungi combined and PGPR on the growth parameters of date palm plants under drought tress conditions

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Abstract: Inoculation with mycorrhizal fungi and Plant growth rhizobacteria may be considered as a sustainable approach for increasing plant growth and abiotic stress resistance. A greenhouse experience was conducted in order to study the effect of a mycorrhizal fungal isolate from the rhizosphere of Zagora palm grove and a bacterial strain isolated from the arid rhizosphere in experimental domain of INRA, Marrakech, on the growth parameters and the resistance of date palm plants grown under drought conditions. The fungal isolates applied have shown to be infectious with a mycorrhization frequency that reaches more than 90 % and root colonization intensity that enhances when combined with PGPR. Depending on the irrigations system introduced to the soil, the effects of both mycorrhizal and PGPR inoculation on the biomass production and the improvement of minerals absorption are well demonstrated. The enhancement of Aerial biomass of the treated seedlings under the drought conditions is three times higher than untreated plants. All plants inoculated with AM fungi, with or without PGPR, have clearly demonstrated extreme growth compared to non-inoculated plants, despite the water deficit conditions.

Key words: Mycorrhizal fungi, Plant growth-promoting rhizobacteria, Date palm, abiotic stress

Nutrient status of *Citrus aurantium* and *Buxus sempervirens* in historic gardens of Arboretum Trsteno

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Abstract: The Arboretum of the Croatian Academy of Sciences and Arts with its historic gardens is considered to be one of the most valuable works of landscape architecture in Croatia with the collection of cultivated plants of particular significance. It should therefore be immediately revitalized, with special focus being paid to the plants from the Renaissance period. The aim of this study was to find appropriate revitalizing method of two plant species (*Citrus aurantium* and *Buxus sempervirens*) using nutrient status data. Data collection was undertaken in the field: a record of visual observations of intensity of chlorosis and average samples of soil and plant material were taken. Statistical analysis was used to estimate the correlation between intensity of chlorosis and soil reaction with biogenic elements and canonical discriminant analysis for each plant species. The results have shown that the nutrition status of *Citrus aurantium* is not optimal (pH_{H2O} is in positive correlation with the intensity of chlorosis (r=0,96, $p<0,0001$); higher dry matter content increases the Ca in the leaves and the higher Ca content decreases N. The antagonistic relationship was confirmed by the negative strong correlation of K and Mg (r=-0,90, $p<0,0011$). The canonical discriminant analysis revealed a significant difference between visual evaluation according to the results of the chemical analysis of leaf). In the case of *Buxus sempervirens* the values of most elements are within optimal values (a medium strong correlation between dry matter and magnesium (r=0,80, $p<0,0099$) and a negative medium strong correlation between dry matter and zinc (r=-0,75, $p<0,0188$)). Based on the results, certain measures of revitalization according to the methods of the restoration of the historical gardens have been proposed as well as the proposed fertilization method for each plant based on nutrients status and plant nutrients requirements.

Keywords: chlorosis; fertilization design; garden heritage; Renaissance; soil reaction

Wild and cultivated *Centaurea raphanina* subsp. *mixta*: a valuable source of bioactive compounds

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Abstract: *Centaurea raphanina* subsp. *mixta* (DC.) Runemark is a wild edible species endemic to Greece. The aim of the present study was to evaluate the chemical composition and bioactive properties of leaves collected from wild and cultivated *C. raphanina* subsp. *mixta* plants. For this purpose, edible leaves were collected from the wild, while at the same time wild plants were transplanted in plastic pots for conventional cultivation. The results showed that wild plants had higher nutritional value than cultivated ones in terms of fat, protein and carbohydrates content on a fresh weight basis. In contrast, tocopherols content (α-, γ- and total tocopherols) was higher in cultivated plants compared to the wild ones. Fructose, glucose, sucrose and trehalose were identified in both cases, while glucose and sucrose were higher in cultivated plants and trehalose in wild ones. Regarding organic acids, oxalic acid and total organic acids were detected in higher amounts in cultivated plants compared to wild ones. The main fatty acids were α-linolenic, linoleic and palmitic acid, with wild plants being richer in polyunsaturated fatty acids. The antioxidant activity assays showed contrasting results with extracts from wild and cultivated plants being more effective in the OxHLIA and TBARS assay, respectively. As for cytotoxic effects, both extracts showed mild cytotoxicity in non-tumor cell lines (PLP2), while samples from cultivated were more effective against cervical carcinoma (HeLa), breast carcinoma (MCF-7) and non-small lung cancer (NCI-H460) cell lines. Finally, wild plant extracts showed higher antimicrobial activity against *Staphylococcus aureus*, *Bacillus cereus*, *Aspergillus versicolor*, *Trichoderma viride* and *Penicillium verrucosum* var. *cyclopium*. In conclusion, cultivation of *C. raphanina* subsp. *mixta* plants showed promising results in terms of tocopherols content and cytotoxicity against cancer lines, however further research is needed to regulate the high oxalic acid content which is considered an antinutritional factor.

Keywords: antioxidant activity; bioactive properties; *Centaurea raphanina* subsp. *mixta*; tocopherols; wild edible species.

Inventory of water and natural gas infrastructure in the rural locality and creation of GIS database

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Abstract: The objective of this research is GIS database establishing of utilities infrastructure like water and natural gas in a rural locality in frame of lands inventory in the village Palanca (about 500 households), Stefan Voda district, Republic of Moldova.
Presently utilities documentation in rural areas is represented only in paper form, mostly being schemas (not georeferenced maps) with no scale. Usually these schemas are not update on adding new infrastructure connections.
Base map for the inventory is served ortofoto from year 2016 created by support of Norwegian government. Based on the ortofoto a digital Line Map is created – buildings (by roof), fences, roads, hydrography, forestry, contour lines etc. This Line Map is equivalent to a classic 1:2000 map.
QGIS was used as a desktop software for creation and population of established GIS layers. On the first step these layers were created as shape files. Further they were uploaded to a PostGIS database in order to provide different levels of access.
The article will describe step by step inventory of utilities infrastructure, digitizing of technical documentation, GIS creation and web enabling of resulted geodata.

Keywords: infrastructure GIS, utilities documentation, rural locality GIS, web GIS, giscuit

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Introducing NDVI, Tree Cover Density and Land Cover type as Fuel Indicators in the Wildfire Spread Capacity Index (WSCI); Case of Montenegro

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Abstract: This paper presents an updated version of our previous GIS-based method developed for indexing the forest surfaces by their wildfire ignition probability (WIPI) and wildfire spreading capacity (WSCI) (Hysa & Baskaya, 2019). The previous study relied on a multi-criteria approach including a variety of factors of social, hydro-meteorological and geo-physical character of the context. However, this study is challenging the drawbacks of the previous work, by introducing three new criteria regarding the vegetation properties in the area. Normalized Difference Vegetation Index (NDVI), Tree Cover Density (TCD), and land cover type are launched as indicators of fuel properties of the forest being indexed. The materials and software utilized here belongs to different open sources. CORINE Land Cover (CLC), Open Street Map (OSM), TCD via Copernicus high resolution data, and multispectral satellite images via Landsat 8 (Semi-Automatic Classification Plugin- SCP) (Congedo, 2016) are utilized as raw materials in a workflow in QGIS software. At this stage the study area is the territory of Montenegro. Following the inventory stage, the indexing method relies on a normalizing procedure in QGIS and the assignment of weighted impact factor to each criterion via analytical hierarchy process (AHP). The WSCI value is derived as the sum of the products between the normalized class and the respective weighted impact factor of each criterion. Besides the methodological improvements the results of this work deliver tangible outputs in support of forest fire risk reduction in disaster risk management and fire safety agendas.

Keywords: Disaster risk management; QGIS; Semi-automatic classification; Analytic Hierarchy Process; Montenegro.

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Temporal dynamics of land use and occupation changes in the Municipality of Alfenas, Brazil

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Abstract: Abstract: Land use and occupation changes, such as urban expansion and the expansion of the agricultural frontier associated with demographic growth, make the environment protection a priority. The work aimed to evaluate the in land use and occupation changes in the years 1985, 1995, 2005, 2015, and 2018 in the Municipality of Alfenas, Minas Gerais state, Brazil, and identify the social and environmental impacts of these changes. The municipality covered an area of 850,446 km². Using the MapBiomas (https://mapbiomas.org/) project data between 1985 and 2018, we elaborated maps of the study area to assess the effect of the temporal evolution of different land uses in the municipality. We found an increase of 330% in the urban area during the studied period with a growth of 330%. There was also a reduction in the area of pasture (68%) and an increase in the area destined for agricultural crops (83%), leaving the two practically equivalent in terms of space occupied with about 32000 ha. There was an increasing expansion of the area destined to the production of sugarcane (1200%) as well as silviculture/eucalyptus (48%), which is a consequence of the economic interest that these activities have gained in the last decades. Considering the areas occupied by forest (4,231.64 ha), we found small changes during the studied period (3%). The results show that land use and occupation in the municipality of Alfenas has changed significantly over time, and these changes must be accompanied by public policies that encourage the preservation of the environment and natural resources. Thus, in the future, the community may have a better quality of life in both urban and rural areas.

Keywords: Land use and Cover, Soil conservation; Agricultural sustainability.

Estimate of sweet potato productivity based on vegetation indices of drone imagery

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Abstract: Environmental technologies are applied in agricultural systems to increase productivity and promote sustainability. The use of technological innovations is constantly growing in the agriculture field, allied to the development of advanced methods and techniques of data processing based on intelligent systems to obtain precise results. Therefore, the use of unmanned aerial vehicles (UAV) has been showing significant results in the monitoring of several crops, making it possible to diagnose stresses before physiological, environmental, or economic damages. Moreover, another advantage is the possibility of estimating productivity with vegetation indices (VI). Thus, the aim of this study was to evaluate the feasibility of using a multirotor UAV, DJI Phantom 3 – Professional and RGB sensor, to estimate the productivity of sweet potato (Ipomoea potatoes) (L.) Lam), in the municipality of Lavras, Minas Gerais – Brazil. For this purpose, flights were performed at 20, 50 and 75 m height, and the Green Leaf Index (GLI) vegetation index was applied; to determine the best altitude for the research. Subsequently, multiple regression analysis was performed assuming a probability gamma distribution, considering Mg ha-1 productivity variables as responses and values of the GLI index as explanatory. The results showed that only the 50 m flight is significantly associated with the productivity of sweet potato. Thus, the method applied in this study is a low-cost alternative that can significantly impact root production. Although it has been applied in a small area, it has the potential to be extrapolated to larger contexts, increasing the quality and quantity of production, which are generally characterized by family farmers and conventional farming practices.

Keywords: Structure from motion, Green Leaf Index, Precision Agriculture, Ipomoea potatoes (L.) Lam.

Effects of liming and nutrient management on yield and other parameters of potato productivity on acid soils in Montenegro

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Abstract: This study was conducted to evaluate the effect of liming ($CaCO_3$ 1000 $kgha^{-1}$), and application of organic fertilizers (rotted farmyard manure 40 tha^{-1}) and six different combination of mineral fertilizers: NPK 15:15:15 800 $kgha^{-1}$ + KAN 240 $kgha^{-1}$; NPK 15:15:15 400 $kgha^{-1}$ + MCB (water-soluble mineral fertilizer NPK 13:11:20 + 2MgO + microelements + humic acid) 300 $kgha^{-1}$ + KAN 125 $kgha^{-1}$; MCB 400 $kgha^{-1}$; MCB 400 $kgha^{-1}$ + KMg (water-soluble mineral fertilizer Multi KMg 13:0:43 + 2MgO) 100 $kgha^{-1}$; MCB 600 $kgha^{-1}$ + KMg 100 $kgha^{-1}$ and MCB 800 $kgha^{-1}$ + KMg 100 $kgha^{-1}$ on yield and other productivity parameters of potato (Kennebec variety). The experiments were carried out during 2015 and 2016 in the mountainous area of Montenegro, on acid-brown soil.
The results obtained suggested that in both years, the highest values for all studied parameters were measured on plots with combined application of liming, organic and mineral fertilizers. In addition, a significant influence on the increase in the number of tubers per plant, the average tuber weight and the total yield was also demonstrated in all individual trials of potato nutrition, as well as the interaction of organic manure and mineral fertilizer. Fertilizing with rotted farmyard manure had significantly increased potato productivity, with the effect more pronounced in treatments with liming. The highest number of tubers (6.2 and 7.2), average tuber weight (93.5 g and 101.0 g) and yield (27.6 tha^{-1} in 2015 and 34.8 tha^{-1} in 2016, respectively) were obtained using combinations of MCB 800 $kgha^{-1}$ + KMg 100 $kgha^{-1}$ on variants fertilized with rotted farmyard manure and liming.
Potato yield variations in productivity characteristics (average weight and number of tubers) ranged from 0.99911 (2015), to 0.99904 (2016). Multiple regression analysis showed that an increase in average weight and number of tubers in both examined years resulted in a statistically very significant increase in yield.

Keywords: potato, liming, nutrient management, potato productivity

Impact of different organic fertilizers on lavender productivity (L*avandula officinalis* Chaix)

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Abstract: The impact of four organic fertilizers (Chap liquid, Guano, Slavol and Vermikompost) on the productivity of lavender was carried out at the organic lavender plantation "Sunny Valley" in Danilovgrad during 2019. Non-fertilized control variant was included in the experiment. The efficiency of the nutrition systems applied is monitored through the most important productivity parameters of lavender: plant height, number of flower shoots and herb yield.
The highest average height of the lavender plant was measured on variants using Slavol (59.5 cm), Shap liquid (58.8 cm) and Vermikompost (58.0 cm), while the lowest plants were measured on the control variant (49.8 cm). All fertilizer variants applied had a significant effect on increasing the height of the lavender plant.
The largest number of flower shoots was measured in variants fertilised with Vermikompost - 444.5 and Slavol - 405.8, while the smallest number was determined on the control variant - 292. Differences in the number of flower shoots between all studied organic fertilizers and controls were statistically justified.
All fertilizer variants resulted in a significant increase in the herb yield of lavender. The highest yield of the herb was achieved by applying the organic fertilizer Slavol - 337.3 g. This variant showed a significant increase in herb weight compared to the control - 225.3 g, but also to the variant fertilized with Chap liquid - 284.8 g.

Keywords: lavender, organic fertilizer, productivity

Counting Fuel Properties as Input in the Wildfire Spreading Capacities of Vegetated Surfaces at Landscape Scale: Case of Albania

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Abstract: Albania as a Mediterranean country is highly vulnerable to forest fires. This is amplified by the emerging effects of global warming and climate change. Extreme weather conditions characterized by increased peak temperatures and stretched draught seasons are expected to become more frequent. In this context, estimations about wildfire ignition probabilities and spread capacities of the territory are crucial. In this paper we bring an update to our previous indexing method for forested lands classification by their wildfire ignition probability (WIPI) and wildfire spreading capacity (WSCI) (Hysa & Baskaya, 2019). The original method follows a multi-variable approach by simultaneously considering social, environmental, and physical aspects of the territory. In this version, we push forward four new parameters regarding the fuel properties. We integrate Normalized Difference Vegetation Index (NDVI), Heat Zones map (Teqja et al., 2018), Tree Cover Density (TCD), and land cover type along with the previous ones. Raw materials and the software are purposely selected from free-accessible sources. This makes the method easier to be reproduced to other study areas. The analytical steps of the process are performed in QGIS software including the Semi-Automatic Classification Plugin (SCP) which is useful in calculating NDVI values. The diversity among the inventory values of the selected criteria urges for a normalizing procedure within QGIS. Besides, each criterion is foreseen to have a specific impact on the WSCI value, which is weighted via Analytic Hierarchy Process (AHP). The sum of the products of the normalized class and the weighted impact factor of each criterion generates the WSCI value. The results of this study provide useful materials in support of wildfire risk reduction within the national priorities of disaster risk management and fire safety in Albania.

Keywords: Disaster risk reduction; QGIS; Albania; Analytic Hierarchy Process; NDVI.

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WATER4EVER Project: Use of Mohid-Land to model water balance for deficit irrigation in vineyards

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Abstract: Agriculture is the largest water consumer, with 70% of the diverted water used in irrigation, and is a key source of diffuse pollution, promoting eutrophication and biodiversity loss. WATER4EVER Project (http://water4ever.eu/) aims to increase irrigation water and fertilization efficiencies through precision farming. The project has a technological component based on optical sensors; a modelling component at local and catchment scales; and a fieldwork component based on 11 case studies where the new sensors and modelling tools are combined with field data and remote sensing. MOHID-Land is a physically-based, spatially distributed, continuous, variable time step model for the water and property cycles. It integrates four compartments (atmosphere, porous media, soil surface, and river network). MOHID-Land model has been calibrated at plot scale in two study cases, with different conditions: (i) Vinha do Mel-Companhia das Lezírias (Portugal) is an irrigated vineyard of 14000m^2 with limited slope, while (ii) the Cannona Erosion Plots (Italy) are 1200m^2 portions of a rainfed hillslope vineyard, with different inter-rows' management. In both sites water inputs (precipitation and irrigation), meteorological parameters and soil water content at different depths have been monitored during two years, using field sensors. Direct runoff measurements are available for the Cannona Plots. The vegetative development of the vineyards has been estimated from remote imagery. The field and remote datasets were used to calibrate and validate the model, by comparing with simulated values of SWC and LAI. The model was considered adequate to support the IrrigaSys decision support system, using the Portuguese study case as reference for weekly irrigation recommendation in the region. For the Italian plot (rainfed) the model allowed the estimation of the water balance in two growing seasons with contrasting weather conditions, assessing the effect of different soil managements and the needing to irrigate.

Keywords: water management; precision farming; sensor network; models

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Grain yield and yield components of winter barley

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Abstract: The experiment was established at the experimental field of the Small Grains Research Centre in Kragujevac (Serbia) during the two growing seasons. The objective of the research was to evaluate the effect of cultivars and the environment on the yield of winter barley. This investigation included a three winter barley cultivars (Grand, Zlatnik and Rekord). The following characteristics were analysed: grain yield, 1000 grain weight and test weight. The soil used in the trial was vertisol having a very acid reaction. The average grain yield and test weight of all cultivars in 2014/15 growing season was significantly greater than in 2013/14. The grain yield of the studied genotypes of winter barley ranged from 5.342 t/ha (2013/14) to 5.922 t/ha (2014/15), while the average grain yield was 5.623 t/ha. The 1000 grain weight of barley ranged from 49.22 g (2013/14) to 32.93 g (2014/15), while the average 1000 grain weight was 41.08 g. The average value of test weight was found in two growing seasons was 65.28 kg/hl. Grain quality is a qualitative property influenced by the genetic factors and environmental factors, as well as their interaction, so the variety can behave in some years as forage crop (Popović et al. 2011; Đekić et al., 2017). The importance of these components in the formation of grain yield depends on the climatic conditions in critical phases of growth and development, applied agro-technology (Rajičić et al., 2019). Based on these results, it can be concluded that several traits have a decisive role in the formation of grain yield. The contribution of each individual feature can be different for different genotypes and the various environmental conditions.

Keywords: cultivar, grain yield, winter barley

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Sunflower seed, meal and oil world market

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Abstract: Sunflower is one of the most important oilseeds in the world as well as in our country, and this raw material is an important commodity on the world market. Sunflower and sunflower seeds production is growing worldwide, and so is the production of protein sunflower meals, which are a by-product of the oil industry. The largest producers of sunflower seeds globally are Ukraine, Russia and Argentina. As a by-product after the oil production, the cake and meal is left behind, depending on the way the oil extraction. They are a significant source of protein that has not yet been found application in human nutrition due to the presence of chlorogenic acid and less efficient dehulling process. However, compared to other plants that represent a significant source of protein (eg soybean seeds), sunflower seeds contain small amounts of anti-nutritional substances (eg protease inhibitors, cyanogen, lecithin) (Gassmann, 1983; González-Pérez, 2015). The amino acid composition of sunflower seed protein, except for a small amount of lysine, is in accordance with the FAO/WHO recommendations for human consumption (Gassmann, 1983; Raymond et al., 1991). In the last four years, sunflower seed production has increased by 25.95%, oil production by 28.14%, while protein meal production has increased by 28.10%. Today, sunflower is grown on a 22.53% larger area than 11 years ago. The price of sunflower seeds, meals and oil has been falling on the world stock exchanges for the last 8 years (FAO, 2019; USDA, 2019).

Keywords: sunflower, seed, oil, protein meals, market, prices

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Total and available phosphorus dynamics in Brazilian Oxisols on a toposequence in steep slopes

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Abstract: In tropical soils the portable X-Ray Fluorescence (pXRF) spectrometer was recently adopted to determine soil elemental contents rapidly, allowing correlations with soil physical and chemical properties, contaminants and so on. Furthermore, it can be used in both laboratory and field. This equipment contributes to more accurate studies as for soil formation, morphology, and chemical constitution. In Brazil, Oxisols are the most common soil class. This study aims at characterizing Oxisols from steep slopes, unexpected landscape position for such soil class, concerning total and available P. PXRF were used to determine total P and these results, compared with available P. Soil organic matter and pH were also measured. On this toposequence composed by Dystrophic Red Oxisols in upper and middle backslope positions (P1 and P2) and Dystrophic Yellow Oxisols in lower backslope position (P3), localized in Muzambinho municipality, south of Minas Gerais, Brazil, were analyzed available and total phosphorus behaviours. Three profiles were studied in the toposequence: P1 (upper backslope), P2 (middle backslope) and P3 (lower backslope). The slope gradient varies between 8 and 45%, the altitude ranged from 945 to 1024 meters and the climate is classified as Cwb following the Köppen classification system. The obtained results showed that available P content was higher in A horizons and lower in B horizons, and its availability is conditioned by the O.M. content since pH was less variable (6,52 to 6,98). Total P had similar behavior, except for B horizon of P3 (555mg kg^{-1}), corresponding to the greatest P content found, followed by A horizons content in P2 and P3 (512 and 507mg kg^{-1}, respectively). The latter result was expected since O.M. is higher on the surface, but, conversely, the greater contents in depth in the lower backslope position is probably due to the P leaching in the toposequence and following accumulation.

Keywords: Phosphorus accumulation; Tropical soils; pXRF.

The influence of Indole-Butyric acid on the rhizogenesis of ripe cuttings of olive Arbequina

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Abstract: The olive tree has significant importance in the world economy due to its use as oil and fruit by many peoples, especially in the Mediterranean. In this research we presented the results of exogenous application of different concentrations (1000, 2000, 3000 and 4000 ppm) of the phytohormone Indole-3-butyric acid (IBA) to the rhizogenic properties of the Arbequina olive cuttings. The research was carried out in the greenhouse of the nursery Culjak in Capljina during season 2019. The cuttings were treated with different concentrations of IBA mother liquor (1000, 2000, 3000 and 4000 ppm; on 18.03.2019) into the workbench with the agroperlite. Cuttings in the control variant were not treated with phytohormones. A different influence of exogenous application of phytohormones IBA (1000, 2000, 3000 and 4000 ppm) was found on the success of root development of mature olive cuttings, as well as on root length and summer shoots of cuttings of olive oil. The weakest point was with the application with phytohormone concentrations of IBA concentration of 1000 ppm and amounted to 20,41%, and the best was determined using IBA concentration of 4000 ppm and amounted to 77,24%. The average length of the tested Arbequina olive variety varied depending on the IBA concentration used. Thus, the lowest average length is recorded for cuttings treated with phytohormone IBA at a concentration of 1000 ppm (9.35 cm), and the highest treatment with a concentration of 4000 ppm (15.83 cm). Different average root lengths were recorded depending on the applied IBA concentration. There were no roots observed in cuttings not treated with phytohormones (control). The average root lengths were 7.12 cm in cuttings treated with IBA (1000 ppm) to 11.15 cm in cuttings treated with IBA (4000 ppm). Increased lengths were observed with the increase in IBA concentration of the cultivar tested. Analysis of variance and LSD test revealed statistically significant differences in the success length of shoots and roots of the tested variety Arbequina, where the success of rhizogenesis depends on the concentration of the phytohormone IBA with which the cuttings were treated. The use of IBA solution (4000 ppm) has proven to be the best in the process of rhizogenesis and as such can be recommended in the technology of production of olive seedlings at their own root.

Keywords: Olive variety, phytohormone, cuttings, concentration

The Effects of Surface Rock Fragments on Hydrological Processes in Northern Iran

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Abstract: The rock fragments of soil surface are inorganic amendments, which are an important effective factor on hydrological behavior. The aim of the present study was to assess the effect of rock fragments on splash erosion, runoff, sediment concentration, soil loss, sheet erosion and sediment delivery ratio parameters. The rock fragment covers of about 2±2, 10±2, 18±2, 26±2, 34±2 and 42±2 with 3 replications in 1 m^2 plot, with the slope of 18%, under field conditions and simulated rainfall with the intensity of 40 mm h-1 and the duration of 25 min were considered. The experiments were conducted in a slope around Kodir village in Educational and Research Forest Watershed of Tarbiat Modares University, in the north of Iran. The results verified the multiple and complex relationships between soil surface rock fragments and the various stages of erosion process. The results of Generalized Linear Model (GLM) and Generalized Additive Model (GAM) showed the significant effect of surface rock fragments on studied variables. The GAM smoothed curve for evaluating the trend of the studied variables showed that total and net splash variables reached the maximum in surface rock fragment cover of about 30%. The sediment concentration, soil loss and sediment delivery ratio generally decreased because of increasing soil surface rock fragments.

Keywords: Generalized Additive Model, Rock Fragments, Runoff Coefficient, Soil Erosion, Splash

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Biogeographical characteristics of the Shirindareh basin, Iran

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Abstract: The aim of our study was to analyse Biogeographical characteristics of the Shirindareh basin, Iran for the needs of the preparation of soil erosion analysis of the same region. Analysis of ecological factors included climatic (derived from WORLDCLIM data), topographic (calculated from digital elevation model) and geological (bedrock characteristics) variables. The biogeographical characteristics of the Shirindareh Basin are determined by semiarid climatic conditions. The annual sum of rainfall in the basin slightly exceeds 300 mm, with minimal amounts in the summer months, with high evaporation, allowing dry steppe vegetation and suitable fauna to be represented in this area. Based on data from 2007, as well as on recent own research 2014-2019, we concluded that the pastures and meadows occupy about 60% of the area of the Shirindareh Basin, with 48 physiographical units represented. This is one of the most important natural economic resources in the area as the locals can mow 10483 tonnes of grass and feed about 44,000 sheep over a period of about four months during the year. However, this resource is constantly exposed to grazing, and in some parts of the Shirindareh Basin there is a change in the structure of grassland communities, where poor quality ones are beginning to dominate (KhaledI Darvishan, A et al, 2017; Sazab-e-Shargh Consulting Engineers, 2008; Spalevic et al, 2016; Spalevic et al, 2017; Vujacic, 2019).

Keywords: paleozoic, tectonic, zone, Polimlje, Lim River, Montenegro, Serbia

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Climate characteristics of the Shirindareh basin, Iran

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Abstract: The aim of our study was to analyse climatic characteristics of the Shirindareh basin, Iran for the needs of the preparation of soil erosion analysis of the same region. The climatic characteristics of the Shirindareh Basin are determined by its altitude and its location deep in the interior of the continent. According to Köppen climate classification, this area belongs to the cold semi-arid climate (BSk) and also according to the de Martonne's classification (semi-arid, A2). During the colder part of the year, northern Khorasan is influenced by continental arctic and continental polar (Siberian) air masses coming from the north and northeast (Khalili and Rahimi, 2018). The climatic characteristics of the area are also characterized by frequent droughts, making the central region of North Khorasan one of the most endangered parts of the area (Eyshi Rezaei et al., 2011.; KhaledI Darvishan, A et al, 2017; Sazab-e-Shargh Consulting Engineers, 2008; Vujacic, 2019).

Keywords: paleozoic, tectonic, zone, Polimlje, Lim River, Montenegro, Serbia

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Geological characteristics of the Polimlje Region in Montenegro and Serbia

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Abstract: Tectonics and geologic material were processed based on maps and interpreters for the Basic Geological Map 1: 100 000: "Gusinje" (Mirković et al, 1968), "Ivangrad", "Bijelo Polje" (Živaljević et al., 1981, 1983), "Prijepolje" (Ćirić et al., 1978), "Pljevlja" and "Višegrad", as well as a review of the literature related to this issue. The investigated area belongs to the Durmitor Unit of the Dinarides (Karamata et al., 1997), and only the northernmost part, the lowest corners of the studied area around the Potpeć reservoir; belong to the Ofiolytic Zone (Karamata et al., 1997). The Durmitor unit covers the north of Montenegro and the far southwest of Serbia and generally extends into the middle of the Dinarides. A series of branch forms for cores of Paleozoic rocks extend from the Paleozoic Lima formations to the mid-Bosnian shale mountains (Marovic, 2001). The southwestern border of the Durmitor Zone is known as the "Durmitor Cover". This structure, with its numerous tectonic windows, half-windows, and tectonic pistons, shows that it was at least decakilometrically transported to the southwest via the upper Cretaceous flysch zone of the Vis Krš, located within the Dalmatian-Herzegovina unit (Karamata et al., 1997). On the northeastern side, it is underlain by the Ophiolite Belt (Karamata et al., 1997), which is marked by the entire length of this contact between the diabase-corneal formation and the shale shales (the Ophiolite Belt) and the Triassic, Lias and Dodger limestones of the Durmitor Unit (Marovic, 2001).

Keywords: paleozoic, tectonic, zone, Polimlje, Lim River, Montenegro, Serbia

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Contribution to the research of Flora of the Polimlje region in Montenegro and Serbia

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Abstract: The vegetation characteristics of the Lim basin are conditioned by the influence of numerous natural and anthropogenic factors on a particular area. Land use and vegetation are a reflection of climatic characteristics, geological background, soil, relief and demographic trends.
Based on the Corine Land cover data, it can be seen that forest communities represent the dominant aspect of land use in the upper part of the basin, as well as at higher altitudes and steeper terrain. Mountain pastures and meadows also occur in smaller areas in these parts. Agricultural-field farming and meadows are dominant in river valleys and at lower altitudes, while on the hillside there is a large number of a smaller area with fruit crops. On the map of forest communities, certain regularity in the schedule is also noticeable. Thus in the lower part of the river basin at lower altitudes we have dominant thermophilic forests: *Querco-Ostryetum carpinifoliae*, *Quercetum petraeae cerridis, Querco-Carpinetum illyricum*. The largest area in the lower part of the basin is occupied by beech forests (Fagetum montanum montenegrinum).

Key words: Flora, vegetation, forest communities, pastures, Polimlje, Lim River, Montenegro, Serbia

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Soils of the Polimlje region in Montenegro and Serbia

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Abstract: Soils present a vital functional part of the ecosystem. It is a substrate for plants and living organisms. The main soil–forming factors define the soils of the Polimlje region in Montenegro and Serbia: climate, organisms, topography, parent material and time. The following main soils types are represented in the Polimlje region: Regosol, Calcomelanosol, Rendzina, Humus-Silicate Soils, (Ranker), Eutric Cambisol, Dystric Cambisol Calcocambisol, Alluvial Soils (Fluviosol), and Eugley, (Fuštić and Djuretić, 2000; Spalević, 1999; Spalević, 2011; Sikirić, 2018; Vujačić, 2019). The map of Soils of the Polimlje region in Montenegro and Serbia was prepared based on the results of this research.

Key words: Soils, Polimlje, Lim River, Montenegro, Serbia

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Analysis of the Fracturing, Folding and associated Tectonic structures in the Hercynian Massif of Moulay Bouazza (Western Meseta, Morocco)

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Abstract: As part of our field study, we first tried to map the area and follow the major geological structures. It is a very deformed area with brittle and ductile styles (Boushaba A. & Cailleux Y., 1992). The Moulay Bouazza massif has undergone an apparent metamorphism linked to two distinct geodynamic frameworks: The first is intimately linked to the contact of granite and which manifests itself in a metamorphic halo with decreasing intensity going from the centre towards the peripheries. The second geodynamic framework is related to the different tectonic phases recorded by the junction zone between the Fourehal-Telt synclinorium and the Khouribga-Oulmès anticlinorium in general and the Moulay Bouazza massif in particular (Cailleux Y., Delouche C., Gonord H. & Rolin P., 1983; Belfoul A., Oubbih J., Cailleux Y., Bennani A. 1988). Indeed, this is a regional metamorphism compatible with that recorded in the rest of central Morocco. The geological map that we have established shows us the existence of large overlaps with a preferential direction NNE-SSW to NE-SW. The deformation which affected the Ordovician terrains remains the most important while that which affected the Silurian and Carboniferous terrains remains of minor importance. The zone shows the existence of hectometric folds which are of antiform type for the zones in reliefs accentuated and occupied by the Ordovician series, and synform structures occupied by more recent grounds namely those of Silurian and Carboniferous. Indeed, the axes of foliations recorded at the level of the zone SW show preferential directions of this one N40 to N70. The main direction of the measured schistosity gives a main NE-SW direction parallel to that of the Smaâla-Oulmès fault (Oubbih J., 1991). We subdivide our zone according to the style of the deformation affecting these terrains. First subdivision into two units: the first unit is indigenous located NW of the Moulay Bouazza fault; the second unit, non-native and located SE of it.

Keywords: Moulay Bouazza Massif, Fourehal-telts, Smaâla-Oulmès accident, Moulay Bouazza granite, tectonic structures.

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Determining PES compliance in sectoral acts connected to the forestry

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Abstract: One of the ways to preserve nature and ecosystems from a group of market mechanisms is a mechanism called Payments for Ecosystem Services - PES. In this paper, sectoral laws related to forestry and nature protection are analyzed to determine whether existing legislation has elements that are similar to PES and support its implementation or are closer to the principle of "command and control". Three acts were selected for analysis: the Act on Forests, the Act on Waters, and the Act on Environmental Protection. These are the three sectoral acts that are closely related to nature conservation policy, with forest and water systems being the largest suppliers of ecosystem services and the most common subject of PES schemes. The aim of this research is to find those articles of acts that contain the basic elements of a PES definition, by using certain keywords to search for articles of the acts. Qualitative and quantitative content analysis was used for the analysis. First, keywords were formed to distinguish articles of acts that are relevant to the research itself, and later the meaning of each article was transformed into one or more terms called "determinants". In this way, the meaning of the articles was determined and quantified to determine if there were a certain number of articles that overlapped with the PES principles to some extent. In this research, we found that there are very few articles and parts of the legislation that fully support PES, and ecosystems and ecosystem services are not explicitly linked to valuation and funding. In each of the acts in the chapters related to financing, there are elements of PES and there is some form of financing of activities aimed at preserving and improving the ecosystems and the environment. The closest to the PES is the Act on Waters, the Act on Forests is with the lack of some elements, as funds are collected from sources that have no connection with forest ecosystems, and the AEP is based on the "Polluter pays" principle and is farthest from the PES concept.
Keywords: PES; ecosystems; forest; water; funding;

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Content of heavy metals in *Satureja montana* L. and *Satureja subspicata* Vis. in Grahovo and Dragalj, Montenegro

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Abstract: The genus savory (*Satureja* L.), family *Lamiaceae* Lindl., includes 30 herbs, sub-shrubs, and shrubs distributed in temperate areas. *S. montana* is a widely distributed species in the Mediterranean, while *S. subspicata* is an endemic Illyric-Balkan species that grows on calcareous rocky slopes at altitudes between 200 and 1800 m in Slovenia, Croatia, Bosnia and Herzegovina, and Montenegro. The species of the genus Satureja are well known as aromatic species, as they contain substantial quantities of the essential oils. Several *Satureja* species have considerable antimicrobial, antifungal, antiviral, and antioxidant activities. Taken internally, this plants can be a remedy for colic and a cure for flatulence, whilst it is also used to treat gastro-enteritis, cystitis, nausea, diarrhoea, bronchial congestion, sore throat and menstrual disorders. In this study we wanted to test its ability to absorb heavy metals. For that cause, we sampled a plant from three locations in the localities Grahovo and Dragalj in the southwestern part of Montenegro. One location was in Grahovo, in a relatively isolated location, the other was ten meters distance from local road and the third was far from the road and anthropogenic influence in Dragalj field. The sampling period was during the vegetative period of this plant, in early July 2019. year. The crude plant material was dried at room temperature of 25 ^{o}C during the 3 weeks period. The material was homogenized, pulverized and subjected to microwave digestion with concentrated nitric acid to convert metals to ionic forms. We examined the contents of Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb and Hg by atomic absorption spectroscopy method. The order of the total element content was Fe>>Mn>Cu>Cr>Pb>Ni>Hg, while cadmium and cobalt concentrations are below the detection limits of the instrument. We found relatively high concentrations of iron, while concentrations of lead and mercury, as very strong pollutants, are quite low. Based on the obtained data it is possible to calculate ecological risk (RI) index and index of geo-accumulation (I_{geo}).

Keywords: Satureja montana, heavy metals, ecological risk, Grahovo, Dragalj

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Visitor management in protected areas in Serbia

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Abstract: Protected areas contribute to the environmental, social and economic goals of sustainable development through support of ecosystem functioning, promotion of sustainable use of renewable resources and provision of space for tourism and recreation. The organization of the protected area (PA) management system includes interaction of different frameworks, the structural characteristics of the PA management, and the mechanisms for financing the PA management system (Djordjevic, 2018). This interaction is carried out at different levels and involves the involvement of various stakeholders in the decision-making process. One of the characteristics of structural characteristics is visitor management, while in Serbia most of the managers of PA are coming from public sector and some of them are in the private sector (Djordjevic et al., 2014). The main research objective was to study and define the organization of PA visitor management in Serbia and examine differences in the visitor management between different groups of managers. As the research method in data collection phase, structured interviews with standardized survey questionnaire were used (Neuman, 2014). The results of the research indicate that public enterprises that manage national parks show the best results, compared to other groups of managers. As a proposal for the improvement of visitor management it is proposed formation of an organizational unit for the provision of tourist services referring to the formation of separate organizational units in the PA, which would deal with this issue, and through which it would be possible to improve the tourist offer, monitor the number of visitors and more actively communicate with visitors.

Keywords: protected areas: Serbia; visitor management; groups of managers

Refereces

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Laboratory rearing of *Ceratitis capitata* Wiedemann (Diptera, Tephritidae): larvar and pupal development

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Abstract: The Mediterranean fruit fly, *Ceratitis capitata* is among the world most destructive agricultural pests. It attack fruits of more than 350 different species. Infested fruits are with destroyed pulp, inedible and without any economic importance. Duration of larval and pupal development were tested in laboratory, in thermostat at 25°C. As material for the study, the first instar larvae (L1) were used. Larvae hatched from eggs that were collected every day from the laboratory stock colony. Eggs were placed in Petri dish on moistened filter paper until hatched. Total of 84 L1 were transferred in four consecutive days with tiny, soft brush to the rearing medium made of tomato puree (71.8%), corn grits (28.0%) and sodium benzoate (0.20%). Rearing medium was placed in large Petri in thermostat. Results showed that larval development lasted eight to eleven days when 71 fully grown larvae (or 84,5%) ready to pupate, were transferred for hrisalidation into a plastic box filled with soil, also placed in thermostat. On the same temperature pupal stage lasted 11-12 days when 67 adults (or 94,3%) emerged.

Our results indicate that in favorable conditions (temperature and food) larval and pupal stage can be completed for around 20 days. This is important for prediction of population development speed in natural conditions.

Keywords: *Ceratitis capitata*, laboratory, thermostat, rearing medium, larval and pupal development

The Mediterranean fruit fly (*Ceraitits capitata* Wiedem.): results of monitoring in 2019 in Montenegrin seacoast

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The Mediterranean fruit fly, *Ceratitis capitata* (Wiedem.), is a highly invasive species and one of the world's most devastating and destructive fruit pest attacking more than 350 species of fruit and vegetable. Although originated in the tropical region of the western Africa, as a cosmopolitan pest, it invaded all tropical and subtropical regions of the world, and even some temperate regions.

The Mediterranean fruit fly has been considered as an established pest in Montenegro since the early 2000s. Infested plants that have been detected include citrus species (mandarins, oranges, lemon, grapefruit), peaches, figs, persimmon, jujube, apples, although the most commonly infested are mandarins, figs and persimmon. In an economic sense, the most important host plant is mandarin. Monitoring of *C. capitata* in 2019 was conducted on the seacoast, in localities from Ulcinj to Herceg Novi. Eight commercial fruit orchards were chosen, both citrus producing orchards and mixed orchards. Two types of attractants and traps were used: a synthetic, 3 component female-targeted attractant marked as Bioulure, placed in Tephri traps and para-pheromone Trimedlure used to attract the males, placed in Jackson traps. Traps were set up at the beginning of July and inspected until the end of November. In both types of traps the first specimens were captured in last decade of July. The population level remained very low during August and started increasing in September. The population reached maximum in period from mid-October and remained high to mid-November when started decreasing.

Results of monitoring showed that in Montenegrin seacoast *C. capitata* has a distinct seasonal occurrence of population fluctuations with summer months with low capture rates which increased during autumn (September), and reached maximum in October. According to the time and number of captured files the localities within Boka Kotor Bay were recorded as the earliest and highest for adult captures. Our results also showed that according to the total number of captured files both types of traps/attractants captured similar number of specimens.

Keywords: *Ceratitis capitata*, monitoring, population, Montenegro, orchards.

Study of some productive and quality traits of winter triticale varieties in Montenegrin conditions

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Abstract: Productivity and grain quality characteristics of winter triticale varieties were tested in field conditions in northern Montenegro, in the vicinity of Bijelo Polje. The trial, carried out in a random block system in four repetitions, on river alluvium type soil, included five winter triticale varieties (Odysseus, Kg-20, Triumph, Rtanj and Tango). During the three-year study, all tested varieties were fertilized with the same amount of NPK fertilizer in the ratio 90:80:80. During the research, grain yield, mass of 1000 grains, hectoliter mass and protein content of grains were monitored. The obtained results showed that the highest grain yield as well as the mass of 1000 grains were recorded in the Tango variety, while the highest values of hectoliter mass and protein content of the grain were found in the Triumph variety. The lowest yield and mass of 1000 grains were in the Kg-20 variety. Guided by the fact that triticale is a high quality food and an important component in the preparation of concentrated fodder, and thanks to its nutritional value, we wanted the results of the research to provide reliable recommendations to fodder producers when choosing the cultivation variety. In addition, agro-ecological conditions in the area favor triticale cultivation, so the results of the study would also contribute to the popularization of this species, which is still unknown to fodder producers and livestock holders.

Keywords: triticale, productive traits, variety, quality, yield.

Forest ecosystems vitality monitoring (ICP forests, Level I) with special emphasis to the affected part of the sample trees in the Republic of Serbia

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Abstract: Conditional state of the trees at the ICP Forests sample plots on Level I in specifically considered and follows: the type affected part of the tree it occurs on. Due to the need to enter uniform data on measured parameters (visible damage), codes are assigned for each damage. These are the results of observations made by experts from all countries with First-levelICP Forsests sample plots, and as figures they shold be entered into a single continent-wide database. attacked asimilation organas - leaf or needles directly condite the conditional state of the trees. Those are miners, galls, rollers and extremely defoliators which totally devoured/missing leaf parts (in examle *Lymantria dispar* L.). Leafs are mined by Stigmellidae; Gracillaridae, Cynipidae of gall makers, and from early oak defoliators, Geometridae, Tortricidae (Mihajlović, 2008). The fungus which is the most common is oak ash powder (*Microsphaera alphitoides*), and on species of the genus Acer -*Rhytisma acerinum.*
The further damages and their division by plant part (besides asimilation tissue): are verticillosis, diseases of conducting vessels and central thickness. Then beech bark disease on tree trunks, with fungus in symbiosis with insects: then decaying, and further trunk xylophagous – insects those who live inside the tree and feed on in the hallways. Then, perhaps the most important pests in forestry which are bark beetles and further insects pests of roots (in example: Scarabeidae).
The paper will provide information - intersection of these findings and detected damages on the ICP Forests Level I sample plots in Serbia.

Kew words: forest vitality, monitoring, ICP, affected tree part

Conflicts in the Protection of Natural Values; Example of River Neretva Valley

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Abstract: Landscape and nature are public good used by all species but changed mostly by human. So this paper tried to identify the main issues in perception of the natural values and conflicts that arrives from divergences in protection demands. Although the tourism and recreation are basic source of income for inhabitants from settlements near protected areas (Lupp and Konold, 2008, Čaldarović, 2006), this transformation from rural to touristic space causes huge changes in landscape. Also, the conflict between users arrives because protected areas are perceived as a fact or a set goal which have to be respected in spatial planning but at the same time they tend to increase the coverage of the protected area and the level of prohibitions (Marušič, 1993).

The problem of river Neretva valley, chosen as research area, is multiple protection and tendency for designation of the area as a nature park. Currently, there are 7 nature protected areas, and the whole area is protected under the planning protection measures and international protection categories; Natura 2000 (HR1000031, HR5000031) and Ramsar. Due to the great complexity of the existing nature protected areas and the multiple demands of the local population, the question of management efficiency and mutual coordination between institutions is being raised. So this paper point that nature park, as newly introduced protection category, can be considered as an additional source of conflict. According the Wells and Brandon (1993) sustainable management of protected areas depends on cooperation and support of local residents. So, that issue certainly must be addressed in further planning and protection process. However, although there are many different interests in space, many authors emphasize that the involvement of different stakeholders in the management process contributes to their acceptance, understanding and support.

Keywords: landscape; local residents; nature park

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Preliminary characteristic of wines Vranac from Crmnica sub-region, Montenegro

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Abstract: Montenegro has a long tradition in wine and vine production. Sub-region Crmnica belong wine region Basen of Skadar lake; has a special agro/pedo/geological condition (between lake and sea), and is place of origin autochthonous variety Vranac.
In this paper 10 wines Vranac, from different localities (Boljevići, Limljani, Godinje, Bukovik, Ovtočići i Utrg) which belong Crmnica sub-region, vintage 2017, were analyzed with aim to define typical characteristics of wine Vranac from this area. Analyses of meteorological parameters, chemical composition and phenolic compounds of wines were done.
During the investigated vintage meteorological parameters were favorable for quality of grapes and wines. The results of chemical analyses showed uniform content of analyzed wines Vranac: density 0.9926, content of total alcohol 13.64 vol%, contnet of total acids 6.49 g/l, volatile acids 0.58 g/l, free SO_2 12.16 mg/l and total SO_2 30.34 mg/l, pH 3.56. Phenols composition was not uniforms in the examined wines: total phenols were vary in the range 1310.7-2892.1 mg/l, total anthocyanins in range 362.8 mg/l do 806 mg/l, whereas the index 280 was between 40.77 do 81.99.
The presented results confirmed good reputation wines Vranac from Crmnica sub-region. However, the producers should be paid more attention in phenolic composition of wines.

Key words: meteorological parameters, chemical composition, polyphenol contet

Animal husbandry of Karst Region in Montenegro

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Abstract: The paper deals with the role, production systems and possibilities of development of animal husbandry in the Karst region of Montenegro, which covers the area of the municipalities Cetinje and Niksic, and largely matches with the old Montenegro. It accounts for 21% of the area of Montenegro, and only 8.3% of its arable land. This region, characterised by rough terrains with small plots unfavourable to cultivate, is not suitable for crop production. Therefore, livestock production is the most important branch of agriculture and often the main source of income for the rural population. Ruminants (cattle, goats and sheep) are far more important than non-ruminants. Cattle are of greater importance in the areas where conditions for fodder production are better. The cattle population has been most influenced by the Tirolean Grey breed, to a lesser extent by Brown Swiss. Indigenous cattle breed „Buša“ has been maintained at several family farms included in the Program of genetic resources conservation. Goat farming is especially important for this region, the Domestic Balkan goat and its crosses, mainly with the Alpine breed, are reared either in smaller or in relatively larger flocks. In addition to goats, sheep are also important, most often indigenous Jezero-pivska pramenka breed and numerous crossbreeds are reared in small flocks. Domestic mountain horses and donkeys, as well as mules (locally called "maske") are still used in load transporting through the rocky terrains. The Karst region is dominated by an extensive livestock farming system - that is in harmony with environment preservation. Traditional livestock sector based on the above-mentioned indigenous and local breeds and the production of traditional dairy and meat products provide additional opportunities for the development of ecotourism.

Keywords: karst region, indigenous breeds, production system, traditional livestock farming

Variability of stress indicators in jumping horses in parkour due to horse age and competitive season

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Abstract: Aiming determination of variability in stress indicators due to horse age and competitive season (May, July, September) in jumping horses in parkour, research was performed on 14 studs (7 younger, and 7 older) trained and bred in the same conditions. The stress indicators (heartbeats, cortisol, glucose, and lactate concentrations in saliva) were measured or sampled before, during and at the end of the training - parkour jumping. The significance of the differences in stress indicators between the horse age classes regarding the competitive season was tested by t-test (PROC GLM, SAS/STAT). Based on determined results it could be concluded that all stress indicators, during the entire competitive season, were higher in younger (less experienced) than in older (more experienced) horses. Also, all stress indicators, with exception of heartbeats, were highest in the peak of competitive season (July), while the lowest values of all stress indicators were determined at the end of competitive season (September). Monitoring of stress indicators, especially heartbeats could be used for routine evaluation of horse preparedness for a particular activity.

Keywords: jumping horses, parkour, stress indicators

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The connection between climate conditions and population size of most represented large game in a hunting area in Eastern Croatia in period 2008 - 2018

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Abstract: Climate change has an impact on population growth of red deer, roe deer and wild boar, on their survival and reproduction. When observing the climate of an area, air temperature is one of the main climatic elements. Besides, for the normal life of a wild animal, a significant factor is also humidity. Given the fact that populations of red deer, roe deer, and wild boar have great significance in Croatia, this study aimed to determine the relationship between population size of most represented large game and climate conditions in hunting ground in Eastern Croatia during the analyzed period from the year 2008 to the year 2018. The study was conducted in the area of Kućanci, Osijek-Baranja County. Data were given by Croatian Meteorological and Hydrological Service. Company Gavran d.o.o. is the owner of the population data and the hunting staff of the company made the investigation. Based on the conducted research following could be pointed out: the mean yearly air temperature varied in the interval from 11 – 13°C; the mean yearly humidity varied in the interval from 76 – 84 %; the total number of red deer was highest in 2015 when mean air temperature amounted to 12,5°C; the highest number of roe deer was recorded in the year 2009 when the mean air temperature was 12°C, humidity 82 %; the highest number of wild boar population, males and females, was recorded in the year 2013, the mean air temperature was 12.5°C. Comprehending the climate effect on behavior is necessary to anticipate the number of new offsprings and to sustain stability in the hunting ground, when coming climate change may bring local weather variables different from the current range.

Keywords: red deer, roe deer, wild boar, climate, population

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The effect of n-3 unsaturated fatty acids addition on somatic and microorganism cell count in goats' milk

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Abstract: Numerous studies indicate that the short-term addition of relatively large amounts of n-3 fatty acids could have a beneficial effect on inflammatory processes. Therefore, the aim of this study was to determine whether such treatment affect and how long the effect lasts on somatic and microorganism cells in goats' milk. The study was performed on 90 dairy goats machine milked twice a day. Regarding the supplementation, the study was divided in the period before supplementation; supplementation; and after supplementation. Accordingly, to supplemented n-3 PUFA (eicosapentaenoic, α-linoleic, and docosahexaenoic), the goats were randomly allocated into 4 groups (control, and supplemented). Milk samples was taken at each milking and analyzed for the number of somatic and microorganism cells. Conducted research indicate that the supplementation of PUFA had positive effect on both analyzed traits. The addition of supplements induced the reduction of somatic and microorganism cells in milk in all experimental, compared to the control group with the lowest values determined in group with added α-linoleic acid. This effect lasted even after supplementation. Finally, in order to determine the exact formulation of PUFA addition, further research is needed.

Keywords: dairy goats; n-3 unsaturated fatty acids supplementation; somatic cell count; microorganism cell count

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Precision farming – estimation of ammonium pollution from dairy cattle farms

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Abstract: Precision dairy farming is one of the major topics that influences dairy farming developments world-wide. Precision dairy farming implies the use of technologies to measure: physiological, behavioral, and production indicators on individual animals. The primary goals of precision dairy farming are 1) maximization of animal performance, 2) early detection of diseases / disorders in individual cows, 3) early detection of herd level health and production problems, and 4) minimization of the use of medication through preventive health measures. Examples of precision dairy farming technologies include: milk yield recording systems, milk component monitors, activity monitors, heat detection monitors, etc. Milk recording implies collecting of data on productivity of dairy cattle that are under the system of breeding and selection work. The production data together with the pedigree data are basis for: estimation of breeding value of individual animal, and selection according to the breeding program of each breed. Milk recording results also enable farmer the improvement of management of dairy herd. Finally, milk recording data enable monitoring of pollution from dairy farms. The aim of this paper was to determine the ammonium pollution from dairy cattle in regard to parity and stage of lactation, as well as season using precision farming methodology. Preparation of database, logical control of data, as well as statistical analysis was performed using SAS/STAT.

Keywords: dairy cattle, milk recording, estimation, ammonium pollution, precision farming

Indirect method for detection of subclinical mastitis in dairy cows

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Abstract: Monitoring the health status of the mammary gland is an essential element in the process of safe milk production. The aim of the research was to evaluate the usefulness of the California Mastitis Test (CMT) which is an indirect method for detecting subclinical mastitis in dairy cows and it is used as a farm screening test. The efficacy of CMT for diagnosis of the subclinical mastitis was determined by comparing the results with LACTOSCAN SCC instrument. A total of 18 milk samples were examined. The results of our research indicate that there is a good correlation between the results of the California Mastitis Test and the total number of somatic cells, i.e. the test showed 75% sensitivity and 70% specificity.

Key words: mastitis, SCC, CMT

Monitoring the titration acidity as one of the most important parameters for yoghurt quality

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Abstract: Fermentation is one of the oldest methods for extending the life span as well as improving the sensory characteristics of milk. Today, the most commonly consumed fermented milk products include yogurt that offers a range of health benefits. The purpose of our research was to monitor the titration acidity of yogurt from the retail chain within five days of opening, in order to detect the occurring changes. The obtained results showed that time of storing have no impact on the quality properties of yogurt. Storage time had no significant effect on titration acidity ($p>0.05$).

Keywords: titration acidity, yoghurt, quality

Monitoring the quality of yogurt during storage

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Abstract: Yogurt as a fermented dairy product is one of the most used in the daily diet due to the large number of positive effects on human health (improve digestion, rich amount of calcium and protein, increased immunity, improved bioavailability of other substances, etc.). In correlation with this, the study was carried out to determine the effect of storage time of yogurt after opening (the first and fifth day), in the refrigerator, on titration acidity, viscosity and water holding capacity (WHC). The results of the research have shown that storage time has an impact on them. The changes that occur are more pronounced in the samples of yogurt analyzed after one month of refrigeration i.e. the quality of the yogurt is correlated with the expiry date.

Keywords: yogurt, quality, water holding capacity (WHC), titration acidity, viscosity

Innovations in the Algerian Dairy Sector: evidence from Mila region

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Abstract: The dairy cattle sector has experienced a significant change since the country's independence due to the introduction of modern breeds imported mainly from European countries. This innovation (in the sense of Schumpeter) is introduced to remedy the problems of the low milk production of cows of local breeds and meet the needs of the populations to fill the protein deficit noted after the independence of the country. Indeed, the State has put in place instruments to facilitate the introduction of new techniques through support (investment support). The question of the adoption and dissemination of innovations also arises in terms of coordination between different actors who should take charge of the process of adopting innovations. These actors can be producers, extension agents, farmers, institutions (banks, administrations, etc.). The method used to draw the sample to be investigated is based on the principle of reasoned random choice. This choice is justified by the absence of an updated database on breeders active in the region; but also, by the absence of the breeders during the interviewers' visits to the breeding farms. The innovations that are developed and/or adopted by breeders with a direct or indirect impact on the product obtained can be on dairy cows, on the quality of feeding, or on farming conditions. In our study, we hypothesized that contact with other economic, technical and institutional agents facilitates the dissemination of innovations and their adoption. In our region, most of the contacts established by breeders are personal (especially in cattle markets) or administrative. Indeed, the absence of technical institutes in the wilaya of Mila constitutes a limiting factor for the diffusion of new techniques of breeding. The obstacles to innovation mentioned by breeders are of several types: the lack of qualified personnel, the risk of return on investment, the size of the market, insufficient State aid, and the difficulty access to finance, land ownership, climate variability, cost of inputs, access to water resources.

Keywords: innovation, subsidies, networks, adoption, adaptation.

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Effects of the β-lactoglobulin genotype on milk production parameters of Jezeropivska sheep breed

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Abstract: Effects of β-lactoglobulin (β-Lg) genotypes on milk traits (duration of lactation and milk yield) and milk composition (content of fat, protein, lactose and solids nonfat - SNF) of a Montenegrin autochthonous sheep breed were studied. The study was carried out on 44 ewes of Jezeropivska sheep breed. This is the most numerous autochthonous breed of sheep in Montenegro, which is traditionally raised in mountain area of Durmitor and Sinjajevina, and partly in the central part of the country.

According to the recent investigations, genetic polymorphisms in β-Lg, a major whey protein in milk of ruminants, are closely related with milk production parameters and technological properties. Polymorphisms within ovine β-Lg gene were detected using PCR-RFLP method - RsaI restriction endonuclease. Two genetic variants (A and B) and three genotypes (AA, AB and BB) of β-Lg were identified. The analysis showed a prevalence of strong A allele (0.63) compared to the weak B allele (0.38), while the frequencies of genotypes were 0.364, 0.523 and 0.113 respectively.

Milk yield and milk composition parameters were obtained by using the standard procedures of milk recording during lactation. There were no statistically significant differences in duration of lactation and total milk yield between these three genotypes, while daily milk yield was significantly influenced ($p<0.05$) by genotypes. Study showed that variant B of β-Lg was linked with higher milk production. Daily milk yield was the highest (0.70 kg) in ewes of BB genotype β-lactoglobulin than AB (0.60 kg) and AA (0.54 kg) genotype.

The effect of genotype of β-Lg on protein and lactose content were significant ($p<0.05$), while it is not significantly influenced fat and solid non-fat content. In Jezeropivska sheep breed genotype AA was linked with the higher protein content (5.86%). The protein content in the milk of AB and BB genotype was the same (5.64%). Significant association between AB genotype of β-lactoglobulin gene with higher lactose content (4.67%) was found.

The results presented in this study could be useful in improvement of the concept of conservation and sustainable use of this autochthonous sheep breed, while gene of β-Lg as a potential marker in improving milk traits of sheep.

Keywords: Jezeropivska sheep; milk yield; milk composition; β-lactoglobulin; genotype

Economic and ecological importance of goat production in Montenegro

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Abstract: Goat breeding is very important sector in the Southern and Central regions of Montenegro, mostly in karst areas where natural conditions are more in favour for goats than for other ruminants (cattle and sheep). This area is overgrown with shrubs, many low palatable plant species, grasses and forbs which easily be fired during dry summer season. Thus, goats grazing in such areas has an important economical role (provides very valuable products) and ecological contribution (reduce risk of fires during summer).

The results of survey of goat breeders in Southern region of Montenegro that are commercial oriented showed that goats are reared mostly on family farms with semi extensive production system. Average size of commercial flocks in this region is 130 breeding animals. The indigenous Balkan goat breed still dominates. However, the share of Alpine breed, including its crosses, has been increased permanently, while share of other breeds, as Murciana and Sannen, is very low.

Favorable climate in this region enables grazing season up to 10 or 11 months. For additional feeding in winter time hay and concentrate feeds are used, especially during kidding season and start of lactation. The kidding is usually in January and February. The average twining rate is 33%, while average mortality in three months of suckling period is about 5%. The main products are milk and meat, with a growing orientation on milk production and processing. Milk mostly processed into traditional cheeses and kids sold after weaning.

Low inputs and very high price of the products provides sustainability of goat production.

The existing resources of pastures allow rearing of much bigger goat population in this area of Montenegro. The biggest identified problems in the goat production is a lack of labor and low level of equipping for milking and milk processing.

Keywords: goat production, grazing, milk and meat

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The importance of conducting diagnostics of senotainiasis in Montenegro

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Abstract: Senotainiasis (*apimyiasis - bee myiasis)* is a disease of adult bees that causes the larvae of the insect *Senotainia tricuspis Meigen*, 1838 (syn. *Miltogramma tricuspis Meigen,* 1838). This insect is 5 to 8 mm in size and resembles a domestic fly. Senotainiasis leads to the death of bees by up to 50% and is of great health and economic importance. The larvae of this insect feed on the hemolymph and muscle tissue of the worker bee. Due to the weakening of the musculature of the leg, the bees lose their ability to fly, fall very quickly near the hive and disappear within 24 hours. *Senotainia tricuspis* is widespread in the world. It is located in Europe, North Africa, South Siberia, Australia, etc. It is especially widespread in sunny and warm places, such as the Mediterranean countries, Spain, Portugal, Italy, France, Greece, Albania, Tunisia, Egypt, Algeria, Jordan and others. There are no data on the prevalence of this disease in Montenegro and no diagnostic tests have been performed on this disease. However, due to the favorable climatic conditions for the life cycle of this parasite, its presence in the surrounding countries, as well as dynamic international traffic, regular diagnostics, as well as other preventive measures in the fight against this disease in our country, should be carried out.

Keywords: *Senotainia tricuspis*, senotainiasis, Montenegro, honey bees

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Organic livestock farming in Republic of Croatia- state and perspective development

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Abstract: Recently, in the Republic of Croatia an increase in organic farming was observed. The aim of this paper is to present the state and perspectives of organic livestock farming development in Croatia during recent five years. There has been an increase in the number of organic farmers by 114% and the number of organic processors by 52.28%. The used agricultural land decreased by 1.54%, while the land under organic production in total used agricultural land increased, which is 6.94%. Areas sown with crops important for organic livestock feeding increased the most for rapeseed and green forage from arable land and gardens and a decrease was observed in oats. The largest increase regarding livestock was in the number of equidae and sheep and goats, while the only decrease was observed in poultry. The largest increase was also found for sheep meat, beef and pork, while in dairy production the largest increase was in goat milk, as well as production of cheese. Expansion of organic production is observed in the recent five years in Croatia. This contributes to the growing interest in organic production, as indicated by increases in the analyzed indicators in the organic livestock sector.

Keywords: organic livestock farming; the Republic of Croatia; state and perspectives of development

The role of local government in strategic planning and stimulating investments in agriculture sector

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Abstract: Strategic governance in public administration is a doctrine that emerged at the beginning of the new millennium on the basis of criticism of the previous very influential doctrine of the so-called. "New Public Management." This concept seeks to link public administration, citizens and environmental partners into one system. The rules and procedures arising from the strategic approach should contribute to the efficient management of public funds and assets, all in order to create favourable market conditions. This concept stems from the process of decentralization of public authority. The aim of this paper was to analyse techniques and methods of strategic concept that can be implemented by carriers of the management structure at the local level in order to improve the entrepreneurial climate and improve the investment environment. The purpose of introducing the strategic concept into local government was also analysed, and it was shown what incentive measures local governments could bring to stimulate the development of agricultural production. This approach focuses on development programs that can improve the quality of life of the local community.

Keywords: local government, strategic management, agricultural production, investment environment, social responsibility, incentive measures

Planning and development of wine villages in Montenegro

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Abstract: Cultural heritage landscapes are consistently perceived as landscapes of high value. However, these landscapes are very vulnerable to change. In Montenegro, rapid land use change, especially urbanization, has become one of the main challenges for the conservation of cultural heritage landscapes in rural areas. Wine tourism is globally regarded as a traditional, yet at the same time dynamic form of alternative tourism. In this paper the regional distribution of the villages and their connection; typology and spatial forms; rural morphology; urban assemblies and equipment they used is presented. This assessment gives also direction and guidance toward the selection of the most threatened cultural villages for detailed investigation and additional protection measures.

Keywords: Planning and development, Wineries, Wine routes, Wine Roads, Montenegro

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The House on the Lake Skadar, Montenegro

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Abstract: The Skadar Lake basin is located in the south-eastern part of the classical Dinaric karst region in Montenegro (northern Mediterranean). The region abounds in examples of Vernacular architecture which characterized the use of local materials and local knowledge, with the construction of houses usually without the supervision of professional architects. It encompassed 90% of the regions built environment and should be carefully studied in traditional history of design in Montenegro. From this point of view, this paper focuses on two key issues; firstly: study and analysis of the mentioned sustainability trends in housing design, secondly: assessing and analyzing the impact of these trends on shaping the identity of the typological features of the House on the Lake Skadar in Montenegro. It was concluded that environmental design concept is a significant factor, regionally and locally in some selected villages studied. Specific points on location and structure of architectural assemblies where analyzed in relation to the Lake level in winter and summer flooding; all in relation to the concept of newly constructed facilities in relation to the lake and their vulnerability to floods. Forming guidelines for the design of structures in the Lake area using the experience of old builders were also analyzed.

Keywords: The Skadar Lake, Vernacular architecture, sustainability trends, housing design

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Types of materials, variety of use and construction systems used in residential buildings of the village Frutak (Gornji i Donji), Bjelopavlici, Montenegro

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Abstract: Rural settlements have occurred as a result of an organic growth that integrates with the natural and built environment within a wide range of time. Each dwellings zone contains traces reflecting its own residential texture, nature, culture and social life. Most of the settlements are rural and they are stable and permanent. They are of three types: (1) Compact, (2) Semi-Compact and (3) Dispersed Settlements. Compact Settlements are based on farming. These are mostly found in highly productive alluvial plains. The houses are compact and congested with narrow plains. Compact settlements are also found in hunting and fishing communities. Semi-Compact Settlement is with a transitional phase to the growth of compact settlement. Increase in population cause villages to grow in number of houses. These houses occupy open spaces and lead to semi-compact settlement which ultimately acquires a nucleated settlement. Dispersed Settlements are generally found in hills, plateaus and grasslands. These are found in areas where it is essential that the farmer should live on his own land. Overpopulation is one of the reasons for dispersed settlement. If a part of the population left a village to found a new one they often found dispersed rather than a new village. The studied region of the village Frutak (Gornji i Donji) from the Bjelopavlici of the Danilovgrad Municipality belongs to the type of semi-compacted settlements. The village was created during the period of the Ottoman Empire administration. It is placed in the two parts: upper and lower, spread because of the natural population growth on the plateau and on the slopes of the surrounding hills. It was created spontaneously and has elements of traditional regulation. In the structure of rural settlements, in general, is observed that different materials and construction techniques are used depending on geological, geographic and topographic conditions of the region. Each dwellings zone contributes to the formation of a distinct architectural texture variety by the use of types of materials appropriate to the geological features of the region. The houses are made of local native materials (stone, wood, straw, clay). Traditional type of the house is with the ground floor, rarely a house on two floors, being constructed by local masters. Houses are built in two periods: the period under Ottomans and the buildings constructed during the period of the third decade of the twentieth century. In this study are examined types of materials, variety of use and construction systems used in residential buildings belonging to the rural architecture settlements located in the studied region by addressing its architectural characteristics.

Keywords: Rural Architecture, Rural areas, Types of materials, Residential buildings, Montenegro

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Dinaric house in Montenegro: Formation, duration over time and typological features

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Abstract: The Dinaric House, as a separate type, contains all the necessary elements for such a qualification. It was named after an area where it has been used for more than half a millennium. Therefore, it is a Dinaric Mountains area in the western Balkans, and is thus present in the northern parts of Montenegro. It is present in Bosnia and Herzegovina as well as Serbia, where it is met in variations resulting from the use of local materials but nonetheless remains there in the borders of a defined typology. It is a village home which represents the core of a household that includes auxiliary facilities. Due to transformations through the initial stages of development, and in order to create the most appropriate response to functional and climatic characteristics, this house has received a recognizable spatial scheme and architectural expression. These are the elements that have been singled out as special type that is different from the entire known house types by now defined. The Dinaric House, as a unique type, has been a point of interest of scientific circles since the nineteenth century. Thus, at the behest of the Vienna Academy of Sciences, R.Meringer, a professor at the University of Vienna at the time,has visited twice (1897 and 1898) the Dinaric area of Bosnia and Herzegovina (then part of the Austro-Hungarian Empire). He noticed all the important types of the Dinaric House and published the results of the research. This prompted additional research and Jovan Cvijic emerged, touring the entire Dinaric area. In his observations the Dinaric House was shown with all its characteristics. The study in this paper narrows down the perception of the Dinaric house to the area of present-day Montenegro in order to show its unique specifications which are the result of, first of all, the localized materials and conditions. In the area that is covered by this paper, there is not a unique way of building, which led to an architectural expression that always bears a certain *Genius loci*. It should be noted that the dimensions of this house and the range of used materials, as in all similar situations, were a reflection of the economic power of the owner. It is interesting that in such circumstances, this house retains the same typical layout, number and disposition of rooms, which makes it consistent in one are over a long period of time. In this way, the Dinaric House is the best witness to a perstistent lifestyle that has lasted unchanged for a very long time.

Keywords: Dinaric house, Formation, Duration, Typological features, Montenegro

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„Genius loci“(*Lat*): The spirit protector of a place; the peculiarity of a place given by his patron saint; the general spirit that rules a place and gives it its characteristic

Fragments of the Past fractured in Time: The Study of the Sarcophagus of Zlatica

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Abstract: Time and space are two inseparable notions when it comes to History. Segments of the past left to question the present and the future to teach represent what is the essence of a space and people. This paper deals with the investigation of a fragment of time in the area of Zlatica in Podgorica in the former Doclea, one of the representatives of the great Roman Empire. Sarcophagus from Doljani, Zlatica (Podgorica) is a small fragment of the overall picture of civilizational progress and history in Montenegro. The spread of Christianity in this area leads to the gradual construction of the entire complex. That is why the remains of the existing buildings, the triconch and the basilica, differ in many respects in relation to the typology of the architectural model and the architectural plastic decoration, and represent contemporary buildings from different time periods. The discovery of the sarcophagus also points to the mutual relationship between the two objects. A sarcophagus is a container or coffin used to bury dead human bodies. The most commonly used materials in the production of sarcophagi are marble (the finest and most expensive), stone, lead and wood. In the second century, Roman funeral practices or traditions changed from body cremation to body burial. In the beginning, Etruscan and Greek were cultures that practiced burying bodies in this way. However, the change in Roman culture turned the production of sarcophagi into a luxury-dominated industry as well as the styles of the Roman Metropolis, Attic and Asians as well as the styles that emerged in those regions. This paper seeks to unravel the segment of mystery that surrounds this element through a research and conservation methodology.

Keywords: sarcophagus, Doclea, basilica, Roman Empire

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The preservation of the old building system in the Saharan environment as factor of sustainability

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Abstract: The objective of this research is to reveal an aspect of Saharan architecture in Algeria that has been neglected for more than 60 years. It focuses on the presentation of traditional conservation techniques using local materials in the Saharan regions of Algeria. The establishment, which is part of the vernacular heritage, is a testimony to the tormented periods that the country has gone through. It is finally the result of the "know-how" developed by the inhabitants of the desert in this field marked by the birth of the first ksour (grouping of several typologies of a residential nature) for more than 1000 years (case of the ksar el Atteuf, Ghardaia), considered as witnesses of the period of human settlement in these territories.
This article argues that this "know-how", particularly in the field of traditional construction in some regions, is not the result of intuitive and reckless actions. Through well-documented case studies, and in comparison with other examples in the country, we will show that the existence of these ksour in a fairly difficult territory due to these climatic conditions has never excluded man's ability to develop this "know-how" which reflects a perfect mastery in the choice of materials. The article will also show the relationship between the geographical context and desert people in the discovery of new materials developed in a context linked to geometric, architectural and spatial logic, ensuring both functional comfort based on dimensional control and determining a technical method by adapting to the use of these materials in a sustainable approach.

Keywords: Saharan architecture, traditional conservation techniques, local materials, climatic conditions, spatial architectural logic

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Presentation and revitalization approach of the traditional architecture of Sirogojno: Conjoining traditional building principles and modern architecture

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Abstract: Traditional architecture has a very strong cultural and historical value. Its variety of forms and high artistic domain are one of the most important creations of our ancestors. The architecture of the house and rural settlement organization have created a different style typical for a different region of the country. Traditional houses are one of the most endangered types of cultural heritage in Serbia at the moment. Due to its values, this type of architecture should be preserved and presented in the best way possible. The presentation of heritage is a problematic area, which has diverse attentions in various countries. It seeks a professional and ethical approach in order to enhance its credibility. Since there are several types of presenting traditional architecture to open public, in this paper I will focus specifically on Open-air museums considering them the optimum way of presentation of traditional architecture. The one example that is considered as the most presentable in Serbia is The Open-air museum Sirogojno, witch in this paper will be used to analyze a typical traditional house and garden, also its approach of presentation and revitalization. This paper emphasizes the paradoxical situation where traditional building principles are declining, and they are being replaced by modern techniques which are cited as exemplary models of traditional and environmental practice. Sustainability as a concept has become the main interest in different disciplines, as well as in architecture. The outcome is finding the way of creating modern sustainable architecture following traditional principles of building timber houses in interaction with nature and environment properties.

Keywords: Traditional architecture, Heritage presentation and revitalization, Traditional building principles, Environmental houses.

Traditional Architecture of the rural areas: Case study of the Zeta Valley, Montenegro

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Abstract: Traditional Rural Architecture is a historical bridge connecting past with the modern times, holding them together for the future. The main goal of this research is to present the design philosophies of the main constructional elements of the traditional architecture in the Zeta Valley, Montenegro with the idea to propose it for the innovations. The buildings that are studied were constructed by local master builders on the end of the 19th century during the period when this area was a part of the Ottoman Empire. The objective of this research is to present the recent Zeta valley region history and demography with overall analysis of the local traditional architecture and construction systems in order to contribute to the future restoration of this important architectural heritage. The study is mainly based on an in-situ research undertaken in the period 2018-2020, which included field visits with the detailed photographic recording, transformation of drawn information into descriptions of construction work of the remaining traditional buildings in 22 settlements of the Zeta Valley of Montenegro. The research included the documentation of some representative buildings in selected settlements on the territory of the Zeta, Montenegro. From the collected data, conclusions concerning the typology, the form, the construction techniques and the materials of the buildings are drawn. This leads to the formulation of a series of design principles, which characterized the architecture of the past and can be applied as guidelines for the restoration of existing buildings, as well as for the construction of new ones.

Keywords: Rural Architecture, Demographic Analysis, Montenegro

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Rural house types of the Mountainous area of the Balkans: Villages of the Bijelo Polje Region, Polimlje, Montenegro

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Abstract: With the rapid development of urbanization in the Balkans after the Second World War, more and more new buildings are being constructed in the urban, but also in the rural areas. Some of these structures follow original modes of construction, or at least those processes that have persevered for centuries, and certainly deserve attention. Even more, inhabited structures, which may still be called traditional, possess modifications that have altered their original form. On the other hand, the land resources available are not managed well and are becoming quite limited. Residential development initiated conflict between man and land. The majority of land resources in the studied area of the Villages of the Bijelo Polje Region (923 km^2), Polimlje, Montenegro are in the form of mountains or hills. In this specific moment, people who are living in the city centers, after the period of the transition of industry has to consider on how to develop mountainous areas to increase the living space, taking the advantage of the upcoming governments and donors strategic investments in the mountainous rural areas. However, in the process of building mountainous residential buildings, the protection of land and environmental resources is often neglected due to the pursuit of the maximization of commodity interests and the large demolition and construction of land resources in mountainous areas, which result in the loss of land resources and the occurrence of various consequent natural disasters. The main goal of this research is to present the basic designs of the traditional architecture of the Mountainous area and its traditional setup of the rural household, using it as a model that survived through the time as sustainable model for this region. The objective is to present the analysis of the so called local traditional architecture and construction systems in order to contribute to the future restoration of this rural architectural heritage. The study is based on the two periods of research: 1995-2011 of the general Physical-Geographical research of the Polimlje region; and the period 2018-2020, which included field visits with the detailed photographic recording, transformation of drawn information into descriptions of construction work of some traditional buildings in villages of the Bijelo Polje Region that is a part of the wider area of the Polimlje Region in Montenegro (2200 km^2) and Serbia. The research (2018-2020) included the documentation of some representative buildings in selected settlements. A field investigation for this specific research was conducted in seven villages of the studied area. Using the snowball technique, a total of 77 farmers were interviewed using various methods, including semistructured interviews and key person interviews, which included opportunities for free listing. After the work on the field and in studio, conclusions concerning the typology and forms, but also the construction techniques are drawn. Concepts of function and form are central to the study of traditional buildings. We started from the statement that the "form follows function" with the idea to identify the discrepancies between form and function. The changes are a constant in any society; but with

this research we would like to highlight the rate at which a society is forced to absorb the new. The results will make up for the shortcomings of the research in the field of rural human settlement environments and serve to improve the appearance and optimize the function of villages of the studied region.

Keywords: Rural Architecture, Rural areas, Sustainability, Montenegro

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Green Roof Types as an Alternative to Extensive Green Roof – Costs and Benefits

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Abstract: Climate change and its effect on Urban Heat Island is still a major challenge. One of the strategies to keep a balanced environment is by increasing the areas with green and blue roofs in urban areas. Many research showed that it can reduce the amount of storm water that rushes in sewer system, lower cooling and heating costs, improved sound absorption and air quality, increased habitat promoting biodiversity and prolong roof life. In practice, the reason of their rare occurrence on the city roofs are the cost for constructing and maintaining green roofs and the question of ownership. This paper tried to identify main issues when choosing the best types of green roof and evaluate their costs and benefits.

The problems are often the price of the material needed for constructing green roof and the transportation cost, especially concerning the substrate. With that in mind the concept of the brown biodiverse roof has been created. Although the use of recycled brick and concreate from a local recycling area sound very ecological, there can occur many problems. Due to the complexity between the plant species, soil type and height, and the site weather conditions, the question of proposing the green roof with minimum soil or an alternative growing medium for plants is raised. The feasibility of such lightweight green roof can have a far-reaching effect through quantity of square meters created due to easy to install system. However, this roof type depends on organic content or adding fertilizers in regular intervals. So, some issue concerning long term maintenance costs still need to be addressed. Also, this paper suggested further investigation on finding best combination ratio of brown, blue, lightweight and extensive green type on one roof or to choose one on the base of costs and benefits in order to achieve sustainable solution for urban environment.

Keywords: brown biodiverse roof, lightweight green roof, extensive green roof, blue roof

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Integrative approach to protecting cultural heritage in Montenegro

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Abstract: In the protection of cultural heritage, the basic starting point should be affirmation of urban continuity, but with full protection and promotion of cultural monuments, spatial cultural and historical sites, archeological sites and landmarks, with the aim of preserving the spirit and character of urban space, permanently indicating all elements of urban culture.

Planning solutions should first and foremost be achieved: preserving cultural heritage and stopping further degradation of existing spaces, aligning the policy of development of cultural and historical heritage protection with programs of other areas participating in planning, in order to create optimal conditions for integrative conservation and urban renewal in individual parts town.

Spatial solutions in the Master Plan strive for corrections and additions to form parts of Montenegro as recognizable structures that have persisted throughout Montenegro's history and represent spatial cultural and historical entities of exceptional and great importance, cultural property or property that enjoy prior protection. In order to achieve this, it is necessary to define the boundaries of areas with different categories of values of immovable cultural property, within which planned activities must be carried out with special precautions and in cooperation with institutions for the protection of cultural monuments.

The architectural heritage of Montenegro is protected by applying the measures defined by the Law on Protection of Cultural Heritage, which also ensures that the total urban heritage is, to the extent appropriate to its value, integrated into the contemporary life course of the state as a factor of its overall development. Idea behind this work also envisages protection mechanisms within legal instruments. The Master Plan seeks a balanced compromise between the protection and restoration of the architectural heritage, daily living needs and the legality of economic development.

Keywords: integrative; urban; heritage; rural settlement; self-sustain; culture

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Implementiation of preventive conservation measures on urban villa with hypocaust, Doclea, Montenegro

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Abstract: The work itself is designed to give a practical example of conservation and restoration of the cultural property in question, methodologies (methods and techniques), research, method of writing documentation (graphic and photo contributions), as well as a proposal for the sustainability of this cultural property.

It is necessary to study and respect international charters and conventions in order to take the most correct position in the practical protection of cultural property. Based on our different experiences in research and knowledge, we can make suggestions and conclusions in the direct implementation of conservation measures themselves. The use of science and technology in the practical use of modern materials must follow the old techniques and methods that will most suit the cultural property itself and its degree of threat.

By proposing a plan for the sustainability of the site and drafting documentation using modern IT programs, it will serve suggestions and suggestions to the institutions of the system to the scientific, professional public as well as tourist agencies for the best presentation and promotion of this cultural property.

The architectural heritage in the territory of Montenegro obliges us, through European cooperation, European conventions for its protection from the 1930s to the present, to build and emphasize the need for mutual understanding and deletion of borders in order to protect the common cultural heritage.

Keywords: archaeology; Doclea; restauration; convention; hypocaust

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Conservation and consolidation in rural enviroment, case study portal of the Balsic in Godinje, Bar

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Abstract: In the title of the work itself, its structure is conceptualized, which, through the prism of the cultural property in question, will include chronology, stylistic-chronological analysis, relation to cultural heritage through the practical application of protection measures (in the case of conservation and remediation) work methodology (method, technique), accompanying conservation research as well as a plan for the sustainability of the Godinja site as a whole.

With conservation research, we determined the degree of threat to the cultural property in question, determined conservation measures to implement conservation and consolidation, proposed a plan for the sustainability of the site, prepared documentation that would serve not only the protection services but also tourist agencies for the best possible final presentation.

The aim of this paper is to improve the status of this cultural property through expert suggestions and suggestions.

Building heritage in the territory of Montenegro obliges us to build and emphasize the need for mutual understanding and deletion of borders in order to comprehensively protect cultural heritage through European cooperation, European conventions on its protection since the 1930s.

Keywords: cultural heritage; conservation; sanation; ambient; Godinje

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Urban solution of Boan (Šavnik municipality, Montenegro) in function of agricultural activation

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Abstract: Today, at a time when, day by day we are increasingly moving away from the countryside and the population is gravitating towards cities, looking for better living conditions and work ,it is necessary to stop it and turn to the village and return to its roots. The aim of this project is to refine and modernize the area of the rural settlement Boan, in the municipality of Savnik, in order to create the best possible conditions for the "forgotten" settlement. So it could be revived and so it would restore its old splendor and become a sub-municipal center of Savnik again. This urban solution plans reconstruction of infrastructure parts, objects and the introduction of new facilities, of public, commercial and tourist character, with associated hiking and biking trails that would further connect the space into one. The main emphasis is on the maximum utilization of all the natural and cultural potentials of this area, which are abundant. With the implementation of this urban solution, Boan would not only be a place that meets the needs of both the indigenous and the population of the gravitational rural settlements of the "uskocki kraj" region , but would attract tourists with its natural beauty and its contents, and become a self-sustaining settlement and regional agricultural center.

Keywords: agriculture; Boan; cultural landscape; rural settlement; self-sustain

Analysis of the new block settlement in the context of land policy and expansion of the city: Case study of Rudo Polje in Niksic, Montenegro

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Abstract: The concepts of the cities we know nowadays, and which we are accustomed to, change at a very rapid pace. The philosophy of their design is also changing. The subject of the research is one of the block settlements of the northeastern part of Niksic in Montenegro, near the industrial zone of the former Boris Kidrič ironworks complex. This settlement, which occupies the belt of space known as Rudo Polje, is known also as "Integral Settlement", and "Palestine Settlement". The development of the city of Niksic after the Second World War characterized so called industrial revolution, when there was a rapid increase in population to from the rural areas to the city.The planers had a hard work of urban planning related to the organization of urban space, creating the space to be more comfortable for residents and to the city administration. Initially, there were urban projects based on Slade's plan, and the new urban plans were more or less respecting the concept of Joseph Slade's ideas in the contemporary spirit. Accordingly, there is a massive construction of collective residential buildings, as well as the so-called barracks for the temporary accommodation of workers. In the first rush of urbanization and urban construction, Rudo Polje was, for the ideas of the urban planner (Sajsel's plan), out of the narrower part of the city and as such intended for a settlement for out-of-town individual housing. According to the information received from the newspapers and publications related to the time of the establishment of this settlement, we are witnessing that the city is protecting itself, with the revision of the urban plans.. Changes are made in terms of density and way of living, so the place of the individual housing draws urban blocks with large residential buildings of collective type of housing, and the individual ones are pushed further along the edges of the newly planned settlements. Such a fate is foreseen for Rudo Polje, more specifically for the part of Rudo Polje, which is the subject of this research. In this research the views of the inhabitants were analyzed, the land use, land use changes, plans of this part of the settlement including the advantages and disadvantages and some of the spot mistakes.

Keywords: maize; microorganisms; nitrogen

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Images from the google Earth.

Photo taken from the City of Nikšić Archive, Building Section.

Photo taken from the documentation of the Niksic News Archive (1971)

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Integral protection, a significant mechanism for the protection and preservation of the architectural heritage

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Abstract: Cultural heritage is a significant segment of each country's national identity. That is why its protection and preservation is a priority of all modern state policies.

In the past period, through the institutions of the system and the implementation of the law, Montenegro has recognized the importance of protecting and preserving the exceptional values of its cultural heritage.

The importance of cultural heritage for our country is also indicated by the fact that the largest state act, the Constitution of Montenegro refers to the responsibility of citizens in relation to cultural heritage and also to the belonging of the cultural heritage of Montenegro to all its citizens. The constitution stipulates "Everyone is obliged to preserve the natural and cultural heritage of general interest. The state protects the natural and cultural heritage

On the territory of Montenegro there is a rich architectural heritage from different epochs, which testifies to the long history and tradition of these areas about the influence of different cultures, which have left valuable testimony, which we are protecting today.

A particularly sensitive segment when it comes to protection is the immovable cultural heritage (architectural heritage).

Although legal mechanisms of protection were in place, this type of cultural property was often manifested in an inadequate relationship, especially through the process of drafting planning documents in which institutions of protection were not included in a timely manner, so we often have in practice examples of deviations from conservation principles and rules of the conservation profession.

It has been a common occurrence that owners of cultural property, when performing works, primarily aim at adapting the object and their immediate environment to new needs, most often commercial ones, with cultural and historical values often not seen as cultural potential, but as a restriction of property rights and economic downturn. potential.

Therefore, integral protection is an important mechanism of protection in the process of preserving authentic architectural expression and materialization, of each individual object and of all cultural values, for which they have been protected by law and acquired the status of cultural property.

The earlier system of protection contained certain shortcomings which in practice, in themselves, created problems and difficulties in the application of protection measures, primarily of the architectural heritage. Considering all the shortcomings, and in order to improve the overall situation in the field of cultural heritage protection, the Ministry of Culture has carried out legislative and institutional reforms, with the aim of meeting the new organizational framework to meet the state's requirements for the protection and preservation of cultural property.

The Law on Protection of Cultural Property, among other things, clearly defines new mechanisms for the protection of cultural property in planning documents, which ensure their protection and the protection of their environment, in a way that respects their integrity and status and consistently enforces the regime and protection measures prescribed. by this law.

The Study on the Protection of Cultural Property, as a mechanism for the protection of cultural property in planning documents, contains, among other things, the regime and measures for the protection, preservation and enhancement of cultural property and their protected environment and represents the most important form of protection of the architectural heritage in planning documents. The planning document must be harmonized with the study on the protection of

cultural property, which, according to the law, is adopted and prepared by the Directorate for the Protection of Cultural Property and, after its implementation, gives an opinion.
Also, the management plan is a strategic document for the integral protection of the architectural heritage, through long-term management, protection, preservation, use and presentation. It is mandatory to bring it for cultural property that is listed on the World Heritage List and cultural property that is nominated for inclusion on this list.
All this indicates that the state is in search of solutions that will provide safe integrable protection, and thus the future of cultural heritage, has shown concern and taken a clear stance, indicating that in accordance with the procedure prescribed by law, possible problems are addressed and how integrally preserves the architectural heritage.
These protection mechanisms are designed to prevent changes and risks that may negatively affect the cultural values of heritage buildings, and in particular those changes that express the need of the modern man for overbuilding.
Recognizing that architectural heritage is an indispensable expression of the richness and diversity of Europe's cultural heritage, and an invaluable testimony to our past and a common heritage of all Europeans, integral protection is of particular importance, both in the preservation of the individual cultural property and in the space and environment in which findings.

Keywords: Integral protection, preservation, architectural heritage

Geospatial analysis of agricultural land in Nikšić from 1990 to 2018

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Abstract: The area of Niksic municipality covers the western part of Montenegro, and is characterized by several relief forms that differ in geological, geomorphological, climatological, hydrological and pedological characteristics, different anthropogenic influences, and therefore land cover. This paper aims to analyze the changes of agricultural land in the territory of Niksic municipality from 1990 to 2018. The data from the CORINE Land Cover (CLC) database were used to create this paper. The changes were analyzed for five consecutive versions of the CORINE Land Cover (CLC) database and by applying GIS. The analysis also included the determination of the percentage share of agricultural land in the total area and its changes in the indicated period.

Keywords: CORINE Land Cover, Niksic, agricultural land, GIS (Geographic Information System)

The spatial aspect of the number of respiratory diseases in Montenegro from 2006 to 2016

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Abstract: Respiratory diseases are the most leading diseases in Montenegro. This paper is intended to present the spatial aspects of the number of respiratory diseases in Montenegro for 2006 to 2016 using the GIS tool. Data for the preparation of this work were obtained from the statistical yearbooks of the Institute of Public Health of Montenegro. The analysis included the calculation of percentage participation, incidence rates and comparative analysis of data for municipalities and regions in Montenegro. To calculate the incidence rate, we used the population from the 2003 and 2011 censuses. The incidence for municipalities is calculated for 10,000 inhabitants and for regions and the state for a total of 100,000 inhabitants. The registered incidence was the highest in the municipality of Pljevlja from 2006 to 2013, in 2014 and 2016 it was the highest in the municipality of Cetinje, and in 2015 it was the largest in the municipality of Herceg Novi. In regional terms, from 2006 to 2013 it was the largest in the Northern Region, in 2014 and 2016 it was the largest in the Central Region, while in 2015 it was the largest in the Southern Region.

Keywords: space, respiratory diseases, Montenegro, GIS

Investigating factors affecting Sustainable Development and formulating Sustainability-Related Scenarios in Mashhad Metropolis, Iran

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Abstract: This descriptive-analytical study was carried out in Mashhad metropolis and based on both primary and secondary data sources. The study utilises official documents, questionnaires, interviews schedule and software (MICMAC and SCENARIO WIZARD) to get the results. Based on previous studies, 30 primary variables of sustainability were selected and finally, based on the opinions of 120 experts, six key variables in economic, socio-cultural, physical and environmental dimensions were identified and evaluated in the MICMAC software cross-impact matrix for 13 regions of Mashhad metropolis. Then, by determining the optimal, moderate, and catastrophic states for each of the key variables, the effects of these conditions on each other were determined in the interval of 3 to -3. In this way, using the SCENARIO WIZARD software, the patterns of the study areas could be determined. The results of this analysis included one optimal scenario and one catastrophic scenario for the advantaged areas, three optimal scenarios, one moderate and one catastrophic scenario for the semi-advantaged areas, and five optimal scenarios, one moderate scenario, and one catastrophic scenario for the disadvantaged areas. According to these results, it seems that unless policy-making and development projects are substantially transformed, it will not be possible to follow moderate scenarios, but also the catastrophic scenarios will prevail throughout the city. Accordingly, the strategic recommendation of the research is to pursue optimal scenarios in all regions under study.

Keywords: Sustainability, Scenario development, Development, Mashhad, Iran.

Women empowerment domains in the Macedonian agriculture

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Abstract: Gender inequality is an important issue for any society and is especially pronounced in the agricultural sector. Generally, agriculture is perceived as a male-dominated sector, but as an engine of growth and development, it should provide greater recognition of the importance of women. In Republic of North Macedonia, the majority of agricultural workers are men, and they dominate all age groups and management activities. Women participation in the management of agricultural holdings is very low, and accounts around 10%. We aim to measure the women empowerment in agricultural sector in Republic of North Macedonia in five domains: Production, Resource, Income, Leadership and Time Allocation. The results show that men have higher participation in the decision-making process as compared to women. Although it seems that women have high power in decision-making process in the agricultural production related activities and have a good control over the income, still opportunities are not equal for the women. Men have mainly paid work, whereas almost half of women's work is unpaid (41,7% of the total workload belongs to unpaid work). However, a positive impact on the higher empowerment of the households is when women are responsible for farm accountancy within the households. Therefore, the further policy interventions should be tailored to empower women in agriculture by giving responsibilities for farm accountancy and deicing-making and also providing opportunities and services to lower their unpaid work.

Keywords: women's empowerment, agriculture, decision-making

Farm tourism as a significant form of agrarian enterprise in Vojvodina

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Abstract: Farm tourism, as a special form of rural tourism, is characteristic of the territory of the Autonomous Province of Vojvodina and is a well-developed, promoted and popular rural tourist product. This form of rural tourism can initiate the development of rural economies, increasing the employment rate of rural population since it is a labor-intensive activity. Farm tourism is, also, a form of agrarian entrepreneurship. Agrarian entrepreneurship is a "new organizational form of entrepreneurship" that can be developed in all activities covered by multifunctional agriculture. These activities can provide rural residents with additional employment and income. Therefore, multifunctional or multifunctional agriculture is often referred to as agrarian entrepreneurship in the literature. The most important segment of multifunctional agriculture is rural tourism, since it can create the fastest diversification and development of rural economies. The importance of rural tourism is derived from the multiplicative impact of tourism on economic development. Therefore, the development of farm tourism, as the most authentic and represented form of rural tourism in Vojvodina, is of great importance for the development of rural economies. The revitalization of Vojvodina farms, and the development of tourism on them, enables the affirmation of tradition as well as its economic valorization. It is an affirmation of the Farm lifestyle, farming, traditional and authentic gastronomy, as well as the revitalization of old crafts, domestic crafts and the like. Tourism, in return, provides funding for investments and further revitalization of the farm. The economic importance of farm tourism is also reflected in the rise in entrepreneurial activities. Of particular importance is the impact on the development of women's entrepreneurship, given that this type of tourism mainly engages the female workforce. Farm tourism can keep women as well as young people on farms and initiate economic development and survival of villages and small towns in Vojvodina.

Key words: farm tourism, agrarian entrepreneurship, development, rural economy, Vojvodina

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Research of Consumers attitudes as a basis for improving the consumption of Organic Food Products

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Abstract: Organic product sales have achieved significant growth in the last decade and it is anticipated that this trend will continue in the coming years. The subject of the research is consumer attitudes towards organic food products in the Republic of Serbia, which can serve as a premise for improving their consumption. The research was conducted with the aim of determining the attitudes of different consumer groups of organic food products, the factors that influence their purchase, as well as the relevant elements for improving the consumption of organic products in the Republic of Serbia. The survey was completed in 2016 on a sample of 416 respondents exclusively on the territory of the Republic of Serbia. Research results have shown that by reducing the price of organic food products and emphasizing their health benefits to the greatest extent, an increase in consumption can be achieved. The organic food market is characterized mainly by the low purchasing power of the population, lack of information and low environmental awareness of our population. Therefore, building trust of the consumers in nutritional and overall quality of the organic food is needed.

Keywords: Consumer Attitudes, Organic Food Products, Purchasing, Consumption

Evaluation of the Conceptual Framework of Social Farms

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Abstract: Activities at social farms are only successful if an appropriate relation is established between the owners and participants. In the case that the initiator of the social farm is a supporting social institution, it has to find such an agricultural unit that performs production relevant for the target group, and/or to engage an expert who is familiar with the agricultural production or processing at that unit. Members of different target groups can be employed in cattle breeding, gardening and food processing, either during the entire process or at its different phases. When the agricultural unit itself starts the social farm then it is convenient to ask a supporting organization to find an appropriate target group that will contribute to the activities of the farm. In this paper we will acquire data and expert opinions from the areas of healthcare and social care.

The evaluation of effects of social farms (and other farms, which have the same goals but are registered under different names) begins with sampling. The characteristics of the chosen farms should reflect the situation in the analysed country concerning location, farm size, the number of clients and the nature of problems. For the evaluation we will use SWOT analyze. In this paper we will acquire data and expert opinions from the areas of healthcare and social care.

The success of a social farm depends on the correspondence between the habitats of the owner and the target group. Public supporting and care institutions can help match clients to owners. Local experts could give detailed and reliable information about local needs.

Agriculture is an extremely important sector of the economy. Countries, which have the possibility of development of agriculture, give great importance to this issue.

Keywords: social farms; SWOT analyze; agricultural unit

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Importance of agriculture and innovative activities - a factor of sustainable development

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Abstract: Changes in the way we do business and the implementation of innovative activities is important for all areas, as well as for agriculture, as agricultural production is not spared. Natural resources are threatened by production that is only intended to generate high yields and generate large profits for producers. The environment, its conservation, the efficient use and the improvement of the quality of natural resources are gaining in importance. Sustainability of agriculture includes not only environmental protection, but also has an impact on economic and social, but also encourages the development of each country. Agriculture has a major impact on every aspect of the economy, providing, above all, healthy and safe food of natural origin, which contributes to improving the health of the population of that country, but also has a major impact on the development of the rural economy, the promotion of traditional crafts and the promotion of rural tourism. The aim of this paper is to review the current state of conservation of natural resources, improve the quality of the environment, the quality of products and the spread of tourism in this region. Obtaining real data provides an opportunity to provide guidance for creating a strategy that encourages economic development.

Keywords: sustainable development, agriculture, innovation

Migration issues in Montenegro: Readmission as a significant segment in the fight against illegal migration

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Abstract: World population is projected to reach close to 10 billion by 2050, with most of this growth in developing countries. From the Second World War, the reasons for major crises and how the world responds to them have changed every decade. Whereas these crises vary greatly across global regions, their economic, environmental, ecological, social, and disease aspects are increasingly under the influence of widely integrated global changes and forces arising primarily from: climate extremes; rapid unsustainable urbanization; critical biodiversity losses; and emergencies of scarcity in water, food, and energy. All of this caused human migrations, the movement of people from one place to another with the intentions of settling, permanently or temporarily at a new location (geographic region). The movement is often over long distances and from one country to another, but internal migration is also possible; indeed, this is the dominant form globally. People may migrate as individuals, in family units or in large groups. There are four major forms of migration: invasion, conquest, colonization and immigration. Conflicts, wars, climate changes and its impact will be greatest on people in the developing world. Climate change, for example, and population can be linked through adaptation (reducing vulnerability to the adverse effects of climate change) and, more controversially, through mitigation (reducing the greenhouse gases that cause climate change). The contribution of low-income, high-fertility countries to global carbon emissions has been negligible to date, but is increasing with the economic development that they need to reduce poverty. Rapid population growth endangers human development, provision of basic services and poverty eradication and weakens the capacity of poor communities to adapt to climate change. Significant mass migration is likely to occur in response to climate change and should be regarded as a legitimate response to the effects of climate change. The contribution of population growth, migration, urbanization, ageing and household composition to mitigation and adaptation programmes needs urgent investigation. In order to successfully combat illegal migration, effective implementation of national legislation in line with the International and EU standards, effective fight against illegal migration, effective readmission, quality motivation of officials, then the application of science or scientific methodologies, practical training, adequate technical and information equipment and connectivity are required , and quality co-operation and exchange of operational and statistical data on illegal migration in the fight against all forms of crime. Migration is certainly a basic and inevitable component of the economic and social life of every state and a good regulation of migration can be beneficial, both for individuals, institutions, as well as for society and the state as a whole. The paper describes the readmission process as an act of a state accepting the re-entry of a third-country national or stateless person who has been found to have illegally entered, or was present, or resided in another country. A readmission agreement is an agreement establishing the reciprocal obligations of the contracting parties as detailed administrative and operational procedures to facilitate the return and transit of persons who do not or no longer meet the requirements for entry, presence or stay in the territory of the requesting state. The migrant crisis that has hit Europe, but also the Western Balkans, has highlighted the many weaknesses of national systems and called for strengthening regional cooperation, joint actions and operations, sharing experiences, information, data, and preparing a common response to this phenomenon, as well as sharing resources , especially when it comes to missing readmission

agreements with migrant countries of origin, poor translation capacities for Afro / Asian languages, and more efficient identification of undocumented persons. Multiple and complex dimensions of migration include the following essential components: migration - security, i.e. combating illegal migration, readmission - effective return of their nationals and third-country nationals, migrant rights - integration of migrants, i.e. migration and development of the state of Montenegro and the Western Balkans. This research has intention be a modest contribution to the global contribution of the analysis on population growth, migration, urbanization, to mitigation and adaptation programmes that needs urgent investigations.

Keywords: migration, illegal migration, readmission, implementation, national legislation, standards, training, cooperation and exchange of data.

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Causes and consequences of depopulation in rural areas of Balkan: Case study of the Municipality of Niksic, Montenegro, Southeastern Europe

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Abstract: This paper analyzes demographic trends and population decline of the rural area surrounding Niksic, Montenegro from the second half of the 20th century to the first two decades of the 21st century. After the World War II industry in Niksic began to develop strongly. A large number of state enterprises started to operate, and the consequent industrialisation and improved living conditions triggered a wave of migration from the surrounding rural areas to Niksic. The paper describes the depopulation of rural areas and the causes and consequences of migration within the Municipality of Niksic based on an analysis of population movement and density, the rural and urban populations, and the age structure of the population. Transformations of the economy after 1990 indicate that the neglect of agriculture and the destruction of agricultural land are mistakes that will prove difficult to correct. The results of our research reveal that, today, revitalisation of the countryside is only possible if non-agricultural activities are brought to the area centres and quality of life is improved in the villages, which would reduce unemployment in the city. A solid traffic infrastructure between individual settlements and their connection with the city is also necessary. Between 2003 and 2011, the agricultural population increased by 1.2%, which gives hope because agriculture is now being recognised as significant, and a movement for changing the inherited negative perception of it is being created. This research is addressed to the state and municipal administrations of the region with the message to implement responsible and timely measures to revitalise the countryside and stop the extinction of the villages.

Keywords: depopulation, industrialisation, migration, demographic ageing, rural development

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Village revitalization through eco katuns

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Abstract: The second half of the 20th century was marked by a decline in population in rural areas of Montenegro. In 1948, rural population accounted to 79%, while in 2011 its share was 35.8% at the national level, with significant regional differences. Therefore, rural areas are exposed to depopulation and senilization, with the threat of being left without permanent residents. Over the last twenty years, Montenegro has established itself as a tourist destination, and the development of the economy has largely been based on tourism development. Such conditions have created an opportunity for the revitalization of rural settlements and the reactivation of their natural and anthropogenic potentials through establishing of eco and ethno katuns, whose operation provides livelihoods to the indigenous population in rural areas. Mountain tourist sites in Montenegro were visited by 4.4% of the total number of tourists in 2018, which indicates the underutilization of their tourism potentials as well as the dominance of seaside tourism in our country. The development of rural tourism through the construction of eco and ethno katuns is a way to reduce the pressure on the coastal region, but also to revive Montenegrin villages.

Keywords: village, size of population, eco-tourism, ethno-tourism, village revitalization

Socio-economic and political changes and its impact on economy and migrations in the northern region of Montenegro (1991-2011)

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Abstract: The socio-economic and political changes which resulted from the disintegration of the Yugoslavia, the wars waged in the region, from the one in Slovenia in 1991 to the war in Kosovo in 1999, the economic sanctions imposed by the countries of the European Union and other countries, as well as numerous accompanying negative social phenomena and processes, had significantly impeded Montenegro's economic development. At the beginning of 1986, Montenegro's economic development reached a significant level, with industry as its main component. Although economic growth seemed to be stable, there were some indicators that called for caution: the level of foreign debt, i.e. the companies' international debts through the banks of Yugoslavia amounted to USD 850 million; also, although the number of employees amounted to 152,000, around 40,000 workers were seeking employment. (Radojicic, 2015, 299-301).

The transition period has left dire consequences for the Montenegrin economy. According to the data of the Independent Trade Unions, from 1992 to 2014, 45,000 workers remained unemployed, which is the size of a population of the city of Bijelo Polje, for example. Out of this number, 25,000 workers remained unemployed in the period 2009-2014 alone. At the same time, in mid-2014, around 40,000 people worked in Montenegro without a contract of employment. National per capita income has fallen by three times by 2015, although according to earlier development projections and predictions at the end of the 20th century, it was expected to increase threefold. During the last decade of the twentieth century and the first two decades of the twenty-first century, emigration became very common in Montenegro. Due to poor economic conditions, the population was forced into external and internal migrations. Additionally, the wars in the Yugoslav territory contributed significantly to the population movement. Due to the war activities, the population from the endangered areas came to Montenegro, most of whom remained to live there, thus contributing to the changes in the country's ethnic composition. Internal migrations, i.e. population relocation within Montenegro, indicate that these depopulation tendencies are present in the Northern Region which comprises 11 municipalities and takes up almost 53% of the territory of Montenegro. The largest population outflow was recorded in the Municipality of Bijelo Polje.

Keywords: Socio-economic changes, political changes, Yugoslavia, Montenegro, population, economy, migration

Waste Management in Environmental Function: Example of an agricultural enterprise

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Abstract: Environmental protection is crucial for human life and health. One way to protect the environment is to properly manage waste. This paper is created with the aim of demonstrating how it would be desirable for companies to manage waste in order to protect the environment. The agricultural company „Sava Kovačević", whose results have been used for analysis, is mostly oriented towards agricultural production, so most of the waste is biodegradable waste,which can be reused most efficiently for production. In order to manage waste properly, it is necessary to analyze all the units of work, the types of waste they generate, and to define methods by which waste will be properly managed. In this paper, the research was conducted using observation and tour methods, and analysis of the appropriate archival material of the company. In the first part of the paper, the authors obtained information on the organization of work units in the company, on the types of waste, as well as on ways of waste management. They also recognized the problems that the company faces when it comes to waste management due to the distance of indiviual work units. As the company strives to invest in biogas plants, the second part of the paper presents the biogas production technology and its new technologies, especially those that are in the function of environmental protection. In the future, it is necessary to increase the awareness of all companies in our country on how to manage waste, while focusing on environmental protection and therefore on human health. In this regard, the state support is needed.

Keywords: waste management, environmental protection, agricultural enterprise

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Ecology and Media

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Abstract: The Sustainable Development Goals (SDGs) are a set of global goals targeting all the levels: from planetary biosphere to local community. The aim is to end poverty, protect the planet and ensure that all people enjoy peace and prosperity, now and in the future. The beginning of the Twenty-first Millennium and the last fifteen years of the twentieth century have been the awakening of human consciousness when it comes to ecology and environmental protection. The man of digital age is slowly becoming aware that a new society organization of life characterized use of modern technologies and overuse of natural resources and, in some places, already devastated and degraded environments. The modern economy survives on the use of living and inanimate natural resources. Natural resources, such as air, water, soil are polluted and some animal species are exterminated in this period. For this reason, it is of great importance to force producing and broadcasting numerous environmental shows on local, regional and global media. Going deeper into the issue, we have to see that the problem should be addressed more and more, strengthening at the same time the ethics of all people on the planet, which would lead to the adoption of binding norms that would affect people's behavior when it comes to ecology and environmental protection. The media are playing key role in this issue. A part of the discussion on the concept of conservation, including main scientific and ethic points of view, is presented is this paper, highlighting environmental, socio-ecological and ethical aspects behind the comprehensive concept of industry and economy. This paper is having the idea to be one of the calls in media regarding the urgent need for socio-environmental ethic personal engagement and collective actions.

Keywords: ecology, media, environment, ethics, sustainable development

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Climate change: Perspectives on curriculum innovation and application in the Montenegrin education system

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Abstract: Understanding of climate change and responding to the climate changes as a complex global phenomenon requires constant education and learning. Climate change education, developed in the broader context of education of sustainable development, is part of the Montenegrin education system.
Climate change is one of the major challenges, especially in primary and secondary education. Therefore, the purpose of this paper is to contribute to the effective implementation of climate change education at these levels of education, and to indirectly illustrate the contribution of the education system to achieving a vision of sustainable development. We will highlight some of the current trends in education and possible articulation.
Theoretical analysis method was used to evaluate the structure of the Subject Programs, and to evaluate the content and concept of the cross-cutting issue of Climate change, as important educational tools in the context of climate change education. A strategic and systematic review of the literature has mapped key strategies that have been shown to contribute to meaningful learning and teaching about climate change.
It has been recognized that the Subject Programs and the Cross-curricular Topic Climate Change Program for Primary and Secondary Education, from the point of view of the analyzed elements, provide a broad, open and flexible framework for quality education on climate change and related issues. It has been shown that importance is given to teaching and learning, which places the student at the center and provides a context in which students can develop their ideas, values, and understand and reflect on reality. Experiential and research teaching, the promotion of collaborative relationships, and the local and global dimension of education, occupy a special place.
It is expected that this presentation will encourage teachers to think about improving their subject curricula (planning) and / or methodology (selecting and applying didactically methodical approaches to learning) with the aim of increasing students' competencies and critical engagement in the field of study. At a broader level, the results presented could help policy makers reflect on their national curricula to integrate climate change issues.

Keywords: climate change; education; elementary and high school programs; Cross-cutting issues; learning strategies

Respecting green policy by developing a new ecological-economic model of compost

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Abstract: This study presents the potential benefits of developing a new model of behavior in local government units in the Republic of Serbia. The authors have focused the research on a compost pile, which could be developed instead of on the perimeter of inhabited places within the settlement itself, thereby reducing the costs of transporting and handling plant waste as a basic raw material for compost development. According to the author, the new model of the compost functioning approach set up in this way could be realistically applied in local self-governments in the Republic of Serbia and beyond. There would be no negative impact on ecological systems within populated areas, and the authors point out numerous benefits in ecological and economic terms if the model presented in the paper were to be applied.

Keywords: compost; economic; environmental, benefit

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Respect for green policy by application of new economic model of mulching in park surfaces of cities

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Abstract: This study points to the creation of an economically viable possible model of mulch application through a new approach to mulching within the green areas of predominantly park areas in cities in the Republic of Serbia. The authors focus their research on creating mulch in the framework of populated areas through the direct milling of branches obtained by felling and maintenance of wooden trees, that is, using the milled branches as mulch rather than hauling branches to city landfills. According to the author, the new model of mulching functioning approach set up in this way could be realistically applied in a large number of green areas of cities in the Republic of Serbia, and beyond. There would be no negative impact on the ecological systems within the settlements, and the authors point out a number of economic advantages, since avoiding unnecessary costs of branching to landfill, reloading, costs related to landfill fees, should the model presented in the paper be applied.

Keywords: mulch, economic; environmental, benefit

Implementation of internal audit in companies intending to operate on the principles of green economy in the Republic of Serbia

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Abstract: Introduced international audit in the business of companies that want to serve with respect for the principles of green economy can say that they will best succeed in achieving results in the work of significant enterprises. One of the important factors is the existence of professional staff leading the internal audit business, which can reduce the overall risks in the management of the top management of significant companies. Top management should serve as the supreme organ of the company, which is of utmost importance for the continued successful operation of the company. Establishing an internal audit mechanism is done by external management and we need to make use of overall corporate governance, that is, the results of the future are visible. Internal audit uses in its work new knowledge of the internal audit profession and liaises with the adopted central political enterprises, in this case companies interested in the popular implementation of green policy.

Keywords: internal audit, process management, enterprise.

The importance of making valid business decisions of top management enterprises in a tranzition economy

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Abstract: Formation and making of real business decisions in the whole process of enterprise management by top management is of great importance for successful performance of business activities in the company. This particularly applies to the functioning of a company in transition economies such as the economy of the Republic of Serbia. The business decision-making process in enterprises should include information that top management receives from the most important sources of information. In this paper, the authors emphasize the importance of taking into account the 4 sources of information that top management of a company should use when making important business decisions in the process of managing a company. The authors emphasized that valid business decisions should include information from internal audit, external audit, information from the established financial management and control system, as well as information obtained from official state bodies. The aim of the paper was to present a possible decision-making system in enterprises that will have a higher degree of security and a lower degree of risk to the top management's decision-making process if top management's reporting solutions are applied by responsible managers of the enterprise sector. The contribution of the study authors is that they have discovered a link between the security of business decision-making in the company and the way top management reports.

Keywords: business decision, risk, management, transitional economy.

Implementation of Global Agenda 2030 in post-conflict society: Case study Bosnia and Herzegovina

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Abstract: Bosnia and Herzegovina (BiH) is member of the United Nations (UN) in 2015 adopted the 2030 Agenda for Sustainable Development with 17 Sustainable Development Goals (SDGs) and 169 targets. Currently, BiH is on the beginning, under the consultation process with stakeholders aimed to identify SDGs that are priority for the country. Political and administrative organization is very important factor that determines the level of SDGs achievement success, while implementation of indicated goals depends on efficient partnerships among the governments, private sector, local communities, civil society and people. However, this is often challenged by the political rivalries and insufficient monitoring mechanisms, particular under post-conflict environment such is in BiH. Decentralization of state level and complexity of administration is one of the obstacles for efficient implementation of international commitments including SDGs. Also, complex legislative and strategic framework, corruption, weak economy, social status, lack of horizontal and vertical inter-sectoral coordination and migrations slows down implementation of existing processes and sustainable development raised by Global Agenda. Although competent authorities play a leading role in the supporting of academic community and civil society in the implementation of the SDGs, it is important to emphasize the involvement of the private sector, women, youth and local communities is not sufficient. Particularly, private sector can provide significant financial support in SDG implementation, but only if they are active not passive stakeholder in this process. In this context, the paper represents the overview of implementation of SDG process in BiH, starting from state to local level, considering political, national and subnational context from post-conflict perspective.

Keywords: sustainable development, global agenda, post-conflict society

Sustainable functionality of machine rings in Northern part of Montenegro

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Abstract: The research in this paper was conducted during 2008-2009-2010, year, and then in 2019 an evaluation was made. In the first year of the research 2008, was determined the initial condition of the number of tractors and attachments on farms, before association. A survey of farmers on their willingness to join machine rings was also conducted, to better equip with agricultural machinery. In 2009, were formed 7 machine rings with 36 associated farmers in the Northeastern part of Montenegro. In 2010, were formed 8 machine rings with 56 associated farmers in the Northwestern part of Montenegro. The aim of the research is to after 10 years since establishment of machine rings is showed their sustainability and development. So in 2019 the survey method of the same farms was repeated and supply of tractors and equipment machinery was analyzed. The results of the establishment of MP machine rings in the Northeastern part of Montenegro showed that the number of tractors per farm increased almost twice from 0.44 to 0.79. Average tractor power increased by 10.14% from 31.05 kW to 34.2 kW. Equipments with machinery increased of the farms by 71.76% from 1.31 to 2.25 machines per farm. Ratio of two-axle tractor on average power 31.05 kW is 2.83 attachments machinery. In the Northwestern part of Montenegro, equipments by tractor increased for 20.83% from 0.96 to 1.16 tractors per farm. The number of tractor attachments per farm increased by 16.27% from 3.75 to 4.36. Per two-axle tractor on average power 36.11 kW, comes 3.75 attachments machinery. By association of farmers into machine rings the number of tractors was increased, average power of tractor and number of attachments machinery in the farms which is confirmed by the research Koprivice et al. (2010), Takacs and Takacs (2012), and Radića et al. (2016).

Keywords: machine ring, equipment on the farm, tractors, attachments tractor machinery

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The influence of Green Marketing on Consumer Environmental Awareness

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Abstract: Due to increasing environmental problems, environmental management is becoming a challenge and a necessity in the modern world today. Negative consequences of human behavior are increasingly being observed. These reasons have led to environmental changes and consumer awareness of the impact they may have on environmental conservation. Green marketing has raised consumer awareness of how their behavior can have a positive impact on the environment. Various environmental changes affect consumer behavior, so it is imperative that all factors be monitored continuously to meet consumer demands. The main aim of the paper is to research the attitudes and opinions of the respondents on the importance of green food, how green marketing affects the sustainability and use of green food products. The survey was completed in 2019 on a sample of 100 respondents exclusively on the territory of the Republic of Serbia. Research results generally show that consumers are not sufficiently familiar with the term green marketing. The analysis shows that they know what a green product is, but that they cannot easily recognize it in the market, and that they do not buy it sufficiently to preserve the environment.

Keywords: Green Marketing, Consumers, Food Products, Environmental Awareness

Green economy in the function of creating green jobs

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Abstract: The subject of the paper is the transition to a green economy, which is part of the broader concept of sustainable development, but does not replace it, but simply offers us the power to develop that is sustainable. Sustainable economic development is based on the creation of green jobs that will require green manufacturing and service activities and will affect the behavior of economic operators, both producers and consumers. This transition has different trajectories in different countries depending on, among other things, the country itself and its natural capital and socio-economic priorities. The aim of the paper is to highlight the importance of a green economy in providing opportunities for green jobs and, therefore, in eradicating poverty and the importance, understanding and differentiation of conventional ones. The concept of green jobs marks the transformation of economies, businesses, jobs and the labor market into a sustainable, low-carbon economy that delivers decent work. Green jobs are potentially significant for a number of reasons, they can contribute to the attainment of climate change mitigation and environmental degradation targets and, on the other hand, offer important employment opportunities as they have significant potential for strengthening the labor market and can therefore help achieve sustainable development and economic goals and creating decent work**.**

Keywords: sustainable development, green economy, green growth, green jobs.

Collaborative Land-Sea Integration Platform at the Danube Delta – Black Sea coastal zone

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Abstract: The COASTAL project, funded by the European Union's Horizon 2020 research and innovation programme is a research and innovation project (2018-2022), a unique multi-actor collaboration of coastal and rural business entrepreneurs, administrations, stakeholders, and natural and social science experts to formulate and evaluate business solutions and policy recommendations aimed at improving the coastal-rural synergy to foster rural and coastal development while preserving the environment (https://h2020-coastal.eu/). The project is organized around six interacting, complementary Multi-Actor Labs (MALs) spread over the EU, exchanging their tools and expertise: Belgian coastal zone; Greece – South – West Messinia; Sweden – Norrstrom Baltic; France – Charente River Basin; Romania – Danube's Mouths - Black Sea; Spain – Mar Menor coastal lagoon. COASTAL Multi-Actor Labs will contribute to the COASTAL Knowledge Exchange Platform. The aim of the COASTAL'S Romanian MAL, Danube's Mouths – Black Sea is to elaborate a system dynamics model based on input from local actors and experts from the Danube Delta and Black Sea coastal zone. The valuable contribution will come through collaborative exercises to analyse problems, the underlying causes, propose and discuss solutions. During the project, the system dynamics model will be validated for the interpretation of the impacts of simulated business and policy decisions for a sustainable development of the area (Danube Delta Integrated Sustainable Development Strategy 2030).

Acknowledgement: This study has been carried out with financial support from the project COASTAL (Collaborative Land-Sea Integration Platform), funded by the European Union's Horizon 2020 research and innovation programme under grant agreement N° 773782.

Keywords: Multi-Actor-Lab (MAL), Danube's Mouths – Black Sea, system dynamics model

The waste wood potential in the Municipality of Kursimlija, Serbia

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Abstract: Serbia has a relatively small area but renewable energy potential derived from waste wood is large. The municipality of Kursumlija located on the south-east has a very large potential for waste utilization. The municipality of Kursumlija has an area of 952 km^2. The municipality is a mountain-hilly area with average altitudes between 300-1700 with deep forest-covered areas. This part of the Republic of Serbia is rich by forest. In 2013 area covered by forest was 676.76 km^2 or 70% of the whole territory. The municipality characterised different species of trees. The most common are Oak, Beech, Pine and Fir. Using the geostatistical analysis, cadaster data, satellite recordings, topographic maps and Geographical Information System (GIS) methods, the waste wood energy were estimated to be 1123.5 TJ/year or 35.6 MWt. Forest density was estimated with a specially created method called sub-pixel contrast ratio method. After that with using the software QGIS and SAGA these raster data were analyzed. GIS software QGIS and SAGA, with the tools for geo-spatial calculations, provided satisfactory results. The estimated waste wood energy present 3.13% of the total energy used. The municipality has a large area of forest with 1106 trees average per hectare; the areas of forest land are 70%. In some parts of the municipality, this area is larger than 85%. This energy could be one important budget of renewable energy resources in the future.

Key words: Municipality of Kursumlija, Waste wood, GIS, Cadaster data, Satellite recordings, renewable energy.

Status of spatial data infrastructure in Montenegro

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Abstract: The rapid development of modern society and the use of increasing amounts of spatial data have stimulated the development and construction of spatial data management systems, known as spatial data infrastructures or geoinformation infrastructures worldwide. User requirements for SDI are no longer just applicable to conventional charts, charts, etc. forms, but to up-to-date, geometrically accurate and easily accessible spatial data in digital format. Information is increasingly being linked to a spatial component, so spatial data and their distribution are gaining general interest. They are based on a large number of different human activities including agriculture, forestry, environmental protection, transport and public infrastructure, telecommunications, the real estate market, etc.

More efficient planning, decision making and general improvement of society in which we live today is being more and more directed to usage, exchange and analysis of information on space. To properly arrange the information on space we create and use, establishing their infrastructure has become necessary.

The need for geospatial data has increased in Montenegro in the last few years. By accepting new trends and technological achievements, requests for data in analogue form are neglectable compared to requests for data in electronic form, which implies the conclusion that there is a need to digitize available data. Spatial information consolidated into common infrastructure prevent duplication and data inconsistency, and provide the possibility of efficient management, faster, easier access and decision making.

While intensively work on updating, aligning and standardizing spatial data is in process, still some of the data does not correspond to the criteria required for a quality National Spatial Data Infrastructure (NSDI). Additionally, the associated metadata is missing for part of the data. As spatial data is a fundamental component of NSDI, this is one of the major weaknesses of the Montenegrin NSDI.

Keywords: spatial data, geoinformation systems, National Spatial Data Infrastructure, geospatial data, system digitization

Space weather impacts to the environment and its monitoring by geodetic data

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Abstract: Space weather is term describing conditions in the Earth – Sun system. Space weather is caused by different dynamical processes in the outer atmosphere of the Sun, that emits a continuous stream of plasma called the solar wind, and periodically releases billions of tons of matter what are called coronal mass ejections (ECM) what disturbances our space environment. When ECM is directed towards Earth it can causes magnetic storms in the space near Earth but also in the Earth´ magnetosphere, ionosphere and thermosphere. These phenomena might have a detrimental effect on the Global Navigation Satellite Systems (GNSS) and on the modern infrastructure on the Earth's surface such as electric power distribution grid. As the society has become dependent on technological advances in transportation, communication and navigation, monitoring and the forecasting of space weather has become necessary. In addition, some studies show that the effects of space weather are detrimental to health of the passengers in air traffic. Radiation at the flight altitudes can be 20 to 70 times stronger than at sea level. This paper describes the effects of space weather based on GNSS observations, since radio signals from satellite get the impacts of the disturbed ionosphere. Ionosphere reference parameter, the total electron content (TEC) are estimated by the Ciraolo methodology. Time series of TEC values of GNSS stations of the European permanent network (EPN) are compared with the data of geophysical parameters as: solar wind speed, the vertical component of the interplanetary magnetic field, indices of geomagnetic field Kp, Ap, AE, and Dst. Comparations show the signatures of different phenomena of space weather in the GNSS TEC values. The paper also demonstrates the applications of these TEC analyzes in various environmental studies.

Keywords: space weather; ionosphere; TEC; GNSS

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Economic aspects of UAV application in changes detection monitoring

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Abstract: Unmanned aerial vehicle (UAV) systems are nowadays widely used, especially in applications where aerial imaging is an important source of information for performing certain tasks. With the advancement of technology, UAVs have reached an enviable level of practical reliability and functionality that has enabled these systems to enter the geomatics business market as valuable additional platform for collecting spatial information. One of the potential applications of UAV images is the change detection on the Earth's surface by recording a series of images of the same surface over time. Change detection is of great interest for a number of applications including agriculture, forestry, mining and monitoring of urban and green areas. Unlike classical methods of remote sensing and aerial photogrammetry the obvious advantages of UAV data are their high spatial resolution and flexibility in acquisition and sensor integration. Besides that, UAV is not only the cheapest platform for image acquisition, but it is also the easiest platform to operate in repeated data collections over a changing area. However, their role as a low-cost airborne platform for capturing high-resolution, geo-referenced imagery has not been fully utilized. In practice, UAV images will be used if they provide the required accuracy and an additional value and if they are competitive in terms of economic aspect compared to other measurement technologies. This paper will show how the UAV images can be used to monitor smaller sites such as archaeological sites, to monitor green urban areas and their application in agriculture together with the economic aspects of performing certain tasks

Keywords: UAV, change detection, site monitoring

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Reducing gap between business and academia in introducing modern technologies – GEOBIZ project approach

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Abstract: There is continuous request on academic institutions to introduce study programs which will in practical part based on case-based problems coming from business sector. This request understands change of way how practical part of university courses are conducted and establishing new form of academia-business cooperation. This challenge has become leading idea for GEOBIZ project (Erasmus+ CBHE Ka2 „Business driven problem-based learning for academic excellence in geoinformatics") which will introduce problem-based learning in practical part of geoinformatics courses in geodesy, geoinformatics and related study programs at higher education institutions in Albania, Bosnia and Herzegovina, Kosovo, Moldavia and Montenegro. Looking for a new sustainable and lasting cooperation model between business and academic partners new content should be introduced in technology driven courses.
The project leader of GEOBIZ project is the University of Zagreb Faculty of Geodesy. Partners from partner countries are: Polytechnical University of Tirana, University of Tirana, Land & Co. Ltd, Tirana, University of Banja Luka, University of Sarajevo, Gauss Ltd, University of Pristina, University for Business and Technology in Pristina, Technical University of Moldavia, State University of Tiraspol, University of Montenegro, and from program countries Catholic University of Leuven, University of Split, Bochum University of Applied Sciences, University of Beograd, University of Novi Sad, and Gilab Ltd. Beograd.
The paper presents the Erasmus+ GEOBIZ project, which has started in November 2019, its goals, objectives, methods and especially activities foreseen to foster business-academia cooperation.

Keywords: Erasmus+, GEOBIZ, technology, problem-based courses

References:

Official web site of GEOBIZ project funded by European Union under ERASMUS+ KA2 Capacity Building in Higher Education: www.geobiz.eu.

Mapping the ancient olive trees and identification of best conservation practices in Džidžarin plantation

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Abstract: Džidžarin olive complex, located in the area of Bar municipality, is one of the main potentials for the development of local agri-tourism in the southern of Montenegro, given its magnificent landscapes and numerous cultural-historical treasures of great valorization importance. Experimental field work in this area consisted of two sets of activities. The first set covered surveying local olive growers about ordinary agronomic practices followed by their on-field validation, meteorological data monitoring, soil profile opening and sampling, soil moisture control, irrigation implementation testing and olive yield prediction in irrigated and rainfed conditions; while the second set of activities encompassed identification of the oldest olive trees, selection of cultural-historical objects with high agri-tourism potential, as well as their geo-referencing and maps compilation. According to the national soil classification system, the subtype of the examined soil was *Eutric cambisol on phlich.* Maps of the ancient olive trees, cultural-historical objects, roads and trails were compiled, as well as two types of comprehensive maps, an orthophoto and topographic map, all available and ready for further update in GIS. Average canopy radius of the twenty-three selected oldest and most prepossessing olive trees in Džidžarin plantation equaled to 5.1 meters, while the values varied from 3.4 up to 8.3 meters. The circum-reference of the olive trees ranged from 3.0 up to 5.6 meters, while the average value equaled to 4.0 meters. Even though introduction of the surface irrigation would not be economically justified, it showed a positive impact on the olive yield.

Keywords: ancient-olive trees; geo-referencing; mapping; conservation practices.

Acknowledgement

Activities were supported through the implementation of the project CROSS BORDER OL, funded within the trilateral Program IPA CBC Italy – Albania – Montenegro.

Influence of retained node number on Sauvignon Blanc (*Vitis vinifera* L.) vegetative growth, yield and quality of grapes and wine in Podgorica subregion, Montengro

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Abstract: Sauvignon (Vitis vinifera L.) is a white wine variety that is currently grown in Montenegro in commercial vineyards of the „13. jul – Plantaže" company, Podgorica, Montenegro. It is grown in a trellis with five rows of wires. Areas under this variety are still insufficient and there is a need for analysis and evaluation of the impact of different ampelotechinical measures on the growth of vines and the quality of grapes and wine.
For that reason, three-year research (2005-2007) of the influence of retained node by pruning on Sauvignon Blanc vegetative growth, yield and quality of grapes and wine were done in agroecological conditions of Ćemovsko polje, location Tuzi (Montenegro). There were three pruning variants: spur (16 nodes per vine) and two cane prunings (22 and 30 nodes per vine).
After three years of research and based on the analysed data, the following conclusions were drawn: a 16 nodes (V1) had a restrictive effect on the vigor of the vine and capacity; 22 nodes (V2) had a more favourable effect on lushness and yield. The number of grapes and the yield was the highest in the variant with 30 nodes (V3), but the quality of the grapes was a shade worse. The parameters of chemical analysis as well as sensory evaluation of wine were the most favourable in the first variant.

Key words: Sauvignon Blanc, retained node, yield, wine

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Liquified Natural Gas - fuel of the future with advantages, benefits and specific hazardous potential

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Abstract: Europe as important trade spot and part of the wold that influences trade of green energies needs a reliable, secure and affordable energy. Such energy is liquified natural gas (LNG) coming from a very remote sources. LNG as a low-carbon fuel is considered as environmentally friendly, even fuel of the future, with the certain potential for coal-out stage. Terminals have a leading role in most projects but storage, as a great part of every terminal, is most sensitive in terms of hazards, especially onshore. Successful implementation and construction of onshore LNG terminal provide preconditions for adoption of such policies, but also introduces potential uncertainties in field of ecology and safety. MNE has a special potential in the field of energy, tourism and ecology primarily with its geographical position and possibly natural resources. In addition to that, active state projects concerning gas and oil reserves researches, the construction of the Adriatic-Ionian pipeline, construction of LNG onshore terminal Bigovica and construction of the gas power plants in the area of Bar, strongly support development in area of energy polices. As a country with an extensive transportation infrastructure in all modes of transport, also with a favourable ratio of short distances in relation to the diversity of infrastructural modalities of supply, storing and the transmission of LNG, MNE has a natural platform to successfully implement and develop strategy for low greenhouse gas emissions and low carbon development, not only at local but regional level. This paper analyses the influential of stocking of LNG on chemical hazards.

Key words: LNG, terminals, green energies, risk, store

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