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19-20 MARCH, 2022 / BURDUR

CONFERENCE PROCEEDINGS BOOK

EDITOR

Prof. Dr. Hakan ONER

Assoc. Prof. Dr. Seyithan SEYDOSOGLU

ISPEC
9th INTERNATIONAL CONFERENCE ON AGRICULTURE, ANIMAL SCIENCE and RURAL DEVELOPMENT

DATE – PLACE
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Opening Speech-

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Authors	Affiliation	Presentation title
Gennady Karaschuk Hanna Fedonenko Sergiy Lavrenko	Kherson State Agrarian and Economic University	Influence of variety composition, seeding rates and plant growth regulators on the yield of winter durum wheat
Nazlı Kalender Serap Dogan	Mardin Artuklu University	Who owns the soils? : A macro look to agro-ecosystem services
Wan Nadzri Osman Faisal Zulhumadi Mohamed Najib Salleh	Universiti Utara Malaysia	Acceptance and readiness of malaysian farmers towards drone technology: The perspective of drone entrepreneurs and agricultural agencies
Özay Güleş	Afyon Kocatepe University	Protective effects of gallic acid and lycopene against 4-nonylphenol-induced toxicity in rat kidney
Benyamin Lakitan Salsabila Ramadhani	Sriwijaya University	Responses of red lettuce grown at different population density using fine grained oil palm solid waste as growing substrate
Sabiha Gülanar Kocaarık Esin Ebru Onbaşılar	Ankara University	Goose breeding in Ardahan province
Peliyagodage Chathura Dineth Perera Prabath Priyankara Susil Mendis	University of Ruhuna	Farmers' perspective and distribution of mimosa pigra: A case study in matara district, Sri lanka
Sabiha Gülanar Kocaarık Esin Ebru Onbaşılar	Ankara University	Composition and quality properties of goose meat
Sergii Zaets Valery Netis Leonid Sergeev Olexander Rudik	Kherson State Agrarian and Economic University	Nitrogen supply system as a basis for realizing soybean productivity under irrigated conditions of the southern steppe of Ukraine
Murat Şevik	Necmettin Erbakan University	Seroprevalence of the epizootic hemorrhagic disease virus in cattle in the aegean region of Turkey

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WHO OWNS THE SOILS? : A MACRO LOOK TO AGRO-ECOSYSTEM SERVICES

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ABSTRACT
Ecosystem services are receiving increasing scientific interest due to their importance in sustainability. Ecosystem services are benefits to humans provided by the natural environment and ecosystems. These services are vulnerable to land use and land cover changes. Biodiversity has a positive and stabilizing effect on the delivery of ecosystem services. Agricultural expansion and intensification are major drivers of biodiversity loss. Diversification enhances biodiversity, pollination, pest control, nutrient cycling, soil fertility, and water regulation without compromising crop yields. Soils participate in the provision of numerous ecosystem services of great importance for the maintenance of ecosystems and human societies. Freshwater ecosystem services cover only a small area worldwide but harbour high levels of biodiversity.
Keywords: Ecosystem services, agriculture, biodiversity, soil, water

INTRODUCTION

Academic interest in ecosystem services has been growing in the past ten years with an increasing number of research studies and articles being dedicated to this complex and diverse field of enquiry (Csurgo & Smith, 2021). Ecosystem services and human well-being receiving increasing scientific interest due to their importance in influencing sustainability (Wang et al., 2021). Ensuring reliable supply of services from nature is key to the sustainable development and well-being of human societies. However, varied and frequently complex relationships between biodiversity and ecosystem services have frustrated our capacity to quantify and predict the vulnerability of these services to species extinctions (Ross et al., 2021).

Terrestrial ecosystem services are vulnerable to land use and land cover changes. These changes are triggered by different drivers of change (e.g., economic, social, political, environmental change) (Gomes et al., 2021). Climate change has imposed tremendous impacts on ecosystem services (Hua et al., 2021). Ecosystems are severely damaged with rising global temperatures, the rapid increase in population and the continuous exploitation and utilization of natural resources. The selection of conservation priorities is of great significance to regional ecological security and sustainable development (Ma et al., 2021a).

Agricultural ecosystem

Natural vegetation has a vital role in ecosystem services, while anthropogenic land-use change causes extensive damage to natural vegetation, decreasing ecosystem services, and impacting human well-being. Therefore, it is of great significance to establish protected areas and implement vegetation protection measures (Ma et al., 2021b). Ecological theory suggests that biodiversity has a positive and stabilizing effect on the delivery of ecosystem services. Yet, the impacts of increasing the diversity of cultivated crop species or varieties in agroecosystems are still under scrutiny (Beillouin et al., 2021). Agricultural expansion and intensification are major drivers of biodiversity loss. Findings demonstrate the urgent need for enhanced communication platforms and cooperation between scientists and key agricultural stakeholders to establish open dialogues between agricultural research, practice, and policy (Maas et al., 2021). Enhancing biodiversity in cropping systems is suggested to promote ecosystem services, thereby reducing dependency on agronomic inputs while maintaining high crop yields. Diversification enhances biodiversity, pollination, pest control, nutrient cycling, soil fertility, and water regulation without compromising crop yields. Practices targeting aboveground biodiversity boosted pest control and water regulation, while those targeting belowground biodiversity enhanced nutrient cycling, soil fertility, and water regulation. Most often, diversification practices resulted in win-win support of services and crop yields (Tamburini et al., 2020). Low-intensive agricultural landscapes are of utmost importance for biodiversity conservation and the delivery of cultural ecosystem services (Assandri et al., 2018).

The concept of nature-based solutions has emerged to foster sustainable development by transversally addressing social, economic, and environmental urban challenges. However, there is still a considerable lack of agreement on the conceptualization of nature-based solutions, especially concerning typologies, nomenclature, and performance assessments in terms of ecosystem services and urban challenges (Castellar et al., 2021). Agroforestry bridges the gap that often separates agriculture and forestry by building integrated systems that address both environmental and socio-economic objectives. Agroforestry can improve the resiliency of agricultural systems and mitigate the impacts of climate change. Existing research suggests that integrating trees on farms can prevent environmental degradation, improve agricultural productivity, increase carbon sequestration, generate cleaner water, and support healthy soil and healthy ecosystems while providing stable incomes and other benefits to human welfare (Brown et al., 2018). Soils participate in the provision of numerous ecosystem services of great importance for the maintenance of ecosystems and human societies. Physical and chemical soils properties sustain supporting ecosystem services like plant production and the infiltration and provision of clean water. Carbon sequestration is a regulating ecosystem service important for climate regulation. Soils are also home of a large biodiversity whose participation in soil processes is critical for their sustainable use (Velasquez & Lavelle, 2019).

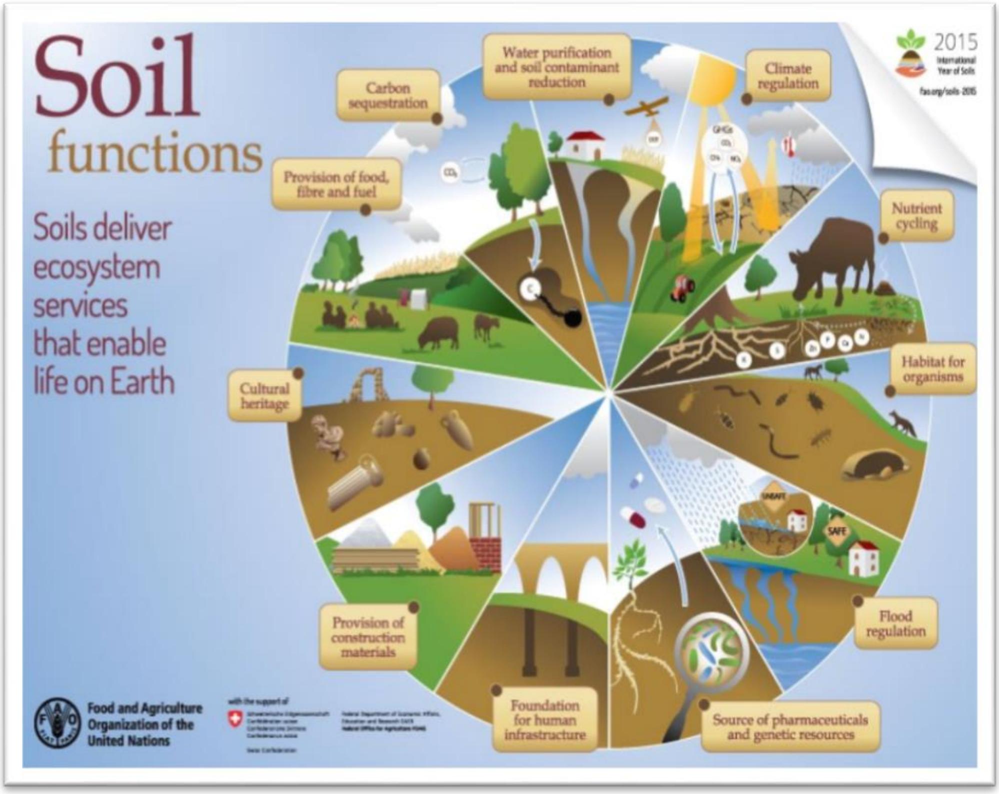

Fig. 1. Soil functions and ecosystem services (FAO, 2015).

The Food-Energy-Water-Waste Nexus represents the interconnections between food, energy, water, and waste production systems, and it has become a key research area. Enormous quantities of agricultural and organic wastes are produced throughout the Food-Energy-Water-Waste Nexus. Often, these wastes are not treated appropriately because their true costs are rarely quantified, and usually externalized to the environment (Garcia et al., 2019).

Global social and economic changes, alongside climate change, are affecting the operating environment for agriculture, leading to efforts to increase production and yields, typically through the use of agrochemicals like pesticides and fertilizers, expanded irrigation, and changes in seed varieties. Intensification, alongside the expansion of agriculture into new areas, has increased harvest, but has also had numerous well-known impacts on the environment, ultimately resulting in a loss of resilience and lack of sustainability in agro-ecosystems. Combined with features of agricultural systems such as the differential movement of ecosystem services, and interactions among ecosystem services driven in part by management choices, such intensification has disrupted key feedbacks in agricultural systems. These changes have tended to perpetuate the management choices that have led to efficient, productive agriculture, often at the expense of nature and the provision of important nonfood ecosystem services (Bennett et al., 2021).

Water ecosystem

Land-use change alters the dynamics of freshwater ecosystem services flows by affecting both service supply (by influencing hydrological processes and runoff) and demand (via changes in human water use) (Lin et al., 2021). The Anthropocene presents formidable threats to freshwater ecosystems. Lakes are especially vulnerable and important at the same time. They cover only a small area worldwide but harbour high levels of biodiversity and contribute disproportionately to ecosystem services. Lakes differ with respect to their general type (e.g. land-locked, drainage, floodplain and large lakes) and position in the landscape (e.g. highland versus lowland lakes), which contribute to the dynamics of these systems. Lakes should be generally viewed as 'meta-systems', whereby biodiversity is strongly affected by species dispersal, and ecosystem dynamics are contributed by the flow of matter and substances among locations in a broader waterscape context. Lake connectivity in the waterscape and position in the landscape determine the degree to which a lake is prone to invasion by non-native species and accumulation of harmful substances. Highly connected lakes low in the landscape accumulate nutrients and pollutants originating from ecosystems higher in the landscape. The monitoring and restoration of lake biodiversity and ecosystem services should consider the fact that a high degree of dynamism is present at local, regional and global scales. However, local and regional monitoring may be plagued by the unpredictability of ecological phenomena, hindering adaptive management of lakes (Heino et al., 2021).

In mountainous watersheds, agricultural land use cause changes in ecosystem services, with trade-offs between crop production and erosion regulation (Kim & Arnhold, 2018). Submarine Groundwater Discharge is recognized as a fundamental hydrological process that supports many coastal biogeochemical cycles and social-ecological systems (Alorda-Kleinglass et al., 2021).

Being the most productive ecosystem on earth, wetlands provide basic as well as critical ecosystem services to humans and other living beings. However, the wetland resources are constantly being degraded because of poor understanding of its importance at local level and the lack of recognition of their economic value at sub-national and national levels (Aryal et al., 2021). Social development and changes in natural conditions have seriously affected the ecosystem services value of wetlands. The area of natural wetlands decreased, mainly converted to arable land. It is important for social sustainable development and human welfare to identify and evaluate the driving factors that lead to changes in ecosystem services value (Song et al., 2021).

Changing patterns of land use, temperature, and precipitation are expected to impact ecosystem services, including water quality and quantity, buffering of extreme events, soil quality, and biodiversity. Scenario analyses that link such impacts on ecosystem services to human well-being may be valuable in anticipating potential consequences of change that are meaningful to people living in a community. Ecosystem services provide numerous benefits to community well-being, including living standards, health, cultural fulfillment, education, and connection to nature. Yet assessments of impacts of ecosystem services on human well-being have largely focused on human health or monetary benefits (e.g. market values) (Yee et al., 2021). Plastic has created a new man-made ecosystem called plastisphere. The plastic pieces including microplastics and nanoplastics have emerged as a global concern due to their omnipresence in ecosystems and their ability to interact with the biological systems. Nevertheless, the long-term impacts of microplastics on biotic and abiotic resources are not completely understood, and existing evidence suggests that microplastics are hazardous to various keystones species of the global biomes. Microplastics-contaminated ecosystems show reduced floral and faunal biomass, productivity, nitrogen cycling, oxygen-generation and carbon sequestration, suggesting that microplastics have already started affecting ecological biomes (Sridharan et al., 2021).

Rapid urbanization throughout the globe increases demand for fresh water and the ecosystem services associated with it. Protected areas can improve the capacity of large dams in reducing sediment loads and producing hydropower, but cities mainly depend on reduced impervious surfaces and more green spaces within urban areas for flood mitigation. Improved understandings of the role of natural infrastructure in urban water networks must underpin strategic decision-making to sustainably provide freshwater ecosystem services to global cities (Chung et al., 2021).

Fig 2. High Line in New York, renaturalization of the former railway viaduct, USA (Marchi & Ungaro, 2019).

Wildlife

Coral reef ecosystems are important for tropical and subtropical coastal communities, small-island developing states, and Indigenous peoples because they provide ecosystem services such as food provision, livelihood opportunities, carbon sequestration, and protection from storms. Capacity of coral reefs to provide ecosystem services that are relied on by millions of people worldwide has declined by half since the 1950s. Achieving climate-change-emissions targets and reducing local impacts can reduce stress on coral reefs, allowing them and the ecosystem services that they provide to persist (Eddy et al., 2021).

Seagrass meadows, algal forests and mussel beds are widely regarded as foundation species that support communities providing valuable ecosystem services in many coastal regions (Heckwolf et al., 2021).

Urbanization leads to significant changes in land-use types and affects various ecosystem services (Ouyang et al., 2021). The expansion of urban areas worldwide is increasing the anthropogenic impact upon soil and highlights the important role of urban areas in supporting a sustainable future. As such, urban soils are becoming more important in the delivery of a broad range of ecosystem services (ESs), including carbon storage and climate regulation, biomass provision for food and water flow regulation, and recreational benefits (O'Riordan et al., 2021).

Management

The integration of ecosystem service knowledge into decision-making processes is increasingly endorsed by various policies and initiatives, with spatial planning targeted as one of the most relevant fields. Learning and feeding back from existing experiences is therefore a fundamental step to ensure appropriate and useful support by ecosystem service science (Longato et al., 2021). Understanding ecosystem service trade-offs and synergies is the foundation to achieve the efficient management of the ecosystem and improve human well-being (Feng et al., 2021). Ecosystem health assessment is vital for regional ecological restoration and management (Pan et al., 2021).

Currently, the main tools for assessing and managing ecosystem services at large scales are maps providing snapshots of their potential supply. However, many ecosystems change over short timescales; thus, such maps soon become inaccurate. The high rates of dynamics mean that static snapshot ecosystem service maps provide limited information for assessing and managing multifunctional, dynamic landscapes, such as forests. Dynamic, spatially explicit tools to assess and manage ecosystem service dynamics be further will probably be developed and applied in post-2020 biodiversity and ecosystem service policy supporting frameworks

(Snall et al., 2021). Ecosystem service mapping has been developed with the aim of supporting ecosystem management, but ecosystem service maps often lack information about uncertainty and risk, which is essential for decision-making (Stritih et al., 2021).

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