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ORBIS: AGENDA 2030 AND A SUSTAINABLE FUTURE

MUNA

INTRODUZIONI

Gilberto Sammartino, General Coordinator of the Mediterranean and Middle East University Network Agreement (MUNA)

Giulia Guerriero, Coordinator of MUNA Board of Coordinators

INTRODUZIONE ALLA PRIMA SESSIONE

R. Capozzi, session co-coordinator

CONTRIBUTI

Sustainable Cities Beyond Crisis Management

A.M. Salama, Department of Architecture, University of Strathclyde (UK)

Naples as a city of inclusion

R. Capozzi, Dipartimento di Architettura, Università di Napoli Federico II

New complex urban units for hospitality of migrants as an active and productive interface with the city. A proposal for Naples

C. Sansò, Dipartimento di Architettura, Università di Napoli Federico II

INTRODUZIONE ALLA SECONDA SESSIONE

G. Guerriero, session co-coordinator

CONTRIBUTI

Soil Biodiversity as a key element for sustainability programs of Agenda 2030 and beyond

C. Jacomini, ISPRA (Italy)

Use of bio-fertilizers for a sustainable agriculture: evaluation of the soil ecotoxicity of biological amendments and the impact on the environment

A. Siciliano, F. Carraturo, S. Meriç, M. Guida, Dipartimento di Biologia, Università di Napoli Federico II (Italy); Çorlu Engineering Faculty, Environmental Engineering Department Namik Kemal University (Turkey)

Genetics of sex determination and biocontrol of agricultural alien insect pests

M.M. Perrotta, A. Ruggiero, N. Fucci, E. Giordano, M. Salvemini, L. Tagliano, G. Saccone, FAO-IAEA; Dipartimento di Biologia, Università di Napoli Federico II, Istituto di Biostrutture e Bioimmagini (IBB) - CNR, Naples

Use of co-products in animal nutrition

Y. A. Attia, S. Calabrò, Department of Arid Land Agriculture, King Abdulaziz University (Saudi Arabia), Dipartimento Di Medicina Veterinaria E Produzioni Animali, Università di Napoli Federico II

Renewable sources for active packaging products

S.F. Mirpoor, C.V.L. Giosafatto, Dipartimento di Scienze Chimiche, Università di Napoli Federico II

Sustainability and "zero waste" recovery from waste matrices of the agri-food production system

P. Daliu, A. Santini, Albanian University - Universitas Fabrefacta Optime (Albania), Dipartimento di Farmacia, Università di Napoli Federico II

Impact of climate change on fauna and flora in South Sinai Mountain, Egypt

Abdelraouf A. Moustafa, IUCN member, Botany Department, Suez Canal University (Egypt)

ABSTRACTS

SUSTAINABLE CITIES BEYOND CRISIS MANAGEMENT

A.M. Salama, Department of Architecture, University of Strathclyde (UK)

Cities have been, and still are, places for the formulation of and experimentation with new values, social practices, industrial development, and innovative manufacturing. They produce, reproduce, represent, and convey much of what counts today as culture, social norms, environmental knowledge, science, public health, governance, and politics. Characterised by these elements, and while aspiring for resilience and a sustainable urban future, the cities continue to witness various forms of struggles and endures to experience a multitude of influences that include crises which are resulting from both natural and human induced hazards. Across many regions, cities host the largest share of national populations, continue to accommodate growing communities, and are accountable for the economic, infrastructural, environmental and social contexts in which these populations live.

These cities have already endured the test of time and have withstood significant urban challenges and the associated social and environmental ramifications. This talk underscores urban challenges and health implications that emerge from crisis situations and how they were managed. The talk captures contrasting ideas on how environment and health priorities, cities have envisioned as part of their urban resilience strategies, policies, and practices, are being shaped and developed.

NAPLES AS A CITY OF INCLUSION

R. Capozzi, Dipartimento di Architettura, Università di Napoli Federico II

A city that includes is above all a city in front of the Sea, a Mediterranean city, that opens up to distant horizons, a city that defines itself in its relationship with the forms of the land: a promontory as a view of the vast nature of the sea, an isthmus city...

A city that includes is predisposed to welcoming, to the landing of the foreigner, of the migrant, but it is also capable of structuring the plain, of connecting in a linear manner-by means of large à-redent systems-to the hinterland, to the urbanized countryside.

An inclusive city is a city made up of large courtyards open to the sea, repeated or garrisoning the depths of the sea like monasteries, with a few theories of towers signaling the coastline or the acropolis from afar. But it is also a city made up of dromos, of underground parts, of passing tunnels, of cavities that emerge unexpectedly on the summit to recapture the horizon.

A city for those who pass through and those who remain, where to the west of the isthmus an open courtyard facing a two-sided pier houses a church, a mosque and a synagogue, and a building for all, also a courtyard immersed in the water.

A city that includes could be Naples...

NEW COMPLEX URBAN UNITS FOR HOSPITALITY OF MIGRANTS AS AN ACTIVE AND PRODUCTIVE INTERFACE WITH THE CITY. A PROPOSAL FOR NAPLES

C. Sansò, Dipartimento di Architettura, Università di Napoli Federico II

The European cities, although they have always been inhabited by a plurality of different cultures, are often 'unresolved' places from the point of view of social integration. The causes of these critical issues are probably to be found not only in migration policies that are still weak, but also in inadequate attention to the spaces to be allocated to migrants, both in terms of housing and collective spaces (civil or religious buildings) that can facilitate the encounter between the cultures of the 'welcomed' and the 'welcoming' peoples.

The Action Plan for Integration and Inclusion 2021-2027 promoted by the European Commission, in defining measures to build more cohesive and inclusive societies for all, places the theme of housing within a series of actions to implement the Plan.

Among the objectives of the Plan, moreover, is the promotion of autonomous housing models (rather than collective housing) for migrants, the research presented proposes for the city of Naples a model settlement based on a 'horizontal' housing unit that contains both autonomous housing spaces and spaces for production and work, as well as collective spaces that can be connected the scale of architecture and that of the city in order to establish a strong relationship between migrants and local inhabitants.

SOIL BIODIVERSITY AS A KEY ELEMENT FOR SUSTAINABILITY PROGRAMS OF AGENDA 2030 AND BEYOND

C. Jacomini, ISPRA (Italy)

The future of our planet seems to be more and more at risk, as the industrial age of Anthropocene did not manage to define safety thresholds and growth limits for our development to be sustainable. This year, we reached the unbelievable amount of 8 billion human beings, the atmosphere CO₂ rates are the highest, as well as global temperatures and extensive pollution, while inequity and discrimination are widespread and without control.

Wars are daily raging throughout our planet, and outbreaks and epidemics are showing the defects and fragility of our artificial life, where consumerism and lack of ethics left man without moral, ideology, and clear motivation.

To change this dangerous path for our planet, but also for the sake of our roots and traditions, we should take more care of what hidden treasures we have beneath our feet, the crucial part of life that is still neglected and forgotten, both by economy and society.

Unknown and unseen organisms, belonging to seldom considered taxonomic units, and gathered under the common name of soil biodiversity, or soil biota, are organised in the most complex and efficient food webs on Earth. Throughout the planet, from the top of the mountains to the shores of rivers and seas, both in the cold and hot deserts, across any range of biomes up to the tropical forests and urban soils, wherever dirt and ground exist, they perform activities that first allowed plants to grow on the land, about 500 million years ago.

Thereafter, soil biota evolved in a myriad of forms, survived three great mass extinctions, and will probably survive also our own extinction, since they provide ecosystems with fundamental functions, and true resilience.

Soil Biodiversity works for free and works so hard, 24 hours * 365 days, and accomplishes throughout the planet so many tasks, which make our life possible, to deserve one day to be proposed as Peace

Nobel Prize winner. The microbial part of it continuously produces most of the drugs and antibiotics we use in health and sanitary issues.

Moreover, their natural history and peculiar adaptations are a source of secrets that, if analysed and applied to our lives, might allow us to be actually sustainable and smart.

Some communities are able to clean up soils, waters, air, food and fodder, and succeed in creating invisible barriers to prevent erosion, floods, and landslides. They stop and invert desertification processes, besides being excellent active agents of carbon sequestration, pollution degradation and ultimately providing and preserving soil health.

Finally, in the last decade, a plethora of international programmes and global, regional, and local projects are addressing these useful climate change adapters and mitigators, clean-up providers and quality-of-life improvers. Their role has been recognised at all levels, from the United Nations to the local farmers, or indigenous people. And finally, large corporations, fashion design and new start-ups are taking the chance to implement what has been discovered by science on their life.

Their recent study suggests strategies to recycle everything, managing and organising our society in a more sustainable way. In the meanwhile, and at the same time, they are teaching us how to monitor the progress made through the assessment and evaluation of their communities.

A series of case studies on soil organisms will explain their potentials and our routes to sustainability, and future innovations in Science and Technology, aimed at Nature mimicry and at discovering all their incredible achievements, which could indeed provide new developments and give us a new hope for the future.

USE OF BIO-FERTILIZERS FOR A SUSTAINABLE AGRICULTURE: EVALUATION OF THE SOIL ECOTOXICITY OF BIOLOGICAL AMENDMENTS AND THE IMPACT ON THE ENVIRONMENT

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Among the Sustainable Development Goals (SDG) set by the United Nations (UN) in the context of Agenda 2030, a key role is assigned to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture". Bio-fertilizers from organic waste materials (of animal and plant origin) represent a valid alternative to chemical fertilizers and may play a pivotal role in achieving the sustainable agriculture goal, contributing to the recovery of nutrients, thus exploiting circular economy. Bio-fertilizers are able to reduce organic waste and chemical fertilizers and increase the bioavailability of nutrients. Beyond the reduction of waste, bio-fertilizers additionally improve soil richness, resulting in the increased quality of the crops. Italian and International regulations on fertilizers is particularly stringent because on the matrices' potential health and hygiene risk,

nonetheless the sanitation treatments able to confer safety characteristics that make the fertilizer suitable for use in the field. Moreover, the risk assessment for bio-fertilizers need to consider the evaluation of the effects on the environment and human health of the developed product, considering that available studies lack substantial information, bringing out non-standardizable performance results. In the present work, the potential toxicity of different bio-fertilizers (digestate, compost, urea, and manure) and of the soils treated with the matrices (at 3 different times from fertilization) was assessed considering a battery of bioassays consisting of 5 organisms from different trophic levels (*Daphnia magna*, *Raphidocelis subcapitata*, *Allivibrio fischeri*, *Lepidium sativum* and *Caenorhabditis elegans*). Based on the EC50 values, the sensitivity level of the bioindicators towards the bio-fertilizers was: *C. elegans* > *D. magna* > *A. fischeri* > *R. subcapitata* > *L. sativum*. The toxicity order of the tested matrices resulted in: Slurry > Urea > Digestate > Compost. Data analysis of the soils fertilized with the selected matrices highlighted the absence of toxicity for all the bioindicators considered. The results showed a high degree of stability of the fertilizers, which translates to a lower environmental impact, bringing toxicity levels below those registered for inorganic fertilizers.

GENETICS OF SEX DETERMINATION AND BIOCONTROL OF AGRICULTURAL ALIEN INSECT PESTS

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The dipteran Tephritidae family includes dozens of major agricultural pest species, including the mediterranean fruitfly *Ceratitis capitata* (medfly), the olive fly *Bactrocera oleae*, both present in the mediterranean basin, and the oriental fruit fly *Bactrocera dorsalis*, which invaded the continental Africa and it has been recently intercepted in Campania region. The climate change and the intensification of trading exchanges accelerated the invasion of invasive pest insects in different areas of the planet. In recent years, the peach fruit fly *Bactrocera zonata* has become a widespread pest in Egypt, it has been intercepted in Israel and threatens countries in the Near East, North Africa and in Southern Europe. Genetics can open the road for novel biocontrol strategies which are species-specific and alternative to pesticides.

New generation DNA sequencing technologies and development of novel bioinformatic tools made possible to isolate novel genes involved in sex determination on the basis of their sex-linked location and sex-specific embryonic expression. The identification of the Y-linked male determining gene of medfly, Maleness-on-the-Y (MoY), encoding a novel short protein, led to discover that it is widely conserved in other species of this family, spanning 100 millions of years of evolution. Present challenges are 1) understanding MoY molecular mechanism of action in repressing the downstream female determining transformer gene, influencing its sex-specific splicing, and 2) MoY biotech usage

to harness innovative genetic control strategies for Tephritidae invasive species. Sterile Insect technique and synthetic biology approaches to the control of alien invasive harmful insect species will be also presented and discussed.

USE OF CO-PRODUCTS IN ANIMAL NUTRITION

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Advanced economies are causing an increase of food waste, which enhance environmental impact, in terms of air and water pollution and greenhouse gas (GHG) emissions. On the other hand, developing countries suffer from a shortage of animal feed resources due to limitations of water and suitable land for crop production; here, alternative feed resources, such as agriculture by-products might be useful for livestock. Since ever, some agricultural wastes are used (e.g., straw and cereals bran) all over the world, but in the last years their valorization is receiving great attention. In 2030 Agenda (Sustainable Development Goal 12), the countries involved undertake to implement actions for a sustainable management and efficient use of natural resources, reduction of food losses along supply chains, management of all waste throughout its life cycle (substantially reducing its production through recycling and reuse) to minimize negative effects on human health and the environment (<https://www.fao.org/sustainable-development-goals/en>).

Agro-industrial co-products are formed during the manufacture, processing, use or disposal of other products. The co-products are still processing residues which preserve and sometimes improve the nutritional composition of products which derived. They include corn gluten feed, distillers' grain or soluble, and fruits and vegetable by-products as well. The co-products may represent a valuable source of bioactive compounds (i.e., dietary fiber, prebiotic, pigments, sugars, organic acids, flavonoids, etc.) with important benefits on human and animals' health and environmental impact with the reduction of GHG production [Vastolo et al. (2022) Ita J Anim Sci, in press]. For their characteristics they can be used as livestock feed or a feed supplement, ensuring sustainable consumption and production patterns.

However, many aspects of co-products nutritive value still need to be investigated (degradability, presence of anti-nutritional factors, effect on animal performance). These characteristics, as well as availability, stocking, treatment, and supplementation with enzymes are relevant to valorize their use in improving animal performance. The in vitro gas production technique (IVGPT) is a valid method to determine the nutritive value of feedstuffs because rate and extent of degradation and rumen fermentation can be easily determined; the method also gives a dynamic description of feed utilization. The method allows to obtain information regarding fermentation kinetics and characteristics (volatile fatty acids production, organic matter degradability). The IVGPT should be considered for use also in developing countries, because the manual system does not require large

financial resources and allows to analyze many samples simultaneously using small amounts of material, and at the same time, is highly reproducible, and it is not time-consuming [Calabrò et al. (2012) *J Anim Physiol Anim Nutr*, 96(5) 842-849].

Aim of this presentation is to introduce the results obtained at University of Napoli Federico II (Italy) and at King Abdulaziz University (Saudi Arabia), regarding characterization and use of co-products. In particular, the nutritive value and in vitro fermentation characteristics, of some agro-industrial co-products typical of Mediterranean area (i.e., prickly pear, hemp, citrus fruit, olive oil) studied in Italy will be illustrated [Vastolo et al. (2021) *J Anim Physiol Anim Nutr*, 105 (Suppl.1):1-9; Vastolo et al. (2020) *Animals*, 10 (9), 1716; Vastolo et al. (2019) *Animals*, 9 (8), 556].

Then, trials carried out in Saudi Arabia aimed to assess the effectiveness of pelleting and enzyme supplementation in improving the utilization of diets containing different concentrations of by-products will be presented. In general, results on poultry indicate that 5-10% can be used in broilers, laying hens and ducks, but considering the safety, economic and amount available of the by-product 5% can be advised. However, the best level needs to be determined based on nature of the specific by-product. In addition, several supplements such as enzymes, yeast and organic acids may improve the utilization of the by-product (i.e., olive cake, rice bran, nigella seed meal, prosopis pods meal, etc.) in terms of animal health and performance, eggs quality and this depends on its nature and anti-nutritional limitations [Al-Harhi et al. (2019) *Europ Poult Sci*, 83: 1-13; Attia et al. (2008) *J Poultry Science*, 45:110-115; Attia Y.A. (2003) *Egypt Poultry Sci J*, 23:739-759].

RENEWABLE SOURCES FOR ACTIVE PACKAGING PRODUCTS

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The use of petroleum-based plastics in different fields, such as food and pharmaceutical sectors, has increased significantly in the last 50 years, being the durability of the plastic materials, as well as their outstanding features, the main reason of their success. However, their worldwide applications led to huge waste-disposal problems and, as a consequence, to a dramatic environmental pollution. These issues have encouraged innovation and research activities in the field of biodegradable plastics, offering alternatives for conventional plastics. One potential option to pursue would be to explore agri-food wastes and by-products for bioplastic production. Numerous different seeds are utilized for edible and non-edible oil extraction and seed by-products following oil extraction. These by-products are known as seed oil cakes (SOCs) and represent roughly 50% of the original seed weight. Since SOCs are rich in fibers, proteins and secondary metabolites, they are considered as promising candidates to be raw material consumed in a biorefinery for the production of bioplastics. In this scenario the present work provides insights into the production and characterization of bioplastics obtained by using the proteins extracted from hemp (*Cannabis sativa*), cardoon (*Cynara cardunculus*) and argan (*Argania spinosa* L.) SOCs. Moreover, different additives have been added to

the film matrix for improving biological and technological attitude of the derived materials. SOCs were demonstrated to be effective for preparing eco-friendly bioplastics being renewable and sustainable, thus, leading to a timely, valuable and innovative milestone at least for some specific sectors of food packaging industry.

IMPACT OF CLIMATE CHANGE ON FAUNA AND FLORA IN SOUTH SINAI MOUNTAIN, EGYPT

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Climate change has become one of the issues, which has been at the global level due to the possible consequences of serious changes that can threaten the future of the land. The recorded increase in mean annual temperature is already affecting many ecosystems and scientific studies predict that future changes will be of much greater amplitude. Climate change affects different ecosystems in different ways, depending on the original characteristics of the system, geographical location and on the presence of certain factors that may regulate the extent of the changes. Degraded ecosystems are generally believed to be less resilient to climate change than intact and healthy ecosystems. Climate change affects flora and fauna ecosystems in south Sinai Mountains. South Sinai, an arid to extremely arid region, is characterized by an ecological uniqueness, due to its diversity in landforms, geologic structures, and climate that resulted in a diversity in vegetation types, which is characterized mainly by the sparseness and dominance of shrubs and sub-shrubs and the paucity of trees and a variation in soil properties. Three-hundred and twenty three species were identified in Saint Catherine Protectorate. The mountainous area of south Sinai harbors 26 endemic species. Of the species in Saint Catherine's Protectorate, 10 are extremely endangered, 53 are endangered, and 37 species are vulnerable. Nearly half of the endemic species found in Saint Catherine's are vulnerable, rare, endangered, or extremely endangered are subjected to great disturbance due to the severe impact of the human activities. The continuous over-grazing, over-collection (cutting and uprooting for fuel and medicinal uses), tourism and urbanization resulted in disappearance of pastoral plants, paucity of trees and shrubs as well as disappearance of many rare and endemic species. According to the IUCN definitions of threatened species (IUCN, 1978), threatened medicinal plants species were classified as rare, vulnerable, endangered and extremely endangered based on the local distribution within the protectorate's boundaries, and human impact and. Furthermore it is thought 10 endemic and over 100 other species have been lost from the Protectorate in recent years, as a result of unmanaged human activity. This provides a strong case for additional conservation action in the Protectorate focusing on medicinal plants. Climate change effect on fauna ecosystem can be divided into climatic impact on terrestrial Systems, climatic impact on marine systems and climatic impacts on freshwater systems. Climate change induced shifts in plant species distributions are changing the characteristics of biomes (ecosystems with the same dominant plant

life-forms), altering structure and ecosystem functioning. For example, increased tree growth is occurring in forests at or near latitudinal and altitudinal tree lines, and trees are moving into adjacent tundra. The international cooperation is really necessary for solving the main problems of biodiversity loss of species and to reduce the number of threatened species due to the impact of climate on the fauna and flora.