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# Abstract Book

## *New research techniques and the agricultural progress*

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## **IMPROVING ENVIRONMENTAL AND AGRONOMIC OUTCOMES THROUGH TARGETED SLURRY/MANURE MANAGEMENT: AN ENGLISH POLICY PERSPECTIVE**

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### ***Abstract***

*It is estimated that livestock in the UK produce between 80-100 million tonnes of slurries and manures (SM) annually, with the majority of these being spread directly to land without further treatment, causing potential environmental damage (e.g. eutrophication, air quality), with associated impacts on human and animal health. Furthermore, relatively low and volatile farm incomes, post-Brexit uncertainty, localised pollution issues and climate change coupled with limited public funding means that a targeted policy approach is required to produce the best environmental outcomes with the least amount of capital investment. This paper examines the SM distribution in England as a case study, and considers the economic, policy and environmental impact of a range of common and emerging innovative treatment/mitigation technologies, including anaerobic digestion, covering slurry stores, and covering slurry stores with gas capture and utilisation. Several policy approaches are proposed.*

***Keywords: slurries/manures; anaerobic digestion; policy; slurry storage; circular economy***

## THE ROLE OF SYNTHETIC HEXAPLOID WHEAT IN WINTER WHEAT RESISTANCE TO LEAF RUST AT NARDI FUNDULEA

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### **Abstract**

*The wheat yield and quality are influenced by both biotic and abiotic stress. For human health is necessary to ensure safe, toxin-free crops and, at the same time, to ensure protection for the environment. Access to quality raw material represents a strategic security step for achieving the objective of transposing the Green Deal pact into reality. In Romania, the most important wheat diseases are rusts (leaf or brown rust; stripe or yellow rust and stem or black rust). This study was focused on the genetic diversity in synthetic hexaploid wheat regarding the rust resistance genes that are rare or missing in the Romanian wheat germplasm. Thereby, 26 synthetic wheat amphiploids were analyzed for presence of Lr21 (1DS), Lr22a (2D), Lr32 (3D), Lr34 (7DS), Lr39 (2DS) genes located on D genome of *Aegilops tauschii*. The results based on molecular markers assays showed that the complex gene locus Lr34 is present in both germplasms, *Triticum aestivum* L. and synthetic hexaploid wheat (E5, E17, E20, E21, E22, E26 and E28). The other analyzed genes Lr21, Lr22a, Lr32 and Lr39 were detected only in a few synthetic wheat amphiploids. Thus, Lr21 was detected in 8 amphiploids (E1, E3, E18, E19, E28, E29, E30 and E36), Lr22a was observed only in two genotypes E16 and E22, Lr32 in 6 amphiploids (E1, E15, E17, E18, E22 and E34) and the gene Lr39 only in the lines E21 and E22. These synthetic amphiploids can be used in introgression of these genes and can also increase the genetic diversity in wheat germplasm from Romania.*

### **Acknowledgements**

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## MODERN TECHNIQUES FOR RESEARCH AND CONTROL OF *OROBANCHE CUMANA* WALLR. IN SUNFLOWER

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*Orobanche cumana* Wallr., commonly known as sunflower broomrape, is a parasitic plant that significantly affects sunflower (*Helianthus annuus* L.) crops, causing substantial production losses worldwide. This parasite attaches to the roots of sunflower plants, drawing nutrients and water and resulting in stunted growth, reduced seed production and even complete crop failure in severe infestations.

Traditional control methods, such as crop rotation and the cultivation of sunflower cultivars with vertical genetic resistance have provided some level of protection, but have proven to be increasingly inadequate due to resistance and adaptability in the evolution of the parasite.

In light of these challenges, modern techniques for the research and control of *Orobanche cumana* have become crucial for sustainable sunflower production.

On the one hand, advanced agronomic practices such as precision agriculture and the use of remote sensing technologies can significantly contribute to the monitoring and management of *O. cumana* infestations. These technologies facilitate the early detection of parasite outbreaks, allowing for timely intervention and the implementation of site-specific control measures, thus minimizing damage and optimizing crop yield.

On the other hand, recent advances in molecular biology, genomics, biotechnology and breeding have opened new avenues for understanding and controlling *O. cumana*. Modern techniques, such as the use of molecular markers and next-generation sequencing (NGS), have complemented the information obtained with classical methods and facilitated the identification of resistance genes in sunflower, enhancing the development of cultivars with durable resistance to several races of the parasite. In parallel, the integration of omics technologies - genomics, proteomics and metabolomics - provides a comprehensive approach to sunflower breeding, helping to select genotypes with desired phenotypes for improved resistance, yield and adaptability.

In the future, gene editing tools such as CRISPR-Cas9 may offer promising potential for introducing targeted resistance traits into the sunflower genome, while RNA interference (RNAi) technology may disrupt genes essential for the development of *O. cumana*, effectively inhibiting the infestation. At the same time, the application of artificial intelligence (AI) and machine learning algorithms (ML) can further improve breeding programs by predicting breeding results, identifying patterns in large data sets and improving the efficiency of decision-making, thus accelerating the development of resistant sunflower varieties.

In conclusion, the integration of modern techniques – encompassing molecular biology, biotechnology, advanced breeding programs and AI-based analysis – provides a comprehensive and sustainable solution to manage *Orobanche cumana* Wallr. and improve sunflower production. This multidisciplinary approach is essential to develop resistant sunflower cultivars that withstand evolving parasitic threats and contribute to the sustainability of global agriculture, ensuring food security and environmental resilience for future generations.

## LEARNING FROM HEN’S PHYSIOLOGY TO IMPROVE THE SUSTAINABILITY OF EGG PRODUCTION

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### **Abstract**

*Eggs are widely consumed, as a valuable source of proteins with an optimal amino acid balance, also providing high-quality lipids and micronutrients. However, egg production is a repeated physiological challenge to the hen, requiring the daily export of 2 g calcium (Ca) for eggshell calcification. A candidate genes’ expression study was conducted across tissues involved in Ca homeostasis and its regulation: jejunum, bone, liver, kidney and parathyroid gland, collected from hens at peak vs end of lay (23 vs 90 weeks of age), at well characterized physiological stages, where eggshell mineralization was null, medium or maximal. Genes involved in intestinal Ca uptake were downregulated in older hens, while genes involved in urinary Ca excretion were upregulated. The activity of genes involved in bone turnover was altered by age, consistent with lower bone accretion and higher osteolysis in older hens. Fibroblast Growth Factor-23 (FGF23) was specifically expressed in the hen’s medullary bone during the active phase of calcification and overexpressed in older hens, likely acting on P urinary excretion through the down-regulation of two P transporters, involved in P reabsorption by the kidney tubule. The CYP24A1 gene, encoding an enzyme involved in the degradation of active vitamin D, was induced earlier during the ovulatory cycle of older hens, consistent with the observed decrease of active vitamin D levels. The data support the hypothesis that FGF23 and vitamin D are major players contributing to altered Ca balance in older hens. This research paves the road towards improved nutritional strategies refining the relative dietary supply of Ca and P, or optimising their metabolism with specific nutritional additives.*

**Keywords – hen, egg, bone, calcium metabolism**

## MORPHOLOGICAL VARIABILITY AND MINERAL COMPOSITION OF THREE GARLIC GENOTYPES CULTIVATED IN KORÇA REGION, ALBANIA

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### **Abstract**

*Garlic (*Allium sativum* L.) is a popular vegetable of the *Allium* genus cultivated in Albania. The Korça region is mainly known for its high-quality garlic bulbs. In this study, we examined two local garlic landraces, 'Korça' and 'Puka,' and an introduced cultivar referred to by farmers as 'Dutch garlic' or simply 'Dutch.' These genotypes' morphological and chemical compositions were analyzed, revealing a wide range of diversity in their bulb features. Notably, the introduced cultivar, 'Dutch,' demonstrated numerous unique characteristics compared to the local landraces, highlighting the impact of genotype on the observed diversity in morpho-biometrical features and mineral composition. The mineral composition of all garlic genotypes cultivated in the Korça region was found to be rich, with calcium (Ca) being the predominant mineral, followed by potassium (K), magnesium (Mg), iron (Fe), zinc (Zn), and sodium (Na). The significant mineral content found in these genotypes underscores their potential as a valuable source of nutrients for human nutrition. The landrace 'Korça' and the introduced cultivar 'Dutch' demonstrated high morphological characteristics and mineral composition, meeting the expected quality standards for garlic. This study underscores the importance of genetic diversity in enhancing cultivated garlic's agronomic potential and nutritional value.*

**Keywords:** *Garlic morphological features, mineral absorption, functional food.*

## GENETICALLY DIVERSE LANDSCAPES REQUIRE AN INTEGRATED CONCEPT FOR CONSERVATION OF GENETIC RESOURCES AMONG DOMAINS

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### **Abstract**

*The Genetic resources strategy for Europe was prepared within the Horizon project “GenRes Bridge: Genetic resources for a food secure and forested Europe” in 2021. In it, three domains’ networks: EUFORGEN (European Forest genetic Resources Programme), ECP-GR (European Cooperative programme for Plant Genetic Resources) and ERFPP (European Regional Point for Animal Genetic Resources) have prepared domain-specific and a common genetic resources strategy. Furthermore, Hotspots of genetic resources for animals, plants and forests (Phillips et al. 2021. GenRes Bridge project, European Forestry Institute) was compiled, presenting five case studies, among which one was the Triglav National Park in Eastern Julian Alps in Slovenia. This case study shall be presented, leading to the key messages of the study: Strong interdependence exists between local breeds, crop and forest genetic resources, which provide a range of ecosystem services. The genetic resources are part of natural and cultural heritage, provide support for wider biodiversity in the area, support infrastructure and services for the local inhabitants, and require a multidisciplinary approach in their research and conservation.*

**Keywords:** genetic diversity, forest genetic resources, genetic resources strategy for Europe, Triglav National Park, inter-domain conservation strategy



## **BETTER CAPITALIZATION OF THE ORGANIC WHITE SEA BUCKTHORN (*HIPPOPHAË RHAMNOIDES* L.) AND BLUEBERRY FRUITS (*VACCINIUM MYRTILLUS* L.) AS FUNCTIONAL FOODS**

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### ***Abstract***

*The present study evaluates the quality of white sea buckthorn and blueberry fruits from national organic crops based on indices provided by internal standards or norms, applying the organoleptic examination, complete with specific measurements, and different physico-chemical methods (determination of humidity, total acidity, sugar content and raw ash). The results confirm that for fruits, the quality is influenced by variety, by pedoclimatic conditions and the applied agrotechnics. Through their nutritional intake combined with the mineralizing effect, these products acquire functional food value, due to the sanogenic potential induced by their complex chemical composition. Thus, obtaining fruits from organically certified white sea buckthorn and blueberries raises to the superlative their use as functional foods, dietary supplement, with a reduced production input.*

**Keywords:** *white sea buckthorn fruits, blueberries, quality, capitalization, functional foods.*

## **DOES GENOME EDITING HAVE A FUTURE IN EU AGRICULTURE?**

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### ***Abstract***

*Genome Editing, and particularly CRISPR technology, has revolutionized plant breeding approaches. Many countries in the world have decided to use it to create new fields of research and applications in agriculture with appropriate adaptation of the existing regulations on genetic bioengineering facilitating the implementation of the New Genomic Techniques (NGTs).*

*The work in progress worldwide opens up immense prospects for the plant and animal sectors. The European Union has launched a regulatory review procedure for its use on certain plants. The present review questions the efficacy of the current EU proposals as a response to the European agricultural challenges in question and concludes that based on the precautionary principle repeated over and over again, the challenges of agriculture are only partially taken into account as the regulatory framework remains very restrictive.*

***Keywords: Gene Editing, European Union, Agriculture, Regulation, Innovation.***

## **DIGITALIZATION OF LATVIAN AGRICULTURE AS TOOL FOR AGRICULTURAL PROGRESS, SUSTAINABILITY AND COMPETITIVENESS**

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### ***Abstract***

*Farming societies are searching for appropriate respond to global tendencies of reducing emissions, climate shift, economical and political trends in the area. Therefore, new tools and mechanisms should be considered for implementation. Importance of changes in current way of farming mechanisms is becoming more and more significant.*

*Currently stakeholders in the area are forced to make new approaches, in particular make research, analyse and evaluate digital tools, machinery and technologies, available in the market, its economic effects internally and as well globally, to meet criteria of present agricultural sector developing.*

*In our presentation we would like to stress out major issues for farming sector, give brief description of digital tools needed, how those innovations affect farming.*

*In the end, major goal is to develop a long-term perspective for Latvian agriculture that ensures sustainability and enhances the competitiveness of Europe's food system in correspondence to current CAP policies.*

***Key words: Digitalization, Innovative farming, Technologies***

## **SUSTAINABLE FORESTRY IN SWEDEN SUPPORTED BY DIGITALIZATION - OPERATIONAL EXPERIENCES**

**WILLÉN Erik**

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### ***Abstract***

*Public and private forest organizations in Sweden have a long tradition using and collecting geospatial data. The introduction of national and European data acquisition programs is essential for providing decision support maps in sustainable forestry used by forest companies, agencies as well as private forest owners. Of particular importance are the lidar-derived trafficability and forest parameter maps, the recurrent satellite-based forest change monitoring and the forest state mapping for nature conservation areas. In addition to those examples the presentation will include an outlook for coming digitalization in the forestry domain.*

***Keywords – Forestry digitalization, remote sensing, Copernicus, INSPIRE***