

Sustainable Agriculture and Biodiversity Restoration

by Ettore Barone

The third session of the International School of Higher Education (ISHE), held on the morning of 6 June in the “L. Chiazzese” Hall of the Department of Law at the University of Palermo, was devoted to the theme of Sustainable Agriculture and Biodiversity. It featured interventions by Professors Marco Brocca of the University of Salento, Giannantonio Domina and Rafael Da Silveira Bueno of the University of Palermo, with contributions – respectively – entitled *Agriculture, Landscape and biodiversity between economy and environment*; *Conca d'Oro landscape transformation and the connected biodiversity loss risk*; *Ecological restoration of areas under desertification*.

The common thread linking the three interventions can be found in the inextricable interweaving that has always existed among agriculture, environment and landscape as an effect of the complex of productive and non-productive activities carried out by humans on the territory. Overlapping with these – and interacting with them in a multifaceted and complex cause–effect relationship – are the topics of climate change and biodiversity loss. It was therefore not easy to offer a synthetic overview that would at the same time have the necessary scientific rigor and be as comprehensive as possible. The present writer, however, believes that this objective was achieved – certainly thanks to the merit of the Speakers, but also at least in part thanks to the organizers, who placed a strong bet on the inter- and multidisciplinary approach afforded by the Speakers' belonging to diverse scientific–disciplinary fields such as Legal Studies, Environmental and Applied Botany, and Ecology.

Below is a concise commentary on the interventions delivered during the Session and collected in this volume.

Marco Brocca's intervention offers a convincing overall reconstruction of the long transition from “parallel protections” – agriculture, landscape, biodiversity as regulatory compartments that are indifferent or in conflict – to an integrated paradigm of a “law of the territory.” The

first, historical part effectively shows the aestheticizing matrix of twentieth-century landscape protection (Bottai, then Galasso) and the original anti-agricultural function of certain constraints: here the merit lies in illuminating the initial asymmetry between the valorization of the “beautiful” and the removal of the agricultural landscape, as well as the effects of land reclamation on ecological structure. The notion of “parallel protections” aptly conveys institutional inertia and the procedural frictions produced by fragmentation.

The section on urban planning identifies a pivotal point: the “agricultural zone” as a default category – more an instrument of non-buildability than of promoting agricultural practices. This is an important step because it explains both the elastic use (holding/reserve areas, green corridors, compensations) and the recent requalification via regional and supra-municipal planning (valuable areas, farm programs, differentiation of regimes). The case law presented supports the argument realistically: the agricultural becomes an environmental safeguard even before it is a living economy, though certain administrative choices reopen space for the productive function.

On landscape, anchoring to the Florence Convention and to the UNESCO category of “cultural landscape” allows Brocca to overcome the purely contemplative outlook: the agricultural landscape is processual, identity-bearing, co-produced by practices. Through a solid and up-to-date line of reasoning, the Speaker recalls the 2004 Code which, while not formally typifying the “agricultural landscape,” incorporates elements that legitimize plans and measures aimed at safeguarding agricultural practices as creators of landscape value.

The agriculture-related part places at the center multifunctionality (Legislative Decree 228/2001) and the course of the CAP: from pro-intensification supports with distortive effects to environmental conditionality, green payments, eco-schemes and national strategic plans. This evolutionary thread is well traced and does not conceal the uncomfortable fact that agriculture has been – and can be – a pressure factor on soil, water, climate and biodiversity. The opening to models of “sustainable agriculture” (precision, regenerative, organic, agrivoltaic, short supply chains) is clear-sighted, and the note on regulatory lag in innovative sectors (suitable areas, technical definitions) adds a salutary caution.

The section on biodiversity is very persuasive: from the primacy of

conservation to the new season of restoration (Nature Restoration Law), with measurable targets and a focus on agricultural ecosystems. Here integration proves its practical yield: the indicators to be adopted (entomofauna, soil carbon, landscape elements) turn principles into operational criteria.

Finally, the figure of the “farmer as custodian of the environment” marks a subjective shift: no longer only places or practices, but actors bearing ecosystem functions, to be rewarded also with fiscal and contractual levers. As the author notes, the unresolved issue remains the systemic remuneration of ecosystem services (PES), which is still episodic: the true “missing link” to scale up the shift.

In short, Brocca’s contribution is at once historical cartography and regulatory agenda: it shows why integration is not a cultural option but a legal, economic and environmental necessity. The next step – hinted at between the lines – is to build stable market and public finance mechanisms that make the farmer’s role as a “living infrastructure” of landscape and biodiversity convenient and therefore durable. Ever more, therefore, *homo construens* and less *homo destruens*.

Giannantonio Domina’s contribution offers a robust and readable reconstruction of the transformation of Palermo’s Conca d’Oro – that *aurea concha* already defined in the 4th century BC as “all *kepos* (garden, orchard) in that it is filled with cultivated trees” – interweaving environmental history, GIS-based cartographic analysis and floristic data. The five-phase evolutionary framework – Roman deforestation, Arab irrigation, wetland reclamation, nineteenth-century citrus monoculture, postwar urbanization – is compelling and well anchored in historical series: the quantitative shifts (collapse of forests and semi-natural areas, drastic reduction of wetlands, explosion of artificial surfaces) give empirical depth to the argument. Reading the remaining “refugia” (e.g., rock walls, the Oreto’s carbonate gorges) and the list of endemics clarifies how loss of connectivity and simplification of land use compress floristic diversity, with 40 taxa now locally extinct.

The intervention was enriched by the solid support provided by integrating heterogeneous sources (herbarium, bibliography, cartography 1754–2024) with a CLC-based land-use taxonomy enabling comparability; by the clear identification of the political–economic drivers behind

land-use changes (from the sugar cash crop to post-WWII urban sprawl); and by the explicit management translation: priority to residual hotspots (Oreto, cliffs), long-term monitoring, tracking of threatened species, quantification of urbanization/biodiversity trade-offs.

Accompanying the discussion, appropriate future research lines were indicated: the need to quantify more thoroughly, with adequate spatial/temporal resolution, the historical evolutionary bases that currently generate uncertainties (sensitivity analysis on georeferencing errors); the use of hydromorphological indicators to better spell out the causal link among modern agricultural practices, urban hydrology (burials, channelizations) and the collapse of wet microhabitats; the adoption of landscape-connectivity metrics (e.g., integrity index, circuit theory) useful for designing corridors between rocky nuclei and river axes; and finally the opportunity for greater interdisciplinary inputs addressing the socio-economic dimension, useful for integrating data on land rent, governance and social perceptions to support the feasibility of measures.

On the propositional side, the text rightly highlights the window of opportunity at San Ciro–Maredolce: here, a hydraulic–ecological restoration (reopening/reactivation of residual wetlands, naturalized banks, native hygrophilous species) would have high ecological and cultural returns. In parallel, Palermo could adopt a multilayer green/blue infrastructure network (Oreto riparian parks, agricultural buffer strips, green roofs, targeted de-sealing) to mitigate heat island, runoff and habitat deficit. The protection of endemics requires site-specific actions (trampling control, invasive-species management, micro-fences for critical populations) and a citizen-science monitoring program.

In summary, the work unites landscape archaeology and conservation science, offering a solid basis for Mediterranean urban policies oriented toward resilience: protecting refugia, stitching connectivity back together, reactivating the ecological processes of wet environments, and bringing nature back into the city with measurable, verifiable tools.

Rafael da Silveira Bueno's text provides a clear and well-structured reading of the link between deforestation, desertification and ecological restoration, with specific attention to the Mediterranean and Sicily. The introductory framework is effective: starting from the UNCCD definition, the speaker emphasizes that soil degradation is a global phenomenon, not

confined to arid environments, and links its causes to both climatic and anthropic drivers. The historical section on Sicily is particularly illuminating: from drastic nineteenth-century deforestation to current dynamics of drought, loss of flows and vulnerability to fires, it emerges that the erosion of ecosystem services (water, carbon, microclimatic regulation) is the predictable consequence of forest-cover collapse.

In policy terms, the text neatly synthesizes multi-level commitments (UN Decade on Restoration, Bonn Challenge, EU Biodiversity Strategy and Nature Restoration Law), connecting them to the Sicilian regional strategy. The critical note on past “impoverished” reforestations (mono-specific or with non-native species), useful against erosion but often stuck in simplified successional states, is commendable: a crucial point to explain – both to the general public and policy-makers – why “planting trees” does not automatically equate to restoring ecosystems.

The conceptual core lies in natural vegetation dynamics and in the role of animal-mediated seed dispersal. The author recalls how land abandonment can trigger secondary successions with contingent outcomes, and values biotic dispersal as a demographic and genetic bottleneck. Introducing network approaches (trophic/spatial seed-dispersal networks) is a plus: it turns the ecology of regeneration into a measurable problem (connectance, specialization, modularity), useful for guiding planting choices, assessing the absence of key dispersers or planning reintroductions.

The applied section on the LIFE Desert Adapt project gives the talk further concreteness: the Desertification Adaptation Model integrates environmental, economic and social pillars; combines erosion-control measures, regenerative soil management, native pioneer species and growth-support devices; and documents early positive effects on soil biodiversity and resilience. It is a virtuous example of “functional restoration” that aims to reactivate processes (dispersal networks, carbon cycles) rather than merely producing arboreal stock.

Nor were indications lacking for possible strengthening lines which, in short, concern: (i) analysis of trade-offs among fire prevention, grazing and regeneration; (ii) long-term socio-economic indicators (profitability, social acceptance, multi-actor governance); (iii) durable financing mechanisms (payments for ecosystem services) to move beyond a project-by-project logic; (iv) management of invasive species and faunal recolonization in fragmented landscapes. Overall, the contribution convincingly

connects ecological science, policy tools and field practice, indicating a realistic course for adaptation to and mitigation of desertification in the Mediterranean – confirming, as noted at the outset, that the session as a whole did not consist of sectoral interventions lacking an overall vision, but rather of specialist contributions woven on a single warp consistent with and adherent to the very title of the session.

At the close of the interventions, followed by a brief but lively debate, it can therefore be stated – not without satisfaction – that the general objective proper to ISHE and the specific objective of the third session were fully achieved, with broad appreciation by those present as well as by the moderator, tasked with this brief commentary.

For the present writer, beyond reaffirming satisfaction with the effectiveness of the interventions, the task of drawing a few concluding lines proved less complicated than might have been expected, given the felicitous synthesis that the speakers themselves, each for their part, were able to convey regarding the session's theme, and which is here summarized by borrowing the motto contained in the cartouche of the emblem of the prestigious Italian Academy of Forest Sciences: "*Serva me, serbabo te*".

In other words, the protection of the environment is the protection of humankind, which as such cannot and must not assume the role of mere spectator but – with ever-growing sensitivity – must become a proactive subject and custodian of the surrounding territory. The interventions witnessed in today's session have shown, beneath the surface, how this role can – and indeed must – be carried out at multiple, non-conflicting but convergent levels, concerning the aspects of law and active citizenship, the sustainability of productive activities – first and foremost agriculture – and the ecological footprint that the complex of human activities generates on the territory, according to a holistic approach that increasingly enhances a sustainable model of development.

Indeed, modern intensive agriculture has led to several negative impacts, such as biodiversity loss, climate change, erosion, and air and water pollution. Intensive agriculture is considered the main driver of landscape modification and one of the leading causes of land degradation. Land degradation and abandonment affect both the productive capacity of a given territory and its attractiveness in terms of landscape and natural beauty, also undermining sectors such as tourism. However,

agricultural production remains fundamental to ensuring nourishment for a constantly growing world population. The basic question – now and for the future – is: can the right to food be realized sustainably? Making agriculture “green” again represents a modern dilemma. Consider that:

Agriculture is the single largest employer in the world, providing livelihoods for about 40% of the global population.

Some 500 million small farms – most of them dryland farms – supply up to 80% of the food consumed in many developing countries.

Agricultural intensification is therefore often deemed necessary to feed a growing and increasingly demanding human population.

However, intensification is typically associated with greater use of environmental resources and significant environmental impacts.

It has been reported that “Society needs an agriculture that demonstrates resilience under future change, an agronomy that can cope with the diversity of trade-offs across different stakeholders, and a sustainability based on agreed values and shared knowledge, insight, and wisdom”¹. Some have advocated a kind of return to “natural farming”. However, the first step must be toward fewer losses and less waste: every year, 1.3 billion tons of food produced for human consumption are lost or wasted along the food chain. The second step consists of finding sound alternatives to intensive agriculture – in short: producing more with less.

In this regard I would like to conclude these brief considerations by citing the public statement released in 2007 by Prince Charles who articulated these concepts as follows:

- Preserve agrobiodiversity without destroying ecosystems.
- Reject the culture of homogeneity induced by uncontrolled globalization.
- We lose or waste too much food (~30%) and discard too much waste that could be converted into compost and energy.
- Scientific research needs a holistic, more humane, and less reductionist approach.
- Put human beings back at the center of every action.
- Recover traditional knowledge to support an agriculture in which crops are resilient and energy-self-sufficient.

With the hope that initiatives like the one offered by this ISHE may help increase public awareness of the relevance of the issues addressed

¹ P.C. STRUIK, T.W. KUYPER, *Sustainable intensification in agriculture: the richer shade of green. A review*, in *Agron. Sustain. Dev.*, vol. 37, 2017.

today and of the ineluctable role that such awareness must assume for the protection, conservation and enhancement of the territory, its landscape and its biodiversity for the benefit of present and future generations, this third session therefore comes to a close, with thanks to the organizers, participants and speakers.