

From Waste to Wealth: Giving New Life to Agricultural Residues in Tunisia

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Tunisia is at a crossroads where tradition and innovation converge, and nowhere is this more evident than in the potential of its agricultural waste products. For decades, almond shells, pistachio shells and palm fronds were considered nothing more than waste. However, these materials have the potential to fuel Tunisia's transition to sustainability, restoring soil fertility, greening urban spaces and advancing a circular bioeconomy that benefits both rural and urban communities.



Waste regenerated following the processing of pistachios and almonds on a farm in central Tunisia. ©Author



Poor management of waste generated by the processing of pistachios and almonds for industrial use (intended to be burned or discarded in rural areas). ©Author



Waste generated as a result of maintenance and development activities in municipal areas. © Municipality of Sousse, Tunisia.

Economic Opportunities Rooted in Agricultural Residues

Transforming agricultural residues into organic growing substrates is not just an environmentally friendly gesture; it is also a valuable economic opportunity. Rural farmers, municipalities, cooperatives and entrepreneurs can capitalise on these materials by setting up local businesses to process and market organic substrates. This adds value to what was once discarded and diversifies income streams for agricultural communities.

Furthermore, the creation of green jobs associated with substrate production and urban landscaping can stimulate employment in rural and urban areas alike. As municipalities invest in sustainable landscaping and community gardening, they will require skilled workers to implement and maintain these projects, thereby creating a workforce attuned to the principles of the circular economy. This local job creation helps to reduce the pressure of rural-urban migration by offering economic incentives to remain and thrive in rural communities.



Experience of the “Centro Regionale di Castanicoltura del Piemonte” in Italy in transforming waste and by-products from chestnut cultivation into substrate for crops in propagation nurseries. ©Author

The environmental benefits of repurposing agricultural residues are both significant and multifaceted. In rural areas, transforming these by-products into organic substrates enriches the soil, improves fertility, and reduces dependence on chemical fertilizers that can degrade land and waterways. This approach also prevents the environmentally harmful practice of burning residues, cutting carbon emissions and protecting air quality, while supporting sustainable agriculture and maintaining healthy ecosystems.

Urban environments similarly stand to gain. Incorporating locally sourced organic substrates into city landscaping and community gardens enhances green spaces, improves air quality, mitigates urban heat island effects, and fosters biodiversity. Beyond environmental advantages, these practices reduce reliance on imported or synthetic materials, lower the city’s carbon footprint, and cultivate a sense of community ownership over urban greening efforts. Together, these rural and urban applications demonstrate how valorizing agricultural residues can strengthen ecosystems, promote sustainability, and build climate-resilient landscapes across Tunisia.

Environmental Benefits Across Tunisia’s Landscapes

Linking Rural Productivity to Urban Ecology: The Sousse Model

Sousse is a living laboratory for Tunisia’s transition to a circular bioeconomy. In collaboration with the Higher Institute of Agronomy of Chott Mariem (ISA-CM), the municipality has played a key role in combining scientific research with hands-on fieldwork. Through data collection

campaigns, workshops and field visits, the municipality has conducted a thorough census of almond, pistachio and date palm trees within its territory.

This pioneering effort has enabled researchers to estimate the quantities of by-products generated by each crop almond shells, pistachio shell and palm residues and evaluate their potential conversion into organic substrates. These findings have laid the foundation for a local sustainable residue management strategy that is fully aligned with the principles of the circular economy and waste reduction.

The collaboration did not stop there. Building on this groundwork, the municipality and the institute jointly implemented pilot workshops that transformed palm residues into substrates for vegetable cultivation. The results were conclusive: healthier crops, reduced production costs, and growing partnerships with local restaurants eager to source sustainably produced vegetables.



Different stages involved in processing almonds, pistachios and palm tree by-products into a substrate for horticultural nursery crops. ©Author

This participatory, science-driven model shows how municipalities can drive green innovation. By bridging the gap between academic research, local governance and community engagement, Sousse shows how the principles of the circular bioeconomy can translate into real, visible progress, linking rural productivity to urban sustainability.

Such circular practices embody the spirit of the UN Sustainable Development Goals, particularly SDGs 11 (Sustainable Cities and Communities), 12 (Responsible Consumption and Production) and 15 (Life on Land). They promote local resource utilisation, create green employment, and strengthen the connection between people and their environment.

However, to scale up this success, strong partnerships are required between universities, municipalities and rural communities. Research institutions can refine substrate formulations and monitor ecological impact; local governments can enable supportive policies and infrastructure; and citizens can participate in eco-friendly gardening initiatives and awareness workshops.

International partners such as the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and other development organisations can play a pivotal role by providing technical assistance, funding, and platforms for knowledge exchange. This will help Tunisia to embed these practices into national and regional sustainability frameworks.



Workshops and meetings involving key stakeholders for the implementation of the project. ©Author

Conclusion: A Call to Action for a Circular Future

Turning agricultural waste into wealth is not merely a slogan but a strategic pathway for Tunisia's sustainable development and even the Mediterranean region. By recognising the value of almond shells, pistachio shells, palm fronds and other residues, Tunisia can revitalise

its soils, make its cities more green and generate local economic opportunities, all while demonstrating how rural productivity and urban ecology can coexist in harmony.

The time has come for Tunisia's diverse stakeholders, including rural farmers, urban planners, researchers, municipalities, and citizens, to unite around this vision. Together, they can transform Sousse and beyond into beacons of circular bioeconomy innovation, proving that, through creativity and collaboration, waste can become a cornerstone of wealth.

Through its proactive collaboration with the High Institute of Agronomy of Chott- Mariem, University of Sousse (ISA-CM), the Municipality of Sousse has demonstrated that circular innovation can flourish at the local level through research, field engagement, and citizen participation. This collective effort offers a replicable model for other Tunisian cities and beyond, proving that waste, when approached creatively and collaboratively, can become the foundation of resilience and prosperity.

This article invites policymakers, academics, entrepreneurs, citizens and international partners to embrace and invest in the promising future of Tunisia's agricultural residues a future in which sustainability and prosperity go hand in hand.

References

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*Centro Regionale di Castanicoltura del Piemonte: <https://centrocastanicoltura.org/>

*Municipality of Sousse, Tunisia: <https://www.commune-sousse.gov.tn/fr>

