A Tree for Everything

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Agroforestry Systems: A Sustainable and Traditional Alternative

Agroforestry Systems (AFS) are traditional forms of land management that have been practiced for thousands of years in Spain and neighboring countries. Currently, they are attracting attention for their ability to **improve production per unit area** while simultaneously **fostering biodiversity** and enhancing the **stability of systems against climate change**. These systems integrate practices that combine a woody component (tree or shrub) with an agricultural one. Agroforestry practices are internationally recognized forms of **sustainable land management** and are widely used in developing countries where the purchase of fertilizers, herbicides, and pesticides is very limited. In such contexts, agricultural land management must be based on a deep understanding of the land, the environment, their interactions, and their cycles, thus demonstrating greater respect for nature. A clear example of this knowledge is the use of leguminous trees or shrubs like *Leucaena leucocephala* in Africa or gorse in Galicia, which can provide nitrogen to the soil and thus achieve good harvests of grass or cereals without the need for nitrogen fertilizers.

The Multiple Benefits of the Woody Component in Agricultural Systems

The presence of a woody component, whether a tree or a shrub, in an agricultural system provides **resilience** to systems established in diverse edaphoclimatic conditions. In areas where arable soil loss is a problem, trees not only **prevent water and wind erosion** by promoting water infiltration and providing plant cover, but also **generate soil** through the use of their residues for compost. This practice is still found in some areas of Galicia, where farmers collect chestnut leaves to make high-quality compost compared to conifers, for instance. From the perspective of nutrient and water cycles, trees act as true **nutrient and water pumps**, capturing elements and water from deep within the soil that are not used by the undergrowth and "recycling" them back into the system through litter (mainly leaves), followed by their incorporation into tree tissues and the subsequent generation of these residues. An example of this is the ash tree, capable of extracting water from deep soil layers and making it available to crops and pastures in the more superficial soil layers. This also helps by **reducing fuel load**, thereby perpetuating the trees' existence with less impact from fires. Livestock benefits as they have a greater quantity of food available, especially during periods of scarcity like summers and winters.

Trees also **modify the microclimate**, providing a clear buffering role against thermal extremes, which helps **protect crops from increasingly recurrent heatwaves**. Clear examples of this effect have already been observed in France, where temperatures above 35°C limited grain production in wheat. Trees also act beneficially in some conditions by providing **lower temperatures in the dry season**, **increasing humidity**, and even **generating dew**, making them an enormously useful tool against climate change in areas where drought is worsening. These aspects are especially relevant in windy areas, as they prevent the intense drying effect of the wind. The position of trees in hedges should be perpendicular to the wind direction to avoid this desiccating effect. However, in areas with a high risk of wind-borne diseases, the direction of these tree hedges should be parallel to prevent the spread of such diseases. Furthermore, trees provide the landowner or land manager with **wood for fences, supply firewood** (favoring the bioeconomy), **provide food** for humans or livestock, and **generate well-being** through their shade. In fact, a study conducted in Galicia with AGACA found that close to 83.3% and 43.2% of dairy farms that use grazing as a management method in the interior areas of Galicia coexist with the woody component, and of these, almost 70% obtain

firewood from them to cover their energy needs, with a production of around 15 m^3 ha^{-1} and 7% in the aforementioned areas. Therefore, the expression "**a tree for everything**" is gaining increasing relevance in the agricultural sphere.

The importance of trees also lies in the **greater biomass production per unit area** when combining both uses. This is quantified by the **RET (Relative Equivalent Territory)**. An RET of 1.2 means that 1 hectare of agroforestry land produces the same as 1.2 hectares when trees (for fruit or timber production) and herbaceous crops are grown independently. The RET range in temperate zones is between 1.2 and 1.8, implying that in some areas, biomass productivity can almost double. This biomass production becomes essential as a renewable resource for the production of various goods through the **bioeconomy**, associated, for example, with the textile, paper, cosmetics, food (in the case of fruit trees), and fertilizer industries, among many others.

It is important, therefore, to establish business environment mechanisms and business models that allow for an increase in the collective use of this biomass, benefiting agricultural owners and creating jobs related to the tertiary sector, as the new European project AF4EU, led by the USC, will promote in Europe.

AF4EU advances agroforestry in Europe by sharing best practices, developing digital tools, and supporting farmers in adopting sustainable systems.

Get to know more!

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