AGROFORESTRY PRACTICE IN AGRICULTURAL LANDS

Silvoarable

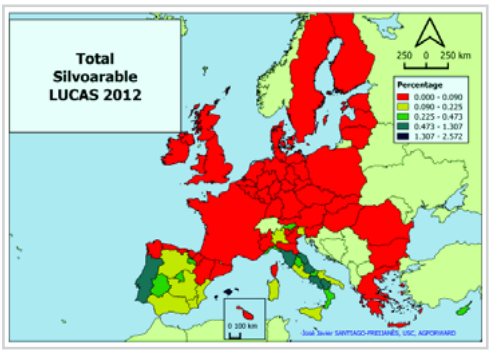
AFINET
AGROFORESTRY INNOVATION NETWORKS

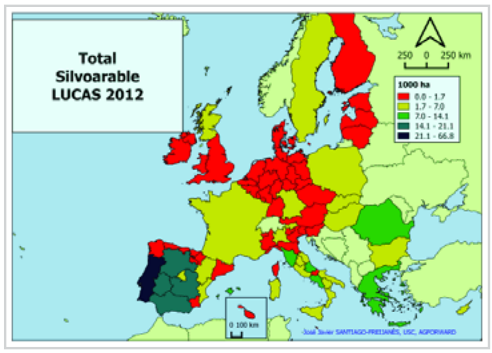
THE WHAT AND WHY

Silvoarable, a land use management practice for arable lands

Conventional farming systems developed in arable farms can be associated to a reduced provision of ecosystem services and, at the end, to a reduced crop production due to soil fertility decrease. Food quality is compromised in conventional farming systems by the use of herbicides and pesticides that are causing increasing human health problems. One of the main solutions to overcome these facts is agroforestry, as it has the capacity of improving soil fertility and health by means of higher organic matter inputs into the soil system, reducing the use of pesticides and herbicides through an increasing biodiversity provision but also enhancing economy through the increasing of farm economic and environment resilience that agroforestry provides to both market and climate change (Figure 1). The main type of agroforestry practice that can be implemented at arable plot level is silvoarable.

Cereal varieties selection of agroforestry in Europe.
Fernández-Paradela, P.





Distribution (percentage -left- and number of hectares -right-) in Silvoarable practices
Mosquera-Losada et al. 2017; Santiago-Freijanes et al. 2018

HOW IS THE CHALLENGE ADDRESSED

Silvoarable practices, the solution of agroforestry systems

Silvoarable practices integrate arable crops with a woody component: trees or/and shrubs. The woody component can be distributed in different forms (borders, hedgerows, windbreaks, scattered trees, lines) within the cropland area, which can reduce the crop production losses that is usually associated to agroforestry when tree density is high. Silvoarable practices can be associated to annual crops intercropped among permanent crops (fruit trees, short rotation coppice, timber trees…), shrublands with and without sparse tree cover and woodlands. The total area occupied by silvoarable practices in Europe is rather small. LUCAS database shows that around 360 thousand hectares, representing less than 0.08% of the total and therefore potential European arable area where silvoarable practices can be implemented is huge. This means that over 99% of the arable land can use silvoarable practices as a sustainable land use system. Silvoarable practices are mostly linked to permanent crops (fruit trees), coming to a total of 223 thousand hectares. However, the combination of crops with woodlands is also important and covers 133 thousand hectares in Europe, in some cases linked to a forest stand afforestation or reforestation. On the contrary, the proportion of silvoarable practices associated to shrublands is very small and amounts to only four thousand hectares (Figure 2). The greatest allocation of land to silvoarable practices occurs in southern countries such as Spain, Portugal and Italy.

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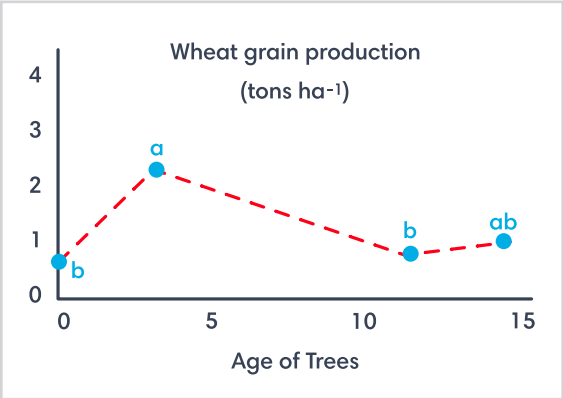
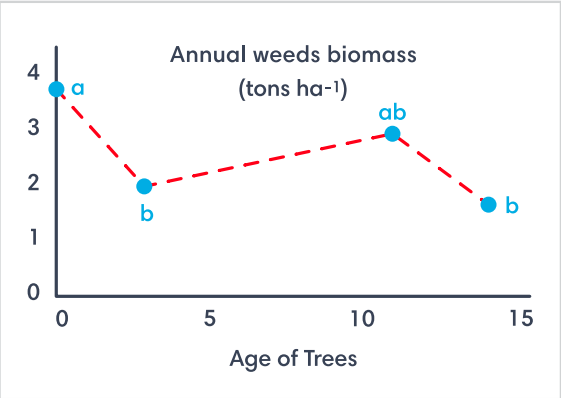
Keywords: Arable, biodiversity, sustainability, resilience, farming systems

HIGHLIGHTS

- Silvoarable practices can contribute to increase the ecosystem services delivery from arable lands while generating employment
- Silvoarable practices enhance productivity, environment and social outputs per unit of land
- Silvoarable practices technical, economic, educational and policy challenges should be overcome through the adequate design and implementation of educational and policy programs.





Grain wheat production and weed biomass control in different tree ages. Wheat grain production increases when some shade degree is present due to the reduction of annual weeds that reduces crop/weed competition
Mosquera-Losada MR

FURTHER INFORMATION

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ADVANTAGES AND DISADVANTAGES

Silvoarable advantages and disadvantages

Advantages

Silvoarable practices can contribute to the needed transition of conventional farming of arable lands towards sustainable land use systems as it improves the three pillars of the sustainability. From an economic point of view, agroforestry increases crop production through reducing desiccating wind effects or flooding but also) thanks to the increased biomass production of the woody component that can be sold if adequately processed within the current bioeconomy framework (fibers, biomass for heating etc..). Environment is improving through the increasing environment biodiversity that creates different microhabitats were vertebrates (birds, bats.), invertebrates (beneficial insects, worms) and microorganisms are placed. This has clear consequences for the land management as it improves soil fertility but also reduces the needs of pesticides and herbicides reducing the need of external inputs. Pesticides needs are reduced because birds and bats are attracted to the woody component and reduce the pest population. Herbicides needs are reduced because small shade reduces the potential of annual species to be developed as they are high light demanding (Figure 2). Tree increases soil physical and chemical fertility as tree root development increases soil porosity facilitating water infiltration and percolation and reducing water and nutrient run-off but also because the fall of tree leaves makes nutrient inputs from the low depth soil layer on the soil surface, improving nutrient recycling. From a social point of view the recognized beauty of the landscape contributes to the increasing use of tourism in the arable land area, associated to strong incomes for the farmers, but also because the multiple production makes necessary more man-power for agricultural practices. Silvoarable practices generates more employment that contributes to the economic potential of rural areas that can reduce depopulation.

Disadvantages

Some concerns that prevents from the needed transition of arable lands to silvoarable include technical aspects related with the best time and spatial combinations of crops and woody perennials that should be linked to the adequate development of business plans considering the value chain. Education of farmers through their life is lacking but also the consumer education linked to the best quality and healthy food that silvoarable farming provides compared with conventional open arable farming and the more sustainable land use associated to silvoarable products. Silvoarable practices have been penalized in the past and current CAP through the limit of a maximum 50 trees per hectare (CAP 2007-2013) and 100 trees per hectare (CAP 2014-2020) or the discount of the tree cover in the arable lands from CAP direct payments.