

AGROFORESTRY DEFINITION AND PRACTICES FOR POLICY MAKERS

Mosquera-Losada MR^{1*}, Santiago-Freijanes JJ^{1,2}, Moreno G³, den Herder M⁴, Aldrey JA², Rois-Díaz M^{1,4}, Ferreiro-Domínguez N^{1,5}, Pantera A⁶, Rigueiro-Rodríguez A¹

(1) Crop Production and Project Engineering Department, Escuela Politécnica Superior de Lugo, University of Santiago de Compostela; Campus Universitario s/n, 27002 Lugo, Spain (2) Geography Department, Facultad de Geografía e Historia. Plaza de La Universidad, n8 1 15782, Santiago de Compostela, Spain (3) Forestry School, University of Extremadura, Plasencia, Spain (4) European Forest Institute, Yliopistokatu 6, 80100 Joensuu, Finland (5) Forest Research Centre, School of Agriculture, University of Lisbon, Tapada da Ajuda s/n, 1349-017 Lisbon, Portugal (6) TEI Stereas Elladas, Dpt. of Forestry & Natural Environment, 36100, Karpenissi, Greece

*Corresponding author: mrosa.mosquera.losadasc.es

Abstract

Agroforestry definitions and practices are difficult to understand mainly because of both time and spatial scale understanding is needed to fully be aware of the concept. The definition of agroforestry to facilitate the identification by policy makers could be “*the deliberate integration of woody vegetation (trees and/or shrubs) as an upper storey on land with pasture (consumed by animals) or an agricultural crop in the lower storey. The woody species can be evenly or unevenly distributed or occur on the border of plots. The woody species can deliver forestry or agricultural products and other ecosystem services (i.e. provisioning, regulating or cultural*”. In this paper, five agroforestry practices are identified (silvopasture, silvoarable, riparian buffer strips, forest farming and homegardens or kitchengardens) that can be linked to agricultural lands, forest lands and urban, rural and periurban areas.

Keywords: silvopasture, silvoarable, riparian buffer strips, forest farming; homegardens

Agroforestry: policy definition and practices

Agroforestry is not always fully understood as it integrates both spatial and time scale and many concepts at the same time. However, this is essential for policy makers to promote agroforestry. Policy bodies such as FAO (2015) define agroforestry as “*a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals*”, definition also supported by the ICRAF (2017). In Mosquera-Losada et al. (2016), the following definition (with some minor changes) was proposed: agroforestry is “*the deliberate integration of woody vegetation in at least two vertical layers on land, with the bottom layer providing an agricultural product such as crops or forage/pasture which is consumed by animals*”. For the European Union, a list of agricultural products including forage, annual and perennial crops is provided by Annex 1 of the EU Directive 1308/2013 CAP. The European Agroforestry Federation (EURAF 2017) defines agroforestry as “*the integration of woody vegetation, crops and/or livestock in the same area of land. Woody vegetation can be inside parcels or on the boundaries (hedgerows)*”. Each of these definitions includes “woody perennials” which is also identified by the agroforestry policy strategies of USA (USDA 2011), AFTA (2016) and India (Government of India 2014) and in the development of the Measure 8.2 of the current CAP. This allows the inclusion of systems such as hedgerows (e.g. bocage in France) and the combined grazing of shrubs or trees besides grass as a mechanism to adapt farming systems to shortage periods and climate change.






Woody perennials are also considered by the European Commission in the sub-measure fiche (EU 2014) describing Measure 8.2 (as a deployment of the Regulation 1305/2013) on the establishment of agroforestry, where agroforestry on agricultural land is defined as “*land-use systems and practices where woody perennials are deliberately integrated with crops and/or animals on the same parcel of land management unit without the intention to establish a*

remaining forest stand. The trees may be arranged as single stems, in rows or in groups, while grazing may also take place inside parcels (silvoarable agroforestry, silvopastoralism, grazed or intercropped orchards) or on the limits between parcels (hedges, tree lines)". Moreover, whilst the EU definition adequately describes agroforestry for agricultural lands two additional contributions could be proposed. Firstly agroforestry can occur on urban, periurban, agricultural and forest land. Secondly, it should be considered that fruit trees that integrate the woody component and the agricultural production in the tree is not agroforestry because at least two layers in the same unit of land is needed. So, a proposal for defining agroforestry is "the deliberate integration of woody vegetation (trees and/or shrubs) as an upper storey on land with pasture (consumed by animals) or an agricultural crop in the lower storey. The woody species can be evenly or unevenly distributed or occur on the border of plots. The woody species can deliver forestry or agricultural products and other ecosystem services (i.e. provisioning, regulating or cultural)" (Mosquera-Losada et al. 2017).

Agroforestry practices

Besides the definition of agroforestry, it is useful to identify agroforestry practices that are used at plot level. Mosquera-Losada et al. (2016), describes five main types of agroforestry practices (Table 1). Silvopasture and silvoarable are the main subjacent practices of agroforestry. However, some global agroforestry practices can also be identified in order to facilitate the identification of such practices by policy makers in different types of lands which are "riparian buffer strip" when besides silvopasture or silvoarable a water body involved, "forest farming" linked to forest lands and "homegardens" linked to households.

Table 1: Spatial agroforestry practices in Europe (Mosquera-Losada et al. 2018)

Agroforestry practice	Description	
Silvopasture		Combining woody with forage and animal production. It comprises forest or woodland grazing and pastoral land with hedgerows, copses, isolated/scattered trees or trees in lines or belts.
Silvoarable		Widely spaced woody vegetation inter-cropped with annual or perennial crops. Also known as alley cropping. Trees/shrubs can be distributed following an alley cropping, copses, isolated/scattered trees, hedges and line belts design.
Riparian buffer strips		Lines of natural or planted perennial vegetation (trees/shrubs) bordering croplands/pastures to protect livestock, crops, and/or soil and water quality. They can be combined with arable lands (silvoarable) or grasslands (silvopasture).
Forest farming		Forested areas used for production or harvest of natural standing speciality crops for medicinal, ornamental or culinary uses, including those integrating forest and agricultural lands.
Homegardens or kitchengardens		Combining trees/shrubs with vegetable production in urban areas

Agroforestry practices and land use

EU and international policies are usually linked to “agricultural land”, “forestry land”, and “other rural areas”, which makes important to link agroforestry practices to land use as shown in Table 2. Silvopasture can be found in both agriculture and forest lands, while riparian buffers strips can only be found in agricultural lands. There are some examples of silvopasture linked to wood pasture and meadow orchards or isolated trees in arable lands. Silvoarable can be a synonymous of alley cropping. Specially interested are the hedgerows that can be linked to silvopasture and silvoarable when they are not connected to water bodies or riparian buffer strips when they are close to inland water bodies. Two types of agroforestry practices can be found in forest lands which are silvopasture (when animals are present) and forest farming usually linked to the extraction of agricultural products from the understorey. Finally, rural, periurban and urban areas are linked to homegardens or kitchengardens practices.

Table 2: Agroforestry practices can be linked to dominant land use categories (agriculture, forest or peri-urban) (Mosquera-Losada et al. 2018).

Land use and agroforestry practice		Examples	Brief description
AGRICULTURE	Silvopasture	Wood pasture and parkland	Typically areas used for forage and animal production that includes widely-spaced non-agricultural trees and shrubs.
		Meadow orchards	Typically areas of widely-spaced agricultural trees and shrubs (e.g. fruit orchards, olive groves, vineyards) which are grazed.
	Riparian buffer strips	Hedgerows, windbreaks and riparian buffer strips, forest strips	Here the woody components are planted to provide shelter, shade, or parcel demarcation to a crop and/or livestock production system. Riparian buffer strips are typically created to protect water quality and can be linked to silvopasture or silvoarable.
	Silvoarable	Alley-cropping systems, isolated trees in arable lands	Widely spaced woody perennials inter-cropped with annual or perennial crops. As the tree canopy develops, the crops may be replaced with a grass understorey.
		Forest grazing, mountain pastoralism, isolated trees in grasslands	Although the land cover is described as forest, the understorey is grazed
FOREST	Forest farming	Forest farming	Forested areas used for production or harvest of naturally standing specialty crops for medicinal, ornamental or culinary uses but also apiculture
RURAL, URBAN AND PERIURBAN	Homegardens	Homegardens	Combining trees/shrubs with vegetable production usually associated with peri-urban or urban areas

Acknowledgements

This work was funded through the AFINET (www.afinet.eu) project from the European Union’s H2020 Research and Innovation Programme under grant agreement no 727872 and the Xunta de Galicia (Consellería de Cultura, Educación e Ordenación Universitaria (“Programa de axudas a etapa posdoutoral DOG n8122, 29/06/2016 p.27443, exp: ED481B 2016/0710”). The views and opinions expressed in this article are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission.

References

- AFTA (Association for Temperate Agroforestry) (2016) What is Agroforestry? Accessed 31 August 2016. <http://www.aftaweb.org/about/what-is-agroforestry.html> (accessed 06/05/2018).
- EU (2014) Sub-measure fiche (annex II to the measure fiche "forestry") Establishment of agroforestry systems Measure 8.2. http://www.ead.gr/images/pdf/articles/%CE%A7%CE%A1%CE%97%CE%A3%CE%99%CE%9C%CE%95%CE%A3_%CE%A0%CE%9B%CE%97%CE%A1%CE%9F%CE%A6%CE%9F%CE%A1%CE%99%CE%95%CE%A3%08_Measure_Fiche_Art_23_agroforestry__NOV_14.pdf (accessed 06/05/2018).
- EURAF (2017) Agroforestry in Europe. Accessed 1 May 2017. <http://www.agroforestry.eu/> (accessed 06/05/2018).
- FAO (2015) Agroforestry. <http://www.fao.org/forestry/agroforestry/80338/en/> (accessed 06/05/2018).
- Government of India (2014). National Agroforestry Policy 2014. Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi, India. <http://www.indiaenvironmentportal.org.in/files/file/Agroforestry%20policy%202014.pdf> (accessed 06/05/2018).
- ICRAF (2017) Corporate Strategy 2017-2026. Transforming lives and landscapes with trees. https://www.worldagroforestry.org/sites/default/files/users/admin/Strategy%20Report_2017.pdf (accessed 06/05/2018).
- Mosquera-Losada MR, Santiago Freijanes JJ, Pisanelli A, Rois M, Smith J, den Herder M, Moreno G, Malignier N, Mirazo JR, Lamersdorf N, Ferreiro Domínguez N, Balaguer F, Pantera A, Rigueiro-Rodríguez A, Gonzalez-Hernández P, Fernández-Lorenzo JL, Romero-Franco R, Chalmin A, Garcia de Jalon S, Garnett K, Graves A, Burgess PJ (2016) Extent and success of current policy measures to promote agroforestry across Europe. Deliverable 8.23 for EU FP7 Research Project: AGFORWARD 613520. (8 December 2016). <http://www.agforward.eu/index.php/en/extent-and-success-of-current-policy-measures-to-promote-agroforestry-across-europe.html> (accessed 06/05/2018).
- Mosquera-Losada MR, Santiago Freijanes JJ, Pisanelli A, Rois M, Smith J, den Herder M, Moreno G, Lamersdorf N, Ferreiro Domínguez N, Balaguer F, Pantera A, Papanastasis V, Rigueiro-Rodríguez A, Aldrey JA, Gonzalez-Hernández P, Fernández-Lorenzo JL, Romero-Franco R, Lampkin N, Burgess PJ (2017) Deliverable 8.24: How can policy support the appropriate development and uptake of agroforestry in Europe? 7 September 2017. <https://www.agforward.eu/index.php/es/how-can-policy-support-the-uptake-of-agroforestry-in-europe.html> (accessed 06/05/2018).
- Mosquera-Losada MR, Santiago-Freijanes JJ, Rois M, Moreno G, den Herder M, Aldrey JA, Ferreiro-Domínguez M, Pantera A, Pisanelli A, Rigueiro-Rodríguez A (2018) Agroforestry in Europe: a land management policy tool to combat climate change. Land Use Policy (in press).
- USDA (2011) USDA Agroforestry Strategic Framework, Fiscal Year 2011–2016. https://www.usda.gov/sites/default/files/documents/AFStratFrame_FINAL-lr_6-3-11.pdf (accessed 06/05/2018).