Review paper
10.7251/AGRENG2103038E
UDC 636

PASTORALISM AND SUSTAINABLE DEVELOPMENT IN THE MEDITERRANEAN REGION

Hamid EL BILALI*, Francesco BOTTALICO, Giovanni OTTOMANO PALMISANO, Gianluigi CARDONE, Antonia ACQUAFREDDA, Roberto CAPONE

International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM-Bari), Valenzano (Bari), Italy
*Corresponding author: elbilali@iamb.it

ABSTRACT

Pastoralism has a long tradition in the Mediterranean region. However, there is little evidence about its contribution to sustainable development in the region. Therefore, this review analyses the state of research on the multifaceted relations between pastoralism and sustainable development in the Mediterranean with a particular reference to the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs). It draws upon a systematic review of all documents indexed in the Web of Science by June 2021. The analysis of the scholarly literature suggests that (i) there is a divide with most studies performed in Northern Mediterranean countries; (ii) no article has investigated the contribution of pastoralism to the implementation of the sustainable development agendas (MDGs and SDGs) in the Mediterranean; and (iii) most of the selected articles deal with environmental sustainability (cf. biodiversity, land use, land degradation, deforestation) while social, cultural and economic aspects are generally overlooked. The ongoing processes of intensification, specialisation and modernisation of pastoral systems do not only jeopardise the provision of various ecosystem services, but also put at risk the preservation and sustainability of traditional pastoral systems. Such modernisation also leads to the erosion of pastoral culture and the abandonment of some traditional systems such as sylvo-pastoralism and mobile pastoralism. Sustainable development of pastoralism in the Mediterranean implies improving the livelihoods and living conditions of pastoralists while preserving their unique cultural heritage and social capital and ensuring the continued provision of ecosystem systems. Such development pathway should be guided by and aligned with the SDGs.

Keywords: *agro-pastoralism, biodiversity, Millennium Development Goals, pasture, Sustainable Development Goals.*

INTRODUCTION

The Mediterranean Strategy for Sustainable Development clearly shows that the development of the Mediterranean region cannot be sustainable unless the fundamental common goods are protected and regenerated (UNEP/MAP, 2005, 2016). The Mediterranean region is facing unprecedented and interdependent environmental, economic and social challenges that affect food security, health, nutrition and sustainability, and thus the livelihoods of all Mediterranean people (Lacirignola *et al.*, 2014; CIHEAM and FAO, 2015; Dernini and Capone, 2021). At the crossroads of three continents (viz. Africa, Asia and Europe), the Mediterranean is undergoing rapid and drastic changes and is expected to be among the regions most affected by climate change, with an acceleration of land degradation and desertification (MedECC, 2019). Furthermore, significant discrepancies in socio-economic development among countries, together with regional conflicts, raise more challenges for the sustainable future of the Mediterranean. Despite progress made over the last decades, Mediterranean countries face several challenges in their implementation of the 2030 Agenda for Sustainable Development (El Bilali et al., 2020; Riccaboni et al., 2020). The 2020 SDG Dashboards for the Mediterranean region (Riccaboni *et al.*, 2020) show that the Mediterranean has a general score of 73.5 (meaning that SDG targets are achieved by 73.5%); the SDG index shows better performance in Europe West than in Europe East, North Africa and Middle East.

Livestock production and pastoralism play a central role in the social, economic and environmental sustainability and results essential in the implementation of the 2030 Agenda and the Sustainable Development Goals (SDGs) (FAO, 2018a, 2018b; Serra Prieto *et al.*, 2019). Indeed, pastoralism and livestock production have strong linkages with, inter alia, SDG 1 (No poverty), SDG 2 (Zero hunger), SDG 6 (Clean water and sanitation), SDG 13 (Climate action) and SDG 15 (Life on land) (FAO, 2018a). While pastoralism is as old as the Mediterranean civilisation, the opinions about its role diverge among actors and stakeholders (El Bilali *et al.*, 2020). These diverging opinions and worldviews might be due to the absence of clear scientific evidence about the contribution of pastoralism to sustainable development in the region. Therefore, this review analyses the state of research on the multifaceted relations between pastoralism and sustainable development in the Mediterranean with a particular reference to the global development agendas viz. Millennium Development Goals (MDGs) and SDGs.

METHODS

The article draws upon a systematic review of all documents indexed in the Web of Science (WoS). The review covers all 21 Northern, Southern and Eastern Mediterranean countries considered in the Mediterranean Strategy for Sustainable Development (UNEP/MAP, 2005, 2016). A search was performed in June 2021 using the search query: *(pastoralism OR pastoralist OR pastoral OR grazing*

OR rangeland OR pasture) AND ("sustainable development" OR "sustainable rural development" OR "development goal") AND (Mediterranean OR "North Africa" OR "West* Asia" OR "Balkan" OR Albania OR Algeria OR Bosnia OR Croatia OR Egypt OR France OR Greece OR Italy OR Israel OR Jordan OR Lebanon OR Libya OR Macedonia OR Malta OR Montenegro OR Morocco OR Palestine OR Portugal OR Serbia OR Slovenia OR Spain OR Syria OR Tunisia OR Turkey).* The search yielded 48 documents. Three inclusion criteria were considered: geographical coverage (viz. dealing with at least one Mediterranean country), thematic focus (viz. both pastoralism and sustainable development) and document type (viz. research articles, book chapters and conference papers; reviews were excluded). Following the analysis of titles, abstracts and full-texts, 22 documents were excluded (Table 1).

Table 1. Systematic review: Article selection process.

Selection steps	Number of documents	Number of excluded documents and exclusion reasons
Search on WoS	48	--
Screening of titles	48	1 document excluded because it deals with Canada
Screening of abstracts	47	20 documents excluded because they do not deal with the Mediterranean (2 documents), pastoralism (15) and/or sustainable development (3)
Scrutiny of full-texts	27	1 review excluded
Inclusion in the systematic review	26	--

Consequently, 26 documents were selected and included in the systematic review (Table 2); the selected documents include 24 journal articles and 2 conference papers.

Table 2. List of the selected documents.

Year	Number	References
2021*	1	Venturi et al. (2021)
2020	1	Noll et al. (2020)
2019	3	Alary et al. (2019); Correia and Chaves (2019); Faccioni et al. (2019)
2018	2	Berriet-Solliec et al. (2018); Fetzel et al. (2018)
2017	4	Chalazas et al. (2017); Genovese et al. (2017); Salvati et al. (2017); Statuto and Picuno (2017)
2016	4	Bagella et al. (2016); Jouven et al. (2016); Ocak (2016); Ocak et al. (2016)
2015	1	Gibon et al. (2015)
2013	1	Pantera et al. (2013)
2011	2	Bauer and Bergmeier (2011); Cohen et al. (2011)
2010	1	Barhoumi (2010)

Year	Number	References
2009	2	Beranger (2009); Le Roux and Bouazid (2009)
2003	1	Marin-Yaseli and Martinez (2003)
2001	1	Plieninger and Wilbrand (2001)
1999	1	De Miguel (1999)
1991	1	Bencherifa and Johnson (1991)

*As of June 2021.

RESULTS AND DISCUSSION

The analysis of the geography of the research on the nexus between pastoralism and sustainable development in the Mediterranean region suggests that there is a research divide with more research carried out in the Northern Mediterranean countries (NMCs) with respect to Southern and Eastern Mediterranean ones (Table 3). In fact, the highest number of the selected studies was performed in Greece, France, Italy and Spain. This might imply a higher interest in pastoralism among the research communities in NMCs or, simply and merely, that research systems are more performing and have better funding in these countries, which allows them to get quality results and publish them in journals indexed on WoS (which are often paying journals). Moreover, there is no single article that addresses the relationship between pastoralism and sustainable development in the whole Mediterranean region but there are some multi-country studies that deal with both shores of the Mediterranean. For instance, Alary et al. (2019) analyse the dynamics of agro-pastoral systems in Egypt, France and Morocco. Further articles have a more global perspective and provide comparisons between Mediterranean countries and those from other world regions (Ocak *et al.*, 2016; Venturi *et al.*, 2021). For example, Venturi et al. (2021) investigate the multifunctional role of the features that characterize cultural landscapes of traditional agro-silvo-pastoral systems in the Mediterranean and Latin America viz. the *sabana de morro* in Dolores (El Salvador) and pastures with carob trees in Ragusa (Sicily, Italy).

Table 3. Geography of research on pastoralism and sustainable development.

Country or region	Number of documents	References
Greece	5	Bauer and Bergmeier (2011); Chalazas et al. (2017); Fetzel et al. (2018); Noll et al. (2020); Pantera et al. (2013)
France	4	Beranger (2009); Berriet-Solliec et al. (2018); Gibon et al. (2015); Jouven et al. (2016)
Italy	4	Bagella et al. (2016); Faccioni et al. (2019); Genovese et al. (2017); Salvati et al. (2017)
Spain	4	Cohen et al. (2011); De Miguel (1999); Marin-Yaseli and Martinez (2003); Plieninger and Wilbrand (2001)
Algeria	1	Le Roux and Bouazid (2009)
Morocco	1	Bencherifa and Johnson (1991)
Portugal	1	Correia and Chaves (2019)
Tunisia	1	Barhoumi (2010)

Country or region	Number of documents	References
Turkey	1	Ocak (2016)
Mediterranean *	1	Alary et al. (2019)[1]
Northern Mediterranean **	1	Statuto and Picuno (2017)[2]
Global ***	2	Ocak et al. (2016)[3]; Venturi et al. (2021)[4]

*This category includes documents dealing with at least one southern/eastern Mediterranean country and one northern Mediterranean country; ** This category includes documents dealing with at least two northern Mediterranean countries; *** This category includes documents dealing with at least another country outside the Mediterranean region.
[1] Egypt, France and Morocco; [2] Italy and Montenegro; [3] Romania and Turkey; [4] El Salvador and Italy.

Most of the selected documents deal with cattle, goats and sheep but a few address other animal species such as horses (Jouven *et al.*, 2016). No article analyses the potential contribution of pastoralism to the implementation of the sustainable development agendas (viz. MDGs and SDGs) in the Mediterranean. Furthermore, studies on pastoralism in the Mediterranean region generally focus on environmental aspects while economic and socio-cultural aspects are generally overlooked.

As for environmental sustainability, most of the selected articles focus on land use and land cover changes (Plieninger and Wilbrand, 2001; Cohen *et al.*, 2011; Salvati *et al.*, 2017) as well as the effects of pastoralism on biodiversity, land and climate. Salvati et al. (2017) found that intensive grazing is one of the main drivers of land-cover changes in Tolfa-Cerite district (Northern Latium, central Italy) and a key cause of deforestation as it determined the forest conversion to pastures and shrublands. Meanwhile, Pantera et al. (2013) argue that valonia oak silvopastoral systems in Greece are being at risk of extinction because of deforestation, illegal logging, overgrazing and forest fires. However, Cohen et al. (2011) found that forest area more than doubled at the expense of non-forest habitats such as pastures and cultivated lands during the second half of the 20th century in the Catalan pre-Pyrenees (Spain).

Both overgrazing and abandonment of grazing can lead to environmental degradation (Noll *et al.*, 2020). Faccioni et al. (2019) show that the processes of intensification of dairy production and abandonment of summer pastures, unfold simultaneously in Alpine agroecosystems in north-eastern Italy. Referring to the Greek island of Samothrace, Noll et al. (2020) and Fetzel et al. (2018) argue that local ecosystems have been severely degraded because of decades of overgrazing by sheep and goats, as the feed demand of small ruminants covered by grazing exceeded available grazing resources. Bauer and Bergmeier (2011) argue that intensive grazing and overgrazing affected the plant communities of mountain woodlands in the western Crete (Greece) and advocate a set of exclosures in

different areas and elevations to allow their regeneration. Also, Plieninger and Wilbrand (2001) posit that livestock production intensification and traditional grazing practices abandonment threaten biodiversity within the *dehesas* agro-silvo-pastoral systems in Cuatro Lugares (Spain).

It seems that the impacts of pastoralism on ecosystems in general and biodiversity in particular depend on the pastoral system. In fact, while many scholars highlight the role of pastoralism in biodiversity loss, others point out that pastures are rich in biodiversity (De Miguel, 1999; Bagella *et al.*, 2016; Venturi *et al.*, 2021). For instance, Venturi et al. (2021) point out that traditional silvo-pastoral systems in El Salvador and Sicily (Italy) help "*creating important microhabitat for many animal and vegetal species and a network of ecological corridors*". Focusing on Central Anatolia (Turkey), Ocak (2016) and Ocak et al. (2016) suggest that by practicing agro-ecological principles over millennia, transhumant pastoralists have helped to shape a complex mosaic of habitats, reduce erosion, improve soil quality and deter the likelihood of forest fires. Also, De Miguel (1999) argues that traditional agro-sylvo-pastoral systems in Spain (*caserios* and *dehesas*) are important in the maintenance of biological diversity as a result of the continued optimization of natural resources management. Furthermore, pastoralism is important for the preservation of High Nature Value (HNV) farmland (Genovese *et al.*, 2017; Noll *et al.*, 2020). Correia and Chaves (2019) suggest that adaptive land management (e.g. rotational grazing system) can contribute to solving some environmental concerns related to livestock production and can regenerate and provide greater resilience to pastoral ecosystems.

Pastoral, agro-pastoral and silvo-pastoral systems provide different ecosystem services (Gibon *et al.*, 2015; Ocak *et al.*, 2016). According to Ocak et al. (2016), ecosystem services provided by Turkish transhumant livestock systems include biodiversity preservation as well as carbon sequestration and CO_2 emissions reduction to mitigate climate change. Likewise, Gibon et al. (2015) argue that extensive livestock systems have allowed the preservation of numerous ecosystem services in the Pyrenees National Park (France) and point out that "*The most common strategy seeks the long-term preservation of the different types of services (production, regulation, and cultural) provided by semi-natural ecosystems, from the field level to the landscape level*" (p. 305). The valuation of ecosystem services (Faccioni *et al.*, 2019) is at the interface between environmental sustainability and economic sustainability. In this respect, Faccioni et al. (2019) argue that local stakeholders in north-eastern Italy value positively the services provided by the mountain dairy livestock systems (especially regulation services cf. water quality) and the total economic value of ecosystem services clearly exceeded current expenditure on agro-environmental programmes. However, Chalazas et al. (2017) found that nutrient mitigation capacity is exceeded in a grazed area draining to the Gulf of Kalloni (Lesvos, Greece) with a compensation cost of millions dollars over a 20-year period.

Social and, especially, cultural issues are rarely addressed in studies on pastoralism in the Mediterranean. In this context, Venturi et al. (2021) argue that "*Despite*

many researches on traditional agro-silvo-pastoral systems tend to focus only on land uses and land use changes, is also important to analyse the different features that characterize cultural landscapes, as well as to produce detailed spatial maps, in order to preserve and valorise these systems as a whole". Indeed, it is important to recognise and valorise the multifunctional role of traditional pastoral systems such as *sabana de morro* (El Salvador) and Sicilian pastures with carob trees (Italy) (Venturi *et al.*, 2021).

The literature also underlines the paramount importance of local and traditional knowledge in the preservation of pastoralism and its transmission from a generation to another (Ocak, 2016). Bencherifa and Johnson (1991) warn that the cultural determinants behind indigenous resource-use practices (e.g. terracing, mobile pastoralism) do no longer exist in the Moroccan Middle Atlas mountains and natural resources are endangered by the new agro-pastoral patterns. Evidence from the area of Sefiane in Algeria (Le Roux and Bouazid, 2009) shows that the awareness of the community about the impact of desertification and land degradation led them to have a strong desire to be assisted in the development of environmental education initiatives. Such initiatives can combine the existing local, traditional knowledge with scientific knowledge to achieve a better understanding of the complexity of pastoral socio-ecological systems and suggest ways to ensure the sustainable development of pastoral communities.

Migration from pastoral areas can determine labour shortage. For instance, Fetzel et al. (2018) argue that large-scale migration from the Greek island of Samothraki to Germany in the 1950s and 60s caused a lack of labour power, which, in turn, hinders the capacity of local livestock breeders to apply adequate management practices to halt or reverse land degradation. This clearly shows the strong linkages between social dynamics and environmental degradation, especially in remote and isolated territories such as islands.

Studies also highlight trade-offs between the sustainability dimensions. For instance, Alary et al. (2019) suggest that there is an antagonism between social vulnerability and ecological efficiency as "*Crop and livestock integration reduced the risk of biodiversity loss and low environmental efficiency observed in specialized systems, but mixed systems were more socially vulnerable*" (p. 40). Likewise, Berriet-Solliec et al. (2018) identify and analyse trade-offs between short-term agricultural economic strategies of some livestock farmers and long-term environmental and social benefits produced by agro-pastoral systems in the Cevennes National Park (France). Beranger (2009) point to the opposing requirements of productivity and the respect of nature and its diversity, and argue that "*The correct utilization of the permanent pastures and the acknowledgement of the multi-functionality of grasslands are part of the sustainable development and of the protection of the environment*" (p. 465).

Some articles analysed the relationships, antagonistic or synergistic, between tourism and pastoralism in Mediterranean countries (Marin-Yaseli and Martinez, 2003; Genovese *et al.*, 2017; Statuto and Picuno, 2017). Marin-Yaseli and Martinez (2003) argue that the current model of tourism development represents

serious problems in terms of sustainable development as it had negative impacts on extensive livestock farming in Upper Esera (Spanish Central Pyrenees). In fact, tourism development determined a drop in livestock farming (decrease in livestock population and farms). This is due to the competition of tourism for labour and fertile land. The abandonment of pastures, in turn, led to a decrease in landscape diversity and an increase in fire hazard and soil erosion. However, using the example of the Lanzo Valleys, an alpine mountain region in north-western Italy, Genovese et al. (2017) suggest that pasture-based livestock farming systems (PLSFS) and tourism can coexist and put that a system of collaboration between firms and institutions may represent a strong network, able to foster sustainable development for the territory so that "*environment and cultural heritage may be preserved, as well as the economic perspective of farms reinforced, while the PLSFS could become more attractive for the tourism phenomenon*". Similarly, Statuto and Picuno (2017) suggest that the valorisation of vernacular farm buildings in areas of mountain pasture for summer cattle grazing can favour the sustainable development of rural tourism in mountain areas of southern Italy and Montenegro.

The literature also points out the importance of synergies in the sustainability of pastoralism in the Mediterranean area. For instance, Ocak (2016) suggests that there is "*a clear link between social and ecological resilience emphasizing that sustainable development relies on the interconnectedness between biological and cultural diversity*" (p. 439) in the case of mobile pastoralism in Central Anatolia (Turkey). Further elaborating on the necessary synergies in the Catalan pre-Pyrenees (Spain), Cohen et al. (2011) put that "*The sustainable development of this territory should make the objectives of conservation, biodiversity and landscape protection and the preservation of their Mediterranean features compatible, and support agricultural activities that will contribute to this biological diversity and cultural identity*" (p. 79).

Mediterranean livestock farming and pastoral systems have evolved to adapt to pressures such as climate change, demographic growth and urbanization as well as greater competition for land and water resources. In their analysis of the pathways for integrated crop-livestock systems in southern (Egypt, Morocco) and northern (France) Mediterranean countries, Alary et al. (2019) identified two main trends: a centrifugal trend of specialization and a centripetal trend of diversification. Both pathways are affected by the gradient of socio-ecological contexts and the availability of natural resources. The specialization trend is towards cash crops or dairy herds in favourable areas and pastoral systems for meat production in harsher environments. Meanwhile, the diversification trend is based on mixed crop-livestock systems in irrigated areas and agro-pastoral livestock-crop systems in intermediate rain-fed areas.

Some papers highlight the importance of policies in determining not only the environmental sustainability of pastoralism but also the socio-economic sustainability of the livelihoods of pastoral communities (Alary *et al.*, 2019; Noll *et al.*, 2020). In this regard, Noll et al. (2020) put that "*The regional implementation*

of CAP (Common Agricultural Policy) continues to support excessively high animal numbers, while farmers are highly dependent on subsidies and find themselves in an economic deadlock" in the island of Samothrace (Greece). Indeed, in the European Union (EU), subsidies play a paramount role in livestock farmers' income but they also determine their financial dependency which can increase their economic vulnerability. Alary et al. (2019) call for dedicated rural development policies that favour the diversification as a lever for sustainable development, take advantage of spatial mobility abilities of livestock farmers, promote collective actions, develop higher value added product chains, while halting or reversing land fragmentation and degradation.

Sustainable development also implies the adoption of inclusive governance arrangements and participatory processes that ensure the active involvement and participation of pastoral communities in the development of their territories. However, experience from north-western Tunisia (Barhoumi, 2010) shows that the leading role played by the public administration in designing and implementing development projects and the population's expectations are among the main difficulties faced when applying participatory approaches.

CONCLUSIONS

This paper explores how the scholarly literature indexed in WoS addresses the relationships between pastoralism and sustainable development in the Mediterranean. The analysis of the scholarly literature suggests that there is a divide with most studies performed in Northern Mediterranean countries (e.g. Greece, France, Italy and Spain). Furthermore, no article analysed the contribution of pastoralism to the implementation of the sustainable development agendas (viz. MDGs and SDGs) in the region. The analysis also shows that most of the selected articles deal with environmental sustainability (cf. biodiversity, land use, land degradation, deforestation) while social, cultural and economic aspects are generally overlooked. As for environmental sustainability, most of the selected documents focus on land use and land cover changes as well as the effects of pastoralism on biodiversity, land and climate.

Pastoralism is important for sustainable development not only from an environmental viewpoint, as a provider of different ecosystem services, but also from economic and socio-cultural standpoints. Pastoralism contributes to local economies and is central in the livelihoods of many communities in remote, mountainous Mediterranean territories. Pastoralism is also an important asset for developing different income-generating activities. Indeed, pastoralism-related culture, traditions and landscape are important in many rural tourism destinations. Pastoralism in the Mediterranean has been undergoing a deep transformation with social, economic, and ecological changes thus shaping the development of rural territories, especially remote and mountainous ones. The ongoing processes of intensification, specialisation and modernisation of pastoral systems (cf. agro-pastoral, sylvo-pastoral and agro-sylvo-pastoral systems) not only jeopardise the provision of various ecosystem services but also put at risk the

preservation and sustainability of traditional pastoral systems. In fact, these processes lead to an increase in stocking rates which exacerbates the pressure on the natural resources and determines overgrazing and/or grazing abandonment with an increase in reliance on purchased feed as well as disturbance of natural landscapes (cf. extension of shrubland). Such modernisation also leads to pastoral culture erosion and the abandonment of traditional systems such as sylvo-pastoralism and mobile pastoralism (cf. transhumance).

The sustainable development of pastoralism in the Mediterranean region implies halting and reversing biodiversity loss and land degradation, and mitigating climate change while ensuring the livelihoods and preserving the cultural identity and social fabric of pastoral communities. This implies improving the livelihoods and living conditions of pastoralists while preserving their unique cultural heritage and social capital and ensuring the continued provision of various ecosystem systems. Such a development pathway should be guided by and aligned with the principles and philosophy of the SDGs. In this context, more, Mediterranean-wide studies are necessary to better understand and operationalise the relationships between the development of sustainable pastoralism and the achievement of the SGDs in the Mediterranean.

The main limitation of the present research was the choice of the search database. The use of WoS means that the present article considers only quality scholarly literature published in journals with impact factor (cf. Science Citation Index Expanded, Social Sciences Citation Index) or that are under evaluation to get impact factor (cf. Emerging Sources Citation Index) as well as the proceedings of some conferences (cf. Conference Proceedings Citation Index – Science) and some books. This implies that articles published in journals, books and conference proceedings that are not indexed in WoS were not considered. Similarly, the grey literature (e.g. reports) was not considered in this paper.

ACKNOWLEDGEMENT

This work is financed by the Italian Ministry of Education, Universities and Research (MIUR) in the framework of PACTORES (Pastoral ACTORs, Ecosystem services and Society as key elements of agro-pastoral systems in the Mediterranean) project (http://www.pactores.eu) within ERANET-MED program (project code: ERANETMED2-72-303).

REFERENCES

Alary V., Moulin C.-H., Lasseur J., Aboul-Naga A. and Sraïri M.T. (2019). The dynamic of crop-livestock systems in the Mediterranean and future prospective at local level: A comparative analysis for South and North Mediterranean systems. *Livestock Science*, 224: 40–49. doi: 10.1016/j.livsci.2019.03.017

Bagella S., Caria M.C., Farris E., Rossetti I. and Filigheddu R. (2016). Traditional land uses enhanced plant biodiversity in a Mediterranean agro-silvo-pastoral system. *Plant Biosystems - An International Journal Dealing with all Aspects of Plant Biology*, 150(2): 201–207. doi: 10.1080/11263504.2014.943319

Barhoumi L. (2010). Approach to Rural and Participatory Development in Northern Western Tunisia: implementation and outputs. *New Medit*, 9(2): 17–24

Bauer E.-M. and Bergmeier E. (2011). The mountain woodlands of western Crete – plant communities, forest goods, grazing impact and conservation. *Phytocoenologia*, 41(2): 73–105. doi: 10.1127/0340-269X/2011/0041-0482

Bencherifa A. and Johnson D.L. (1991). Changing Resource Management Strategies and Their Environmental Impacts in the Middle Atlas Mountains of Morocco. *Mountain Research and Development*, 11(3): 183–194. doi: 10.2307/3673612

Beranger C. (2009). Are the situation, the debates and the controversies of the beginning of the "Forage Revolution" in the fifties still of interest in 2009? *Fourrages* (200):465-474.

Berriet-Solliec M., Lataste F., Lépicier D. and Piguet V. (2018). Environmentally and socially beneficial outcomes produced by agro-pastoral systems in the Cévennes National Park (France). *Land Use Policy*, 78: 739–747.

El Bilali, H., Cardone, G., Ottomano Palmisano, G., Bottalico, F., Capone R. (2020). Mainstreaming of the Sustainable Development Goals in the Mediterranean: integration into policies and strategies. *AGROFOR International Journal*, 5(2): 15–26.

El Bilali H., Cardone G., Bottalico F., Ottomano Palmisano G. and Capone R. (2020). Pastoralism in the Maghreb: a review on environmental, socio-cultural, economic and political aspects. *AgroFor international journal*, 5(3): 105–118.

Chalazas T., Tzoraki O., Cooper D., Efstratiou M.A. and Bakopoulos V. (2017). Ecosystem Service Evaluation of Streams for Nutrient and Bacteria Purification in a Grazed Watershed. *Fresenius Environmental Bulletin*, 26(12): 234–244

CIHEAM and FAO (2015). *Mediterranean food consumption patterns: diet, environment, society, economy and health. A White Paper of Priority 5 of Feeding Knowledge Program, Expo Milan 2015*. Bari & Rome. Retrieved from http://www.fao.org/3/i4358e/i4358e.pdf

Cohen M., Varga D., Vila J. and Barrassaud E. (2011). A multi-scale and multi-disciplinary approach to monitor landscape dynamics: a case study in the Catalan pre-Pyrenees (Spain). *The Geographical Journal*, 177(1): 79–91.

Correia C. and Chaves C. (2019). Adaptive Management: Thinking over a way to Reduce Environmental Problems from Livestock Production. In: Ferreira P. and Soares I. (eds.). *4th International Conference on Energy and Environment - Bringing together Engineering and Economics (ICEE)*. Guimaraes, Portugal, pp. 378–384

Dernini S. and Capone R. (2021). A Change of Route in the Mediterranean, revitalising the 'Mediterranean Diet' towards more Sustainable Food Systems: A Cross-disciplinary Approach. In: Medina F. X. and Macbeth H. (eds.). *THE MEDITERRANEAN DIET from Health to Lifestyle and a Sustainable*. International Commission on the Anthropology of Food and Nutrition (ICAF), pp. 41–63

Faccioni G., Sturaro E., Ramanzin M. and Bernués A. (2019). Socio-economic valuation of abandonment and intensification of Alpine agroecosystems and associated ecosystem services. *Land Use Policy*, 81: 453–462. doi: 10.1016/j.landusepol.2018.10.044

FAO (2018a). *World Livestock: Transforming the livestock sector through the Sustainable Development Goals*. Rome. http://www.fao.org/3/CA1201EN/ca1201en.pdf

FAO (2018b). *Shaping the future of livestock - Sustainably, responsibly, efficiently*. Rome. Retrieved from www.fao.org/3/i8384en/I8384EN.pdf

Fetzel T., Petridis P., Noll D., Singh S.J. and Fischer-Kowalski M. (2018). Reaching a socio-ecological tipping point: Overgrazing on the Greek island of Samothraki and the role of European agricultural policies. *Land Use Policy*, 76: 21–28.

Genovese D., Culasso F., Giacosa E. and Battaglini L.M. (2017). Can Livestock Farming and Tourism Coexist in Mountain Regions? A New Business Model for Sustainability. *Sustainability*, 9(11): 2021. doi: 10.3390/su9112021

Gibon A., Ladet S. and Balent G. (2015). A socioecological assessment of the relationships between grassland management practices and landscape-level ecosystem services in Pyrenees National Park, France. *Fourrages*, (244): 305–319

Jouven M., Vial C. and Fleurance G. (2016). Horses and rangelands: perspectives in Europe based on a French case study. *Grass and Forage Science*, 71(2): 178–194.

Lacirignola C., Capone R., Debs P., El Bilali H. and Bottalico F. (2014). Natural Resources - Food Nexus: Food-Related Environmental Footprints in the Mediterranean Countries. *Frontiers in Nutrition*, 1: 1–16. doi: 10.3389/fnut.2014.00023

Marin-Yaseli M. and Martinez T. (2003). Competing for meadows - A case study on tourism and livestock farming in the Spanish Pyrenees. *Mountain Research and Development*, 23(2): 169–176. doi: 10.1659/0276-4741(2003)023

MedECC (2019). *Risks Associated to Climate and Environmental Changes in the Mediterranean Region - A Preliminary Assessment by the MedECC Network Science-policy interface*. Retrieved from https://ufmsecretariat.org/wp-content/uploads/2019/10/MedECC-Booklet_EN_WEB.pdf

De Miguel J. (1999). Nature and configuration of the agricultural-forestry-pasture landscape in the conservation of biological diversity in Spain. *Revista Chilena de Historia Natural*, 72(4): 547–557

Noll D., Lauk C., Gaube V. and Wiedenhofer D. (2020). Caught in a Deadlock: Small Ruminant Farming on the Greek Island of Samothrace. The Importance of Regional Contexts for Effective EU Agricultural Policies. *Sustainability*, 12(3): 762.

Ocak S. (2016). Transhumance in Central Anatolia: A Resilient Interdependence between Biological and Cultural Diversity. *Journal of Agricultural and Environmental Ethics*, 29(3): 439–453. doi: 10.1007/s10806-016-9613-z

Ocak S., Ogun S. and Yilmaz O. (2016). Creating Resilience for Transhumant and Small Farm Systems - Turkish and Romanian Paradigms. *Scientific Papers-Series D-Animal Science*, 59: 228–232

Pantera A., Papadopoulos A., Pantera M. and Papaspyropoulos K.G. (2013). Socioeconomic Dimension of Oak Forests: Understanding Local People Perceptions with Emphasis on Children. In: Lekkas T. (ed.). *13th International Conference on Environmental Science and Technology (CEST)*. Athens, Greece: Univ. Aegean and Global Network Environm. Sci. & Technol.

Plieninger T. and Wilbrand C. (2001). Land use, biodiversity conservation, and rural development in the dehesas of Cuatro Lugares, Spain. *Agroforestry Systems*, 51(1): 23–34. doi: 10.1023/A:1006462104555

Riccaboni A., Sachs J., Cresti S., Gigliotti M. and Pulselli R.M. (2020). *Sustainable Development in the Mediterranean. Report 2020. Transformations to achieve the Sustainable Development Goals*. Siena.

Le Roux C. and Bouazid T. (2009). Subsistence living and eco-positive behaviour: Two diametrically opposed concepts? A case study of farmers' perspectives in sefiane, Algeria. *Arab Gulf Journal of Scientific Research*, 27(1–2): 59–69

Salvati L., De Zuliani E., Sabbi A., Cancellieri L., Tufano M., Caneva G. and Savo V. (2017). Land-cover changes and sustainable development in a rural cultural landscape of central Italy: classical trends and counter-intuitive results. *International Journal of Sustainable Development & World Ecology*, 24(1): 27–36.

Serra Prieto V., El Bilali H., Ottomano Palmisano G., Bottalico F., Cardone G. and Capone R. (2019). Livestock, sustainable food systems and the Sustainable Development Goals. *X International Scientific Agriculture Symposium "AGROSYM 2019"; October 03-06, 2019 – Jahorina (East Sarajevo), Bosnia and Herzegovina*. pp. 1556–1563

Statuto D. and Picuno P. (2017). Valorisation of vernacular farm buildings for the sustainable development of rural tourism in mountain areas of the Adriatic-Ionian macro-region. *Journal of Agricultural Engineering*, 48(1s): 21. doi: 10.4081/jae.2017.643

UNEP/MAP (2005). *Mediterranean Strategy for Sustainable Development: A Framework for Environmental Sustainability and Shared Prosperity*. Athens. Retrieved from http://mio-ecsde.org/epeaek09/basic_docs/unep_mssd_eng.pdf

UNEP/MAP (2016). *Mediterranean Strategy for Sustainable Development 2016-2025*. Valbonne. https://planbleu.org/sites/default/files/publications/mssd_2016-2025_final.pdf

Venturi M., Piras F., Corrieri F., Martinez Aguilar E.A. and Santoro A. (2021). The multifunctional role of linear features in traditional silvopastoral systems: the sabana de morro in Dolores (El Salvador) and the pastures with carob trees in Ragusa (Italy). *Biodiversity and Conservation*. doi: 10.1007/s10531-021-02220-9