

## CHAPTER 4

# CHANGING AGRICULTURE – CHANGING LANDSCAPES: WHAT IS GOING ON IN THE HIGH VALUED *MONTADO* LANDSCAPES OF SOUTHERN PORTUGAL?

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### ABSTRACT

*The Portuguese montado is a particular land use system, characterized by the combination, in the same area, of the forestry and the grazing components interrelating with each other, in large-scale farm units. Mostly, this system is acknowledged due to its specific landscape character, in a savanna-like phisionomy, with changing densities along a continuous tree cover of holm and cork oaks and grazing in the under cover. The montado is a production system, and its extensive character and particular pattern makes it possible to support a multitude of ecosystem goods and services nowadays valued by society. Nevertheless the system is threatened and the resulting landscape is under strong reduction in the last decades. This paper shows the dimension of the ongoing reduction, for the whole region of Alentejo, since 1960 and up to now. And furthermore, based on a survey to land managers of montado*

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*in a Natura 2000 site, it shows how the land management options for the most are still focusing on production and productivist ideals, even when keeping a multifunctional system. These orientations do not result in a radical replacement of the system, and therefore the illusion is kept that the multifunctionality is maintained – but progressively the system loses its balance and the tree cover decays in such a way that the montado disappears. This unique landscape is thus under severe threat. The paper ends with a discussion on the urgent need for integrated policy goals and tools for the montado as a system, and for much more collaboration with the land managers in order to strength the multifunctionality relevance and support a novel attitude replacing the productivist concept of farming, misleading in the context of this system.*

**Keywords:** *Montado*; agro-silvo pastoral system; savanna-like landscape; land management; productivism and post-productivism; decay

## THE *MONTADO* SYSTEM AND LANDSCAPE

The Portuguese *montado* is an agro-silvo pastoral system quite similar to the *dehesa* in Spain, and covering in Portugal most of the Southern region, Alentejo (Fig. 1).

Even if the different data sources do not show the same exact dimension, there is agreement that the total area covered is over one million hectares (Pinto-Correia, Ribeiro, & Sá-Sousa, 2011) (Fig. 2).

The most singular characteristic of the *montado* is its savanna-like physiognomy, spread throughout a large-scale mosaic, in changing densities, of cork (*Quercus suber*) and holm oak (*Quercus ilex rotundifolia*) trees (Fig. 3). Opposite to what characterize most well-known Mediterranean land use systems, the *montado* can only be found on large-scale properties, in a *latifundia* structure, where each farm unit can be from 100 to 1,000 hectares, and sometimes even larger. The highly extensive use of this system, developed along centuries of progressive human adaptation of the natural vegetation (Aronson, Santos-Pereira, & Pausas, 2009), explains why it is not manageable in small-scale farms.

*Montados* are complex agroforestry systems, in which complexity increases with the conjunction of production activities that share the

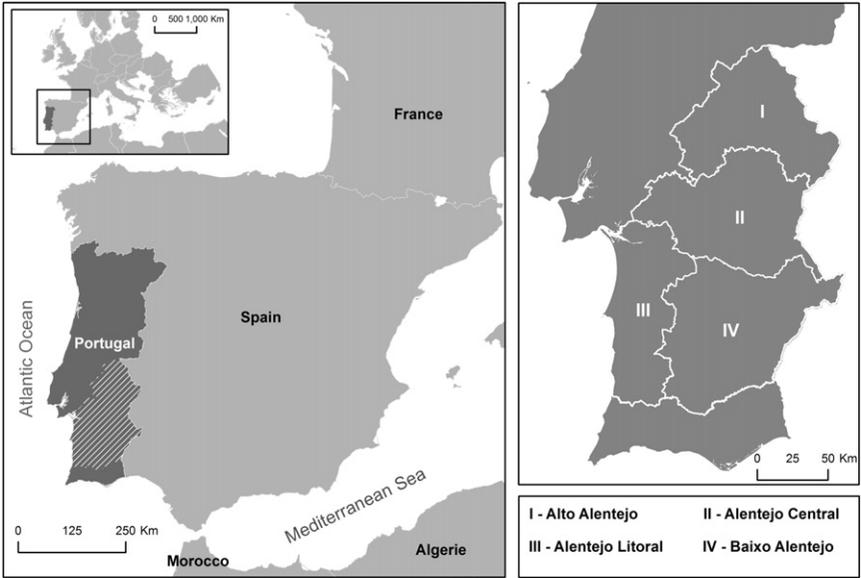


Fig. 1. Study Area and NUTS III Boundaries.

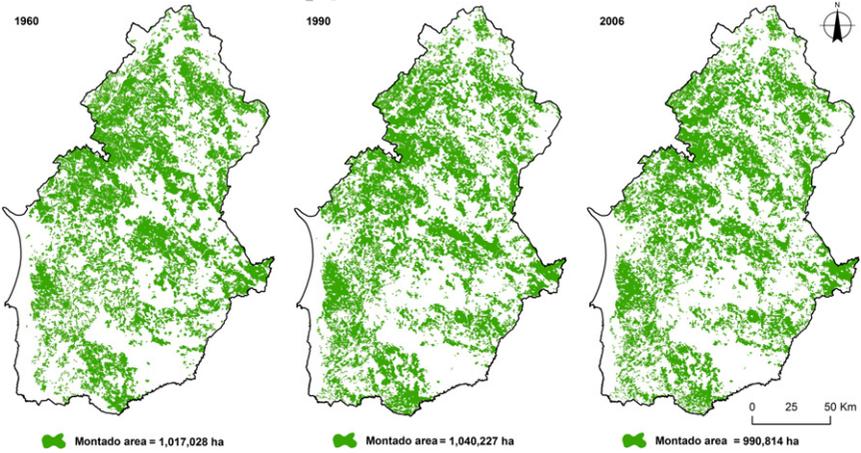


Fig. 2. Montado Land Cover Distribution in Alentejo Region between 1960 and 2006.



Fig. 3. Characteristic Montado Landscape in Southern Portugal.

same growing space in a region characterized by its site variability, especially at the climate, soil and topography levels (Pinto-Correia, 1993; Pinto-Correia et al., 2011). The *montado* is mostly acknowledged due to the cork production, in combination with charcoal produced from tree pruning, and livestock grazing in the undercover. Further, the *montado* is known for supporting other multiple and complementary productions as honey, aromatics, mushrooms, and a diversity of goods and services ranging from biodiversity to landscape character, recreation and cultural identity (Costa, Pereira, & Madeira, 2009; Surová & Pinto-Correia, 2008). Both the large-scale pattern combining both pastures and trees, and the fuzziness both of the tree cover and of the grazing and shrub patches in the undercover, create a particular landscape pattern highly appreciated today (Paracchini, Pinto-Correia, Ramos, Capitani, & Madeira, 2012; Surová, Surový, Ribeiro, & Pinto-Correia, 2011). Due to these qualities, the *montado* can broadly be classified as a High Nature Value Farming System, according to the European classification proposed by the European Environmental Agency and which is aimed for a better targeting of public policies for the provision of public goods and services through agriculture and forestry (Oppermann, Beaufoy, & Jones, 2012; Pinto-Correia & Ribeiro, 2012).



Fig. 4. Extensive Livestock Grazing in Montado Landscape.

Production activities in the undercover are extensive livestock grazing of cattle, sheep, goats, cattle and the Iberian pig (Fig. 4). These were combined in former days with cereal crops cultivated in long rotations with fallow, but cultivation is seldom today (Gaspar, Mesías, Escribano, Rodríguez de Ledesma, & Pulido, 2007; Plieninger, 2007). The open tree cover is maintained through natural regeneration and trees are seldom planted. Nevertheless, trees have a direct value as fodder crop, providing acorns and leafy branches in autumn and winter, when the herbage production is low, and an indirect value as shelter against cold in the winter and heat in summer (Cañellas, Roig, Poblaciones, Gea-Izquierdo, & Olea, 2007; Moreno-Marcos et al., 2007). Furthermore, the trees create the ecological characteristics that are fundamental to the sustainability of all activities occurring at stand level (Ribeiro, Surový, & Oliveira, 2006). The sustainable management of the combination sets of production activities requires a detailed knowledge of the resilience and elasticity of the forest components, in each particular conditions of climate, soil and topography (Ribeiro et al., 2004).

Despite its many qualities and the general acknowledgement of their value, the balance of the *montado* is threatened today by a combination of different factors (Costa et al., 2009; Eichhorn et al., 2006; Pinto-Correia et al., 2011).

The most acknowledged threats are, on one hand, the over-exploitation of the tree cover, as cork harvest and pruning for charcoal production, in non-balanced terms, which will harm and weaken the trees (Cañellas et al., 2007). On the other, intensification of the activities in the undercover, such as overgrazing and mechanized ploughing, may hinder tree regeneration, so that the long-term regeneration of the tree cover is not guaranteed (Plieninger, 2007). Natural regeneration can thus become unreliable. Artificial planting is seldom successful, as the development of the young trees is severely constrained by the hard natural conditions, when the root system and the canopy protection of adult trees is absent. The reduction in trees and the lack of regeneration is a severe threat to the future maintenance of the system. Mechanized and deep ploughing also affects the root system and weakens the trees. Overgrazing may result in compaction of the soil and higher erosion risks.

Finally, in more peripheric and more fragile areas, there has been a trend of extensification or abandonment, that allows an invasion of shrubs and other oaks increasing the competition (reducing cork production), resulting in shrub encroachment and the risk of forest fires (Pinto-Correia & Mascarenhas, 1999). Furthermore, ongoing climatic change may presumably induce more repeated and severe droughts, while the spread of wildfires may force the turnover of *montado* mosaic into large and persistent shrublands (Acácio, Holmgren, Rego, Moreir, & Mohren, 2009).

From a landscape perspective, the impact of these changes in management will lead to a simplification, with the progressive reduction of the *montado* area, through an extreme opening of the tree cover or, on the opposite, shrub encroachment and thus a turn into a dense maquis or forest formation.

## RECENT CHANGES IN THE *MONTADO* PATTERN

Considering the region of Alentejo, the distribution shown in Fig. 2 is clear in showing how the *montado* is dominant in the landscape pattern of the region. In the area of *montado* shown in the maps, all different types of pattern are included: with the tree cover dominated by *Quercus suber*, by *Quercus rotundifolia*, a few with *Quercus pyrenaica* (in northern Alentejo), and many areas also with mixed tree cover. Further, the area of *montado* includes areas with more dense tree cover, also eventually more shrub, and a more forestry oriented use, and areas with a more sparse tree cover and a more relevant role of agriculture. The *montado* is an extremely resilient land

use system, where the different components can be maintained under a dynamic balance, even with different weights along time, resulting from different management options. Therefore, the local land cover pattern can be variable, within what is classified as *montado*.

This also means that cartographic delimitation of *montado* areas is a difficult task and the extent of these areas varies according to the criteria followed for example for tree density or for the use under the tree cover. The areas of *montado* can be classified as agricultural areas, under pastures or even sometimes cultivation, but they can also be classified as forest, or also shrub or maquis areas, and for example only part of the *montado* areas fall within what is classified in CORINE land cover maps as agro-silvo pastoral areas. For the maps shown in Fig. 2, data has been gathered from different cartographic sources specifically to produce a map of the *montado* distribution in the region of Alentejo, and its changes along recent decades (Godinho et al., submitted). The dates of the maps, 1960, 1990 and 2006 corresponds to the years from which the existing information is available.

What has been happening so far? The most striking change is that while the area of *montado* has been improving in the decades 1960 to 1990, in recent years it has been strongly reducing. In global terms, between 1960 and 1990 there has been an increase of 23,199 ha, while from 1990 to 2006 a decrease of 49,413 ha. This means an average rate of expansion of 773 ha year<sup>-1</sup> in the first period, and then from 1990 to 2006 an average rate of reduction of 3,088 ha year<sup>-1</sup>. The global patterns of *montado* change observed in 1960–1990 and 1990–2006 periods are the result of the magnitude of the loss and gain spatial processes all over the region. Despite the observed *montado* total area increase between 1960 and 1990, several areas in the study region registered a loss of *montado* in this period, mainly in the Baixo Alentejo where the holm oak *montado* is dominant. On the contrary, for the period 1990–2006, results of the spatial analysis showed there was only an insignificant *montado* area increase, in a few areas. And mainly, as shown above, the global balance of this 16-year period put in evidence there is a long-term declining trends of the *montado*. The figures are alarming, as they show a continuous decrease. And this alarm is strengthened by other data on case-study areas in the region, which show how this trend has continued in the years from 2006 until now.

The *montado* has been developed along centuries, and results from the progressive adaptation of the natural ecosystem into a productive land use system that could deal with the natural constrains of the region and, through the integration of the agro-silvo and pastoral components, profit

from all the scarce resources (Aronson et al., 2009; Pinto-Correia & Fonseca, 2009). Nevertheless, this integration requires multiple levels of human intervention, and a careful intervention in the system at each level. Most work has been done until the 1960s–1970s with manual labour, what was made possible due to the property and social structure in the region of Alentejo. With the progressive increase in labour and other production costs, the general replacement of manual by mechanized work, and after the change in the Portuguese political regime and the integration in the European Union as well as the globalization of markets, the former balance in the management of the *montado* was disentangled. The changes registered reflect the disappearance of the former balance and the quest for new paradigms and management practices.

The areas most affected by this reduction are the areas of holm oak, more dominant in the in-land, in areas with poor soils and harsh dry Mediterranean climate, and formerly valorized to a large extent by the grazing of Iberian pig. The propagation of the African swine fever in the sixties and the prohibition of grazing pigs, have stimulated the destructions of significant areas of holm oak *montado* to promote other land-use types with better economic returns (Crespo, 2005). The holm and especially the cork oaks have been protected by law since the past, and are since 1977, and again 1997, under sever legislation controlling their use. They cannot be withdrawn without permission from the competent authorities – but a land use damaging the tree balance and impeding natural regeneration leads in the same way to the tree cover depletion, in the medium term. In a first stage, in the middle of the 20th century, many of these holm oak areas were used for intensive cereal cultivation with heavy machinery that led to soil degradation and depletion, and also in the medium term, to the decay in the trees, with no regeneration, and thus a progressive disappearance of the tree cover. More recently (1986–2006) the afforestation with faster growing trees (*Pinus* and *Eucalyptus* spp.) in the depleted soils and generally in soils with low agricultural capacity, emerged as a viable alternative to the economy of the agroforestry holdings. Eucalyptus have been planted since the 1970s in the whole Portugal, as a response to agricultural abandonment and the demand of fast growing timber by the paper industry. Pine trees have been planted in the Alentejo region since the middle of the 1990s, as a direct consequence of the afforestation measures within the CAP (Common Agricultural Policy), after the reform of 1992 (Pinto-Correia & Breman, 2009). Forestry measures have been used mostly in the *montado* areas which were already under decay, in poor or depleted soils, steep slopes or extreme peripheral locations, as a strategy to secure a regular income in plots where

the maintenance of the agro-silvo pastoral system was seen as difficult. On another side, on the better soils and also including cork oak *montado*, mainly since two decades ago, intensification in livestock production in the undercover is the major driver of change. Again here the major driver is the CAP measures, in particular the livestock premium. Payments according to the livestock headage lead to intensification in grazing. Further, as payments for cattle have so far been considerably superior to payments for sheep, many *montado* areas formerly grazed by sheep and goats have changed into cattle grazing, even if sheep or goats, with a much lower grazing impact, were better adapted to the preservation of the *montado* balance (Bugalho, Caldeira, Pereira, Aronson, & Pausas, 2011; Pinto-Correia & Breman, 2009). The high intensity of grazing and the use of heavy breeds leads often to soil compaction, depletion and the decay of the tree cover by lack of natural regeneration.

In this way, even if there is still much *montado* in the region of Alentejo, and even if this system is broadly acknowledged due to its specificity and the multiple goods and services provided, some drivers are affecting its management so strongly that the result is a decay in an extremely strong pace. There is no particular pressure caused by urban growth or infrastructure development. Besides the large Alqueva dam, where many hectares of *montado* have disappeared, mostly these pressures affect the small-scale farming and land cover mosaic. Changes in *montado* distribution are mainly resulting from changes in its management. The areas with more marginal conditions, poor soils, steep slopes and peripheral locations, are mostly under extensification and have been replaced by shrub encroachment or new forestations. In other areas, and especially in the more fertile soils, the changing trend is mostly intensification by cattle grazing and mechanization, leading to the decay in tree cover and progressive opening of the *montado*.

## LAND MANAGERS OPTIONS IN FACE OF CONFLICTING PRESSURES

The maintenance of this land use system and related landscape is a challenge today, both for policy makers as well as for land owners. The increased acknowledgement of the *montado* as a highly multifunctional land use system opens up multiple possibilities for new market driven activities as well as for an increased support through public policies. But for these new possibilities to support new management orientations, a paradigm shift is

required, not only in policy targeting, but mainly in the land owners goals and strategies (Marsden & Sonnino, 2008; Wilson, 2009).

Recent literature shows how land managers are now following different pathways. The main divide described from the Northern and Western European context is between those continuing the productivist strategy and those opting for a more post-productivist orientation (Holmes, 2006; Wilson, 2007, 2008). It is also described how those last land managers are often struggling to transmit this orientation in their practices, and may opt to adapt their management so that spatially there is a divide between productive areas and marginal non-used areas, and thus continue a dominant productivist practice (Marsden & Sonnino, 2008; Sutherland, 2010; Wilson, 2008, 2009).

The analysis of the options taken by land managers in the *montado* show a quite different arrangement between the attitudes expressed and the options followed in practice. The multifunctional character of the *montado* as it appears and is valued today creates the impression that its management aims for multifunctionality. A survey in the Natura 2000 site of Monfurado, an area of 24,000 ha in the centre of Alentejo, with large-scale holdings and a land use dominated by a dense *montado* has been applied in 2011 (Pinto-Correia, Menezes, & Barroso, 2012). 70 land managers have been interviewed, about their management practices and the relation to their expressed attitudes concerning farming. Land managers are here all those who take the decisions on management orientations for the farm unit; they include land owners, even if they are absent, not living in the farm but taking major decisions that are set to practice by an employee; they include also in some cases others which are not the owners but are responsible for management, as leasers.

This survey reveals how, even if the system is kept extensive, integrating multiple components, and supporting multiple ecosystems goods and services, this does not necessarily mean a post-productivist strategy from the land manager side. Production keeps on being the main driver of the land manager options, and the productivist ideal is strongly embedded in the farmers self-concept. A so far hidden tension is made clear. Previous surveys (Bruckmeier & Tovey, 2009; Rodrigo & Veiga, 2009) have showed how the conservationist behaviour by managers of these extensive systems may be grounded in reasons such as the awareness of the farm environmental constrains, sensitivity concerning heritage values, lack of entrepreneurship and the prevailing property structure. All these factors have been there for long. They do not reflect a transition process from productivism to post-productivism or a quest for a multifunctional landscape.

In the Monfurado survey, only 20% of the land managers inquired have expressed a conviction that their land should be managed for multi-functionality, and also in practice build their everyday management strategy based on this conviction. They keep an extensive management and promote or support other non-productive land-based activities in their land, and are much aware of their role in preserving a delicate balance for the long-term sustainability of the *montado*. The remaining expresses clear productivist goals. From these, a group of 25% keep the conventional extensive practice, with low intensity of grazing and a specific care for the natural regeneration of the tree cover, but express strong production oriented goals. This is the opposite to what often has been described from other regions of Europe, where some farmers describe themselves as non-productivist but opt in their everyday decisions for keeping a productivist orientation (Sutherland, 2010; Wilson, 2008). The remaining 55% in the inquired land managers express themselves and their convictions as agri-business farmers, and manage their land with a main focus on intensification and increase in production levels. This is mostly done through an increase in cattle density, and sometimes a change in cattle breeds to higher meat productive breeds. Such intensification in livestock production is reflected in a need to intensity cultivation in order to produce fodder, hay or forage, generally creating irrigated areas in the farm. Otherwise fodder to supplement the pastures needs to be bought outside the farm, increasing farm dependency from the exterior. In the Monfurado site, conditions for agriculture are relatively good and this is the most common trend. Extensification or abandonment trends are not significant.

The design of the Common Agricultural Policy tools so far surely has a role in the intensification strategies, as the payments for livestock production in Portugal have been kept fully coupled to production, and thus income from subsidies in the *montado* farms is strongly related to the number of livestock units in each farm. Further, cattle payments are considerably higher than sheep payments, what has led to a replacement of the later by the first, even in areas where cattle is far too damaging for the balance of the system.

Furthermore, previous studies on Alentejo land managers have shown how failing to observe the productivist ideal can have a significant and direct impact on the social position of farmers within the agricultural community and strong influence their ability to perceive themselves as good farmers (Rodrigo & Veiga, 2009). In order to keep their position in the farming community, land managers want to keep and be seen as producers, and better, successful producers. In the region of Alentejo, besides the role of the

CAP and its economic incentives in the last two decades, several historical conditions may contribute to explain the resistance of the productivist paradigm and the weakness of true transitions: fragility of the rural institutional framework; absence of capacity building networks; lack of social fabric open to new developments. The innovative and skilled rural entrepreneur faces a difficult context. Therefore probably, the transition into a multifunctional management model is still weaker than what can be expected from the analysis of the landscape multifunctional capacity.

As far as the landscape is concerned, the *montado* structure in each farm unit reflects the options of the landowner, and this production oriented paradigm has consequences. The cork and holm oaks are protected through specific legislation. They cannot be cut or withdrawn, or even pruned, without a specific permission by the competent authorities. But grazing intensity affects soil compaction and tree regeneration. And soil mobilization may increase erosion risks and affects the root system and also the survival of the young tree shoots (Ribeiro et al., 2004). Therefore, impacts of the options taken can only be observed to a large extent, in the long term. When land owners are not explicitly paying attention to the interlinked components of the *montado*, there is a lower attention to the tree cover and thus a progressive decay of the same, through lack of natural regeneration and weakening of the existing trees. In the long term, the result of intensification in livestock production is the progressive opening of the tree cover, with no younger trees to replace the old ones, and thus a replacement of former *montado* areas by open patches which will be occupied by shrub, if grazing or cultivation are not maintained.

The observed fast reduction in the *montado* area, shown in the maps from Fig. 2 and discussed in the previous section, demonstrates how the recent practices have affected the system and thus also the underlying fragility of this system.

## DISCUSSION: *MONTADO*, A THREATENED LANDSCAPE?

The fast reducing area of *montado* in Southern Portugal is shown clearly in the maps in Fig. 2. This is an evidence, and this reduction is much stronger than any change in the *montado* area observed before. This is nevertheless not a perceived change, nor by the public nor by the public authorities, as the extension of *montado* is still largely dominant in the land cover in the region, and decay and disappearance of the *montado*, as well as oaks

mortality, are seen as local processes. Nevertheless, understanding the land managers attitudes and options reveals the deepness of the threats affecting the *montado*. The heritage value that most land managers consider in the *montado*, and the respect they also express for this system and for its richness and specific character is being overwhelmed by the economic constraints they are facing, and mostly, their farmer self-concept.

The revealed conflict between the practices and the attitudes in the analysed land managers is quite the opposite to what has been found in other places in Europe. It has been described from different European examples how a post-productivist attitude and discourse is in opposition to the more productivist management, explained by land managers as needed in relation to economic survival (Marsden & Sonnino, 2008; Sutherland, 2010). Or also, in other examples, how different practices in the same farm, by the land owner as a producer or as a landscape manager, reflect different and complementary views on the farm (Primdahl & Kristensen, 2011). What this Mediterranean example shows is another combination of attitudes and practices. Many land managers keep a so far multifunctional system but many of them are aiming for a production oriented, and if possible a more specialized farm. Only a few opt for a management strategy aiming for multifunctionality and for valuing the multiple goods and services provided by the *montado*.

The question then, when aiming for the future preservation of the *montado* system and landscape, is what will be the future pathways taken by most land managers, and if it is possible to progress towards a renewed balanced management of this system.

The design of the Common Agricultural Policy and of the options for its implementation in Portugal, have so far resulted in conflicting messages to the land manager in such extensive and high nature value land use systems. The strength of CAP payments has created an increase dependency of land owners from its measures and schemes, and a deviation from long-term reasoning on the land use system. From one side, the coupled livestock payments and the higher premium for cattle lead to the replacement of sheep by cattle, in many areas where the pressure by cattle grazing is unsustainable, and further, it lead to a progressive increase in cattle grazing intensity. On the other, agri-environmental measures and other environment supporting schemes, including the afforestation support measures, aim for the opposite, e.g., extensive grazing and the maintenance of a semi-natural vegetation and natural regeneration of the tree cover. The new focus on land-based payments as discussed for the next coming CAP period may create a new reasoning. But also, even if policy mechanisms deriving from

the CAP will change in the next future, the global economic crisis and evolving context may lead to a higher pressure for food production in these Southern European regions and systems.

On one side, policy goals and design are crucial in this issue. If multifunctional landscape assets are to be exploited and contribute to the higher resilience of the *montado* in face of changing global context, then there is an urgent need to clarify policy objectives and avoid placing the land manager in face of conflicting instruments and options. On the other side, the need emerges to work more comprehensively with land managers for a broader understanding of their options and an integrative support and guidelines for a management oriented to multifunctionality, what could undoubtedly be strengthened by the construction of new land manager identities.

If land managers would value more explicitly the landscape qualities of their *montado*, focus on their landscape potential, they would be prone to enroll in a more complex and variable mix of production, consumption and protection goals in their farm management (Pinto-Correia & Breman, 2009). These changes would require a deepening, a re-grounding or a broadening in farm activities (Van der Ploeg & Marsden, 2008), similar to what has been done before in many *montado* farm units. The need for a joint strategy, playing at all levels of decision affecting the *montado*, is obvious. Only such a strategy can lead to a change the threatening trends observed today.

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