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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Land cover changes and forest landscape evolution (1985–2009) in a typical Mediterranean agroforestry system (High Agri Valley)" *by* T. Simoniello et al.

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REPLY TO REFEREE # 3

We thank the referee for his/her comments that we considered carefully. We have revised the paper by including further details on our analyses and by clarifying the rationale of our approach.

REPLY TO DETAILED COMMENTS

1. Referee # 3: The remote sensing classification is not well described. The authors should explain at least why they chose the K-means technique and the accuracy

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achieved at the end of the classification process.

1. Reply: In the revised version of the paper we have illustrated our approach more in detail. Our procedure is based on a preliminary exploratory analysis of the study area including detailed field surveys associated to the forest map database. On such a basis, we selected the classes of interest (14 classes) for detailing natural lands and forests at a level that is comparable to the CLC 2006 level 4. Such a detail was reached by adopting a hybrid classification approach. In particular, the K-means algorithm represents the first step of this approach and was selected as a simple and speedy pre-classification tool for a preliminary territorial partition; then, within such partitions, the ultimate step for the definition of the land cover classes was represented by a supervised classification. In the revised text, we also detailed the algorithm (Maximum Likelihood) used to classify the training areas identified on the basis of spectral information and ancillary data, derived from field surveys and forestry maps. For the class definition, we paid attention to hot spot covers in the area. As an example, we defined a specific class for the riparian vegetation, which is particularly important for the river management and, as such, in the analysed period was subjected to new specific national and European laws, as explained in the old text.

As far as the classification accuracy, this has been reported in the new version of the paper (about 85% for both the classifications). We apologize for the accidental omission occurred during the last editing of the manuscript.

2. Referee # 3: The analyses are mainly descriptive. The authors should add some analysis to describe the relation between land cover changes and environmental and socioeconomic factors. Some drivers are mentioned, but they are not systematically analysed with specific changes.

2. Reply: Maybe, the referee is used to work on areas characterised by quite different levels of anthropogenic and environmental pressure when it is necessary to evaluate the incidence of various macroscopic factors for explaining complex change scenarios.

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This is not the case. The picture emerging from our change matrix is simple, reflects stability and is sufficient for elucidating causal relationships in an area still characterized by a rural, rather uniform socio-economy. Changes can be interpreted straightforwardly in terms of efficient regional management policies, natural dynamics of resilient vegetation, and secondly to land abandonment; some cases of land take were also observed, which are related to the building of the oil exploitation plants. Census data are useful to support our findings within a descriptive context, as in the case of land abandonment, but specific changes consist of few and very small patches randomly distributed within natural areas (especially in forests) coherently with the absence of relevant spatial patterns in the driving factors (e.g., land abandonment is a regional scale phenomenon). Local inventories underlying socio-economic indicators mostly ignore the presence of small cultivated plots within forests. Often, just remote sensing is able to pick up them. Similarly, also for larger patches included in local inventories, but showing very confined variations, such as cultivation transformed in to riparian areas, the occurred changes can not be highlighted since the relative incidence is too low for modifying the spatial patterns in the driving factors. Whereas, the identified modifications of specific national and European laws for riparian areas in the analysed period and the significant increase (+18%) of these areas, which is substantially greater than that of similar classes, enabled us to directly put this change into correspondence with efficient management. The change detection does not suggest the existence of significant environmental stresses (absence of significant increments of artificial, bare and burnt lands or fragmentation of natural lands) and quality indexes estimated in previous studies on the Basilicata region, support this scenario (Ferrara et al., 2010; Imbrenda et al., 2013; 2014). Thus, we considered our study as concluded with the analysis of the main anthropogenic driver of change, i.e land management. We decided to compare public and private regimes rather than performing extensive and generic analyses of all the possible forcing factors. These arguments have been included in the new version of the paper to better explain our approach philosophy.

3. Referee # 3: The results of private vs. public forest tenure regimes are not clear.

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The authors should better explain the differences of the land cover changes between the two management.

3. Reply: We performed the comparison between public and private regimes for adding further information on the influence of management. Our results describe a very coherent picture where in both the cases the current legislation seems to be correctly implemented. In the new version of the paper we included some further comments. The main difference between the two regimes can be observed in the transitions from the “Grass and Pasture” to the “Coniferous” and “Shrublands” classes, which are characterized by near inverse percentages (4% toward Co and 18% toward Sh in the private sector; 14% toward Co and 4% toward Sh in the public sector). These differences are mostly ascribable to public reforestation interventions that in the private sector are more limited. Here grass and pasture mainly move toward shrublands that represent the next step in the ecological succession. Some other differences are substantially determined by peculiarities in the local vegetation cover mosaics where clearings have been colonised by neighbouring covers.

4. Referee # 3: The conclusion is also very under-developed. I think that the authors need to spend a bit more time in the discussion of the results. The paper doesn’t dealt with innovative methods and the results are not exactly something new in the Mediterranean context. So, what does the paper actually achieve? What’s the specific contribution? what do we have to learn from these changes? For example, the exploitation of on-shore oil reservoir is presented in the introduction, but at the end of the paper the authors don’t explain if there’s some relation with the changes occurred or not. Conclusively, I would encourage the authors either to re-think the scope and re-write the discussion with the addition of more quantitative and qualitative data.

4. Reply: Our paper fits perfectly into the Special Issue, which focuses on new monitoring strategies for the case study of the Agri valley. Accordingly, our goal was to provide an optimized tool (implementable in operative context) for the evaluation of the ecological stability of an agroforesty system characterised by historical marginal socio-

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economy under the impact of oil/gas extraction activities and to provide useful insights for the development of local management strategies. Thus, as explained above (issues 1 and 2), the assessment of the area in terms of land cover change does not need additional analyses or data because the picture provided by our purpose-oriented analysis is clear: the whole area in the investigated period is rather stable in spite of the presence of oil exploitation activities. The observed scenario is determined by efficient management practices both under public and private land management regimes without significant signs of anthropogenic stress.

The main requisite of our monitoring strategy is its ability to detect "high resolution changes" with low-cost data (free Landsat-TM data) and relatively simple investigations (hybrid classification and ecological metrics). These features make it suited for routine monitoring with performances that are competing with those of more expensive and complex data and analysis tools (e.g. extensive field surveys and photointerpretation or dedicated aerial campaign with hyperspectral sensors). In the new version of the manuscript we have more explicitly discussed aims and conclusions of our analysis.

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