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Pastures valorisation: Tools and effects

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Abstract. Pastures in Greece, as a public good, contributed through the ages to the development of efficient small ruminants farming systems and the formation and preservation of the local ecosystems. The shift of this type of livestock farming towards specialization in milk production was based on the abundant use of concentrate feedstuff. This increased milk productivity also contributed to the degradation of traditional pastures. The new Common Agricultural Policy period raises again the importance of pastoral resources. In this paper the methodological chain (advanced technological tools – innovated methods) that we have developed in order to response to the issues of land pastures' degradation and management are presented. The results of a research in the Region of Thessaly demonstrated that pastures renovation should be based both in the involvement of all stakeholders, as well as on the use of modern technology which will contribute to rational valorisation. Improving grazing capacity of pastureland helps to increase farm productivity and improve farm income through reducing animal feeding costs and adding value through an environmental friendly system of production. The existence of a favourable political framework and appropriate tools provides guarantees to the local rural communities for negotiate and decide the appropriate management of their pastureland aimed their sustainability.

Keywords: Pastures – Valorisation - Region of Thessaly - Technological tools.

La valorisation des pâturages: Outils et effets

Résumé. *Les pâturages en Grèce, comme bien public, ont contribué à travers le temps au développement de systèmes efficaces de petits ruminants et à la formation et la préservation des écosystèmes locaux. Le changement de l'orientation d'élevage vers la spécialisation de la production de lait a été basé sur l'utilisation abondante de nourritures concentrées. Cette augmentation de la productivité de lait a aussi contribué à la dégradation des pâturages traditionnels. La nouvelle période de la Politique Agricole Commune soulève à nouveau l'importance des ressources pastorales. Dans cet article, il est présenté la chaîne méthodologique (outils technologiques avancés - méthodes innovantes) que nous avons développée visant à répondre aux questions de dégradation et de gestion des pâturages. Les résultats d'un projet de recherche dans la région de Thessalie ont démontré que la rénovation des pâturages devrait être basée à la fois sur l'implication de toutes les parties prenantes, ainsi que sur l'utilisation de la technologie moderne qui contribuera à leur valorisation rationnelle. L'amélioration de la capacité d'un pâturage contribue à augmenter la productivité agricole et à améliorer les revenus agricoles en réduisant les coûts de la nourriture, mais en ajoutant aussi de la valeur à travers un système respectueux de l'environnement. L'existence d'un cadre politique favorable et d'outils appropriés fournissent des garanties aux communautés rurales locales pour négocier et prendre la décision concernant la gestion de leurs pâturages visant à leur durabilité.*

Mots-clés. *Pâturages – Valorisation – Région de Thessalie – Outils technologiques.*

I – Overview of current situation

Pastoral land in Greece, as a common good, contributed, through rational management, to the development of an efficient extensive livestock farming sector through the ages (Gidarakou and Apostolopoulos, 1995). The rich and varied flora of pastures contributed, and still does, to covering the nutritional requirements of animals and formulated the composition of high natural value ecosystems (Dover *et al.*, 2011). Although at country level pastoral land corresponds to about half (47.9%) of the Utilized Agricultural Area (UAA), lack of proper management and the

absence of any intervention to reverse degradation, contribute to reducing their productivity in both volume and quality of biomass, hence their failure to sustainably support self-sufficiency in livestock feeding (Hadjigeorgiou, 2011; Goussios *et al.*, 2014).

The public ownership character and the widespread adoption of a high productivity model in animal husbandry, as it was in other sectors of Greek agriculture in recent decades, resulted in replacing this resource with harvested feedstuff in animal nutrition (Hadjigeorgiou, 2011). The abandonment and the non-proper use of this resource contributed to its deterioration (quantitative and qualitative) and thus the diminution of its contribution to livestock production. At the same time, changes in land use of large areas in the lowlands from pastoral to arable farming and the absence of an official grazing land registry (grazing areas are not delimited relative to forestry areas) prevent the application of effective long-term management actions and often discourage establishment of new livestock farmers (Hadjigeorgiou *et al.*, 2002; Goussios *et al.,* 2014).

The rational management of those lands, in order to protect the landscape as well as the environment is of high priority and constitutes the means to obtain the balance between environmental concerns and farming. Rational and planed grazing contributes positively to maintain the established characteristics of these lands, functioning as a management tool and acting favourably in maintaining protected and endangered species (Hadjigeorgiou, 2011). It is now well documented that pastures in Greece are home to thousands of flora and fauna species, which are rings of a complex food chain. Grazing affects positively vegetation and plant species diversity, and in particular the "mosaic" of the landscape (Goussios *et al.,* 2014). In Mediterranean areas, grazing maintains the desired balance of vegetation and prevents invasion and dominance of some/several woody species, leading to the "green desert", thus achieving the conservation and protection of rare and endangered habitat types; also it functions as a tool to remove the flammable material from the understory of forests thus preventing wildfires.

This paper aims to present the methodological chain applied in the Region of Thessaly, Greece (Fig. 1) to resolve degradation and management issues of pastoral lands. Innovative approaches together with modern technology tools (GIS, satellite data, 3D-representation) as well as techniques-methods of pasture improvement were applied in order to: (a) facilitate the participation procedure in pastures' management, (b) raise the pastures' productivity.

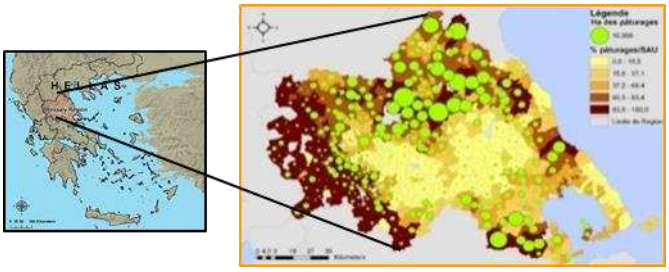

Fig. 1. Map of Greece showing the location of the Region of Thessaly and on the enlarged part the position and size (ha) of pastoral land.

II – Tools to confront the problem

The dominance of extensive and semi-extensive livestock farming in the Region of Thessaly, with significant presence of semi-nomadic farming, helps to preserve the extensive nature of the activity and relies heavily on abundant pastoral resources (Goussios *et al.,* 2014). In order to increase the productivity of these areas and improve the nutritional condition of extensive flocks, especially of sheep and goats, pilot interventions for pasture rehabilitation were undertaken.

Utilizing the innovation action to organize the dairy sector in Thessaly (the LACTIMED research program), the research cooperation of the University of Thessaly, the Agricultural University of Athens and the local authorities was established to reverse the degradation of pastures (Fig. 2). Pilot projects were run in Thessaly and specifically in the Municipality of Sofades aiming: (i) to increase nutritional and economic value of herbage biomass, that can be produced at low cost, by introducing selected forage plants, (ii) to increase the productivity of pastures as well as that of grazing animals. The choice of the selected legume forage plants was based on the abiotic characteristics of the micro-area and on the plants' capacity to react positively to management interventions. Challenging abiotic characteristics considered include: low winter temperatures, long drought periods and high summer temperatures, low fertility and productivity of soils, increased soil salinity etc. Researchers, local authorities' executives and farmers contributed to the monitoring and management of the pilot projects.

Fig. 2. Diagram of the research cooperation project in Thessaly - Visual presentation of the results.

III – Results and discussion

This pilot project brought results at: (a) *the technical level*: based on the analyses of herbage biomass and soils, the nutritional composition of plant biomass and of soil productivity increased twice or three-fold depending on the site; b) *the organizational level*: based on the results at the technical level (biomass volume, soil productivity) it was understood by farmers and by the municipality that is necessary: (i) the formulation of a pasture's management plan in order to pasturelands becoming productive and contributing to animal nutrition and productivity, as well as (ii) the cooperation between breeders and Municipal authorities to implement the management plan; and (c) *the technological tools* which were elaborated in this aspect and were of two types:

1. Participation Tools

With a view to increase participation into land management a methodological chain was developed, in order to allow the various groups operating in the area to gradually describe their relevant actions and practices, to formulate their own strategies and socio-economic objectives, and finally to really/actively involve with researchers in the process of understanding and processing a spatial development program. The success of the above methodology is based on the realistic depiction of the landscape, achieved with digital three-dimensional maps, the virtual flight tool and the integration of other technological tools comprising of geographic information systems (GIS) and remote sensing (using aerial and satellite images). Thus, virtual flight tool (3D-GIS) is a 3D interactive representation of case study area. This tool gives the ability of the 3D realistic representations and movements over the virtual world. The steps of creation of this methodological chain are (Faraslis, 2012):

- creation of the basic three-dimensional digital background,
- enrichment of the background using information by local residents,
- spatial processing and control of the collected qualitative - quantitative information,

- presentation of the current situation of the study area through 3-dimensional “virtual worlds”,
- creation of scenarios-proposals through the construction, presentation and evaluation of "virtual worlds".

The above methodology creates/generates an interactive tool that offers the possibility of a "common language" between researchers and residents/local actors in the region, strengthening dialogue, easing contradictions/conflicts and leading to consensus on effective remedies (Faraslis and Perakis, 2008).

2. Tools to manage pastures

For the efficient management of pastures a specific methodology was developed using geoinformatics technological tools such as remote sensing, pattern recognition and geographical information systems. In particular, to record the current state of pastoral lands (grazing capacity) and to monitor their evolution, the following were used: (i) Satellite data at different wavelengths and at successive time periods, and (ii) High resolution aerial images taken by Unmanned Flight Vehicles (UAV). This methodology involves the combination of field studies with image processing techniques (classifications-automatic image analysis techniques). Spectral signatures of the different vegetation types are connected, as they are associated on the multispectral images after the corresponding field measurements. Thus, the development of a tracking model of the amount of biomass according to the characteristics of pastures is made. Final products are maps of grazing capacity of the study area readily usable by stakeholders.

IV – Conclusions

In the new CAP programming period 2014-2020 the management and improvement of pasturelands across the country has been foreseen. At the same time, local authorities of the Thessaly Region have declared intention to undertake rational pasture management, in order to support livestock farming and to strengthen the connection of the product to the territory. The pastures’ valorisation is based on the involvement of all local stakeholders (local authority (owner), farmer (user), etc.) in their use and management with the use of technological and organizational tools. This contributes to their rational valorisation and conservation –enrichment of biodiversity of natural pastoral resources. Therefore, this contributes to the increase of productivity, the reduction of production’ costs and finally the maintenance of extensive farming.

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