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Complementary approaches to understand the collective dimension of breed management

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Abstract. This article deals with three levels of organisation (farm, territory and animal population) in two sheep breed cases of the Mediterranean region: the Corsica and the Karagouniko breeds. It illustrates their articulation, implementing the complementary approaches that were developed in two ARIMNET funded projects, DoMEStIc (2012-2015) and PeRFORM (2017-2020). The approaches refer to the better understanding of the dynamics and interactions between management and value-adding strategies for local breeds, address farming practices at farm level in connection with the breed management at the collective level. Participatory methodologies were also implemented to understand the involvement of stakeholders (public and private) on the dynamics of the breeds and local livestock farming systems. One of the main issues revealed in the analysis and exchanges, was the challenge to find the balance between the individual and the collective goals. Governance to tackle this challenge refers to various level of knowledge, expertise, capacities and willingness to connect people and objectives. It is a key topic, open to new approaches and methodologies and advancing in participatory research could ensure integration and articulations of several levels of concern.

Keywords. Collective organisation – Participatory approach – Breed management – Corsica ewe – Karagouniko breeds.

Approches complémentaires pour comprendre la dimension collective de la gestion des races

Résumé. Cet article aborde le cas de deux races ovines locales méditerranéennes, les races Corse et Karagouniko, à différents niveaux d'organisation (la ferme, le territoire, la population animale). Nous illustrons les articulations entre ces niveaux d'organisation, à travers plusieurs approches développées dans le cadre des projets DoMEStIc (2012-2015) et PeRFORM (2017-2020). Il s'agit d'une part de mieux comprendre les interactions entre gestion des races et valorisation des produits et d'autre part de mettre en perspective les pratiques de gestion génétique des éleveurs au niveau de l'exploitation avec le fonctionnement collectif de cette gestion génétique. Des approches participatives ont aussi été proposées pour contribuer à la compréhension des interactions entre dynamiques des races et des systèmes d'élevage mais aussi l'implication de différents acteurs dans ces dynamiques. Les analyses à différents niveaux et les échanges avec différents acteurs ont souligné les enjeux d'articulation entre objectifs individuels et collectifs. Mettre en relation différents types de connaissances et favoriser les échanges sur ces questions peut contribuer à faire face à ces enjeux. Il y aurait un intérêt à aller plus loin dans les approches participatives développées pour favoriser ces articulations.

Mots-clés. Organisation collective – Approche participative – Gestion de race – Brebis corse – Brebis Karagouniko.

I – Introduction

Mediterranean livestock production systems operate in an environment characterized by a high degree of dynamism and uncertainty. One of the aspects of their sustainability is connected with the diversity of the available animal genetic resources in interaction with their farming systems. Among the available genetic resources, local breeds adapted to specific territories and farming systems, are recognized as an important element for the maintenance of various and specific farming systems (Couix *et al.*, 2016; Gandini *et al.* 2010; FAO 2015).

In this context, local breeds that have been adapted over generations to satisfy the needs of farmers in the conditions of their local environment are considered as a biological, technical, but also

an organisational object supporting the resilience and the productivity of livestock activities in the Mediterranean hinterlands. As a technical object the local breed with its characteristics contributes to the resilience of the farming system (Couix *et al.*, 2016). Breeding practices at farm level aim to maintain or improve the adaptive capacities of the breeds, enabling them to produce in the local context of the livestock systems. These practices express farmer's individual choices at the farm level, but they also reflect decisions taken in the frame of local networks, linking farmers between them and with other operators (such as exchange of sires between flocks, marketing of goods). Therefore, understanding farmer practices at farm level is important but this is not sufficient (Lauvie *et al.*, 2015; Perucho *et al.*, 2020), as these practices interact with the actions conducted at the scale of the whole animal population.

Managing local breed brings together various stakeholders and is thus highly related to organisational aspects, through stakeholders' involvement and cooperation. The latter though varies within a country and across countries, as illustrated by the analysis provided by Leroy *et al.* (2017). The analysis was based on the information collected by FAO through the preparation process of the 2nd State of the World Country Report (SoW2) and showed the importance of improved coordination between the different stakeholders. In this context, Labatut *et al.* (2011) refer to the rapid evolution of the environmental, economic and technological context in relation to animal genetic resources (AnGR) over the next few years, impacting on the existing relationships among actors and stresses the need to define evolving rules and opportunities of coordination among stakeholders.

As a matter of fact, the local breed as organisational object enables the empowerment of stakeholders around a shared production project, linked with the adaptation of the breed to specific farming systems or value chains. Among the groups of farmers involved in breed management and several stakeholders involved in the valorisation of their products or services, it can be difficult to conciliate the different objectives, for instance the aim of conservation of local breeds and the need to improve animal performance to comply with the product requirements. The involvement of stakeholders with diverse objectives is addressed by several researchers (Lauvie et Couix, 2012), who underline the various interactions between breed and product and the degree of changes that breeders can apply in their breeding practices to comply with the product requirements. In this frame, the dynamics at the farm and at the animal population levels can interact with dynamics at a territory level (like value chains dynamics around specific products for instance) (e.g. Lambert-Derkimba, 2007).

The previous examples indicate that three levels of organisation, the farm, the animal population and the territory, are linked with local breed management. How can they be addressed on specific local breeds' situations?

This article illustrates the articulation between these three levels of organisation, using complementary approaches developed in two ARIMNET funded projects, DoMEsTlc¹ (2012-2015) and PeRFoRM² (2017-2020) (ARIMNET2, 2017). Two local dairy sheep breeds' situations are considered in our case-studies: the Corsica breed in the Corsica Island (France) and the Karagouniko breed in Thessaly (Greece). The approaches developed (i) propose a better understanding of the dynamics and interactions between management and value-adding strategies for local breeds (DoMEsTlc), and (ii) detail farming practices at farm level and put it in perspective with the description of the various dimensions of a breeding program at the collective level (DoMEsTlc and PeRFoRM). Implementation and outcomes of participatory approaches based on the previous research outcomes are finally presented.

1. Mediterranean biodiversity as a tool for the sustainable development of the small ruminant sector: from traditional knowledge to innovation, www.arim-domestic.net

2. Breeding and management practices towards resilient and productive sheep and goat systems based on locally adapted breeds, www.arim-perform.net

II – Material and methods

Concerning the study of the practices at farm level (breeding and flock management practices), 40 semi-structured interviews were carried out with farmers involved or not in the breeding program of the Corsica breed. These semi-structured interviews were enriched with personal observations on farmers' practices by visiting selected farms at key periods, like lambing, weaning and culling periods. Interviews were carried out so that discourse of farmers remains as spontaneous as possible, but oriented on topics of interest. The interviews aimed at specifying the link between the use of collective tools and the on-farm breeding practices. Information on the overall functioning of the farming system was used as illustrative data to discuss this link. The thematic sections of the interview guidelines were i) general information and use of agricultural land, ii) use and perception of collective tools for genetic management, iii) milk production, iv) reproduction, v) animal groups management and feeding practices, vi) replacement and culling practices (rate, temporality, conditions), vii) motives for choosing replacements and for culling animals (Perucho *et al.*, 2020). These interviews were carried out in the frame of the PeRFORM project.

At the collective level, an analysis grid focused on simple descriptors of the breed management was developed to assess the level of collective organisation and it was implemented in the two breed cases, the Corsica and Karagouniko sheep breeds, chosen as two examples of North Mediterranean sheep breeds. The descriptors included in the analysis refer to: 1) identification and role of stakeholders, 2) the existence of breeders' association and elements on the activities of the association (breeding program, selection tools, participation of farmers in decision making and other common activities) and, 3) other not institutionalised collective dimension activities, and exchanges with other stakeholders (not directly concerned by the breed management). This analysis grid was filled by using data reported in former studies and in the frame of the DoMEsTic and PeRFORM projects (Carayol-Costa 2011; Perucho, 2018).

At this same collective level, maps of collective organisation characterizing links between breed management stakeholders and products valorisation stakeholders were developed in each local breeds' situation, identifying the criteria that can be used to analyse territorial dynamics involving those breeds (DoMEsTic). The criteria identified concern: 1) the type of collective action related to breed and products at a territorial level, 2) the initiatives and main stakeholders, 3) the organisational level of the stakeholders involved, 4) the number of stakeholders and interactions, and definition of their roles, 5) the degree of formalisation of the link between breed and products, 6) the effective links between management of products and management of breed, and 7) the potential tension between different stakeholders on the territory (Lauvie *et al.* 2016).

We finally implemented participatory approaches through discussions with local stakeholders' groups in Corsica (n=1) and Thessaly (n=1) in the frame of the PeRFORM project. The type of participation aimed at "transmitting information about the results of the project in each case-study and improving this information thanks to feedback consultation). The operational aim was mainly to inform stakeholders, and the research aim was mainly to validate and improve results. The composition and the outcomes of the stakeholders' groups are presented in results.

III – Results and discussion

The Corsican breed is the main dairy sheep breed in the island of Corsica. A breeding scheme has been established and the selection criterion is based on milk yield, whereas other criteria are considered by the breeding Centre for the evaluation of breeding animals: resistance to scrapie, standard and rams' horns, and more recently udder conformation. This program is organised to involve several categories of stakeholders. Rams born from elite dams are systematically collected in farms at weaning and raised at the breeding centre of the breeding organisation. At the end of a selec-

tion process, rams that are not kept for artificial insemination (AI) are sold to breeders and others farmers through two annual fairs by the cooperative of the breeding scheme. Following the choice to make the use of AI mandatory for breeders within the breeding scheme, the number of involved breeders has slightly decreased to reach 57 breeders in 2016³. Except from the reluctance to AI, other factors limit the accession of farmers to the breeding scheme at the time of the study: farmers outside the breeding program perceive unsatisfactory udder morphology in the selection flocks, remaining of Sarda crossbreeding, mistrust collective action and/or are reluctant to fodder intensification. Despite these perceived limits, the scheme has participated to a global dynamic to maintain the local breed which is used for milk production in the whole island. The case of dairy sheep farming in Corsica illustrated that it is possible to use standardised selection tools (milk recording, genetic evaluation) and tools to disseminate genetic progress in a diversity of farms (AI, selling of rams by the cooperative of the breeding scheme), provided that the adverse effects of collective action are offset, on-farm, by the use of additional selection criteria suited to the farmers' objectives and the constraints of the production environment (Perucho, *et al.*, 2020). Indeed, the results from this case study showed that individual farmers' modalities of replacement and culling were not hindered by farmers' participation in the breeding scheme. Factors influencing farmers' perception and use of collective tools, including the modalities of use of milk recording within or outside of the breeding scheme, were linked to (i) the time devoted to animal observation and the work management (flock size, milking method, waged workforce) and (ii) the feeding resources and the potential of land use to reach the production goal (Perucho, *et al.*, 2020).

In Thessaly, the Karagouniko sheep breed is challenged by various pressures, connected with i) the dense network of operators importing or trading exotic breeds and their crosses, ii) the dairies policies favouring mainly high milk production (prices are based on volumes delivered to the dairy plant) and iii) the interruptions of the milk recording scheme due to discontinuities in the funding and changes of governance structures. These factors led to the decrease of the population size of the breed, which used to be the predominant breed in the region and also to the decreasing trends of flocks participating to the Official Milk Recording Scheme (n=43 in 2020). Dedicated meetings for the reviewing and decide on new orientations of the breeding goal are not implemented within the Breeders Association, although some meetings are organized in the frame of the ongoing Milk Recording Scheme, mostly oriented to specific technical topics. Artificial Insemination (AI) is not performed at large scale, besides the efforts made recently at a pilot study level, although in the 80s a specific scheme was implemented aiming to promote AI and diffuse rams produced, with the participation of several actors and promising results (Georgoudis *et al.*, 1995). Nowadays, dissemination of rams consist in direct interactions between farmers, is mostly restricted to farmers registered in the breeding scheme and based on reputation and level of confidence, whereas the Breeders Association has a minor role in these interactions. The selling of breeding animals is not, in this context, a noticeable way to add-value to local breed-farming.

Concerning the interaction of genetic management with other collective dynamics, the results from DoMEsTic reported by Lauvie *et al.* (2016), showed that the question of the social organisation was crucial in all the cases studied. The map of collective organisation that was developed to understand the coordination between local actors has shown that when local breed management and product valorisation are initiated at national level, difficulties for local stakeholders to get involved in these projects can be observed. Moreover, the size of the product processing projects and its dependence on a single large structure can influence the developments, as changes in the organisation, status and/or practices of this structure can have global consequences on the sector (Ligda, 2016).

3. Following the breeding scheme sources quoted by Perucho (2018). The total number of sheep's owners reported in Corsica in 2016 was of 568 (key figures of Corsican agriculture (2017 campaign) published by CTC, DRAAF and agricultural chambers).

The participatory approach implemented in the case of the sheep farmers of Western Thessaly aimed to exchange with a diversity of stakeholders on the field results. These results identified the “constraints” of breeding and farming practices that might challenge the medium and long-term efficiency of the breeding program. Participants were mainly farmers of the Karagouniko sheep breed participating in the program, other sheep farmers outside the breeding program (in total 20 sheep farmers), representatives from the Breeders Association, the Regional Livestock Genetic Resources Centre and local actors participating in development initiatives. A first presentation of results obtained in the frame of the PeRFORM project was validated by farmers and initiated a discussion on the current functioning and future challenges of the breeding scheme of the Karagouniko breed sheep. The discussions, mainly among farmers, made clear the need for more active involvement of farmers in the setting of breeding goals and the orientations of the breeding scheme. Other local stakeholders involved in local initiatives emphasized the importance of interaction among actors, through regular communication channels. A better characterisation of animal performances and potentialities through standardized and reliable criteria was also required to encourage dissemination of breeding animals within and out of the nucleus population. Besides, the meeting also pointed the lack of knowledge and understanding of classic collective tools (milk recording, AI) by breeders and farmers not participating in the breeding scheme. This lack of knowledge encouraged even more the practice of crossbreeding with exotic breeds for farmers not participating in the breeding scheme, considered as a quick and easy way to improve quickly milk productivity, without requiring a precise knowledge about individual performances. Communication to farmers on tools for genetic management, data collection on farm and interpretation of generated indicators appeared crucial. Drawbacks and gaps mentioned in this first exchange were finally the need for a better cooperation between breeders and with other actors of the value chain, in order to add value to the products from the Karagouniko breed.

The participatory approach implemented in the case of the sheep farmers of Corsica aimed to exchange with them on the field results that identified diversity of breeding practices and in link with farming systems among Corsican breed farmers. The exchanges were among 5 farmers participating or not in the breeding scheme of the Corsican breed, 2 accompanying persons (a farmers' wife and an extension services technician who came with a farmer) and 4 members of the research team. The results obtained were validated and a discussion was engaged on the following topics: i) the meaning of the term pastoralism ii) the type of animal to be selected in the future with respect to the evolution of farming systems in Corsica iii) the on-farm breeding practices to maintain the breed's rusticity. Among the small group, which however cannot be considered as representative of the Corsican sheep farmers' population, the vision of the breed and its orientation was not controversial, as the present farmers globally agreed on a need to find an equilibrium between different dimensions (breeds characteristics to be maintained, rusticity, and production challenge). Despite of this shared objective for the management breed, several participants pointed a current trend towards a two-speed selection of the breed: on one side, a selection focused on milk quantity associated to fodder intensification and supported by farmers delivering milk to dairies, in particular in coastal lowlands. On the other side, a selection based on a diversity of criteria including robustness, associated with more moderate expectations towards milk quantity and mainly supported by farmers processing cheese on-farm and located in areas where forage production is highly affected by the variability of weather conditions. In this context, the genetic diffusion through rams sold out of the scheme was also mentioned. However, the present organisation and the possible collective organisation to reach such a challenge of an equilibrium between different dimensions were not discussed in depth.

In Corsica and Thessaly, the exchanges initially designed for feed-back consultation also played a role of identifying problems and topics to stakeholders (in a problem finding approach). In the Thessaly case, the exchanges revealed i) individual breeding practices at farm level, ii) linkages between the different levels of organisation and especially tensions between objectives at both in-

dividual and collective levels. The need for engaging other stakeholders in the discussions on the orientations of the selection objectives was identified. In Corsica the organisation at the collective level was finally little discussed. The organisation of the breed management at the collective level, its interaction with global trends in the concerned territories, and with expectations at individual level could be a topic for further participatory work involving more stakeholders.

IV – Conclusions

The main outcomes of the two projects concern methodologies and frameworks developed to support local breeds and enhance their positive impact on rural economies. The interactions between management strategies of local breeds and value-adding strategies were used to provide the keys for identifying possible tensions and difficulties, along with positive aspects to support favourable dynamics. The means by which the breeding practices are connected at different levels to maintain coherence among livestock farming systems, local resources (including the breed) and product valorisation processes were considered. The Corsican case has shown that the collective tools are offset by the use of additional selection criteria according to the farmers' objectives and the constraints of the production environment. It raised the issue of managing a breed under a common selection goal when this breed is raised in a diversity of farming systems. The case-study of the Karagouniko sheep breed revealed the various challenges faced by a collective organisation for the management of a local breed in a context of high antagonism with imported highly productive breeds. In spite of the decrease of local purebred flocks of Karagouniko breed in Thessaly, a trend is also observed in crossbred flocks in Western Thessaly towards the introduction of Karagouniko breeding males in highly productive crossbred flocks (involving exotic breeds) in order to improve the flock response to some constraints of the biophysical environments (Perucho, 2018). Although this trend is recent, the future challenges associated to climate change in the Mediterranean area suggest that the use of local breeds to respond these challenges could increase in the future.

The research on breeding practices at farm level and the interactions with practices at collective level provided new elements on the role played by local breeds in the resilience of farming systems. One of the main issues revealed in the analysis and exchanges, was the difficulty to find the balance between the individual and the collective goals. The diversification of selection criteria of breeding programs could be a solution to tackle the diverse needs of farmers in various farming environments and promote their involvement in breeding schemes.

Good governance is always a crucial aspect, as it contains various level of knowledge, expertise, collective determination, capacities to connect people and objectives. It is an interesting topic for exchange among scientists, regional stakeholders, administration and farmers, open to new approaches and methodologies. Going further in developing participatory research, developing Local Stakeholders Groups with a further degree of participation (an active participation where all participant can contribute to the framing) would be a way to tackle these challenges and could help design collective solutions integrating individual and collective levels and their interrelations.

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