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The prospects of pastoral sheep and goat dairy systems in the Mediterranean to cope with global changing: An analysis from the Corsican case

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Abstract. For millennia, small ruminants in the Mediterranean were associated with agro – pastoralism, as a set of practices to manage sustainably spontaneous resources on a wide variety of areas. Today, these practices like transhumance fascinate sustainable development experts and inspire them in terms of territorial resource management and biodiversity or know – how preservation. But, yet, and particularly in dairy and cheese production, pastoral components of the production systems have steadily declined as a technical model in favor of more specialized, more controlled, more intensive systems. Regarding the challenges and changes that livestock is facing at climatic, environmental, and social levels, can pastoralism help to reconfigure livestock systems, contribute to the agro-ecological transition and, if so, under what forms?

With the aim of contributing to the construction of a sustainable pastoral strategy for Corsica, we conducted a survey among pastoralists. We analyzed the organization of their breeding, their performances and expectations. The results of these interviews testify the diversity of the technical and organizational choices of pastoralists to match their activities with their personal projects; we show that these choices are often far from traditional representations of pastoralism. They can serve to build new technical models with new coherences based on qualified skills at individual and at territorial scales. This approach is compared and discussed to compare the situation in Corsica to other situations in the Mediterranean.

Keywords. Technical models – Production systems – Prospective – Dairy systems – Pastoralism.

Les perspectives des systèmes laitiers pastoraux ovins et caprins en Méditerranée face au changement global: Une analyse à partir de la situation en Corse

Résumé. Pendant des millénaires, l'agro – pastoralisme en Méditerranée, auquel sont associés les petits ruminants, a permis de gérer durablement des ressources spontanées sur des terrains très variés. Il est à l'origine de pratiques qui fascinent aujourd'hui les spécialistes du développement durable et les inspirent en matière de gestion des ressources territoriale et de préservation de la bio – diversité. Pourtant, le pastoralisme ne cesse de reculer, en tant que modèle technique au profit de systèmes plus spécialisés, plus contrôlés, particulièrement en production laitière fromagère. Compte tenu des défis et des changements globaux que l'élevage doit aujourd'hui affronter, le pastoralisme peut-il contribuer à reconfigurer les systèmes d'élevage, et à la transition agro – écologique et si oui sous quelle forme ?

Pour contribuer à la construction d'une stratégie pastorale durable pour la Corse, des enquêtes ont été réalisées auprès d'éleveurs se réclamant explicitement de pratiques pastorales. L'organisation de leur élevage, leurs performances, leurs attentes sont analysées et discutées. La diversité des choix techniques et d'organisation des éleveurs, de projets personnels et de modes de vie recherchés sont souvent très éloignés des représentations traditionnelles du pastoralisme. Les références produites peuvent servir à identifier de nouvelles co-hérences basées sur des compétences qualifiées au niveau individuel mais également au niveau territorial. L'approche développée en Corse est mise en perspectives d'autres situations en Méditerranée.

Mots-clés. Modèles techniques – Systèmes techniques – Prospective – Systèmes laitiers – Pastoralisme.

I – Introduction

Corsica is a mountainous island located in the Central Western part of the Mediterranean basin. For millennia, pastoral activities associated to subsistence crop production have influenced the organization of the social life and pastoral culture keeps still in the minds and mental models of a large part of the society. We have chosen here the most common definition of pastoralism as a type of animal production based on the pasture of the spontaneous forage herbaceous and ligneous resources of rangelands. Pastoral production in Corsica was not specialized but dairy production and cheeses were an important part of these activities. A high percentage of lands could not be mechanized but grain could be produced up to high altitudes (Ravis – Giordani, 2001; Mercury, 2013). The progressive extinction of subsistence agriculture during the 20th century has contracted the space used by animals with a growing and general re-in forestation. One answer for animal production has been to settle in the few lowlands areas and continue to reduce the use of rangelands. Abandoning the high summer pastures has been also the consequence of the decrease of the number of breeders who in addition, prefer better conditions of living and working.

We consider this situation is not specific to Corsica, but it is characteristic of what happened in many Mediterranean regions where traditional pastoral systems have been marginalized, seen as archaic and doomed to disappear. Simultaneously, we observe in these areas, an important loss of biodiversity, a degradation of pastoral landscapes with erosion and scrub encroaching with an increasing risk of forest fires in less and less controlled territories. Meanwhile, everywhere, pastoral practices and know – how, appreciated typical products as cheeses fascinate more and more citizens, local stakeholders and development experts, who are inspired to manage territorial resources and to redesign technical systems to answer agro ecological transition issues (Dubeuf *et al.*, 2016).

In Corsica, the Regional authorities have decided to make pastoralism one of the priorities for the development of the island to face the new challenges of global changing and because more lands could be available in pastoral areas (Collectivité territoriale de Corse, 2015). Without documenting their vision, they considered also that pastoralism would have high potentials; and they took several initiatives to define an operational pastoral strategy (Dubeuf and Sorba, 2018).

From the Corsican example, the objective of this communication is to identify at what extent agropastoralism could be a way to re design technical models of dairy small ruminant animal production and for what objectives.

II – Presentation of the regional approach in Corsica

1. Methodology

The approach chosen to help building an operational strategy for pastoralism in Corsica is participative, prospective and based on a documented diagnosis of the present situation of the breeders regarding the pastoral components in their systems. Our hypothesis is that we need to document the present situation to produce landmarks on the productions systems, the breeders' practices and expectations. It has been supported and this project is financed by regional authorities and based on 3 main activities:

- A review of the available information and existing references on pastoralism in Corsica; The documents published between 1970 and now have been reviewed and analyzed to give a general view of the dynamics of pastoralism in Corsica and the main observed changes.
- Several interviews in sheep and goat farms on their pastoral practices, the expectation of the farmers, and the main technical and economical results; at this stage, 13 breeders were interviewed (10 during the study and 3 during a previous project), 7 with goats, 4 with sheep

2 with a mixed sheep and goat herd. All the breeders considered pastoralism is their type of animal production and they expressed how they see it. In the results a special focus was given on food autonomy and the interactions between the utilization of natural rangelands, their management and the distribution of external food (produced or bought hay and feed stuffs). The question of the pastoral products and the interactions between pastoralism, and the definition of pastoral products by consumers and prescribers have also been analyzed.

- The organization of thematic workshops involving the main actors of pastoralism in Corsica to share points of view about pastoralism and build a collective approach to define an operational strategy. The results of the first two activities will be mobilized during the ongoing workshops.

2. Results

A. The characteristics of the pastoral farms, their performances and practices

- **Localization of the farms, land structure available and pastoral practices:** Only three farms are located at an altitude above 500 m and two are in lowlands. Nevertheless, 11 from the 13 have no mechanized lands and most of them cannot produce hay or grain. Some of them cut some hay in far lands borrowed by colleagues but most of them buy hay (and mainly from the continent in the Southern France plain of Crau specialized in the production of high quality hay protected by a DPO). Most of the lands are rangelands with a mixed vegetation of shrubs and herbs associated or not to woods. Ten of 13 farms practice transhumance on summer pastures but only one process cheese during the transhumance what means that only dry, not milked animals go to summer pastures and the average duration of transhumance is below 2 months so significantly shorter than the traditional practices (4 months were reported). All the farms receive subsidies from the first Pillar of the CAP but only for a variable a part of the land they use.
- **Structure of the herds and production practices:** The average total livestock of the interviewed farmers is between 150 and 250 heads of sheep or goats except in one farm of 400 heads but located in the coastal plain. These results confirm the regional statistics showing that a majority of the bigger sheep herds are located in the plain with production systems based on natural or cultivated grasslands. In our case, the only herd located in the plain used natural and not irrigated lands and the farmer considers himself as following pastoral practices. The local sheep breed is the Corsican breed for which a rather efficient breeding scheme has been organized since 20 years. The goat breed is also mainly the old Corsican breed adapted to local conditions, but having neither an efficient selection scheme nor a collective organization, and many animals are crossed animals. Eleven of the 13 farmers are make cheeses at the farm although they sell a variable part of their milk to industrial cheese makers.
- **Technical performances and food efficiency:** The average milk yield per female is between 70 and 219 l/year for goats and 81 and 133 l/year for sheep. These performances are far below the average yield of both sheep and goats production systems in France but rather similar to the figures we observe in many other Mediterranean similar pastoral conditions. Otherwise, we cannot connect directly these yields to the amount of distributed hay and concentrate. While many references on the Mediterranean pastoralism consider that range lands can supply more than 65% of the total needs of animals, we observe here high variations on the pastoral autonomy indexes, between 22% and 75% but with an average under 50%.

Table 1. Main technical and economical results of the interviewed farms. NR: not recorded

Identification (Goats or Sheep)	G1	G2	G3	G4	G5	G6	G7	S1	S2	S3	S4	GS1	GS2
Altitude	<500m	<500m	<500m	<500m	<500m	<500m	<500m	>500m	>500m	lowlands	lowlands	<500m	>500m
Zip Code	202343	20226	20246	20250	20167	20232	20113	20250	20219	20167	20270	20167	20231
Age of the farmer (years)	40-55	40-55	40-55	<40	<40	<40	>55	>55	<40	>55	>55	40-55	>55
Size													
Total number of heads	230	249	302	240	245	182	207	133	208	260	430	G213/S232	G65/S82
Total female	170	203	234	160	220	142	160	113	169	210	360	G160/S200	G50/S66
Total male	20	8	25	10	15	18	35	4	29	40	60	G18/S20	G2/S11
Young does or ewes	40	38	43	70	10	22	12	16	10	10	12	G35/S12	G12/S5
Land used													
Mechanized lands	0	0	0	0	0	0	0	0	0	0	10	60	0
Range lands (ha scrubs and herbaceous without summer lands)	340	273	251	400	180	106	310	37	170	40	50	140	90
Dominant vegetation (herbaceous, ligneous)	L+H	L	L+H+Wood	L+W	L+H	L+H+W	L	H	L	H	H	L+H	L+H
Lands receiving subsidies (ha 1 st Pillar)	NR	NR	NR	120	100	47	55	NR	65	20	NR	30	22
Purchase of hay (t/year)	20,8	8,75	13	30	30	15,5	8	15	26	13,2	77,62	17,5	20
Purchase of Concentrates (t/year)	17,9	13,9	29,2	47,5	30	7,2	13,4	20	15	37,5	139	23,5	15
Transhumance s (Y/N)	O	O	O	N	O	O	N	N	O	O	O	O	O
Duration of transhumance (Months)	2	2	2	-	2	2	-	-	2	2	2	2	2,5
Mountain cheese making (Y/N)	N	N	N	-	O	N	-	-	N	N	N	N	N
Production													
Total milk production (l/year)	18000	25000	26600	35040	32450	18000	17920	17967	15041	27920	39600	10800	16200
Milk production/present female	106	123	114	219	147,5	127	112	159	89	133	110	67,5/81	84,2/84
Milk production /milked female	138	171	133	241	161	181	140	161	105	145	114	112,5/135	114/105
Fecundity (%)	94	83	85	91	92	70	75	99	90	90	97	60/60	66/91
Food autonomy													
Food requirements A (UF)	76166	82289	100137	86270	107703	65840	69950	50195	69996	93236	130892	93026	46520
Distributed food intake B (UF)	34524	37490	25940	66525	60002	18653	18424	35002	41002	46375	87502	47205	28650
Estimated food intake by range lands (A-B/UF)	42642	44799	74197	19745	49299	47187	51526	15193	28994	46861	43390	45821	17870
Pastoral Autonomy Index (A-B/A*100)	54%	54%	74%	23%	46%	72%	73%	30%	41%	50%	33%	49%	38%
Economic results													
Feeding costs (€)	17280	16498	19400	31550	23200	8680	10148	13900	25995	21186	29200	11500	11500
Sold milk products (€)	-	-	-	14003	-	-	61200	18000	-	69998	42000	-	-
Cheese products (€)	45000	57500	45520	79322	42000	40500	-	-	48000	61200	12600	78570	58300
Meat products (€)	7500	8640	15120	4500	7560	4320	6000	-	1120	8050	-	25500	-
Total Products	52500	66140	60640	83822	49560	44820	67200	49120	49120	139248	54600	104070	58300
Margin on food costs (€)	35220	49642	41240	52272	26360	36140	57052	4100	23125	118062	25400	92570	46800

From these data, we can assert:

- That range lands have the potentialities to provide a high amount of the forage supplies for the animals.
- That the control of pasture and pastoral management require high skills, know-how and references which have been lost in many cases.
- That there is great variety of rangelands and a good characterization and evaluation of their potentialities has to be carried out.

Thanks to a good valorization of the cheese and high milk prices, with good conditions to sell the kids (but not the lambs), and in spite of rather poor technical performances and high food costs, the pastoral farms can provide acceptable incomes for the farmers. But these results can be obtained as long as they receive subsidies from the CAP and they accept hard conditions of living. These conclusions agree with the conclusions of the typologies elaborated by the local regional chamber of Agriculture (Lafitte L-M., 2017, 2019; Idele, 2017; ILOCC, 2017).

These collected data are annual and for a given year. It would have been interesting to observe their interannual variability. The sanitary state of the flocks (specially for goats often highly impacted by paratuberculosis and other diseases) and the unpredictable and higher frequency of drought periods due to climate changing could affect the regularity of the performances.

B. Pastoral products: beyond stereotypes, foods to qualify

In many studies on pastoralism and its definition, the products are often forgotten. But defining pastoralism and its potentialities is also defining its products, how they are qualified. A recent research on this point (Sorba *et al.*, 2016) has shown the total dissociation between the product, the food, and the conditions in which it has been produced. The selling points are generally minimalist and give few elements on the qualities given to pastoral cheeses. In main land France, cheeses are sold on purchase platform while in Corsica, direct sale is more common. In the first case, commercial stereotypes are dominant (natural conditions, the aesthetics of pastoral landscapes...) with a permanent reference to the use of raw crude milk; in Corsica, the use of crude milk is considered as usual and the cheese eaters associate them more to very general pastoral conditions (the breed, fantasy traditional practices). The market arguments are very weak in all cases and do not consider the pastoral production conditions. The diversity of cheese types is not related to the diversity of production systems.

III – Discussion: What levers for dairy pastoralism in Corsica?

In Corsica, like in many other Mediterranean situations, small ruminants pastoralism is related to dairy and cheese production. We know that in many mountain areas, we observe a renewal of pastoralism for sheep and meat cattle production systems. But, the results presented above and their variability show that the production systems are not yet fully stabilized. In these conditions, at what extent, considering the special zoo technical requirements of the animals, pastoralism could be also a solution for production systems including milk production? We observe that at a large extent forage autonomy is absent of the systems and presently the purchase of hay outside the island is the rule. In dairy systems, the distribution of hay and concentrates during critical periods (early lactation, late pregnancy) is necessary to control production and we know there is a lack of lands for producing hay near most of pastoral farms. The organization of a regional collective feed autonomy at the island level could be imagined as a solution to stick to agro ecological objectives. Besides, and this is another critical point, the total amount of distributed hay and concentrates could be reduced in many cases without impacting the productivity of the herds. The traditional know-how have been at a large extent forgotten and it should be necessary to produce the references and practices to reconquer and manage the pastoral spaces, to make them available and attrac-

tive to the animals. Paradoxically, because the price of the products and the market demand are high, the context is not very incentive to controlled management of feed complementation.

Pastoralism is no more an archaic and extensive type of animal production. It requires high technical multifunctional skills, innovation, and should be intensified in qualified labor. One way could be to acknowledge its ecological services in the several protected areas of the mountains of the island and follow agro ecological principles. Qualifying and certifying pastoral products according to the conditions could favor their acknowledgment by the society. Such dynamics would require a collective mobilization, a good coordination between the several actors, efficient extension services and a strong public support with a good capacity to define a clear strategy.

IV – Conclusion

The Mediterranean area has to face important challenges at a short term: deadline related to climate changing, water and food shortages and the future of animal production or the management and development of hinterlands are some of these challenges. We have shown here that the case of Corsica is very relevant to identify and face these issues. In spite of nostalgic visions, the rural societies will not be anymore what they were and the return to the past is neither possible nor desirable. For example, no young farmer would accept to give all his time to build stone walls and terraces. It is necessary to imagine new technologies, new know-how mobilizing for instance digital technologies, new knowledge to answer the present environmental and ecological challenges. To explore them and propose solutions for future, we plan to organize a prospective workshop and build collectively scenarios for future.

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