

Adaptation of territorialised food systems to climate change in the Mediterranean region: application to an agro-ecological cluster project in the Medjerda valley (Tunisia)

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According to the forecasting carried out by Agrimonde experts (Paillard *et al.*, 2010), North Africa and the Middle East will be the regions with the worst deficit in terms of food resources in the world by 2050. Nevertheless, these estimations do not take into account the effects of climate change that could, in the long term, cut crop yields by 30% in the region. The consequences of such a scenario would obviously be disastrous on the social, economic and environmental levels.

In Southern and Eastern Mediterranean countries (SEMC), agriculture and related activities employ at least 72 million people (25% of the total population). Around 2 million jobs a year will have to be created between 2010 and 2030 in the region, in addition to the necessary resorption of a high rate of structural unemployment.

The 11 SEMC are likely to undergo severe food insecurity, with deficits that could reach up to USD 50 billion¹ in 2030, thus jeopardising public health and social cohesion in these countries (Rastoin *et al.*, 2012).

The Mediterranean basin, with 1.6% of the global territory, hosts 10% of known plant species and 18% of known animal species (Padilla, 2012). It is therefore rich in seriously threatened biodiversity.

Thus, it seems necessary to study the potential links between food safety issues and agricultural natural resources dynamics in the Mediterranean. In its works, IPEMED suggests the implementation of North-South and South-South agricultural partnerships, based on integrated territorialised food systems (Rastoin et Benabderrazik, 2014) capable of tackling sustainable development issues, and especially climate change.

Towards territorialised food systems

“A *food system is the way men get organised in space and time to get and consume their food*” (Malassis, 1994). This definition obviously includes consumers, but also all the actors of the food chain, not from farm to table but rather from the plant seed or the animal to the molecules going out of waste treatment units. The food system comprises the sector of agricultural supplies, farmers, food artisans and industries, the sectors of packaging, recycling, equipments, retailers, transporters, restaurants, financial and communication services, innovation as well as training and public organisations in charge of agricultural and food policies (Rastoin et Ghersi, 2010).

At the global scale, food systems are numerous and varied. Yet, the last few decades have seen the hegemonic development of a mass consumption and production agro-industrial system, specialised, concentrated, globalised and structured by huge industrial and commercial firms. Even though this model efficiently contributes to reducing the cost of food, by improving its bacteriological quality and accessibility, it generates a certain number of negative externalities encouraging innovation in order to build a new and more “sustainable” type of food system.

This is how the scientific community came up with the concept of “territorialised agri-food systems” (TAS): by associating the concepts of territory and agri-food sector and by integrating a dual objective of social responsibility (for farmers and consumers alike, in other words food ethics) and of sustainable development. This new food system - based on the failure of current systems - is part of a dynamic vision of progress. It is a constructivist, normative and participative approach.

¹ 2012 American dollar

A TAS can be defined as a “*set of agri-food sectors located in a regional geographic space and coordinated by a territorial governance*” (Rastoin, 2015). This notion highlights a triple proximity, as opposed to the long production chains of agri-food globalisation. It is primarily about proximity in the ecosphere, by diversifying agricultural productions, by “reconnecting” vegetable, animal and forestry sectors, according to agro-ecological principles. The second proximity is about the reunification of agriculture and food industries. This reunification will happen by providing processing units in priority with agricultural raw material from the region where they are settled. The third proximity will happen via the reorientation of food demand towards a more abundant and varied local offer, with easily traceable quality, which an increasing share of consumers is asking for.

Adaptation to climate change

A TAS favours adaptation to climate change by mobilising:

- Local biodiversity and therefore animal and plant species adapted to agro-climatic constraints of the zones used for agricultural production;
- Renewable resources of the cultivated and non-cultivated biomass to produce the necessary inputs, and particularly energy inputs;
- Technological strategies favouring a balanced management of natural resources (earth and water) and a circular economy (ecodesign, waste recycling) (Madignier *et al.*, 2015).

These strategies of adaptation to climate change will contribute, directly or indirectly, to the expected impacts of TAS in terms of economic (continuation of activities, competitiveness), social (reduction of rural exodus) and environmental issues (reduction of greenhouse gases, water management) (Hallegate *et al.*, 2008).

Everywhere in the world, initiatives for more sustainable eating habits are developing. They are the result of a dual awareness. On the one hand, a good diet is a key element for a good health and less specifically for individual and collective well-being. On the other hand, the conditions in which our food is produced and consumed, from the gene to the bin, have a significant impact on the natural, economic and social environment. Progress initiatives mostly come from the civil society and, to a lesser extent, from farmers, agri-food VSBs and SMEs and commercial operators. They concern new technical strategies of production (agro-ecology in general), transformation (ecodesign of artisanal and industrial workshops), new packaging, the promotion of co-products (bio-energy and bio-based products), the fight against waste and new forms of organisation (social economy companies) and of consumption at home or outside the home. This emerging movement; that some consider as a breaking point and others as a transition, is part of the search for a sustainable food system. These initiatives are the foundation on which TAS will be built.

The project of Béja dairy cluster (Medjerda valley in Tunisia) is an example of such initiatives, with a Euro-Mediterranean dimension (Lactimed project).

The cluster project of Béja dairy sheep farmers: a territorialised agri-food sector initiative

The dairy industry in Tunisia

Tunisia has long known a deficit in milk. Even though it achieved self-sufficiency in cow's milk, with a yearly production of about 1 billion litres - more than half of which comes from off-land industrial farming, which raises sustainability issues - it is not the case of sheep's milk.

After a peak in the 1980's when there were about 200,000 milk ewes, the flock fell to 15,000 in 2009 according to the Office of Livestock and Pasture (OEP). That is 10% of 1990's numbers and 0.3% of the total ovine population. Nevertheless, signs of recovery recently appeared: increasing price of milk, programmes for the improvement of ewes' production potential, farmers' organisation. Farmers, as well as technical and political organisations, are currently gaining interest in milk ewes farming. Thus, this "small-size" industry is considered as a space for experimentation for a new professional organisation and an adaptation of resulting public subventions.

Most of the ovine flock is located in the North of the country and more specifically in the Bizerte and Béja governorates. The whole milk production is intended for processing by the company Sotulaifrom in Mateur (Bizerte governorate) and by Béja artisanal dairies (H'Mad *et al.*, 2013).

The Sicilo-Sarde breed ewes - the only dairy breed in Tunisia - was introduced at the beginning of the 20th century by Sicilian farmers who came to settle in Tunisia. These farmers imported ewes in order to satisfy their own needs in fresh cheese (mostly family consumption). This breed is a heterogeneous flock resulting from crossbreeding between the Sardinian breed and the Sicilian Comisana breed. Even though its production potential is limited, its milking ability makes it a dairy breed. In spite of the important evolution of animal production industries over the last few years, dairy sheep farming kept a traditional character, with extensive stock farming methods (Mohamed *et al.* 2009).

The total milk production of the Sicilo-Sarde ewe ranges between 68 and 86 kg for an average lactation period of 225 days. The daily average is of 0.53 kg (Moujahed *et al.*, 2008). Milking is done manually. This milk is rich in fat (over 7%) and in proteins (over 5%), it can therefore be transformed into cheese (Ben Sid El Haj *et al.*, 2009).

The whole production of ewe's milk production is intended for processing. Two types of activities currently exist in the Béja and Mateur region: artisanal processing units produce fresh cheeses (Sicilian, rigouta, etc.), highly appreciated by local consumers, and industrial units produce cheeses known on the international market (Carré de Mateur, Numidia, etc.).

The geography of the Béja governorate is quite diversified: mountainous zones, valleys and plains with many meadows. Both ovine and bovine livestock farming developed rather well, which led to the fabrication and consumption of typical dairy products that can be qualified of local products. Ewe's milk also accounts for a significant share of the governorate cheese production. Ewe's milk transformation is part of the agri-food traditions of Béja governorate, which are passed from father to son. Each producer adds its personal touch to the production of such and such cheese, and keeps it secret. There are five typical Béja ewe's milk products: the "Béja Sicilian" (fresh cheese), the "rigouta" (Italian ricotta, fresh cheese), the "Tayeb hard pressed cheese" (whole hard pressed cheese), the ewe's milk yoghurt and the whole ripened cheese. All these cheeses are exclusively made with the milk of the Sicilo-Sarde breed ewes.

Revival of Sicilo-Sarde breed ewe's milk production in the Béja governorate: structuring specifications

In order to maintain the specific and territorial character of ewe's milk and cheese production, the experts of the European Lactimed project (cf. *infra*) defined in the specifications the concerned area and the technical production strategy.

The operators concerned by these specifications are mostly Sicilo-Sarde ewe farmers organised in agricultural development associations (GDA)² in the area North to Béja³, as well as the potential transporters and milk processing units. Each unit must identify its farmers and transporters.

Depending on the size of the flock, the production system is either semi-intensive (200 to 300 heads) or extensive (10 to 20 heads). Animal feeding is based on grazing, with natural processes, or on stubble fields, frequently recurring to supplements (hay, straw and concentrates). The mating period generally takes place between April and June, which corresponds to a lactation period going from November to June. Currently, in the Béja GDA, postponing the mating period of one part of the flock enables to extend the lactation and therefore the processing period.

The GDA encourages the farming of Sicilo-Sarde ewes to grazing, takes part in the training and information of farmers, in the respect of hygiene and quality standards, and in the collection of the milk, which is entirely processed in the region.

Farmers must respect a sanitary programme including the vaccination of lambs and ewes. They must clean and disinfect sheep pens on a regular basis. In spite of the general hygiene regulations for milk manipulation and the regulatory texts cited above, transformation units must respect the following conditions:

- the milk from morning milking is processed immediately, that of the evening is refrigerated and processed on the following day;
- delivery to the factory must be made in refrigerated vehicles;
- the milk delivered must be stored at a temperature of 4°C;
- the storage of milk in these conditions cannot exceed 24 hours.

Each unit must make sure that transport conditions are consistent with hygiene regulations. Where appropriate, the commissioned transporters must respect the regulation in force in terms of dairy product transport.

Cluster project of the Agricultural development association (GDA) of Béja dairy sheep farmers

In the context of the Lactimed project⁴ aiming at developing territorialised dairy product industries under the form of clusters, Zied Ben Youssef suggested, in 2013, an action around the Sicilo-Sarde ovine breed in the Béja governorate. The future Béja dairy cluster already features several elements, two of which are collective (production and collection of ovine milk and technical assistance to producers), as well as a first

² A GDA is a professional organisation gathering farmers around an objective (for example: irrigation, in the present case: animal production) and representing the State through The Regional Commission for Agricultural Development (CRDA).

³ Mainly: Oued Bagrat, Nagachet, Djhayliya, Bou Saada, El Faouar, El Hnaya, Ain Belouin, El Jguagua, etc.

⁴ LACTIMED aims at reinforcing the production and distribution of typical and innovative dairy products in the Mediterranean by organising local industries, supporting farmers in their development projects and creating new markets for their products. The project is implemented as part of the European Union EVP-CT MED programme aiming at reinforcing cooperation between the regions of the European Union and that of partner countries located along the coasts of the Mediterranean sea. <http://www.lactimed.eu>

private project carried out by Zied Ben Youssef, with:

- A workshop for the artisanal processing of dairy products (cheese and yoghurt);
- An educational farm;
- Agri-tourism services (holiday cottage, table d'hôte, hiking trails).

Zied Ben Youssef, who carries out the cluster project, is a Sicilo-Sarde ewe farmer in Béja Nord. Since 2011, he is the president of the Béja Sicilo-Sarde ewe farmers' group created in 2002. In 2007, with two family members who also had sheep farms and issues with milk selling, he launched "From Art Béja", Béja's artisanal dairy, which produces artisanal products with 100% ewe's milk. In order to ensure their supply throughout the year, the three associates also gathered their flocks in 2010 and created "Les Trois Fermes" [The Three Farms], a farm separated into normal season mating on one side and counter-season mating on the other side. This gathering enabled the three associates to significantly increase the volume of processed and transformed milk: from 120 to 1,200 litres a day between 2007 and 2013. The products are sold at a selling point in Béja and another one in Tunis. In response to the clients' interest in their products, "Les Trois Fermes" launched, in 2012, "La Randonnée des Trois Fermes" [The Three Farms Hiking Trail], enabling participants to discover Béja Nord dairy ovine farms and local products, especially artisanal cheeses.

The project follows a sustainable development approach, featuring its four dimensions: social, environmental, economic and governance. As for the social aspects, this project is about one of the elements of the Mediterranean diet and in this regard, contributes to a diet with high nutritional and cultural values which interests all consumers and citizens (impact on health). With regards to the economy, it maintains and creates activities and therefore jobs in rural areas (7 direct jobs: agro-economist engineer, farming technician, master cheese-maker, chef and 3 employees), with a boosting effect on the whole sector (agricultural, industrial and service sectors). Environment protection is taken into account via agro-ecology (pasture farming rather than agro-industrial imported food, synergy between cultures and farming, with a positive impact on the carbon footprint), energy sources (solar and biogas), reduction and reuse of waste (circular economy) in the cheese workshop. Finally, the sector's governance is ensured by a multi-actor professional structure, the GDA.

Conclusion

The example of the Béja dairy sheep cluster shows that in order to revive a declining sector, sustainable development criteria are taken into account. The assets of this sector are a tradition based on regional roots with the Sicilo-Sarde ovine breed particularly adapted to its ecosphere and an empirical expertise of cheese artisanal fabrication, which meets consumer demand. By reinforcing traditional activities (agriculture and craftsmanship) and by creating new ones (dairy, agri-tourism), the cluster contributes to rural development. In short, this initiative follows the dynamic of territorialised agri-food systems considered as an alternative strategy to the hegemonic movement of the agro-industrial model. Among the key factors of success are the capacity of mobilizing actors and an efficient governance of the sector, as well as a stimulating institutional framework.

This example shows that adaptation to climate change is based on the agro-ecology and ecodesign of the transformation workshop of ewe's milk into cheese and yoghurt. This approach reduces net greenhouse gas emissions, favours renewable energies, preserves soil fertility and slows their degradation. Nevertheless, the fight against the negative effects of climate change is only one of the aspects of sustainable development and must therefore be part of a systemic and global approach.

The emergence of territorialised sectors and food systems meeting sustainable development objectives requires a strong institutional framework. In other words, a voluntarist food policy driving consumer behaviour towards the rehabilitation of the Mediterranean diet, reducing unfair competition between actors of the sector nationally and internationally, and stimulating the collective action of sustainable and responsible food project initiators. This is the approach recommended by IPEMED, with the large-scale PACEM project - Euro-Mediterranean common agricultural and food policy (Rastoin *et al.*, 2012). The PACEM tackles the issue of food safety which has already reached a concerning level in Southern and Eastern Mediterranean countries and which is likely to get worse according to several converging studies based on a trend scenario. The PACEM is willing to create an alternative scenario of food sovereignty by increasing local production and a new form of Euro-Mediterranean partnership.

BIBLIOGRAPHY

- Ben Sid El Haj, S., Damergi, C. & Kayouli, C., 2009, Characterisation of Sicilian cheese made from the milk of Sicilo-Sarde breed ewes in the North West of Tunisia. in: Papachristou T.G. (ed.), Parissi Z.M. (ed.), Ben Salem H. (ed.), Morand-Fehr P. (ed.). *Nutritional and foraging ecology of sheep and goats*. Zaragoza: CIHEAM / FAO / NAGREF, 2009. p. 453-458. (Mediterranean options: Series A. Mediterranean seminars; n. 85). 12. Seminar on: Nutritional and Foraging Ecology of Sheep and Goats, 2007/10/11-13, Thessaloniki (Greece). <http://om.ciheam.org/om/pdf/a85/00801042.pdf>
- Hallegate S., Somot S., Nassopoulos H., 2008, *Région méditerranéenne et changement climatique : une nécessaire anticipation* [[The Mediterranean region and climate change: the need to anticipate], Ipemed, Col. "Building the Mediterranean", Paris: 63 p.
- H'Mad Z., Zaiter M., Ben Mosbah, A. Sta S., 2013, *Developing the typical dairy products of Bizerte and Béja: diagnosis and local strategy*, Lactimed, IEVP-CTMED, European Union, Ciheam, Anima, Bizerte competitiveness cluster : 83 p.
- Mohamed, A., Khaldi, R., Jaouad, M., Rached Z. & Khaldi G. Les systèmes ovins de production laitière dans le nord de la Tunisie. [Ovine dairy production systems in northern Tunisia] In: Pacheco, F. (ed.) & Morand-Fehr, P. (ed.). *Changes in sheep and goat farming systems at the beginning of the 21st century: research, tools, methods and initiatives in favour of a sustainable development*. Zaragoza: CIHEAM/DRAP-Norte/FAO, Mediterranean options, Series A. Mediterranean seminars, n. 91, 2009, p. 319-323.
- Madignier L. Benoit G., Roy C., 2015, *Les contributions possibles de l'agriculture et de la forêt à la lutte contre le changement climatique* [Potential contributions of agriculture and forestry to the fight against climate change], Report n° 14056, CGAAER, Ministry of Agriculture, Paris: 83 p.
- Malassis L., 1994, *Nourrir les Hommes [Feed the People]*, Flammarion (Dominos), Paris, 126 p.
- Moujahed, N., Jounaidi, A., Kayouli, C. & Damergi C., 2008, Effects of management system on performances of the Sicilo Sarde ewes farmed in Northern Tunisia. *Mediterranean options*, Ciheam, Paris
- Padilla M., 2012, *Sustainability of the food chain from field to plate: the case of the Mediterranean diet* Symposium of the fiftieth anniversary of CIHEAM, Montpellier: PPT, 22 slides
- Paillard S., Treyer S. et Dorin B. (coord.), 2010, *Agrimonde. Scenarios and Challenges for Feeding the World*, Quæ, Versailles: 295 p.
- Rastoin J.L., Ghersi G., 2010, *World food system: concepts and methods, analyses and dynamics*, Quae, Paris: 584 p.
- Rastoin J.-L., Bourgeois L., Cheriet F., Mohavedi N., 2012, *Pour une politique agricole et agroalimentaire euro-méditerranéenne [For a Euro-Mediterranean agricultural and food policy]*, Ipemed, Col. "Building the Mediterranean", Paris: 86 p.
- Rastoin J.-L., Benabderrazik E.H., 2014, *Céréales et oléoprotéagineux au Maghreb: Pour un co-développement de filières territorialisées [Cereals and oil protein crops in North Africa: for a co-development of territorialised sectors]*, Ipemed, Col. "Building the Mediterranean", Paris: 136 p.
- Rastoin J.-L., 2015, Editorial, Les systèmes alimentaires territorialisés : considérations théoriques et justifications empiriques [Territorialised agri-food systems: theoretical considerations and empirical justifications], *Économies et Sociétés, Tome XLIX, (11/2015), Série « Systèmes agroalimentaires », AG, N° 37, Isméa Les Presses, Paris*

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