

## **The concept of “agro-energy district”: a pertinent tool for the sustainable development of rural areas**

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### **Introduction**

The developments at work in the rural areas of the industrialised countries are the result of both internal dynamics, in part linked to the changes in agricultural activity, and of external pressure underpinned by urban pressure. The production function traditionally ascribed to agriculture has gradually given way to residential, recreational and environmental preservation functions. Transformations of society as a whole (mobility of the population, concentration of economic activities, perception of environmental crises, etc.) place a large question mark over relationships between town and country, continuing to fudge the limits between these two types of area (Perrier-Cornet, Aznar, Jeanneaux, 2010). Beyond the observation that the terms “agriculture” and “rural” are no longer used to mean the same thing, the theory of gradual invasion of rural areas by metropolitan zones (notion of continuum) constantly brings the status and very existence of rurality into play.

Despite these trends, the countryside continues to retain certain advantages giving it incontestable specifics with regard to landscapes, economic activities<sup>1</sup> and forms of sociability. The “consumption” of rural areas for recreational purposes (tourism) strengthens the “natural” dimension of the countryside. These particularities can also be found in the development dynamics at work. Based on work carried out with regard to the qualification of food products, we have been able to underline the original nature of the resource valorisation and operator coordination processes (Frayssignes 2008). Generally speaking, it is difficult for rural areas to rival urban areas in terms of the traditional criteria of competition. They are

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<sup>1</sup> In France, for example, industrial employment is higher in rural areas (25%) than in urban areas (20%). These jobs are often located close to production zones and transport infrastructures (Huiban, 2003).

forced to implement strategies founded on a “specification of resources” as described by Colletis and Pecqueur (2004).

In this context, and in light of the fact that they may satisfy a certain number of objectives, agro-energies represent an additional possibility for rural areas in the range of existing strategies. Defined as the use of agricultural resources with a view to producing energy, the agro-energy sector concerns in particular the use of biomass which corresponds to all plant matter, irrespective of whether it is obtained from natural, forestry or agricultural sources. The most common agro-energy activities include:

- the use of residual heat from thermal power stations (greenhouse crops);
- solar or photovoltaic equipment in farms;
- the production of biomass transformed in specific factories (thistles, etc.);
- the production of biodiesel using rape seed, cabbage, sunflower, soy, etc.;
- the production of biogas using animal husbandry effluents.

In recent decades, these “non-food crops” have seen a rapid development in Europe under the impetus of national and community policies, in particular due to the need to achieve environmental objectives linked to climate change<sup>2</sup>.

With this in mind, envisaging rural developing through agro-energy activities means analysing agriculture as a fully-independent renewable energy supply sector<sup>3</sup>. The much debated sustainable nature<sup>4</sup> of agriculture would be strengthened if the agro-energy sector were developed further as the dependence of modern societies on fossil fuel sources would be reduced. The image of agriculture in society would at the same time be improved. The advantages are just as great for rural areas which have been weakened by the general increase in the cost of energy.

To achieve these objectives, a certain number of principles must be respected. Our paper aims to discuss the relevance of the concept of agro-energy district seen here as an original means of organising this activity which may satisfy a number of the objectives linked to rural development (competitiveness of rural areas, farmers’ income, preservation of natural resources, reduction in climate change, social cohesion).

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<sup>2</sup> Adopted on 11<sup>th</sup> December 1997, the Kyoto Protocol aims to reduce greenhouse gas (GG) emissions in industrialised countries. Having ratified this document in 2002, the European Union prepared a roadmap for reducing GG emissions by 20%, setting the share of renewable energies in total European consumption at 20% and the share of the use of biofuels by 2020 at 10% (Directive 2009/28 relating to the use of energy produced using renewable sources).

<sup>3</sup> In the documents produced by the European Commission, agro-energies are seen as a source of renewable energy in that plants absorb CO<sub>2</sub> and trap sunlight as they grow, which represents a form of storage of solar energy which is then restored through the use of biomass.

<sup>4</sup> In France, agriculture represents 18% of GG emissions and almost 70% of water consumption.

Our thought process is founded in a partially renewed approach to the Marshallian vision of the district and its extensions (Marshall, 1985). Analysis of the organisation of the agro-energy sector at local level in particular raises the question of the collective capacity of local operators to organise a production chain. In this respect, by favouring the exploitation of local resources, it would appear that the concept of agro-energy district might avoid a certain number of controversies often linked to the development of this sector, in particular the phenomenon of competition between food crops and energy crops.

Finally, our aim is also to illustrate the territorial adherence of the concept, in particular in its Mediterranean dimension<sup>5</sup> but also through the increasing role of regional public policies in supporting the agro-energy sector. To do this, we will turn to the theoretical model of territorial anchorage developed in a doctoral work devoted to the link between the quality of food products and territorial development (Frayssignes, 2005). On this basis, this paper should act as a methodological and strategic support for the implementation of a “Sustainable Mediterranean Agro-energy District” (SMAD), perceived as a tool for rural development in its own right.

In the first section, we will explore the challenges inherent to agro-energies and their positioning in relation to sustainable development which will subsequently lead us to present the project underpinning our approach and the substance of the action devoted to implementing an agro-energy district. The theoretical aspects linked to the concept of a “district” will be examined the second section in which we will endeavour to illustrate its territorial anchorage. Finally, the scientific relevance and the operationality of the concept will be discussed in the third section, paying particular attention to the local dimension.

## **I. The challenges linked to agro-energies: the need for reflection on the organisation of the sector at local level**

At the price of compliance with certain principles, the development of agro-energies appears to be potentially compatible with the objectives of sustainable development. This observation justifies a reflection on the means of organising this sector at local level.

### **1. Agro-energies and sustainable development: how do they intermesh?**

According to a certain number of institutional documents (European Union, FAO), the development des agro-energies can be from the standpoint of sustainable development in that it involves economic, social and ecological dimensions.

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<sup>5</sup> Our considerations accompany a cooperation project devoted to Mediterranean agriculture: *Novagrimes – agricultural innovations in Mediterranean territories*.

From an economic point of view, in addition to the objectives linked to farmers' incomes, the prospects in terms of employment would appear to be quite considerable. European Union estimates indicate 250,000 potential jobs in the medium term. More detailed studies conducted by ADEME (French Environment and Energy Management Agency) demonstrate that the production of 1,000 tonnes of biodiesel or ethanol generates between 6 and 10 jobs whereas the traditional oil sector creates only 0.01 jobs for an equivalent volume (ADEME, 2007). Beyond the mere quantitative aspects, agro-energies are also beneficial with regard to the very dynamics of development. As agro-energy is primarily produced by local or regional SMEs, the prospects for rural areas – in particular the weakest areas – are undeniable.

From a social standpoint, in a context of dependence on fossil fuel sources, the development of agro-energies is a possible solution to improving the quality of life in rural areas: this is the notion of “energy safety and well-being” developed in particular within the FAO (Best, 2003). More broadly speaking, agro-energy production intended for urban areas satisfies a desire for social cohesion between territories (balance between towns and countryside)<sup>6</sup>.

Finally, agro-energies offer prospects for the preservation of natural resources and for combating climate change. Furthermore, the development of the sector is one of the cornerstones of the community strategy to reduce its GG emissions. European experts estimate that the 20% renewable energy target will ensure a reduction of between 600 and 900 million tonnes of CO<sub>2</sub> (European Commission, 2007).

This – in principle favourable – position of agro-energies can also be seen in European policies, both sectorial (Common Agricultural Policy) and more general (“EU 2020” strategy).

The year 2010 was marked by the launch of major considerations concerning the reform of the CAP from the standpoint of the new period budgetary programming 2013-2020. Beyond the necessary reform resulting from the increase from 15 member states to 27, one of the objectives inherent to these considerations is to demonstrate that the CAP retains both its utility and its legitimacy. Consequently, the process took the form of a public debate with the civil society and the organisations concerned by the reform (June 2010<sup>7</sup>). The “CAP post 2013” conference was the second stage in this process of reflection (July 2010<sup>8</sup>). In addition to presenting the results of the public debate, this event provided an opportunity to organise

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<sup>6</sup> In particular, this idea is defended in the prospective analyses (Ministry of Agriculture and Fisheries, 2010).

<sup>7</sup> This online debate focused on 4 questions: *Why do we need a common agricultural policy? What do citizens expect of agriculture? Why reform the CAP? What do we need for the CAP of tomorrow?* ([http://ec.europa.eu/agriculture/cap-post-2013/debate/index\\_fr.htm](http://ec.europa.eu/agriculture/cap-post-2013/debate/index_fr.htm)).

<sup>8</sup> “The CAP post 2013”, Conference on the public debate, Brussels, 19<sup>th</sup> – 20<sup>th</sup> July 2010. [http://ec.europa.eu/agriculture/cap-post-2013/conference/index\\_fr.htm](http://ec.europa.eu/agriculture/cap-post-2013/conference/index_fr.htm)

thematic workshops intended to prefigure the future orientations of the CAP (food security, the future of the rural world, the environment, quality, health). All of these works gave rise to a communication published by the Commission outlining the main elements of the impending reform. The document identifies 3 strategic objectives: the preservation of production potential in a context of instability on agricultural markets; improved quality and an increase in the value of food commodities; and the viability of rural communities in which agriculture continues to represent a major economic activity (European Commission, 2010).

At first sight, the desire to introduce a policy focusing more on the preservation of natural resources, competitiveness and innovation would appear conducive to the development of agro-energies. One notion in particular in the document published by the Commission attracts our attention: that of public goods. Drawing on economic theory, public goods are considered here to be non-exclusive (several people can benefit from them), non-competing (their consumption by one individual is not to the detriment of another) and potentially a source of opportunity for territorial development (Cooper, Hart, Baldock, 2009). Irrespective of whether they are environmental (landscapes, biodiversity, etc.) or social (food security, vitality of the rural areas, etc.) in nature, these public goods would henceforth appear to be at the heart of the future CAP. Seen as services rendered by farmers to society, they are not at present governed by the market, thereby justifying public intervention. In this sense, and in light of their adherence to the three pillars of sustainable development, agro-energies can be considered to be public goods in their own right: *“In certain respects, agriculture is like other economic sectors, with a large number of producers participating in a range of markets for food, fibre, and raw materials for energy and industrial products”* (Cooper, Hart, Baldock, 2009). Their position vis-à-vis the reform of the CAP would therefore appear to be relatively favourable.

In more general terms, the development of the agro-energy sector is likely to be coherent with the strategy designed by the European Union to overcome the economic crisis: the “EU 2020” strategy. Following on from the Lisbon strategy, which represented the main thread of the European economic policy for the period 2000-2010, the aim of the “EU 2020” strategy is growth and employment through strengthening an economy of innovative growth with a greater focus on ecology. Investment in human resources (qualification, training), research & development, technological cooperation and innovation are some of the main areas of intervention (European Commission, 2009). From this standpoint, the propensity of the agro-energy sector to generate new activities and to increase the competitiveness of rural areas enables it ensure coherence with the desire of the European leaders to invest in a greener

economy and to remain at the forefront in various strategic sectors (new technologies, renewable energies, etc.).

This relative correspondence between the possibilities offered by the development of agro-energies and the institutional developments at work on a European scale justifies our interest in the means of organising this sector and the best approach to adopt. This is precisely the subject of one of the actions promoted by the cooperation project underpinning our considerations.

## **2. The Novagrimes project: organising the agro-energy sector in the Mediterranean basin**

Through the implementation of innovative actions, “*Novagrimes – Agricultural Innovations in Mediterranean Territories*”<sup>9</sup> is a Euro-Mediterranean project aimed at supporting the regions in defining and implementing agricultural support policies with a view to contributing to the competitiveness and sustainability of the sector. Despite its diversity and originality, the Mediterranean area finds it difficult to make the most of its advantages and suffers from a lack of competitiveness, insufficient management of its natural resources and falling employment in the agricultural sector. By suggesting that the regions now have a pivotal role in implementing support policies intended for this sector, the partners of the project wanted to introduce a number of actions in partnership with local operators. The aim of this approach is twofold:

- first, to encourage an exchange of experience between the partners while retaining the overall coherence of the project, which should enable the milestones of a genuine Mediterranean agricultural strategy to be established;
- second, to illustrate a certain number of recommendations to be made to regional and European decision-makers through tangible actions.

The forms of cooperation undertaken include an action entitled “Agro-energy sector”, the aim of which is to prepare a strategic and methodological document enabling local operators to identify, implement and manage what has been defined as a “Sustainable Mediterranean Agro-energy District” (SMAD). The very content of this action was developed on the basis of the concerns and activities of each of the partner regions which often referred to the means of

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<sup>9</sup> Financed by the European Regional Development Fund (ERDF), the project is part of the 2007-2013 programming of the European structural policy in the Mediterranean area. The partners are NUTS II-level local governments: the regions of Provence-Alpes-Côte d'Azur (France), Puglia and Sardinia (Italy), Murcia (Spain) and Thessaly (Greece). These regions are associates of the Mediterranean Agronomic institute of Montpellier (IAMM). Launched in April 2009, the project should be completed in September 2011. For more information: [www.novagrimes.eu](http://www.novagrimes.eu).

implementing and organising an agro-energy activity within a territory<sup>10</sup>. The idea of putting forward the notion of a district was the result of a threefold ambition: to consider the relevant terms and conditions for collective action; to favour the processes of technological innovation; and to contribute to the organisation of agricultural activity by strengthening its links with industry. Furthermore, as we will see below, the need to ensure that the process is consistent with the idea of sustainability (exploitation of resources, employment) pushed the partners to favour the local context. Consequently, the district proved to be the most suitable solution to the challenges identified. The value added of the action promoted by Novagrimed therefore takes several dimensions:

- a methodological exploration of the institutional and social organisation of the agro-energy sector and the form of governance to be implemented by the potential partners (farmers, industrialists, R&D units, local authorities);
- an argumentation concerning the Mediterranean dimension and territorial particularities of the concept, work which should give rise to the formulation of recommendations;
- reflection on the relevance of the regions' action in supporting the sector (financial, promotional, technical);
- reflection on the sustainable nature of the concept, in particular through its capacity to avoid competition between food and non-food production.

In order to consolidate their approach, the partners wanted to prioritise the production of biomass, leaving biofuels and solar energy to one side. This choice can be explained in particular by the fact that the jobs linked to this sector are more directly related to farms. Furthermore, the production potential is largely untapped (forests, fallow agricultural land). Studies have shown that in France, the volumes resulting from this activity could be tripled without reducing the production of food commodities. At present, biomass accounts for only 4.5% of the total consumption of primary energy, which is a far cry from the targets set by Europe (CEMAGREF, 2008).

## **II. The concept of the district and its territorial anchorage**

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<sup>10</sup> For example, Puglia works on the development of an innovative model of a short energy chain and the identification of suitable technologies. Sardinia wants to introduce an assessment mechanism for energy resources generated by agriculture. Thessaly is working on the implementation of an integrated agro-energy chain within its territory.

As the core of our approach, the concept of the district refers to a particular form of territorial development. It is necessary to examine the theoretical foundations of this concept and its extensions, focusing on its territorial anchorage.

### **1. The district as a specific form of development: benefits for agro-energies**

Put forward at the beginning of the 20<sup>th</sup> century by A. Marshall, the concept of the district was intended to describe the processes of geographic concentration of small specialised firms as opposed to the rationale of the large-scale capitalistic company. These works would once again be turned to during the 1970s by Italian researchers (in particular G. Beccatini) to qualify the development of the textile industry in the northern Italy (Tuscany, Venetia). In France, these so-called “post-Fordist” theories would lead to the emergence of the concept of the Localised Productive System (or Localised Industrial System), adhering to a similar perspective. Generally speaking, the district refers to a geographic area bringing together a large range of specialist SMEs and characterised by an “industrial atmosphere” founded on common values (work ethic, corporate mind set, family, reciprocity, competition) and an accumulation of skills through the search and transmission of knowledge. Characterised by specific social relations, the district is also altered by institutional dynamics taking the form of formal and informal rules underpinning its organisation. While numerous case studies conducted using these tools demonstrate their capacity to describe development paths, approaches in terms of district or LPS also proved to be particularly operational in organising and managing territories.

In France, the notion of LPS was thus formalised by the DATAR<sup>11</sup> with a view to providing local support for a group of firms and institutions operating in the same sector of activity. The label “LPS” thus provides an opportunity to benefit from specific aid. Similar to that of the district, the notion of cluster assumes a combination of local firms, training centres and R&D units focusing on innovative projects and thus helping to increase the competitiveness of the territory concerned. Generally organised around an institutional entity bringing together all the operators concerned, clusters have also given rise to a specific policy through “competitiveness centres” which benefit from technical and financial support<sup>12</sup>.

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<sup>11</sup> Inter-ministerial Delegation to Territorial Planning and Regional Attractiveness. This entity was created in France in 1963 with a view to designing and coordinating territorial development policies.

<sup>12</sup> Created in France in 2005, the competitiveness centres bring together firms, training centres and R&D units within a given territory and aim to implement innovative cooperation with a view to strengthening their international competitiveness. In 2010, 71 competitiveness centres were designated (<http://competitivite.gouv.fr/>).

Transposing the notion of district to the agro-energy sector would appear to be legitimate if we consider the need for technological cooperation strengthening territorial competitiveness. The benefits relating to the networking of firms, training centres and R&D units are highlighted by the European Commission in its “EU 2020” strategy as well as in the Mediterranean Solar Plan, one of the EU’s flagship projects for the Mediterranean area. This format illustrates a certain similarity between our considerations and the works of H. Depret and A. Hamdouch concerning “green clusters” founded on the emergence of green technologies capable of providing a solution in response to the increasing scarcity of fossil fuels. The necessary accumulation of skills and human capital has indeed led to the emergence of the paradigm of the “green economy”, the impacts of which on the territorial organisation of activities will be quite considerable (Depret, Hamdouch, 2010).

Based on the experience of the partner regions, the approach initiated within the framework of the Novagrimes project enabled the milestones to be established for the possible organisation of agro-energy activity into districts in a given territory<sup>13</sup>. The increased cooperation between the industrial and agricultural sectors must therefore operate globally at all levels of the value chain (production, processing and distribution). At this stage, it is essential to identify the operators who might be included in the procedure: producers, processors, research and training institutes and local authorities. This identification work also aims to indicate any “black holes”, i.e. operators whose absence could be detrimental to the correct functioning of the district. In this respect, the roundtables organised in Murcia and Sardinia represent an interesting means of identifying the potential participants in a forest energy sector (land owners, firms, forest associations, etc.).

Once the potential participants have been “noted”, it is important to envisage the implementation of an institutional entity devoted to the day-to-day management of the district. This issue of governance refers both to the definition of common objectives and to the responsibilities of the operators. In the same spirit of the industrial districts, this entity must be both flexible and reactive. Given the myriad local contexts, the forms that such an organisation might take are numerous and cannot be determined beforehand: private operators, consortium of firms, public institution, mixed association (public – private). The only requirement lies in the fact that the entity is deemed legitimate by the operators in order to benefit from sufficient authority. This organisational phase also involves the implementation of operating rules capable of regulating the relationships between the

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<sup>13</sup> The information presented in this section are taken from a first version of a summary of agro-energy diagnostics drafted by the partner regions (Novagrimes project, 2010).

operators, rules which must be formalised within a clear and effective regulatory framework. Establishing contracts between the different links in the chain is of the utmost importance here<sup>14</sup>.

While “dialogue” between the different participants is essential, the existence of an agro-energy district is also underpinned by the presence of training and R&D organisations to guarantee the development and dissemination of skills. In this respect, it is important to underline the fact that the activities introduced must encompass all the stages of production and commercialisation. With a view to mutualisation, grouping the operators concerned in a single more or less formalised entity may facilitate the definition of a global strategy while helping to solve specific production problems. The Agro-energies Development Laboratory founded in Puglia in 2007 perfectly illustrates this approach. It brings together all the research establishments and the representatives of the agricultural and industrial sectors and endeavours to develop training courses suited to the regional and local needs.

Finally, the development of an agro-energy district will be facilitated by its promotion vis-à-vis potential users and the general public<sup>15</sup>. This final aspect leads us to emphasise the eminently territorial nature of the notion of district, which represents an individual element of local development (common values, exploitation of local resources). Through its physical, social, economic, cultural and political dimensions, the analysis of the territorial anchorage of the district represents the next stage of our demonstration.

## **2. The territorial anchorage of the agro-energy district**

In the scientific literature, the district – along with other concepts – is the result of major changes to the productive apparatus linked to the dawning of post-Fordism: the globalisation of the economy, the diversification of demand, technological innovations. Far from heralding “the end of geography” predicted by O'Brien in 1992, the rediscovery of the approach involving the district and its different forms has given the spatial dimension of the processes in play (Perrat, 1992; Courlet, 2001) and the active role of the territory in the dynamics of development renewed relevance (Savy, Veltz, 1993). Fully in line with this paradigm, the approach developed here required the renewed use of an analysis model originally designed to analyse the links between the product qualification process and the territorial development (Frayssignes, 2005). By means of a multidisciplinary approach drawing on geography,

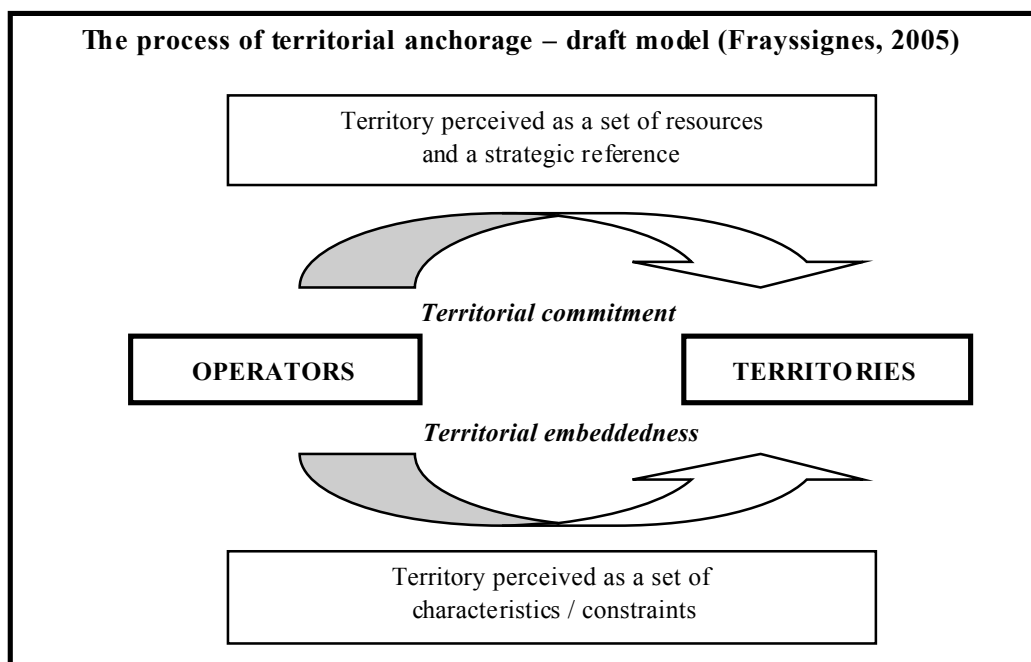
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<sup>14</sup> For example, this involves avoiding situations such as that encountered in Puglia (town of Monopoli), where the major biodiesel production firms essentially work with raw materials from other regions or abroad whereas at the same time, biodiesel produced locally is exported to Germany.

<sup>15</sup> In this respect, Thessaly envisages the implementation of an agro-energy district based on a local participatory approach.

economics and sociology, this so-called “territorial anchorage” model provides the possible meanings of the interplay between economic rationale and territorial dynamics.

Territorial anchorage has in particular been conceptualised by the Proximity Economics school. Through his analysis of relations between firms and territories, Zimmermann offers a dialectic approach founded on a division between anchorage and nomadism, anchorage corresponding here to a “productive encounter” between two stories, two dynamics, thereby leading to the emergence of specific resources. The example of the traditional industrial regions of north-east France reveals this “community of destinies” in that their economic decline is considered a tragedy by the population (Zimmermann, 1998). Perceived as a strategy implemented by the firm, anchorage involves using the territorial potential, irrespective of whether it is generic (costs, distance) or specifics (skills, organisation). This theoretical framework has been complemented by the economic sociology works conducted under the title of “embeddedness”. For M. Granovetter, economic rationality falls into the social, cultural and political frameworks which exercise a constraint (Granovetter, 2000). Transposed to the analysis of products enjoying an origin name, this position enabled us to highlight the multiple influences exercised by the physical and social characteristics of the territories on the strategies of the economic operators (Frayssignes, 2001). Hence, as we see it, territorial anchorage refers both to the strategies of the operators vis-à-vis the territorial resources and to the constraints, the burdens weighing on the operators which are inherent to the characteristics of the territories. This “dialogue” is formalised in the diagram below.



Transposing this model to the agro-energy issue enables us to illustrate the interplay of agro-energy districts with their territory and provides additional keys to their implementation. Three aspects merit discussion here: the influence of the physical and social characteristics of the territories, the Mediterranean dimension and the regional support policies intended for the sector.

In implementing an agro-energy district, it is essential that the local context be taken into consideration in order to satisfy operators' needs as well as possible. Analysis of a certain number of characteristics inherent to the potential sites of a district is necessary. As an island, the relative isolation of Sardinia strongly impacts its energy needs. The semi-arid environment of numerous marginal zones in Murcia requires specific innovative techniques enabling efficiency to be increased (selection of plant varieties resistant to water stress). A final illustration can be seen in the production of rape seed oil used for biodiesel in Puglia. As the needs of rape seed are very similar to those of corn with regard to the climate, it cannot be planted without irrigation, a factor which greatly impacts the site chosen. Far from being restricted to physical aspects, territorial constraints also concern social and cultural dynamics. Thus the development of an agro-energy activity is very often confronted with the reticence of local operators, in particular farmers. This "resistance to change" would appear to be a constant throughout all the partner regions and requires a change in mind set that can only be achieved through sensitisation campaigns. This idea must nevertheless be qualified because local agricultural communities are, at the same time, strongly in favour of alternative strategies to traditional agricultural production which is no longer capable of satisfying modern-day objectives. This "desire for change" is the flip side of resistance<sup>16</sup>. These examples demonstrate that the implementation of agro-energy districts cannot simply be seen as a standard procedure applicable in all circumstances. The great diversity of the local contexts requires adjustments to be made constantly.

One of the ambitions of the Novagrimed project is the identification of Mediterranean particularities inherent to agricultural activity. This objective should facilitate both the formulation of recommendations capable of taking these particularities into account and the establishment of the foundations for a development strategy for the basin as a whole. From the point of view of agro-energy crops, these particularities can be envisaged in terms of vulnerability:

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<sup>16</sup> This observation is particularly true in Thessaly where an important collective dynamic has existed since the 1970s focusing on agricultural modernisation, a dynamic which manifests itself by a profusion of initiatives concerning among other things the development of agro-energy chains.

- scarcity of water and increasing pressure on this resource;
- particularity of Mediterranean production (seasonality, price volatility);
- demographic pressure (urbanisation, tourism);
- increased fragility with regard to the consequences of climate change (fall in output, shifting crops, increase in extreme episodes<sup>17</sup>).

However, the work of the partners is not just restricted to the weaknesses as it also identifies potential to be exploited: the existence of typically Mediterranean plants conducive to agro-energy activity, such as *cynara cardunculus* (thistle) or the prospects offered by the management of forest biomass with regard to land maintenance (fight against fires and erosion). Finally, and even though this point merits a more in-depth discussion, we can also point to a certain Mediterranean tradition of the collective and territorial management of agricultural challenges which contrasts with the situation in northern Europe where a sector-based approach is preferred. This Mediterranean anchorage of agro-energy districts is an important characteristic.

As with the identification of Mediterranean particularities, the analysis of the role of the regional public authorities<sup>18</sup> represents a considerable challenge for the Novagrimes project. At the European level and the level of the member states, the institutional change at work contributes to the profound redefinition of the means of public policy intervention. Even if this observation must be qualified, the processes of decentralisation would appear to be inevitable thereby conferring on the regions broader prerogatives, in particular with regard to territorial planning, agriculture and regional development. The programming period 2007-2013 of the ERDF<sup>19</sup> has therefore seen an increase in the role of the regions which henceforth appear to be essential relays of European action. Acting as an interface between the national and European levels and local concerns, the regional authorities are now – despite the disparities between the countries – sufficiently powerful from a financial point of view to initiate real dynamics of development.

The European policy of agricultural and rural development is part of the same process. While recent documents concerning the current reform of the CAP do not call into question the family farm model, they nevertheless underline the need to take account of other forms of agriculture which exist in the 27-state Europe (very small farms, capitalistic farms). This

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<sup>17</sup> The forecasts published by the European Commission indicate a possible shift of Mediterranean crops towards more northerly areas by 2050 as well as a fall of between 10 and 30% in crop yields which could exacerbate supply risks (European Commission, 2008).

<sup>18</sup> Regions in France and Greece, Autonomous Communities in Spain, Autonomous Regions in Italy.

<sup>19</sup> European Regional Development Fund.

evolution makes the increased scope for action of local authorities all the more important. With regard to agro-energies, Directive 2009/28 relating to renewable energies is quite explicit in this respect: *“To obtain an energy model that supports energy from renewable sources there is a need to encourage strategic cooperation between Member States, involving, as appropriate, regions and local authorities”*<sup>20</sup>.

The partner regions of the project have consequently implemented extremely varied agro-energy support policies. Murcia has thus prepared a certain number of planning documents intended to achieve the objectives set by the Commission<sup>21</sup>. In particular, these documents highlight the obstacles to the development of the sector (absence of infrastructure, competition with food production, size of the farms) and the envisaged solutions. In 2009, Sardinia adopted a Regional Environmental Energy Plan concerning the identification of the main themes to be implemented. Finally, in its Rural Development Plan, the region of Puglia wishes to implement a certain number of measures concerning the construction of biomass processing plants and technical training.

Agro-energy support policies therefore demonstrate certain characteristics which must be taken into account in the processes of implementing districts. This “institutional” anchorage is just as important as the physical (insularity, aridity), cultural (“resistance to change”) and geographic (Mediterranean dimension) anchorage mentioned above. This is one of the lessons learned from our approach in terms of anchorage.

Now that the theoretical foundation of our approach has been explained, we will discuss its relevance and operationality in the hypothesis of the physical implementation of an agro-energy district.

### **III. The concept of agro-energy district: scientific relevance and operationality**

Three core elements of the territorial development process will be examined in this final section: the decentralised nature of the activity generated by an agro-energy district and its propensity to exploit local resources; the incorporation of supply and demand; and the capacity of the concept to avoid the controversies inherent to the development of agro-energies.

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<sup>20</sup> It is interesting to note that this reference to the local authorities can be found in several other directives dealing with agricultural aspects: Directive 2000/60 relating to water management, Directive 2009/128 relating to the use of pesticides.

<sup>21</sup> Murcia Regional Energy Plan 2003-2012.

## **1. The district and the spatial distribution of the activity: the exploitation of local resources**

The local nature inherent to the implementation of an agro-energy district may appear paradoxical in light of the declared ambitions (preservation of natural resources, fight against climate change). In this respect, B. Pecqueur and B. Zuindeau note that in light of the disparity of the territories, fighting global problems requires appropriate local format (Pecqueur, Zuindeau, 2010). This idea echoes the analysis conducted by F. Houtart, who feels that it is a local level that agro-energies are best suited to achieving the objectives required of them: *“Agro-energy is not in itself evil and it may be beneficial at local level on the condition that the biodiversity, the quality of the soil and water, the food sovereignty and the traditional agriculture is respected, that is the opposite of the rationale of capital”* (Houtart, 2009).

In this respect, the prospects in terms of rural development are quite considerable. The district approach emphasises the decentralised nature of biomass resources which in turn impacts the very dynamics of development. The potential advantages of this decentralisation would seem obvious: a secure supply, a reduction in transport costs and the exploitation of the local economy. Furthermore, the European Commission recognises the benefits of agro-energies for rural employment: *“In many cases, biomass is best used in local energy supply and consumption systems. This is why the EU's renewable energy target is good news for the rural areas of the EU: it is stimulating job creation, innovation, business opportunities and prosperity in the countryside.”* (DG AGRI, 2010).

This is why it the project partners feel that it is important for the operational definition of the district to be founded on the local level, and more particularly on the municipalities with coordination at the regional level. For example, the Italian regions recommend the establishment of small processing units with a view to encouraging a balanced distribution of activities across the territory. Experts in Sardinia believe that the supply range of each unit should be restricted to 40 km. Compromises adapted to the local contexts must therefore be found in order to reconcile these requirements with the imperatives linked to sufficient supply. Our approach therefore refers to energy problems primarily focussing on the supply to rural areas located nearby and more importantly the production farms themselves, the issue of energy self-sufficiency representing a growing concern, especially in France (Ministère de l'Agriculture et de la Pêche, 2010).

In this respect, agro-energies as a research subject appear to be relatively similar to the product labelling procedures in that, beyond their contribution to organising the agricultural sector, they give rise to a specific form of development founded on the exploitation of local

resources (local production, processing and consumption). Irrespective of whether we are dealing with European (PDO, PGI) or French (AOC, label rouge) quality signs, these procedures almost systematically require the existence of a circumscribed area outside of which the product cannot legally be produced. This particular means of operating creates incontestable benefits with respect to the use made of raw materials and the spatial positioning of farms and enterprises (Frayssignes, 2007).

## **2. Agro-energy districts and the incorporation of supply and demand**

The agro-energy district approach can also be seen from a market standpoint through in-depth considerations of supply and demand.

With regard to supply, the quantitative and qualitative evaluation of biomass is an essential prerequisite in order to obtain the best possible picture of the resources available, in particular their distribution across the territory and their availability during the year which can sometimes prove problematic. The work carried out in Puglia gave rise to a regional database of the biomass potential for use in energy. In Murcia, in addition to these databases, logistical aspects were made a priority (road networks, etc.) while in Sardinia, potential sites for processing plants were modelled. More often than not created using cartographic tools (Geographic Information Systems), this combination of information highlights the constraints and opportunities linked to the specific context of each territory.

With regard to demand, the district or LPS approach has sometimes been criticised for prioritising production rationales – and thus supply – and ignoring consumer expectations and their organisational impact. Our approach intends to integrate criteria linked to competitiveness and the expectations of the potential users of the energy produced. The Region of Puglia is thus extremely attentive to the positioning on the market of the energy produced and feels that it is preferable to favour niche crops in order to distinguish itself from the competition. We see here the idea of resource specification mentioned in the introduction. In a given region, the implementation of sufficiently specific agro-energy districts is likely to contribute to the emergence of an original production fabric (production, processing, training and R&D activities). Typical of the LPS, these development paths are at the heart of the competitiveness of rural areas.

## **3. The agro-energy district and sustainability: avoiding pitfalls**

Controversies linked to agro-energies occur on a very frequent basis. Considerable doubt is cast over biofuels, for example, with regard to the energy balance. While their production is

theoretically neutral<sup>22</sup> with regard to CO<sub>2</sub> emissions, the risks of too intensive a development are very real. Nor are the other types of energy crop free of controversy: the combustion of biomass generates gases which, while much less harmful than gases resulting from fossil fuels, can nevertheless represent a risk to the environment. Generally speaking, energy crops lose their sustainability when they are farmed too intensively (monoculture, use of pesticides and fertiliser, irrigation).

The potential competition between energy crops and food crops represents another form of pitfall. The phenomenon is linked to the value added generated by the agro-energy activity. At the level of the individual farmer, too great an increase in his income may give rise to major changes in his production system resulting in a reduction in, or even abandonment of, food production. In this respect, recent data provided by the World Bank are persuasive: in 2008, the increase in food products was 75% the result of the development of biofuels. This additional pressure on agricultural land led the European authorities to demand principles concerning the sustainable or non-sustainable nature of the energy crops. Published in the 2009 Directive<sup>23</sup> relating to renewable energies, these “sustainability criteria” concern the propensity of the crops to reduce GHG emissions, compliance of the production / processing procedures with the environmental standards and the non-use of raw materials from land demonstrating a high value in terms of biodiversity (primary forests, wetlands, protected areas). Social aspects are also present in the necessary ratification by the country concerned of conventions relating to labour law, international trade and technological risks. Finally, the directive emphasises the notion of “energy balance”: an agro-energy activity must not consume more energy than it produces. Despite the debates to which they give rise<sup>24</sup>, these criteria demonstrate the desire of European decision-makers to avoid, as far as possible, the potential pitfalls inherent to agro-energies.

From this standpoint, the resolutely local rationale characterising our approach enables agro-energy districts to position themselves in relation to these criteria. Furthermore, the proposals formulated by the partner regions primarily support a restriction of the activity in accordance with various terms and conditions. Sardinia, for example, favours a power restriction on processing units. Similarly, regulations exist in Thessaly concerning the area of land devoted to agro-energies<sup>25</sup>. Murcia favours the development of agro-energy crops on marginal land to

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<sup>22</sup> The CO<sub>2</sub> emitted during the processing procedure is offset by the absorption of the plant during growth.

<sup>23</sup> Articles 17 and 18.

<sup>24</sup> Certain member states, for example Slovenia, would like to go even further in the level of constraints.

<sup>25</sup> For example, in the regional law n°3851/2010, the production of photovoltaic energy is allowed only if the area of land concerned does not exceed 1% of the total area.

avoid it becoming wasteland. This non-competition between energy and food crops can also be achieved through a restriction on income derived from energy production as a share of the total income of farmers. Through these proposals, the agro-energy districts must design suitable rules for governing the activity and maintain the economic, ecological and social equilibria. The local anchorage of the approach is fundamental in that the acceptance of these rules by the operators depends on the legitimacy of the entity governing the district and its capacity to impose its authority.

### **Conclusion: towards the introduction of Sustainable Mediterranean Agro-energy Districts**

The considerations presented highlight the prospects offered by the agro-energy sector which could become an additional component of the competitiveness and sustainability of agricultural and rural areas, despite continuing problems<sup>26</sup>. Designed and developed as part of a Euro-Mediterranean cooperation project, we believe that the agro-energy district is an original and pertinent approach to the question of development dynamics in rural areas. This concept calls into question the organisational practices of the operators as development is increasingly dependent on the implementation of coherent and efficient forms of governance adapted to the local contexts. Analysis of the role of the regions in coordinating the districts at local level is particularly interesting. The new spatial rationales at work encourage certain researches to question the very principle of circumscribed territorial frameworks. M. Vanier believes that biomass is a public good which should increasingly be managed by the territories where it is used, founded more on circulation, rather than by administrative territories. In this sense, the districts would be an illustration of the paradigm of inter-territoriality advocated by the author (Vanier, 2008). Our considerations also have the advantage of proposing a productive approach to rural development in a context where the tendency has too often been to prioritise the residential, environmental and recreational functions only.

Furthermore, the approach adopted tends to confirm the decisive role of the territory in the dynamics of development. Far from merely support the economic activity, it must be a fully-fledged operator in the processes at work, in particular with regard to the participation of the civil society in choices which strongly condition its future. This epistemological relevance is compounded by an operational relevance in that it seems to us that district establishes a

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<sup>26</sup> We can cite the continuing high cost of renewable energies in relation to fossil fuels, the lack of consideration of positive externalities in arbitrage with regard to health and the environment, the complex administrative bureaucracy or weaknesses of promotion and sensitisation policies.

certain number of prerequisites for the construction of an implementation methodology consistent with the demands of sustainable development.

The Mediterranean objective of the Novagrimed project leads us to view the agro-energy district as an individual component of the Mediterranean Strategy for Sustainable Development (MSSD). Developed in 2001 at the initiative of the states of the Mediterranean basin and the European Union, the aim of the MSSD is to involve the region in a process of development, peace and stability. Four key objectives punctuate this strategy: the promotion of economic development, the reduction of social disparities, the transformation of non-sustainable production and consumption practices and the improvement of governance at a local, national and regional level (Action Plan for the Mediterranean, 2005). With this in mind, the work carried out on the agro-energy districts can serve to illustrate a possible institutional construct of the Mediterranean governance of rural development. This reasoning leads us to propose the model of Sustainable Mediterranean Agro-energy District (SMAD), which would facilitate considerations on the relevance of an integrated agro-energy policy at the Euro-Mediterranean scale and the formulation of specific recommendations towards this end<sup>27</sup> while continuing to respect the community framework. The prospect of the reform of the Common Agricultural Policy is an important milestone for the Mediterranean regions, which must absolutely derive maximum utility from the specificities of their agriculture and demonstrate the legitimacy of their action in support of this sector. Through its work on the SMADs, the Novagrimed project resolutely adheres to this perspective.

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<sup>27</sup> For example, the partner regions are considering proposing the introduction of an "Agro-energy District" labelling mechanism (based on the competitiveness centres model in France), facilitating support for exemplary approaches.

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