Novagrimed Project
Agricultural Innovations in Mediterranean Territories

The implementation of the concept of Sustainable Mediterranean Agroenergy District (SMAD)

Strategical and methodological document

Action "Filière Agroénergétique"

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This paper is an upgraded version of the summary of the diagnostics conducted within the framework of the "Agro-energy value chain" action of the Novagrimed project. It prefigures the final version of the strategic document concerning the implementation of an agro-energy district which the partners of this project have undertaken to deliver. This upgrade is the fruit of the debates resulting from the second technical meeting (January 2011) and the additional contribution prepared by the partners aimed at examining a certain number of points from the first document in greater detail. The objectives of the action remain unchanged: to facilitate the organisation of the agro-energy sector and to formulate recommendations intended for policy-makers at both the regional and European level.

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Introduction:
The agro-energy sector – a challenge of sustainable development

Generally speaking, the term agro-energy currently refers to the use of agricultural resources to produce energy. This use can take several forms, including:

- the production of biofuels[1] using rape seed, cabbage, sunflower or soy;
- the use of residual heat from thermal power plants for greenhouse crops;
- solar or photovoltaic equipment on farms;
- the processing of residual or farmed biomass (thistles, sorghum, straw, forests, etc.) in specific plants;
- the production of biogas using livestock effluents (slurry, liquid manure, dairy and slaughterhouse waste).

The work carried out as part of the Novagrimed project primarily concerns the process of enhancing biomass[2], i.e. plant matter obtained using natural, forest or agricultural sources.

Viewed from this standpoint, the agro-energy sector must be seen as a sector in its own right with the general aim of producing different forms of renewable energy (heat, electricity, biofuels). Agro-energy is thus a component in its own right of the multifunctional and sustainable agricultural model advocated by the European Union, even if this model is now accompanied by other forms of agriculture. Moreover, the sector represents a development opportunity for all rural zones within the EU, in particular marginalised zones.

The action implemented within the framework of Novagrimed aims to help the actors in the Mediterranean regions to organise and coordinate this emerging sector by implementing the concept of a "Sustainable Mediterranean Agro-energy District" (SMAD). Defining the different stages of the implementation of this tool means encouraging dialogue between agriculture and industry with a view to solving the recurrent controversies which can be ascribed to the agro-energy sector (competition with food crops, intensification) while satisfying the expectations of the local actors.

Such an approach also aims to satisfy international requirements with regard to the reduction of greenhouse gases (GGs) in a context where greenhouse gas emissions are constantly increasing worldwide. In light of the Kyoto Protocol, the European Union intends to develop renewable energies and thereby reduce its energy dependence. The Commission's roadmap has set the proportion of renewable energies in total European consumption at 20% and the proportion of the use of biofuels by 2020 at 10%[3]. For information purposes, the table below illustrates the share of energy produced from renewable resources in final energy consumption in 2005 and the targets set for 2020.

	Share 2005	**Target share 2020**
Greece	6.9 %	18 %
France	10.3 %	23 %
Spain	8.7 %	20 %
Italy	5.2 %	17 %

Source: Roadmap for sources of renewable energy, communication of the Commission, 10th January 2007.

At an international level, the FAO (Food and Agriculture Organization) is also developing a bio-energy strategy with a view to encouraging sustainable agricultural and rural development and coping with climate change. The indicators developed by the institution refer to the three pillars of sustainable development:

[1] Biofuel is understood as a liquid or gaseous fuel used in transport and produced using biomass.
[2] In particular, this choice can be explained by the fact that the production of biofuels (biodiesel or ethanol) would appear to be very difficult in the Mediterranean because of an often atomised land plan and insufficient soil productivity.
[3] Directive 2009/28 of 23rd April 2009 relating to the promotion of the use of energy produced from renewable sources. These sources include wind power, solar power, aerothermal power, geothermal power, hydrothermal power, tidal power, hydroelectric power, biomass and biogas in all its forms.

- preservation of natural resources: reuse of waste, fight against climate change, reduction of GG emissions[4], preservation of natural resources (water quality, biodiversity, landscapes) and prevention of certain natural risks (soil erosion, fires);
- social equity: distribution of added value along the commodity chains, standard of living in rural areas (notion of "energy well-being", dependence on fossil fuels and price volatility), cohesion between rural and urban territories;
- economic development: increase and diversification of farmers' incomes, employment[5], integration of agriculture / industry, competitiveness of rural areas through the preservation and/or emergence of new innovative activities (technological centres)[6], requalification of certain marginalised territories.

The organisation of the agro-energy sector therefore represents an opportunity for development of the Mediterranean basin insofar as it is at the heart of economic, social and environmental objectives decisive to the future of the basin as a whole. The considerations conducted within the framework of the Novagrimed project must also enable agro-energy activities to play a greater role in the orientations of the future Common Agricultural Policy both in terms of market measures and the question of rural development.

Initially, we will conduct a detailed examination of the different stages of the implementation of the tool favoured by the partner regions of the Novagrimed project: the agro-energy district. The second section will be devoted to the territorial – and in particular Mediterranean – dimension of the concept which, far from being a standard tool, is strongly influenced by a local context consisting of multiple and complex dynamics. Finally, the third section is devoted to the possible inclusion of the concept of an agro-energy district in the future Common Agricultural Policy.

I. The stages of implementing the Sustainable Mediterranean Agro-energy District

The information presented in this section is drawn from the regional diagnostics and has been upgraded through the debates which took place during the technical meetings.

A preliminary stage: evaluating the agro-energy potential of a territory

The implementation of an agro-energy strategy requires an initial evaluation of the potential of the available resources, be they biomass, biofuels or climatic conditions (in the event of solar or wind power). This means conducting the most exact studies possible of the characteristics of the resources available in terms of both quantity and quality, while it is also important to consider their location within the territory. As highlighted in the PACA region and in Murcia, the dispersion of resources may prove to be problematic (e.g. biomass from agriculture or forestry).

Consequently, the PACA region has undertaken a large-scale inventory of the agro-energy resources within its territory, identifying two main types of potential activity: combustion and methanisation (the degradation of organic matter in the absence of oxygen). On this basis, the study enables four large categories of products to be characterised (nature, use, volumes available and costs):

- products and by-products resulting from plant production activities (straw, husks, pruning, etc.),
- products and by-products resulting from breeding (waste, fleeces, etc.),
- products and by-products resulting from initial processing activities (cheese dairies, wine cellars, oil mills),
- sludge from wastewater treatment centres[7].

[4] The combustion of biomass does not contribute either to increasing the rate of CO^2 in the atmosphere (compensation due to photosynthesis) or to the high emission of sulphur responsible for the phenomenon of acid rain.
[5] On a European scale, the prospects would appear considerable. The EU estimates that agro-energies represent a short-term potential of 250,000 jobs in the 27 member states.
[6] *Agroénergies, une nouvelle fonction pour l'agriculture*, LAMNET-NEWS, 3rd issue, June 2003, FAO.
[7] *Les disponibilités agro et sylvoénergétiques en Région Provence-Alpes-Côte d'Azur*, 2009.

This phase is essential in a district's planning process insofar as it means ensuring a sufficient and constant supply volume over time. The mapping tool is particularly useful in accomplishing this task. The partner regions of the project have therefore undertaken corresponding actions. In Puglia, mapping the resources available is a fundamental task and involves the creation of a regional database dealing with the potential of biomass used for energy purposes. In Murcia, in addition to the basic data, the focus is also placed on the logistical aspects necessary to the use of biomass (road networks etc.). In Sardinia, the potential sites for setting up processing companies are also examined using geographic information systems (GIS). This geo-referencing of information allows different types of data to be cross-referenced (physical environment, human activities, infrastructures, production potential, etc.) thereby enabling the constraints and opportunities linked to the implementation of an agro-energy strategy to be identified. Far from focusing on agro-energy resources in the strictest sense of the word, the mapping activity carried out in the partner regions examines the sector as a whole and thus incorporates a wide range of characteristics of the territory.

Taking the evaluation even further, it is interesting to make use of the procedure adopted in Sardinia. The biomass available was measured for each different agricultural sector (crops, breeding and forestry). The methodology developed by ANPA and ONR[8] helps to highlight significant results (the tables below present the results in detail):

- herbaceous crops (not including pastureland): evaluation per province then transposed to the regional scale; use of specific technical coefficients; potential of 118,000 tonnes of dry matter per year (table 9),
- perennial crops: similar evaluation using two by-products (cutting phase then after the production cycle); humidity taken into account; potential of 460,000 tonnes of biomass from orchards (table 18),
- breeding: estimation of waste from the zootechnical sector using specific technical parameters (breeds, feed, type of breeding, etc.); potential of 450,000 tonnes of organic matter (table 27),
- forestry: implementation of the Sardinian Environmental Forestry Plan (SEFP); annual increase in plant cover taken into account; potential of 215,000 tonnes of biomass (table 28).

Tab. 9 - Biomassa potenziale da colture erbacee *(sostanza secca per anno - media 2008-2009) - Sardegna*

Coltura	Produzione raccolta* *(tonnellate)*	Scarto/prodotto principale** *(%)*	Quota scarto riciclata** *(%)*	Umidità media dello scarto** *(%)*	Biomassa netta disponibile *(tonnellate)*
Frumento	118.010	70	55	15	31.597
Orzo	32.096	80	55	15	9.821
Avena	24.285	70	50	15	7.225
Mais granella	24.872	130	50	55	7.275
Legumi da granella	3.809	150	7,5	15	4.493
Patata	51.171	40	2,5	60	7.983
Pomodoro	55.786	30	2,5	85	2.448
Carciofo	106.858	250	2,5	85	39.070
Cavolo e cavolfiore	23.419	250	2,5	85	8.563
Totale	**440.307**	-	-	-	**118.474**

Fonte: * ISTAT (2009); ** ANPA e ONR (2001)

[8] *I rifiuti del comparto agro alimentare*, ANPA – ONR, Studio di settore, no.11, 2001.

Tab 18 - Biomassa potenziale da colture arboree *(sostanza secca per anno - 2008) - Sardegna*

Coltura	Produzione raccolta* *(tonnellate)*	Residuo potatura/prodotto principale** *(% tonn. vite e olivo)*	Quota residuo potatura riciclata** *(%)*	Umidità media residuo potatura** *(%)*	Residuo legna fine ciclo** *(tonnellate/ettaro)*	Durata media impianto arboreo** *(anni)*	Umidità media legna fine ciclo** *(%)*	Quota legna fine ciclo riciclata** *(%)*	Biomassa netta da residuo potatura *(tonnellate)*	Biomassa netta da legna fine ciclo *(tonnellate)*	Biomassa netta totale disponibile *(tonnellate)*
Vite	123.887	749.745	5	50	20	25	40	90	356.129	16.053	372.182
Olivo	56.768	82.704	10	50	80	>50	40	90	37.217	-	37.217
Agrumi	84.128	40	5	40	45	50	35	90	19.181	4.816	23.998
Pesco	22.953	40	5	40	75	15	40	90	5.233	7.503	12.736
Albicocco	3.291	40	5	40	50	15	40	90	750	690	1.440
Susino	4.482	40	5	40	50	15	40	90	1.022	1.176	2.198
Melo	3.519	40	5	40	85	20	40	90	802	1.028	1.830
Pero	6.487	40	5	40	100	20	40	90	1.479	2.058	3.537
Ciliegio	1.174	40	5	40	50	15	40	90	268	468	736
Mandorlo	2.248	40	5	40	40	20	40	90	513	3.564	4.077
Nocciolo	368	40	5	40	40	20	40	90	84	684	768
Totale	**309.308**	-	-	-	-	-	-	-	**422.678**	**38.040**	**460.717**

Fonte: *ISTAT (2009); **ANPA e CNR (2001)

Tab. 27 - Biomassa potenziale da allevamenti zootecnici (anno 2009) - Sardegna

Bestiame	Peso vivo animali *(tonnellate)*	Deiezioni prodotte *(tonn./anno*tpv)*	Contenuto in sostanza organica *(%)*	Produzione totale reflui *(tonn.s.o./anno)*
Bovino	59.200	25,0	12,4	183.520
Suino	55.800	30,6	13,1	223.680
Ovino*	29.800	4,9	27,5	40.156
Totale	**144.800**	-	-	**447.355**

Fonte: INEA (Annate varie); AA.VV. (1997)

* La produzione di deiezioni è stata ridotta ad un terzo

Tab. 28 - Biomassa potenzialmente producibile dalle principali risorse forestali della Sardegna

Tipo di bosco	Estensione *(ha)*	Accrescimento medio annuo *(mc/ha)*	Densità *(Tonn./mc)*	Coefficiente di utilizzo	Biomassa totale* *(Tonn./anno)*
Ceduo semplice	113.275	2,00	0,80	0,5	29.427
Ceduo composto	93.672	2,00	0,80	0,50	74.938
Fustaia	304.686	3,04	0,74	0,16	110.793
Macchia mediterranea	360.908	1,81	0,78	0,00	0
Totale	**872.541**	-	-		**215.157**

Fonte: Piano Forestale della Regione Sardegna

* Biomassa ottenibile nell'ipotesi di 1 anno di stagionatura

This evaluation work is extremely complex insofar as it considers both the residual biomass from waste recovery and the production capacity. The methodology developed by Sardinia is nevertheless useful with a view to agro-energy planning.

In additional to the supply, a good evaluation of the resources available should also include the energy demand at the local or regional level (institutions, companies, private individuals). The data – in particular cartographic – relating to the potential resources should be considered with a view to supply and consumption. It is therefore important to incorporate economic criteria linked to competitiveness, prices and organisational and commercial efficiency. In implementing their agro-energy strategy, the political leaders of the region of Puglia therefore pay attention to the positioning of agro-energy resources on the markets and believe that it is better to focus on niche crops in order to differentiate themselves from the competition.

This evaluation of the potential is therefore an essential prerequisite for the actual implementation of a district. We will now examine in greater detail this concept which represents the basis of the work conducted within the framework of this project.

2. The organisation of the agro-energy sector: the concept of "district"

In most cases, the existing initiatives of the partner regions with regard to the development and organisation of the agro-energy sector are based on the concept of a district. This paradigm can be characterised by a certain number of attributes which vary according to the territorial context: geographical limits, specialisation of production, networks of operators, social relations founded on a duality between competition and cooperation, collective interest, R&D and training activities. The district is therefore a particularly operational tool for planning the agro-energy development of a region.

Extending the economic theories of Alfred Marshall relating to the geographic concentration of small specialist firms, the Italian experience of industrial districts is globally recognised as one of the reference models of territorial development and competitiveness policies[9]. Analyses have since surpassed the purely economic dimension to consider the social, cultural and institutional aspects of development: the industrial growth of a region is also founded on its territorial anchoring. The district is therefore born of a local community which specialises in a certain type of production.

With regard to the notion of a chain, the district differentiates itself through the existence of a specific territorial anchoring founded on economic, social, cultural and institutional dimensions. The chain refers exclusively to a set of activities corresponding to different stages of production, processing and distribution organised for a precise purpose: the creation of a finished product. This concept also incorporates technical and logistical considerations as well as the methods of using and/or consuming the product concerned. From an agro-energy planning standpoint, the chain is already operational for implementing an energy production and distribution system (biomass chains, biodiesel chains, etc.).

Nevertheless, we intend to focus here on the concept of the district insofar by formulating the hypothesis that it is an operational tool for organising and structuring the agro-energy sector of a territory and for coordinating the work of any operators likely to be involved (farmers, industrialists, upstream and downstream suppliers, training and R&D institutes, local and regional authorities) within the framework of coherent and efficient governance. This would furthermore appear to be the most suitable tool to support collective dynamics at a local level while developing an agro-energy strategy on a broader scope (region). It should be noted that the term district, frequently used in Italy and Spain, demonstrates characteristics very similar to the notion of "cluster" in English and has come to represent one of the cornerstones of European development policy (EU strategy 2020).

Consequently, while the desire to implement agro-energy districts aims to rely on territorial dynamics to encourage the emergence of a sustainable development dynamic (new activities, additional income, respect for the environment, quality of life), it is also a question of consolidating the collective force of a territory by highlighting the values shared locally. The next stage involves the physical implementation of such a tool.

3. The organisation of the agro-energy districts: integrating agriculture and industry

The implementation of an agro-energy district presupposes increased cooperation between the industrial and agricultural sectors. This cooperation must lead to the emergence of genuine chains organised within a district. This approach means working simultaneously on three levels:

- the production of energy resources (biomass, biofuel, etc.)
- the transformation of these resources into energy by specialist firms,
- the consumption of this energy (companies, institutions, private individuals).

[9] For example the "local production systems" and "competitiveness centres" which have the object of specific support policies in France since 1998.

The operators at these three levels are in contact with other operators. For example, farmers work with suppliers of inputs (equipment, fertiliser, etc.). At the other end of the chain, biofuel production must also involve the manufacturers of engines capable of using this resource. Thus, the introduction of an agro-energy structure means that the production system must be considered globally.

At this stage, the work of identifying operators capable of integrating a district is primordial. While it is a question of identifying institutions (training, research, management), it is also important to have an overview of the operators in the field: producers, buyers, transformers, users. This task of identifying the links in the chain also serves to identify the "black holes" in the chains, i.e. the operators whose absence could be detrimental to the correct functioning of the district.

Using the example of forestry biomass, the "roundtables" organised by the regions of Sardinia and Murcia represent a pertinent methodology based on a necessarily local approach to the objectives, an approach which, in this respect, matches the spirit of the industrial districts. It is possible, then, to bring together the forest owners, associations and institutions responsible for the agro-energy sector to examine the means of implementing a district (extraction, storage, transport, transformation).

An illustration of the complexity of the work of identifying the actors can be seen in the procedure implemented in Murcia, which shows that these actors are very diverse in nature (institutions, firms, associations, individuals) and are located at different levels of intervention (national, regional and local). The table below summarises this procedure.

Level of intervention	**Actor**	**Type**	**Remarks**
National	Ministries	Public institutions	Different sectors: industry, energy, trade agriculture, education, research, environment, etc.
	Associations	Private / public actors	Producer / trade / consumer associations, Control / certification organisations, etc.
Regional	Regional ministries	Public institutions	Same sectors as at national level
	Associations	Private / public actors	Same sectors as at national level
	Scientific research units	Public / private institutions	IMIDA, universities, technical centres, etc.
	Companies	Private actors	Operators in the field
Local	Local councils	Public institutions	-
	Individuals, owners	Private actors	-

Source: IMIDA, 2010.

According to the diagnostics, it would appear that attempting to establish balanced relations between private operators (farmers, firms) and actors operating in the public sphere (decentralised local authorities, local action groups, etc.) is a condition which underpins the success of the approach. The presence of the civil society and the associative sector is also desirable.

The table illustrates the necessary openness towards the exterior that a district must demonstrate. Nevertheless, the implementation of an agro-energy strategy must define a geographic zone within which the district must operate. This approach calls on one of the essential characteristics of the concept of "district" as it is formulated within the Novagrimed project: its necessarily localised dimension. This spatial planning is a crucial stage in the operation which is based, in part, on the prior evaluation of the agro-energy potential as well as on more qualitative criteria (political opportunities, actors' interests, social consensus, etc.). Hence the region of Sardinia emphasises that pressure and lobbying by the local authorities and/or companies is part of the "natural" process of implementing an agro-energy strategy. The planner must consider this phase through the growth possibilities of the sector available.

Despite these contingencies, the operational definition of the district must be finalised according to more objective technical criteria. Its size must be a compromise between the resource supply necessities (sufficient critical size to reduce costs and generate economies of scale) and the criteria of

sustainability, in particular linked to the size of the companies. This compromise is, of course, extremely variable according to the territorial context.

In operational terms, the implementation of a district could therefore call on emerging territorial dynamics. The approach proposed by Thessaly offers a useful reference point for the demonstration. In Greece, the territorial reform in progress involves grouping the former demes (basic territorial units) into new, larger demes (corresponding to the "arrondissements" or "Communautés de Communes" in France). In fact, these new demes correspond to geographical and historical units and, in some cases, demonstrate a potential complementarity between plain, piedmont and mountains. In this context, the implementation of an agro-energy district would rely on the organisation - at the level of the demes – of integrated agro-energy value chains (production, processing and local consumption of energy based on a small-scale processing unit) and on the coordination of these territorial value chains at regional level, in particular with regard to R&D, training and administrative/technical support policies. This interaction between the regional level and the territorial level could serve as a model for other partner regions.

The installation and/or selection of the district's infrastructures (storage depots, transformation firms, logistics, etc.) must complete the zoning work and enable the transport costs for the resources to be evaluated while minimising the disadvantages linked to the dispersion of the resource. In this respect, the introduction of efficient distribution networks integrated in the existing networks is necessary to facilitate the district's integration in the local socioeconomic fabric.

The experts from the region of Sardinia believe that once the agro-energy district has been "put down on paper", an institutional structure must be introduced which is devoted to its day-to-day management. This issue of district governance refers both to the sharing of common objectives and to the operators' responsibilities (operating rules). In the spirit of the industrial districts, the structure must be flexible and reactive while being endowed with the strategic competences necessary to accomplishing the tasks entrusted to it. In light of the multiple local contexts, this organisation can take numerous forms and cannot be determined *a priori*: private individual, consortium of firms, public institution, mixed association (public-private), technological centre, etc. What is essential is that the structure is perceived as legitimate by the different actors to ensure that it can exercise sufficient authority.

The governance of the district also involves the implementation of operating rules capable of governing the relations between the parties. The region of Sardinia refers to the implementation of "procedures" which should facilitate the day-to-day management of the activity. These procedures must be formalised in a clear and efficient regulatory framework. In particular, these rules concern the creation of contracts between the different links in the chain. For the districts, this means avoiding any "anomalies" linked to supply. In the region of Puglia for example, the large biodiesel firms (localised in particular in the town of Monopoli) work exclusively with raw materials from other regions or abroad. Inversely, the locally-produced biodiesel is primarily exported to Germany. This situation can first and foremost be explained by the absence of supply agreements within the chain.

The need to introduce rules can also be seen in the forestry sector in the region of Murcia. The introduction of a regional law for forest maintenance must facilitate the creation of conditions conducive to the use of biomass (support of the regional administration, improved access to forest areas, good practices charter for the sustainable use of wood, more advantageous forest taxation). Beyond the constraints they create, these rules must encourage the involvement of private owners and their adhesion to the approach while contributing to the reduction of the maintenance costs for forest areas.

First and foremost, the physical implementation of a district therefore requires dialogue between the agricultural and industrial sectors. It is nevertheless also important not to ignore the aspects linked to training and R&D, which are federating elements of any development procedure.

4. The objectives linked to training and research & development: solving the technical problems

The presence of training and R&D organisations is inextricably linked to the organisation of the agro-energy chains within the framework of a district. The role devolved to these structures concerns the development of competences and the dissemination of information (conferences, seminars, etc.) within and outside the district. It is important to underline the fact that research activities must go beyond the simple framework of the production of renewable resources (biomass, biodiesel, etc.), but must encompass all the stages (transformation, distribution, introduction of new products, etc.). The accumulation of knowledge must contribute to providing a better evaluation of the potential and quality of the biomass available (spatial dispersion, behaviour during processing) while offering technical and economic references, in particular with regard to the production and commercialisation costs, the profitability thresholds as well as energy efficiency and environmental efficiency. All of this information serves as a decision-making tool and an instrument helping to formulate the medium- and long-term strategy. Generally speaking, and in light of the relatively recent nature of the sector, farmers and company managers alike feel that they do not yet have sufficient information at their disposal. The development of this "economy of knowledge" is thus a decisive objective.

The parties involved in R&D must be sufficiently close to facilitate the circulation of information. Where necessary, the structures concerned can group together to form a single, more or less formal entity capable of defining a global strategy at district level. This is indeed the case with the Laboratory for the Development of Agro-energies (Puglia) which, since 2007, has encompassed a number of public research establishments and representatives from the world of agriculture and industry. It is also important to ensure that connections are formed with training organisations in order to facilitate the technical and technological transfer.

The approach is somewhat different in Thessaly. Research and training with regard to agro-energies are provided within the framework of partnerships between higher education institutions (University of Thessaly – Rural Area Laboratory, Larissa Technological Institute) and the development agencies.

More broadly speaking, anchoring the district within its territory will be facilitated by information and awareness operations intended for the general public concerning the advantages linked to the use of renewable energies. These procedures can contribute to ensuring that users are better informed with regard to operating equipment which uses agro-energies (boilers, etc.).

In general, training and R&D activities aim to solve the technical problems linked to the existence of an agro-energy activity. For example, the region of Murcia is faced with a lack of standardisation of solid biofuels which today results in boiler faults. The introduction of standardisation norms would appear desirable (labelling, qualitative control).

Having seen how the structures comprising a district can be organised, we must now examine the principles capable of governing its functioning.

5. The objectives linked to evaluating the agro-energy districts: sustainability criteria

Among the principles which should govern the functioning of the districts, the criteria linked to whether or not they are sustainable are some of the most important indicators. Directive 2009/128 relating to renewable energies establishes a general framework by requiring that this type of activity comply with so-called "sustainability" criteria[10]. More specifically, these criteria refer to the following points:

- the reduction of greenhouse gas emissions resulting from the use of biofuels;
- the production of biofuels from raw materials not originating on high-value land in terms of biodiversity (primary forests, protected areas, etc.), land with a high carbon stock (wet areas, etc.) or land designated as peat bogs;
- production and transformation processes complying with environmental requirements.

[10] Directive 2009/128 relating to the promotion of the use of energy from renewable sources, article 17.

Nevertheless, these criteria do not refer exclusively to environmental aspects, as other dimensions involved include the conventions relating to labour law, international trade and biotechnological risks. Whatever the case, the Directive is intended to promote these criteria and integrate this notion of "energy balance" founded on certain simple principles:

- an agro-energy chain must not consume more energy than it produces;
- an agro-energy chain must not compete with a food commodity chain;
- an agro-energy chain must include the impact of positive externalities when calculating the production cost (health, environment).

Biofuels are faced with several controversies in terms of energy balance[11]. The production of biofuels is, in principle, neutral in terms of CO_2 as it offsets its emissions by means of absorption as the plant grows. The UN nevertheless feels that there is a real risk of the rate of CO_2 increasing if development is too intensive. Furthermore, the organisation believes that the use of biofuels is better suited to the production of heat and electricity than to use in transport. Similarly, competition with food is a reality (at least in the case of first-generation technologies): in a report drawn up in 2008, the World Bank indicated that biofuels were responsible for a 75% increase in food prices.

It is therefore crucial that the agro-energy development approach put forward here is not implemented to the detriment of food crops. The partners often highlight the possible competition between agricultural food prices and energy prices. Too great an increase in farmers' incomes linked to the development of agro-energies can, for example, cause distortions in competition and encourage farmers to stop producing food goods.

It would therefore appear necessary to set limits on the development and/or intensification of the activity within the framework of the districts, either in terms of the share of income or in terms of surface area. In Sardinia, for example, it is interesting to note the existence of a regional regulation limiting the power of photovoltaic units for a given farm. Similarly, every farmer on the island must be able to prove that the income derived from agro-energies does not account for the majority of his overall income. More generally speaking, the district approach developed here must necessarily prioritise energy production based on residual sources.

Agro-energy districts must be designed as tools allowing the activity to be monitored and ensuring that it is controlled by the local society. The proposals put forward by the partners with a view to retaining a local strategy include the following:

- promote the energy independence of farms as the main objective of energy production,
- set a maximum power threshold for processing companies in order to avoid excesses linked to too great a level of intensification. The partners' opinions differ on this subject (1 to 3 megawatts depending on the region). It is also possible to approach the problem by limiting the scope of action of the firms (maximum radius of 40 km proposed by Sardinia),
- prioritise land threatened by agricultural abandonment, a phenomenon which is particularly common in Murcia (semi-arid zone) or Thessaly, where approximately 1 million hectares of farming land could be abandoned due to erosion, a loss of fertility or pollution.

More broadly speaking, energy crops must be developed in accordance with the community environmental requirements, in particular with regard to the consumption of fertiliser, pesticides and water. In this respect, energy crops other than biofuels may also be called into question. In general, the combustion of biomass generates gases which, while far less harmful than gases generated by fossil fuels, may present environmental risks. Furthermore, it is clear that an agro-energy activity which is too intensive (single-crop) is potentially dangerous, both for biodiversity and the richness of the soil[12].

The introduction of sustainability criteria would therefore seem necessary in order to regulate the functioning of the agro-energy districts as presented here. Evaluation must therefore be an essential

[11] Data taken from Euractiv, the European network dedicated to European affairs: www.euractiv.com/fr.
[12] This remark is, of course, not specific to agro-energies; it applies to any agricultural activity.

component of the governance of these districts, involving the selection of indicators, application and monitoring over time.

From this standpoint, the procedure launched by the region of Puglia would appear to be of great interest. In 2007, the region created a Laboratory for the Development of Agro-energies, bringing together multi-disciplinary competences from numerous public research establishments and the representatives of agriculture. Today, this structure contributes to determining the criteria enabling the sustainability of the different types of biomass used to be established, irrespective of its origin. This strategy places the region in a favourable position with regard to transposing Directive 2009/128. Furthermore, the leaders of the laboratory believe that for any action intended to guide and support the creation of agro-energy chains, it is necessary to consider the environmental objectives on the same level as the purely competitive objectives during all the production stages.

In conclusion, the introduction of sustainability criteria must help better define the operating principles of an agro-energy district. This work must push the operators to position themselves with regard to several fundamental issues. What attitude should be adopted vis-à-vis genetically modified organisms (OGM)? How can a lasting balance be achieved between sustainability and competitiveness? Once the basic principles of the concept of the district have been established and the stages of its deployment have been fixed, we must demonstrate how this tool becomes immersed in the territorial dynamics and thus adjusts its form to each specific case.

II. The territorial anchoring of the concept of a Sustainable Mediterranean Agro-energy District

While the concept is initially a model which can be transposed to very different conditions, it must also take account of the territorial context in which it is implemented. Analysing the different dimensions of this context would appear to be complex as they encompass not only physical and socio-cultural aspects, but also political and economic elements. This phase is nevertheless essential, in particular with a view to according greater importance to the Mediterranean dimension of the concept. Consequently, the geophysical and socioeconomic aspects of the territory will be examined, followed by questions concerning public policies and regional governance and finally the issues inherent to proximity.

1. The significance of the local context: agro-energies in light of the natural and social characteristics of the territories and the Mediterranean dimension of the concept

If we believe that the idea has been accepted that the agro-energy sector is a component in its own right of the multifunctional and sustainable agricultural model desired by the European Union, then taking account of the local context when implementing such chains demands the inclusion of the natural dimension of the territory. This primarily refers to the characteristics (constraints) of the soil and climate as well as the geographical characteristics in the socioeconomic sense of the word.

The examples drawn from the partner regions of the project illustrate the extent to which these characteristics impact the agricultural sector as a whole and thus the agro-energy sector in particular. The relative isolation caused by the fact that Sardinia is an island therefore exercises a strong influence on its energy needs. The involvement of agro-energy chains must therefore be adapted accordingly. The objectives linked to energy crops are perceived differently in the marginal arid areas in Murcia in that they involve specific innovative techniques enabling their energy efficiency to be increased (for example the selection of specific plant varieties resistant to water stress). In the medium and long term, the prospect of climate change makes the capitalisation of experiences from one region to another all the more important. Another illustration can be seen in rape seed oil destined for Puglia (production of biodiesel). As its climatic requirements (temperature, rainfall) are very similar to those of corn, rape cannot be grown throughout the region without an irrigation system, thereby largely conditioning its cultivation.

More broadly speaking, agro-energies are also incorporated in social and cultural dynamics which have a more or less direct impact (positive or negative) on their development. When implementing agro-energy chains, the decision-makers are often faced with the reticence of local actors, particularly farmers. Irrespective of the region concerned, this "resistance to change" would seem to be a constant. Similarly, using forest biomass leads to negotiations with private owners who are often majority stakeholders in the land management of the massifs. Contractualisation would therefore appear to be a fundamental objective.

Consequently, the implementation of an agro-energy activity requires a change of mind-set in the very perception of the agro-energy activity. As we mentioned in the previous section, awareness operations intended for local actors may be necessary to give impetus to the innovation capacities of rural societies. An approach in terms of the district can prove particularly effective in this case in that this tool must be assimilated by the local population. In simple terms, the aim of this type of operation is to change the agricultural practices acting as a brake on the development of agro-energies, such as burning by-products directly in the fields.

The diagnostics also highlight the Mediterranean characteristics of a district, primarily perceived through a greater vulnerability of agriculture in general, a vulnerability to which agro-energy crops must adapt:

- the rarity of water which is subject to increasing pressure,
- the seasonality and volatility of a certain number of Mediterranean crops,
- agriculture threatened by high demographic pressure resulting from urban development and tourism,
- increased fragility with regard to the consequences of climate change (fall in output, crop displacement, increase in periods of extreme climatic conditions)[13],
- increased risks of erosion or due to the topography.

The partners' work is not, however, limited to the potential weaknesses but also identifies the opportunities to be exploited, such as the presence of typical endemic plants – for example *cynara cardunculus* (artichoke thistle or cardoon) – adapted to the Mediterranean climate and soil conditions, which are conducive to energy farming. We might also highlight the perspectives offered by forest biomass in terms of Mediterranean territorial management (fight against fires and erosion reiterating the notion of public goods). Finally, and even though this point should be explored in greater detail, the Mediterranean tradition of collective and/or territorial management of resources would appear to distinguish itself from the practices common in northern Europe which are oriented more towards sector-based rationales.

In conclusion, the information presented above clearly illustrates that the implementation of agro-energy districts cannot be a standard procedure which applies in all circumstances (notion of "off-the-peg"). The extremely diverse physical, social and cultural situations necessitate constant adjustment to the planning strategy (notion of "made-to-measure"). In the same perspective, the political dimension must also be taken into account, in particular the role of the regional support policies for the agro-energy sector.

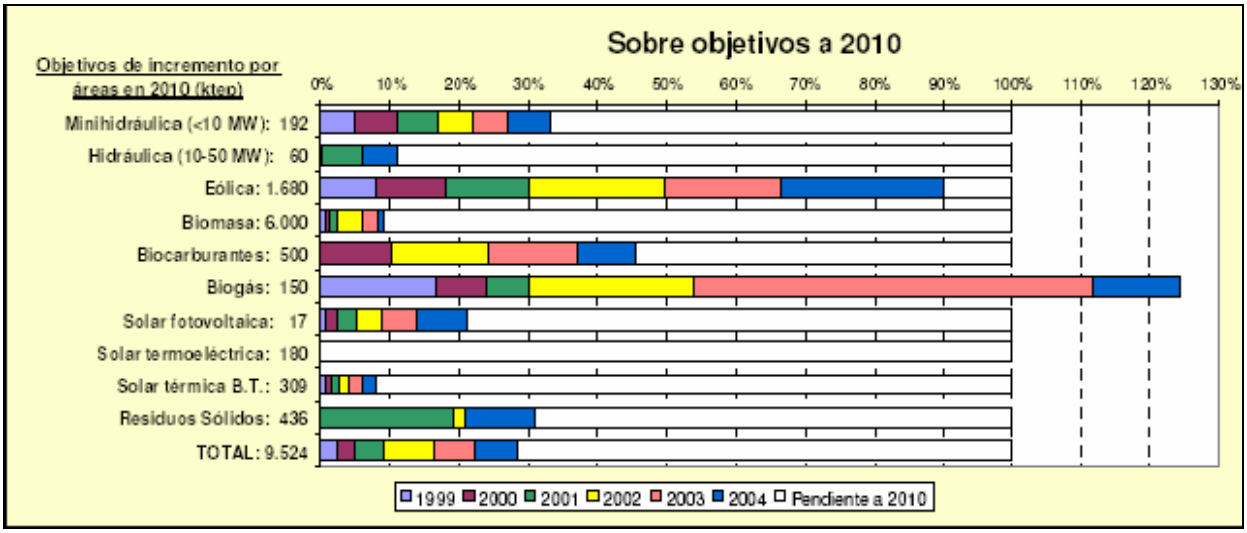
2. Agro-energy policy and governance: what role for the regions?

The role of the regions is explicitly mentioned in the Directive of 2009 relating to renewable energies. It is written that "*The Directive strongly encourages the local and regional authorities to set objectives exceeding the national objectives by developing regional action plans for renewable energies (…). To obtain an energy model favouring energy produced from renewable resources, it is necessary to encourage the strategic cooperation between the member states with, where necessary, the participation of the regions and the local authorities*"[14]. This legitimacy afforded to the regions explains the considerable diversity of agro-energy policies introduced by the project partners.

[13] The estimations of the European Commission illustrate the possible displacement of Mediterranean crops to more northern climes by 2050, as well as a fall in output of between 10 and 30% which could increase supply risks (European Commission, 2008).

[14] Directive 2009/128 relating to the promotion of the use of energy from renewable sources, preliminary considerations.

For a number of years, Murcia has thus developed considerable support for the agro-energy sector through a series of planning documents[15] intended to achieve the nationwide objective of 20% for the production of energy from renewable resources. One of the particularities of Spanish policy lies in the monitoring functions resulting from the national and regional plans. Thus, a certain number of monitoring indicators have been introduced with a view to monitoring the progress of the strategy in relation to the objectives from one year to the next. As illustrated in the graph below, this procedure would appear to be relatively pertinent with a view to implementing an agro-energy district as it highlights the efficient sectors and those where more effort is required.



Source: Promotion of Renewable Energies Plan (2005).

The main obstacles to the development of agro-energies have also been identified, providing an orientation for the policies to be introduced. The table below summarises the work carried out.

Theme	Obstacle	Measure envisaged
General	Late development of biomass areas	Creation of an inter-ministerial committee for the consumption of biomass energy
	Non-existence of a supply chain market	Development of transport
Availability of the resource	Agricultural residues and energy drops	Improved mechanisation of harvesting
	Lack of suitable treatment and high costs	Aid in buying machines
	Distribution and small-scale units	Contracts drawn up for the purchase of biomass
Use of household heat	Competition from other fuels	30% aid for investment in household appliances
	Lack of rules and regulations	Development of regulations for constructions
Co-combustion	Lack of installations	Contracts with the electricity companies
	Lack of studies	Analysis of the potential and technologies for each electric power station

Source: Promotion of Renewable Energies Plan (extracts).

In Sardinia, we note the existence of a SREEP (Sardinian Regional Environmental Energy Plan). This is a technical document relating to the development of agro-energies which identifies the priorities and possible scenarios. It is interesting to note that the document emphasises the technological approaches of agro-energies with frequent references to scientific works. From the point of view of implementing a district, this point illustrates the need for an effective and coherent R&D strategy.

Aware of the importance of this theme for the development of rural areas, the region of Puglia has introduced significant accompanying measures to support the development of the agro-energy chains. The Rural Development Plan 2007-2013 refers to precise measures concerning both support for the construction of residual biomass transformation plants and support for investments and actions in the fields of information and training.

[15] Murcia Regional Energy Plan 2003-2012, to which can be added the nationwide Promotion of Renewable Energies Plan 2000-2010, revised in 2005.

More precisely, the "Renewable Energy and Energy Conservation 2007-2013" inter-regional operational programme is the result of a comprehensive thought process conducted by four regions in the Mezzogiorno, including Puglia. Three primary focuses have been identified: the production of renewable energy, energy efficiency and technical support.

In Greece, in relation with community work, we have witnessed the implementation of an integrated policy aimed at fighting climate change and founded on both a reduction in greenhouse gas emissions and the development of renewable energy sources including energy derived from biomass. Several laws[16] have given substance to this approach which will serve as a framework for the specific regional policy currently being defined in Thessaly.

Hence the implementation of an agro-energy district never refers to a model which is universally identical and must constantly adapt to the local conditions in that it must be incorporated in regional policies taking very different forms from one country to another. From both a financial and technical standpoint, these policies represent potential opportunities for the project leaders and thus require prior analysis. From this standpoint, the regional level would seem to be perfectly placed at the crossroads between the European context and local concerns. Furthermore, and despite the fact that the trajectories differ from one member state to the next, the institutional changes at work are contributing to redefining the local public authorities' means of intervention while conferring broader prerogatives on the regions, in particular with regard to land use planning, regional development and agriculture. The regions would therefore appear to be the best-placed institutions to define an agro-energy policy capable of satisfying the specific territorial objectives and to coordinate this with the local operators (training, R&D, farmers, industrialists).

In this respect, tax policies are a decisive element to be observed in that agro-energy activities generate positive externalities capable of attracting specific financial aid. More broadly speaking, it would seem that one of the obstacles to the development of agro-energy activities lies in the uncertainty linked to the institutional mechanisms supposed to accompany their development. While the aim is to avoid too great a level of dependence on public aid, a system should nevertheless be implemented allowing the multifunctional nature of the activity to be remunerated. The agro-energy districts must therefore be implemented within the framework of a coherent policy enabling local operators to adopt a medium- and long-term approach. More specifically, it is a question of preventing the development of free-rider strategies adopted by investors who are very often "a-territorial". This policy must therefore incorporate financial incentive mechanisms (tax credits, subsidies) as well as technical support. This final idea refers to the issue of territorial development, which takes a particular form in the case of the agro-energy chains.

3. Agro-energies and rural development: the advantages of proximity

The European Directive relating to renewable energies frequently underlines the potential role of agro-energies in the dynamics of development, in particular with regard to fragile rural areas: "*It is accepted that innovation together with a competitive and sustainable energy policy facilitate economic growth. In many cases, energy production using renewable sources relies on local or regional small and medium-sized firms (SMF). There are considerable prospects for growth and employment in the member states and their regions through investment in energy production using renewable sources at regional and local level*"[17]. The development of the agro-energy sector is therefore in line with the Lisbon Strategy and its extensions[18], which advocate the development of a greener economy based in particular on renewable energies.

The prospects in terms of development would therefore appear to be considerable and the European Union believes that agro-energies could generate between 250 and 300 thousand direct jobs across the continent by 2012, not to mention the indirect and related jobs (upstream and downstream industries, related sectors, etc.). Beyond the figures, the benefits for rural areas also relate to social

[16] Law 3734/2009 relating to the promotion of the joint production of energy; Law 3851/2010 aimed at accelerating the development of renewable energy sources and introducing a national action plan.
[17] Directive 2009/128 relating to the promotion of the use of energy from renewable sources, preliminary considerations.
[18] Lisbon Strategy, 2000; Consultation on the future "EU 2020" strategy.

cohesion (quality of life, proximity between production zones and consumption zones). Furthermore, the organisation of the sector into chains could contribute to a more equitable distribution of added value. From this point of view, biomass production can be distinguished from the photovoltaic or wind sectors in that potential job creation concerns the farms directly.

There is an additional point of some importance: it is the very structure of the activity linked to agro-energies (small-scale firms, high level of decentralisation) which gives economic development a very specific form. This aspect is particularly important in the case of agro-energy districts, themselves founded on a rationale of proximity and the localised nature of resources, be it manure, animal or organic waste or biomass. From the standpoint of sustainable rural development, the advantages of this decentralisation would seem clear: a secure supply, a reduction in transport costs (both financial and environmental), the enhancement of the local economy and incomes for both farmers and local authorities. It is for this very reason that, in several agro-energy promotion documents, the European Union acknowledges that the use of biomass is optimised at local level[19]. The concept of the "district" must therefore incorporate this idea of proximity, in particular calling on the forms of organisation of the traditional Mediterranean societies.

It is for this reason that all the partner regions advocate geographic proximity in their agro-energy strategy. With a view to reconciling economic efficiency and environmental sustainability, the region of Sardinia recommends the establishment of small-scale transformation units within its territory to simplify logistical questions as far as possible while bearing in mind the need for a sufficiently large critical size to reach a satisfactory profitability threshold. In the same perspective, the region of Puglia believes that the establishment of large-scale units would contribute to an increase in imports of raw materials which, in addition to a negative carbon footprint, would lead to a new, external energy dependence. It is therefore advisable to favour short chains founded on niche markets.

The implementation of a Sustainable Mediterranean Agro-energy District should therefore result directly from this rationale of proximity. More precisely, the experts in the region of Sardinia believe that the establishment of a biomass transformation plant must be able to rely on supplies from a geographic area falling within a radius of 40 kilometres around the plant. This threshold would indeed appear to reconcile the concerns of sustainability with the requirement of profitability.

Generally speaking, considerations concerning spatial proximity therefore directly examine the issues linked to supply and logistics which are fundamental to processing companies in light of the decentralised nature of the raw material. The implementation of an agro-energy district must therefore be accompanied by constant considerations concerning the economic efficiency of the activity at local level through the analysis of several criteria: collection and processing costs, the diversity of available sources, supply security, price regularity and the quality of the raw material.

4. Conclusion: the necessary territorialisation of the concept of the agro-energy district

In light of the information presented in the second section, the agro-energy would appear to be a territorially-anchored concept aimed at federating all local operators around a common strategy. Thus far from being a simple medium of the activity, the territory is necessarily an actor in the dynamics at work. This particular role should help to avoid excesses linked to too intensive a development of the agro-energy activity without any territorial foundation (private a-territorial investors) importing raw material for example. The importance of public funds – in particular European – is therefore capital.

This anchoring goes beyond the actors involved in the production activity and must also include the participation of the local population and associative sector, in particular with a view to identifying the needs of the users. By incorporating the objectives linked to demand, the agro-energy districts would prove to be innovative tools capable of strengthening the competitiveness of the territories in which they are implemented.

[19] Directorate General of Agriculture (2010), "*Pour un approvisionnement énergétique plus "vert" : le rôle de la bioénergie issue de la sylviculture et de l'agriculture".*

Finally, the territorial anchoring of a district must also be seen through a desire to retain the added value generated on-site by the activity. This idea supports the distinction between local and European public goods, where the territorialised nature of a good involves its management by local actors[20].

III. The agro-energy districts within the future Common Agricultural Policy

In recent years, agro-energy crops have enjoyed extensive development on the international scene due to the impetus injected by the states and also with a view to achieving the objectives set by the Kyoto Protocol. The legislative work undertaken in Europe bears witness to this spectacular development. The Italian government very recently implemented the procedure of transposing Directive 2009/128 relating to renewable energies, opening the way to providing support for the development of agro-energies in the regions. Similarly, only a few weeks ago, the French state consolidated its support for agro-energy activities through an increase in the price of buying electricity produced by means of methanation. This development has been achieved despite the recurrent problems encountered by the sector with regard to production, processing and distribution costs, which remain higher than those of fossil fuels, and to the heterogeneity of the resources available.

The concept of "district" in the development of the agro-energy sector must be implemented in accordance with the reform of the Common Agricultural Policy. Generally speaking, the development of agro-energies as envisaged here can satisfy several objectives set by the future CAP, in particular with regard to the second pillar: the multi-functionality of agriculture, job creation, the fight against climate change and the energy autonomy of farms. More precisely, the concept of "district" would seem capable of maintaining the balance between food and non-food crops in light of the fact that it promotes both sustainability and proximity. The approach put forward by the Novagrimed project is also coherent with the "EU 2020" strategy, which advocates the increased competitiveness of the territories through technological cooperation and job creation linked to the economy of knowledge.

The recent works of the European Commission[21] strongly emphasise the notion of "public good", which will probably be at the heart of the future CAP. Drawn from economic theory and referred to on several occasions in the present document, this notion refers to a good which is non-exclusive (several people can benefit from it), non-rival (one individual does not consume it to the detriment of another) and a potential source of development opportunities for the territories[22] (Cooper, Hart and Baldock, 2009). Irrespective of whether they are environmental (landscapes, biodiversity, etc.) or social (food security, vitality of rural areas, etc.) in nature, these public goods are seen as services rendered by farmers to society and are not yet compensated by the market, thereby justifying public intervention.

With this in mind, and in light of their role in the three pillars of sustainable development, agro-energies are capable of generating a certain number of these goods: "*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*"[23].

On 12th October 2011, the "legislative package" of the future Common Agricultural Policy was officially published. The proposed regulation concerning rural development[24] provided a number of specifications concerning the manner in which agro-energies would be handled. It would therefore

[20] Bureau J.-C., Mahé L.-P., (2008), "*La réforme de la PAC au-delà de 2013 : une vision à plus long terme*", Notre Europe, Thinking a united Europe, 67 p.
[21] European Commission (2010), "*La PAC à l'horizon 2020 : Alimentation, ressources naturelles et territoire - relever les défis de l'avenir*", communication from the Commission to the European Parliament, the European Economic and Social Committee and the Committee of the Regions.
[22] Cooper T., Hart K., Baldock D. (2009), "*Provision of public goods through agriculture in the European Union*", Institute for European Environment Policy.
[23] Op. cit.
[24] European Commission (2011), "*Proposition de règlement du Parlement Européen et du Conseil relatif au soutien au développement rural par le Fonds Européen Agricole pour le Développement Rural*", working document, October 2011.

appear that the concerns with regard to competition with food crops and to the development of the sector on a local level (preeminent role of SMEs) are confirmed.

Three specific points deserve particular attention:

- article 5 relating to the objectives of rural development and their coherence with the "EU 2020" strategy (intelligent, sustainable and inclusive growth). The 6 priorities expressed include prioritising an economy generating low CO^2 emissions and which is resilient to climate change, in particular by providing renewable energy sources: agricultural by-products, waste and residue;
- article 23 relating to afforestation and the creation of wooded areas which, in particular, stipulates that no aid will be granted with regard to the planting of fast-growing trees for the production of energy, thereby giving an indication in terms of sustainability;
- article 36, which encourages territorialised forms of cooperation, in particular between the operators in the supply chains within the framework of the sustainable production of biomass.

In this perspective, the territorial dimension of the district has facilitated the emergence of an initial recommendation proposal intended for European decision-makers: the possibility of supporting these approaches through the institutional recognition of the concept in accordance with the criteria previously defined. Applied to a model comparable to that of the competitiveness centres[25] in France, for example, this "territorial certification" could help to avoid certain pitfalls often associated with agro-energy activities (intensification, competition with food crops) and to consolidate the contractual rationale between the operators, thereby creating conditions conducive to an improved distribution of added value.

While the present document has established the bases of the concept of the "district", the final objective of the partners is to put forward criteria which, in the long term, will possibly give rise to the construction of an "agro-energy districts charter", thereby facilitating the process of labelling territories. Without hoping to be exhaustive, the principles mentioned (see annex) should not be perceived as constraints requiring strict adherence but as strategic orientations towards which local operators should tend in order to increase the sustainability of their territory and to encourage the adoption of new practices by professionals and the local population alike.

This labelling procedure applies principles similar to those of the official European quality signs such as the Protected Designation of Origin and the Protected Geographical Indication. This similarity raises several essential questions:

- How can a potential origin of raw material be guaranteed in the field of energy production?
- Which control procedures must be implemented?
- Is it possible to envisage forms of quality certification for one or other raw material?

A possible point of comparison can be seen in the concept of the "bio-energy village" originating in Germany. In the village of Juendhe (southern Lower-Saxony, 800 inhabitants), the residents decided collectively to abandon conventional power supplies in favour of an energy based on local biomass. Supported by researchers from the universities of Göttingen, Kassel and Berlin, the procedure is founded on 3 essential elements:

- a power station supplied by energy crops and livestock effluents producing biogas, combined with a generator producing heat and electricity (with a proportion of the output sold to the national network at a fixed price);
- a combustible heat plant supplied by the local production of wood chips to cover additional demand in winter;
- hot water pipes distributing energy to the houses connected to the network.

Beyond the local energy production / consumption, the project also aims to create jobs and consolidate a rural identity. In this respect, its acceptance by the local population is an essential

[25] Created in France in 2005, the competitiveness centres bring together, in a given territory, the companies, R&D units and training institutes and aim to implement innovative cooperation with a view to strengthening their competitiveness in the international sphere. At the beginning of 2011, 71 competitiveness centres were certified (http://competitivite.gouv.fr/).

requirement, not only in terms of the collective dynamics, but also with regard to the economic durability of the approach (70% of users in the municipality must be in favour). Since the launch of the project in 2006, the initiative has spread to other villages, both in Germany and elsewhere.

Even if it cannot be transposed in its current state to the considerations carried out within the framework of Novagrimed, this concept[26] is nevertheless interesting in that it is founded on similar principles (territorialisation of an economic activity, local scale).

In conclusion, continuing the work carried out within the framework of the "Agro-energy value chain" action has helped to upgrade the preliminary synthesis, in particular by incorporating aspects linked to the Mediterranean dimension, the role of the region and the possible interaction with the reform of the Common Agricultural Policy, with all three components at the heart of the Novagrimed project.

The concept of a Sustainable Mediterranean Agro-energy District would appear to be entirely relevant in the debate concerning the diversification and multi-functionality of Mediterranean farms. In the current climate, it is a potentially pertinent and operational tool for structuring the sector capable of supporting the implementation of a Euro-Mediterranean energy strategy adapted to the local socioeconomic, soil and climate conditions. In terms of territorial development, the perspectives offered by the rationale of proximity (production, processing, consumption) also seem promising (competitiveness of rural areas, transport costs, sustainability of the activity, creation of jobs which cannot be delocalised).

[26] Karpenstein M., Schmuck P., (2007), *Bioenegy Village – ecological and social aspects in implementing a sustainability project, Journal of Biobased materials and Bioenergy*, vol. 1, pp. 148-154.

ANNEX

Implementing a Sustainable Mediterranean Agro-energy District

- proposed indicators -

The present document is an initial summary of the full list of characteristics which could / should be demonstrated by a SMAD as envisaged within the framework of the "agro-energy value chain" action undertaken as part of the Novagrimed project. Based on the strategic document (see elsewhere), this text attempts to organise the indicators into a coherent whole which, rather like a management chart, would make it possible to monitor the implementation and evolution of a sustainable agro-energy strategy within a given territory. In the long term, these indicators could be perceived as district labelling criteria, as proposed in the strategic document.

It should be recalled that the work primarily concerns the enhancement of biomass, i.e. plant matter obtained from natural forest or agricultural sources (which we might therefore refer to as "bio-districts"). The considerations are nevertheless intended to be extended to other forms of agro-energy activities.

The table below summarises all the elements explored in the document and which should offer a more accurate picture of the strategic position of the concept of an agro-energy district. These elements refer in particular to the issues of proximity, territorial anchoring and governance while also examining the sustainable nature of such a district. This initial proposal must be developed further by the project partners, in particular with regard to the discriminating or non-discriminating nature of each proposed indicator.

Criterion / indicator	Priority orientations within the Novagrimed framework
Energy efficiency	- Optimisation of production / processing costs - Selection of high-energy efficiency sources
Proximity	- Mobilisation of local resources (production, processing, consumption) - Obstacles to "import / export" strategies
Organisation	- Implementation of a coherent and effective form of governance (shared objectives, balanced public / private relations) - Implementation of a central institutional district management structure ensuring the involvement of all the parties concerned - Elaboration of a region-wide agro-energy strategy (production, training, R&D, etc.) - Coherence of the local (agro-energy value chain) and regional (district coordination) elements - Involvement of the civil society and the associative sector
Training – R&D	- Coherence of training and research institutes at regional level and elaboration of a coherent strategy - Production and dissemination of specific knowledge with a view to supporting local operators
Compliance – Directive 2009/128 on Renewable Energies	- Mobilisation of resources not originating from high-value land in terms of biodiversity (primary forests, protected zones, etc.) - Mobilisation of resources not originating from land with the status of a peat bog - Recourse to production and processing procedures compliant with environmental requirements - Contribution to the objectives of reducing greenhouse gas emissions
Sustainability – Natural resources	- Contribution to the preservation of natural resources / biodiversity - Desire for environmental efficiency
Sustainability – Territorial equity	- Desire for improved cohesion between urban and rural spaces - Desire for "energy well-being"
Sustainability – competitiveness	- Desire for improved distribution of added value throughout the value chains - Desire for an increase in / diversification of farmers' incomes - Job creation - Consolidation of competitiveness of rural spaces through innovation
Supervision of the activity	- Prevention of risks linked to intensification (power thresholds of agro-energy units, share of agro-energies in farmers' incomes, scope of action of processing companies, limitation of surface areas, etc.) - Priority promotion of residual agro-energy sources - Development of the energy autonomy of farms as the primary target - Priority spatial location of agro-energy activities on so-called marginal land (semi-arid zones, etc.) - Decentralised development founded on a network of small and medium-sized enterprises
Public policies	- Implementation of long-term public policies (regional, national) recognising the multi-functional nature of the agro-energy activity (notion of public goods) - Joint development of financial aid/administrative and technical support systems
Territorial anchoring	- Implementation of measures conducive to retaining added value within the territory (investments, incomes, jobs) - Implementation of awareness campaigns vis-à-vis the general public - Involvement of the associative sector
Mediterranean dimension	- Reduction of water consumption - Reduction of price volatility - Implementation of land management instruments (fight against urban pressure) - Fight against natural risks (erosion, fires, etc.)