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PPP preliminary analysis for an agro-energy district feasibility: TusciaRomana area's case of study

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Abstract

This paper presents a preliminary study of a methodology to implement public–private partnerships (PPP) for an agro-energy district in TusciaRomana area (central Italy). We propose a PPP scheme (developed from Rural Evolution's methodology) to have starting guidelines, in terms of relationship between stakeholders, agro-forestry biomasses availability, and response to territorial and natural needs.

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1. Introduction

The EU Biomass Policy and Action Plan states that biomass is essential for environmental and competitiveness reasons (Hummel, 1988; Manos, Bartocci, Partalidou, Fantozzi, & Arampatzis 2014; Frayssignes, 2011). The use of wood for heating in the last ten years was promoted with European structural funds, rural development plans, energy projects, regional and provincial funds (Proto, Zimbalatti, Abenavoli, Bernardi & Benalia, 2014). Bioenergy can

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contribute to satisfy, in a sustainable way, the future energy request and it represents the most important renewable energy source (Moneti, Delfanti, Marucci, Bedini, Gambella, Proto & Gallucci, 2015).

Within this context, the concept of building partnerships between the public and the private sector for the purpose of delivering, emerges in a more efficient way. This mixed partnerships, known as PPP, recognize that both parties have strengths and resources in performing certain tasks and therefore one could benefit from different capabilities and levels of expertise (Chaiamarit & Nuchprayoon, 2014).

An agro-energy district represents a useful model for the achievement of important energetic and environmental goals in Europe and the world on the one hand whereas on the other is linked to rural development. A successful PPP in agro-energy district should carry out three conditions at a minimum: there should be benefits for private sector; benefits for the consumer; benefits for the government: fulfilment of a political need, social obligation, development imperative (Manos, Partalidou, Fantozzi, Arampatzis & Papadopoulou, 2014).

During these last years, municipalities are better organizing themselves to take actions in the field of the renewable energies, making agreements with private enterprises, creating awareness to the citizens of the benefits related to renewable energies, involving town and citizen associations into common projects, cooperating with industrial associations and technology institutes for feasibility studies, trainings, and strategy decisions (Frayssignes, 2011; Chaiamarit & Nuchprayoon, 2014). Quite often, a renewable energy consortium is created when there is a clear and strong policy will to proceed in Municipalities (AUTH, 2010). The first step is always almost the Mayor's decision supported by his advisors to take part into a renewable energy initiative, and implement changes and improvements into the municipality district (Phua & Minowa 2005; Singh, Kumar & Rai, 2014). Onwards, the appropriate private companies (technology sellers, installers and maintenance) are contacted for a request to tender the startup of the project at a later time (Manos, Partalidou, Fantozzi, Arampatzis & Papadopoulou, 2014).

1.1 Identification of local needs

The first step in preparing a PPP is the selection of the area where the project will be developed, in order to identify the desired coverage targets and service needs (Shaghaygh, Taraneh & Ken, 2014). The party that conceived the idea for an agro-energy district will have to carry out a sector analysis and define the technical specific actions of the proposed PPP project (Troldborg, Heslop & Hough, 2014). As a result of the sector analysis, the government is able to determine to what extent an enabling environment exists for PPP and what activities are required in advance of PPP to create such an environment. The diagnostic is important in order to: (a) identify the strengths and weaknesses of the sector and the most promising areas for efficiency increases, (b) regularly gauge and report on the progress of reform, and (c) tweak the reform program as needed (Manos, Partalidou, Fantozzi, Arampatzis & Papadopoulou, 2014; Chaiamarit & Nuchprayoon, 2014).

1.2 Role of stakeholders

Despite the long experience with PPP, they remain controversial among a range of stakeholders. This is partly due to the diverse range of stakeholders involved in the process and the difficulty in reconciling their interests and concerns (Uuemaa, Mander Marja, 2013; Hernandez-Morcillo, Plieninger & Bieling, 2013). In addition, too often the stakeholders have not been properly consulted or engaged in the process. Consultation is increasingly seen as important for several reasons. First of all the inadequate consultation or communication with stakeholders increases the danger of opposition, potentially late in the process, leading to delays or even cancellation (Kanakoudis Podimata, & Papotis, 2007; Brand & Missaoui, 2014). Furthermore, the stakeholders are critical to the sustainability of a PPP. Even if the contract is awarded despite opposition, the difficulty and risk of the project increase drastically if public support is not present. Stakeholders provide valuable input to the design and practicality of an approach. Allowing stakeholders to comment on PPP strategies allows a sense of buy-in and can lead to innovative approaches. Dissemination of information leads to an increased credibility of project partners. Despite these compelling reasons, some public organizations see risk in public consultation either through the danger of raising expectations that may not be met, through losing control of the flow of information, through the danger of being unable to reconcile differences, or because information might fuel opposition. These risks are easily outweighed by

the benefits of communication and the crucial role it plays in building support for, and understanding of, PPP. Each role is critical, yet specific stakeholders will have different interests that influence how they approach their role. There must be a consultation process to reconcile and prioritize issues, leading to broad agreement on the objectives of PPP (Velo, Osorio, Fernández& Rodríguez, 2014).

In figure 1 the scheme elaborated by Rural Evolution Projects reported: the procedure to have a correct public private partnerships described.

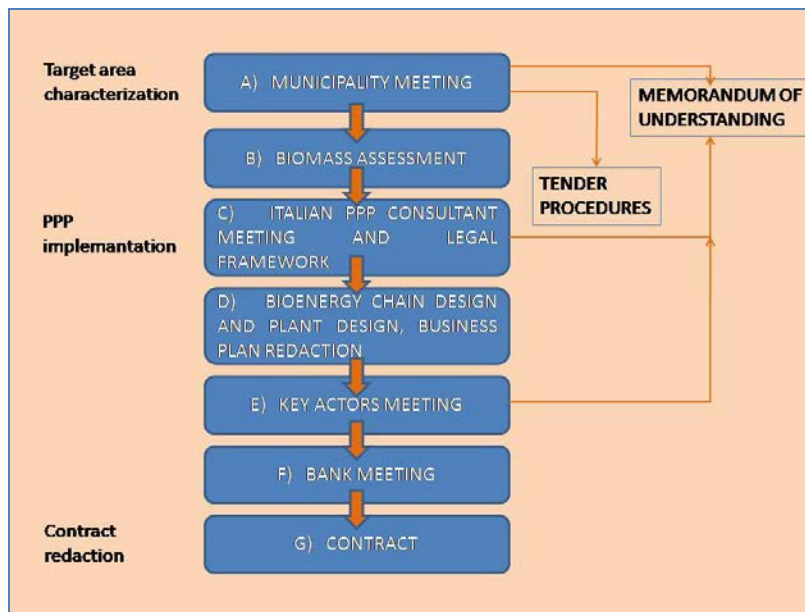


Fig. 1. Evolution Scheme for a PPP.

2. Materials and methods

2.1 Target area

The territorial scope that identifies Tuscia Romana area includes the municipals of Allumiere, Anguillara Sabazia, Barbarano Romano, Bassano Romano, Bracciano, Canale Monterano, Manziana, Oriolo Romano, Tolfa, Trevignano Romano, Vejano, Villa San Giovanni in Tuscia (Fig. 2).

2.2 Identification of local needs

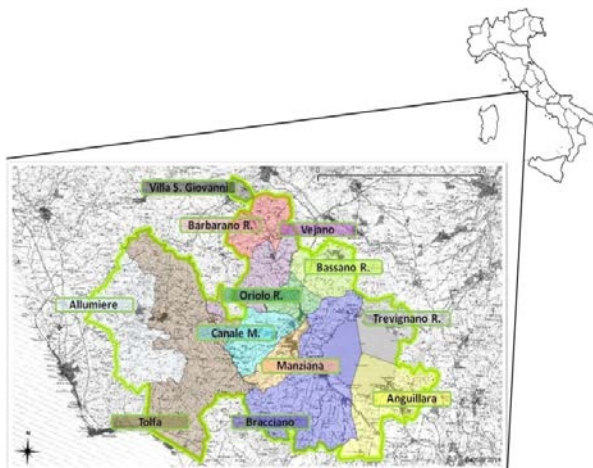


Fig. 2. Location of the studied area.

After specifying the study area, the following step is to identify the desired coverage targets and service needs. The diagnostic is important in order to: identify the strengths and weaknesses of the sector and the most promising areas for efficiency increases, regularly gauge and report on the progress of reform, and tweak the reform program as needed.

In this paper we have oriented our interest towards the offer services, based on a real demand: that is the removal of agro-forestry residues that don't reuse in agricultural activities.

Actually there aren't official statistic that can offer an exactly residual evaluation, both respect to the produced and commercialized quantity, and to the utilized areas. The assessment of residual biomass is therefore based on indirect methods, that are referred to the existent ratio between principal production and residual production, that are evaluable both from direct experience "on site" and from bibliography. To evaluate the real availability of agro-forestry residues to energy use, it is important to know also their actual destination: the agricultural activity, in fact, often uses these residues or in shredding practices, or in zootechnics as bedding or, rarely, as unifeed.

2.3 The stakeholders

In some cases PPP remain controversial. This is due to the diverse range of stakeholders involved in the process and the difficulty in reconciling their interests and concerns. In addition, too often the stakeholders have not been properly consulted or engaged in the process (Manos, Partalidou, Fantozzi, Arampatzis & Papadopoulou, 2014).

Tuscia Romana area is favoured in the stakeholder relationship, thanks to the presence of an associative group: the Local Action Group (L.A.G.)

L.A.G. has advanced a Local Development Plan (L.D.P.) of Tuscia Romana area, enclosing the guidelines of a pilot strategy to an integrated and sustainable development, based on a representative partnership, structured around a theme typical of territorial identity, and built on the basis of situation and needs analysis of our study area.

L.A.G. absorbs all the twelve Municipality, some Natural Parks (Bracciano and Martignano Natural Regional Park, Marturanum Sub-urban Park), some companies (Allumiere agrarian association, Bassano Romano agrarian association, Rome Cooperative Confederation, Lazio Regional association Cooperatives and National Health Found, Rome Companies Craft Confederation) and, finally, some banks (Rome Cooperative Credit Bank (CCB), Formello e Trevignano Romano CCB, Barbarano Romano CCB).

3. Biomass availability

An evaluation was made relatively for the forest sector, about the only public sector, while the private sector is not considered due to a lack of data (Marziliano, Laforteza, Medicamento, Lorusso, Giannico, Colangelo, & Sanesi, 2015; Colantoni, Delfanti, Recanatesi, Tolli & Lord, 2016). Agro-forestry biomasses in Tuscia Romana area can be classified in different typologies:

- forestry biomass (we have used Forestry assessment plan);
- agro-forestry crops (Corine Land Cover data; ISTAT database);
- annual herbaceous crops (Corine Land Cover data; ISTAT database; ENAMA database).

Finally, using calorific value we have obtained the available heat in terms of kWh_{th} (Tab.1). We have gridded this data to create raster files in IDRISI (G.I.S. software) to perform multi criteria analysis. This multi criteria analysis has been performed to obtain the biomass availability in the twelve municipalities of Tuscia Romana (Fig. 3).

Table 1. Total biomass availability.

	Biomass energy use [t]	kWh _{th}
Annual crops for energy use	87645	400723125
Permanent crops for energy use	10289,5	50941007,3

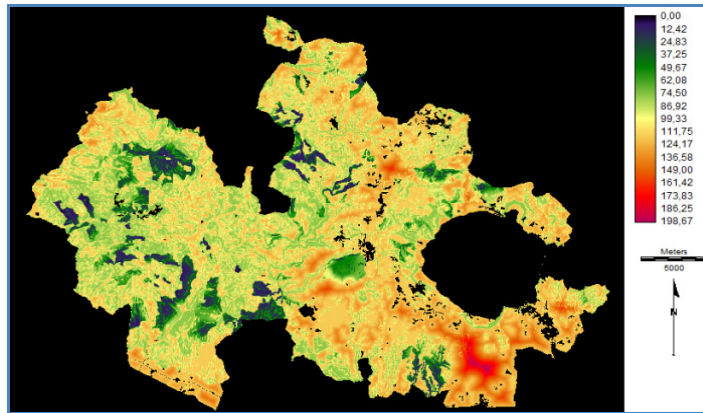


Fig. 3. Results obtained by the multi criteria analysis performed according to fuzzy logic. The whole territory has been zoned in a scale of values that ranges from 1 to 199: values of 1 indicate areas with a low attitude in biomass providing; those with 199, instead, are perfect to provide biomass.

3.1 Determination of the PPP scheme

Regard to biomass availability and to the possibility of creating a partnership between public and private sectors, further sectors already gathered in a group of local action that promotes the territory development, we propose the diagram shown in Figure 4, as an initial guide to follow for a future partnership. The advantage and novelty, compared to the model applied by the Rural Evolution Project is the involvement of the University, as a research institution. Thanks to this institution it will be carried out an in-depth analysis of both biomass estimation, as listed above, and also assessments in the use of prototypes, for the biomass exploitation, developed by the university itself. Certain advantages may be achieved, both in terms of cost savings allocated to energy evaluation companies, and in terms of further co-operation, which connects agricultural and territorial reality to the world of research, currently very detached from the municipalities and often not included for lack communication among stakeholders.

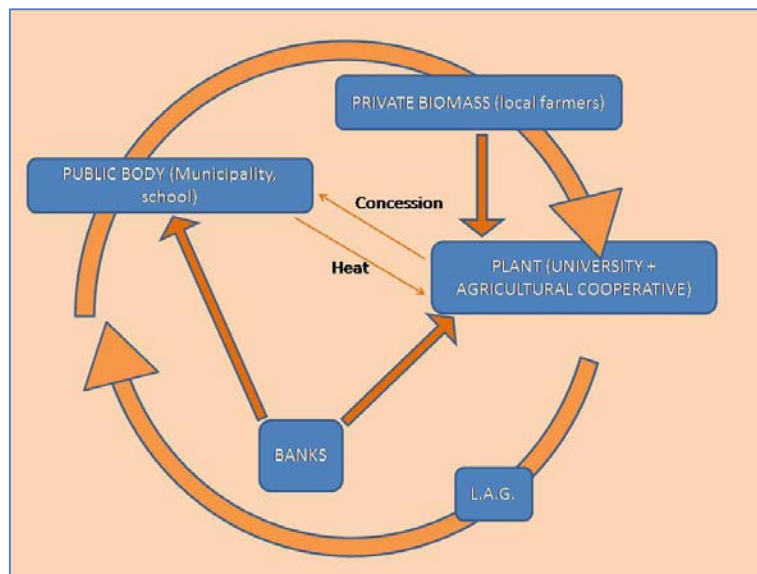


Fig. 4: P.P.P. scheme.

4. Results

Figure 5 shows a riabsuntive scheme of the most important guidelines to have an application of a correct PPP in an agro-energy district.

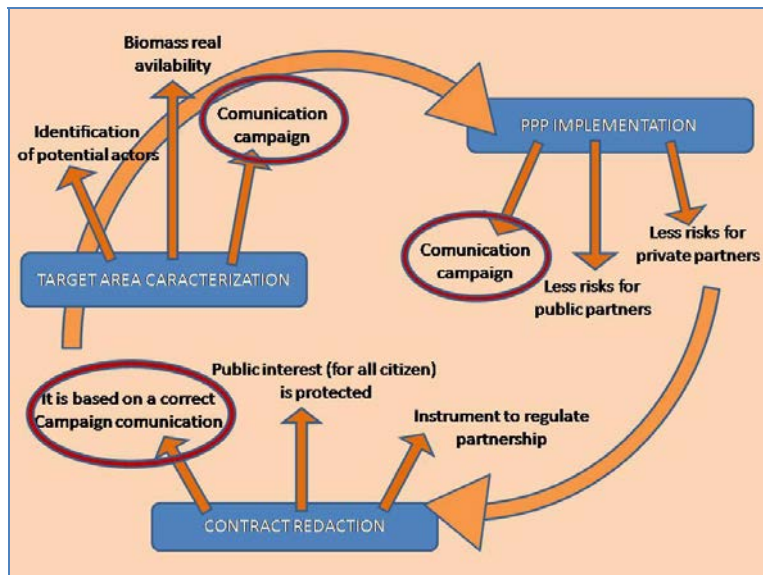


Fig. 5. Riabsuntive scheme of guidelines to have an application of a correct PPP in an agro-energy district.

Guidelines related on Target area characterization are:

- the identification of potential actors is easier if there are some collaboration with farmers organizations (for example GAL Tuscia Romana). Furthermore, the identification of key actors and stakeholders has made simple by the fact that already in other projects (ex. BIC Lazio, and PSL) enterprises networks have been created.
- Biomass availability study have been already realized in our other projects for the same area, in which it results that there are great quantities of not used residual biomasses (for example prunings, and othe biomass residues, as branches...). Some innovative instrumentation has been developed to describe the biomass potential of an area through the use of Geographical Information Systems, in particular with multicriteria analysis of Idrisi software.
- the coefficient used to estimate biomass production are not always updated and reliable. Infact in many cases the estimated area potential production is not the same as that of the real production. Anyhow the study of area characteristics is very important but requires time and imply elevated costs. The harvest or collection of biomass is very expensive too and the individuation of the right conversion technology to transform biomass into energy has to be done with accurate analysis. For this reason we propose all these analyzes in collaboration with a university team.
- the communication campaign is fundamental, but could be difficult to realize if there is a little interest from the population and the industrial sectors. For this reason an awareness campaign could be done.

Relatively to a PPP implementation, the following guidelines should be considered:

Participation to PPP is more efficient both for private and public sectors, in fact, the Public Private Partnership organization will reduce the risk connected with the business model for the private on one side, and the competition among private bidders will produce lower costs for the service for the public counterpart on the other side. Nevertheless the selection of the public partners, but also of the private partners, has to be based on clear motivations and on a communication campaign, that in some cases could become very expensive and not useful.

Indeed the promotion of a bioenergy project in a municipal area requires numerous meeting with the population to better explain the advantages and disadvantages of this kind of new energy sources.

Furthermore, from research on literature (Manos, Partalidou, Fantozzi, Arampatzis & Papadopoulou, 2014) it is not always simple to find local legislation about PPP; PPP budget in the agroenergy sector is quite low and banks loans are very difficult to obtain and are characterized by very restrictive conditions.

Guidelines connected on contract redaction:

- the contract will defend public needs and interests and grant good conditions of service by the concessionaire. Biomass raw material contract has to be granted for the whole duration of the project. The contract has to be followed by financial, economical but also technical documentation;
- land acquisition and connection to the electrical grid have to be taken into account.

5. Discussion and conclusions

In PPP implementation it is important, first of all, to know the territory very well, both in physical characteristics (influences the biomass availability) and in type of stakeholders. The preparation stage is the time needed to develop the preliminary technical specifications. Development of the final technical specifications of a project is an iterative process, which builds on feedbacks from the market and the affordability of the project at each design stage (Barontini, Proietti Silvestri, Nardi, Bovicelli, Pari, Gallucci, Spezia & Righi, 2013).

The technical design of a project starts with identification of desired coverage targets and service standards. From these starting points, estimating the cost of these desired services (factoring in presumed efficiency gains) and cost recovery tariffs is possible. In case of large project where high level governance is involved, there are the options of putting these cost recovery tariffs in place, subsidizing cost-recovery, or revisiting the initial targets and service standards. These preliminary specifications will ultimately be enshrined in the PPP contract dictating the technical outputs expected from the partnership. The technical preparation builds on (and refines) the analytical work that has been done in preparing the sector analysis.

Most of the area, as it appears in our study, has a useful amount of biomass that can be used for energy purposes. However this amount of biomass could be increased once the private forests will be included in the energetic district. At the current state, in this research, we have analyzed the forest land just considering the state-owned forests because their future common management, from an energetic point of view, turns out to be more realistic considering that the private owners often do not agree with this kind of policy, because in this case often the management of the forest turns out to be more expensive. One of the most limiting factors detected in the methodology proposed is represented by the difficulty in collecting data especially for the forestry production.

Another important aspect in defining the real capability of the agro forestry system in providing biomass for an energy plant, consists in planning and achieving a georeferenced database able to detect the complexity of the environments systems. Data such as the road network, forest tracks and dendrological and silvicultural parameters are often difficult to find and require plenty of time for acquisition in the GIS database (Cavalli & Grigolato, 2010).

It is also very important the involvement of local stakeholders, above all of private sector (farmers, citizen, etc.); this is because public support is fundamental for the success of PPP. Consultation is increasingly seen as important for several reasons. First of all the inadequate consultation or communication with stakeholders increases the danger of opposition, potentially late in the process, leading to delays or even cancellation. Furthermore, the stakeholders are critical to the sustainability of a PPP. Even if the contract is awarded despite opposition, the difficulty and risk of the project increase drastically if public support is not present. Stakeholders provide valuable input to the design and practicality of an approach. Allowing stakeholders to comment on PPP strategies allows a sense of buy-in and can lead to innovative approaches. Broad public support and understanding of the reform agenda encourage politicians to stay committed. Dissemination of information leads to increased credibility of the project partners.

For these reasons we wanted to highlight (Fig. 5) the importance of a correct communication campaign, which starts not only when you want to make the project to be known, but which is carried out from the started study stages of the project. It is essential to take into account the real interests of all stakeholders, especially citizens,

because you can also learn about the cultural value that the entire study area possesses. This value, that is considered a key indicator, if not evaluated, could compromise the entire PPP success. Therefore, we are creating the questionnaires to be submitted to all stakeholders, so that we will better take the real interests (and not just potential) of the Tuscia Romana area, and we will be able to assess in order the optimum location of an agro-energy production chain, the kind of plant and the environmental feasibility (using L.C.A. - Life Cycle Assessment - methodology).

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