Valuing profitability of Mediterranean forest plantations: Permanent Polycyclic Plantations as a new business model combining industrial timber production and ecosystem services provision

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Forest plantations in the Mediterranean

Forest plantation are growing worldwide. At present, they are estimated to contribute to more than one third of the global industrial timber supply, and most studies foresee this contribution to increase up to 70-80% by 2050 (Carle and Holmgren, 2008).

In the Mediterranean, forest plantations play a very important role and in several countries their contribution to the timber supply is even more relevant than the global average.

For example in Italy, poplar plantations already contribute for more than 50% of the total roundwood supply. Mono-specific and intensively managed Poplar, eucalyptus and pines plantations are consolidated segments of investments in Mediterranean countries as Spain, Portugal, France and Turkey. Their role is fundamental for the forest-based economy but their environmental impact (on water and biodiversity) and their social acceptance is subjected by widely shared concerns.

Permanent Polycyclic Plantations

What are?

With Permanent Polycyclic Plantations (PPP) we intend multi-objective and mixed forest plantations which are:

- Polyyclic because they include multiple species with different productive rotation lengths;
- Permanent because rotations cycles can be continuously repeated, allowing (with careful spacing and management strategy) a continuous soil cover (Burestii Lattes et al, 2014)

For example, a PPP can produce three types of products from different species and rotations lengths: firewood (from poplar or platanus managed in SRF), plywood (from poplar with short-medium rotation) and sawnwood/veneer (from oak or walnut with medium long rotation).

Where?

Figure 1: Permanent Polycyclic Plantations in Italy

When?

Scientific research on PPPs started in the early 1990’s and the first experimental plantations have been established in Italy in Casal Butano (CR) and San Matteo delle Chiaieche (MN) between 1997 and 1998.

Why?

In spite the production of industrial timber is still the major reason for investing in forest plantation (and will be increasingly important), there is a growing awareness for the provision of other products and services, supporting the idea that forest plantation can generate economic, social and environmental benefits (potentially marketable in voluntary and emerging markets for carbon, water and biodiversity protection) (Brotto ef al, 2016).

The complexity of PPPs vertical and horizontal structure and the diversity of planted species (see models in Figure 2) makes them a new interesting plantation business model, especially in intensively cultivated agricultural lands and peri-urban areas.

Financial valuation of PPP profitability and comparison with competitive land uses

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Objectives:
1. to analyze and compare the investment returns of forest plantations in northern Italy, including: poplar, walnut and Permanent Polycyclic Plantations (PPPs);
2. to compare it with the main competitive investments in agriculture.
3. to test the effect of policy and market factors (timber prices, land cost, subsidies)

Methodology:

a) We defined five plantations models (Table 1) and the competitive agricultural crops (maize and soy):
1. Traditional poplar (planting 46y);
2. Walnut with medium-long rotation (planting 10x10);
3. PFP with focus on plywood production;
4. PFP with focus on veneer production;
5. PFP with focus on biomass for energy (Figure 2).

b) We collected data and information from case studies and literature on costs (preparation, planting and management) and timber prices (Table 2).

c) We computed the discounted cash flow (r=3.5%) and calculated two capital budgeting criteria: Net Present Value (NPV) and Internal Rate of Return (IRR).

For all models we considered four scenario:
Maximum costs (maxC) and minimum costs (minC), and in a average fertility situation (Af) and High fertility (HF).

Our performed a sensitivity analysis in order to test the effect of:
- different timber prices on the market;
- land cost;
- subsidies regimes.

Results and discussion:

Table 3 reports the cash flow of discounted costs and revenues for all forest plantations models.

Table 4 shows the NPV (€/ha/year) and the IRR (%) for all the forest plantations models and agricultural crops, calculated for the four scenarios. The ranking is based on the NPV criteria.

Table 5 presents the results of the sensitivity analysis. For further details on the results and on the methodology please make reference to Prag et al (2016).

References


Potentials:
- More important role in the provision of ecosystem services (potentially marketable)
- Increase biodiversity
- Regulate microclimate
- Improve water flow
- Reduce effects of some pollutants
- Higher social value and social acceptance
- The diversification of species, rotations and products can reduce the investment risk
- First financial analysis demonstrate interesting performances

Limitations:
- We are still working on a limited n. of hectares (about 200 ha in Italy)
- Require careful planning
- Require deep knowledge on growth dynamics and appropriate interventions
- The market for high value oak or walnut timber is still very uncertain and fluctuating.

Table 1: Plantations models used for analysis.

Table 2: Cash Flow

Table 3: Net Present Value (NPV) and IRR

Table 4: Sensitivity analysis