

A methodology for sustainability evaluation of food supply chains: Example of organic potato in Northern France

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This study aimed at developing and testing a method to assess the economic and environmental impacts of different local food supply chains. This method should easily test the sensitivity of economic and environmental indicators to new technical choices. It was tested by evaluating the supply chain of organic potato in Picardy (Northern France). The environmental assessment was performed by the Life Cycle Assessment. The system boundaries were from cradle to selling location's gate (including the distribution phase). Environmental impact was calculated with Recipe method for climate change, acidification and eutrophication, with cumulative energy demand method for energy demand and with UseTox method for ecotoxicity. Economic assessment was based on the calculation of financial accounts for each economic activity along the supply chain (agricultural production, storing, packaging ...). Financial accounts represent resources and workforce required for the production throughout the entire business life cycle and allowed to calculate the following indicators by activity: investments, profitability (Net Present Value), return on investment, employment, value added and its distribution. The latter determine the distribution of wealth created amongst national economic actors (figure 1): workers (wages), financial institutions (interest charges), local and national administration (taxes, social charges) and non-financial enterprises (Gross operating surpluses). A sector study was conducted to identify all the economic activities encompassed by the value chain and to quantify the physical and monetary flows between each step.

Table 1 gives an example of comparison between mechanical and thermal haulm crushing. Little differences appear between both practices on environmental and economic indicators. For organic potatoes supply chain, more than 20 different scenarios (with different practices on crop production and distribution system) were assessed. The tests show the links between economic and environmental indicators for each activity of the supply chain. This method is reproducible for other food supply chains and can be easily used to assist the decision making process and the system optimization by giving a wide overview of different scenarios quickly.

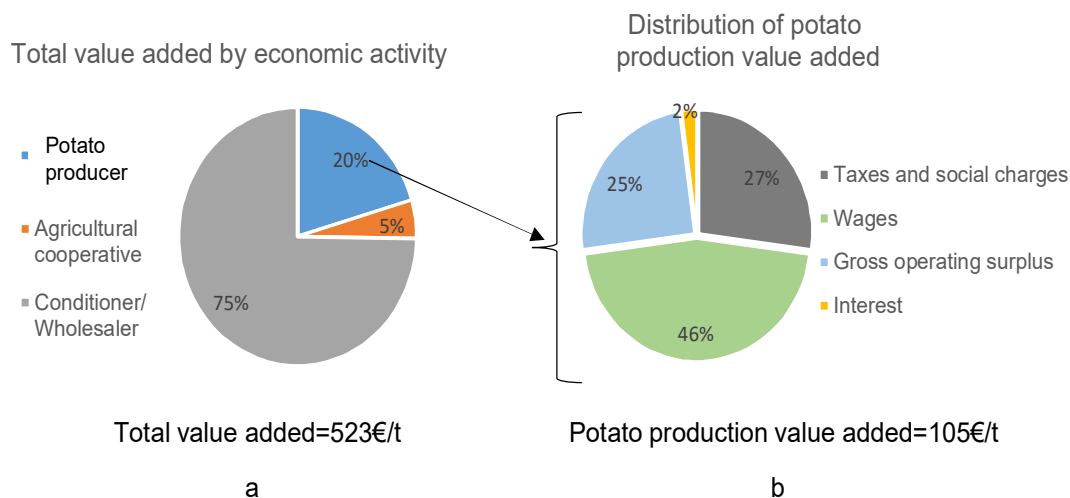


Figure 1 : Value added distribution:

- Among each economic stakeholder along the supply chain (left)
- Among potato production (agricultural activity only) (right)

Table 1 : Variation on environmental and economic indicators for 1 ton of potato at farm gate: example of the substitution of mechanical haulm crushing by thermal haulm crushing.

Dimension	Indicators	Variation (thermal haulm crushing/mechanical haulm crushing)
Environmental	Climate change	+4%
	Eutrophication	0%
	Acidification	+2%
	Ecotoxicity	0%
	Energy demand	+7%
Economical	Value added	-3%
	Gross operating surplus	-6%
	Net present value (on 10 years)	-11%
	Time of return on investment	+30%
	Employment	0%