Rural land in Flanders, the northern part of Belgium, is becoming increasingly limited (Kerselaers et al. 2013). As a result, some dairy farmers are unable to produce sufficient silage maize for their livestock, leading to the emergence of an informal silage maize trade market between farmers. Semi-structured interviews with experts and stakeholders revealed three distinct features of this market. First, given the low density of chopped silage maize, the market is characterized by high transport costs. Secondly, the market is subject to large variability in prices, quality of the product and in yield. Finally, there is no use of formal contracts. Therefore farmers tend to build durable relationships with their trading partners over the years, which are often perceived more important than “getting the best deal”.

Recently, this market has been altered by the establishment of biogas plants in Flemish dairy farming regions, consuming large amounts of silage maize. In 2013, biogas plants processed 333,780 tons of silage maize, or 6% of the total silage maize production in Flanders, and it is likely that this number will continue to increase in the future (De Geest et al. 2013).

This poster presents ongoing research on the influence of biogas plants on the informal silage maize trade market. More specifically, we investigated the importance of transport and transaction costs in the silage maize trade market, and, consequently, the influence of the establishment of biogas plants on silage maize prices and the robustness of durable relationships between farmers.

We developed a multi-agent spatial trade model, assuming cost minimizing behaviour for silage maize buyers and profit maximizing behaviour for silage maize sellers, in function of transaction and transport costs. The mixed integer linear programming model was developed in GAMS and made use of real data for a high density dairy area. Two versions of the model were made: one without a biogas plant, in which farmers with a silage maize surplus have the option to sell this surplus through the informal silage trade market to another farmer, or sell it through the formal grain market as grain, while farmers with a deficit have the option of buying extra silage maize through the informal silage trade market, or buy alternative feeds through the formal feed market.

The second version adds a biogas plant located in the centre of the modelled area. The model takes into account three kinds of transaction costs: search costs, negotiation costs and enforcement costs (Williamson 2004), which are influenced by the social and negotiation capacities of the farmers, as well as the tendency for opportunistic behaviour by their trading partner. The model simulates trade over a period of 10 years.

Over consecutive transactions, farmers learn about their trading partners and build up trust. As a result, information asymmetry declines, which leads in turn to declining transaction costs. Since only indicative data on the transaction costs between farmers were available, we conducted a sensitivity analysis on this parameter. We found that with increasing initial transaction costs, the number of transactions declines. Moreover, we found that as transaction costs increase, transactions mainly occur between farmers with a large surplus and farmers with a large deficit.

In absence of a biogas plant less than half (41%) of the farmers are involved in the trade of silage maize. These transactions happen over short distances, with an average distance of 1.77 km per transaction. In presence of a biogas plant, demand for silage maize largely increases, leading to higher silage maize prices. As a result, the number of transactions between farmers also rise, with almost all farmers (93%) involved in the silage maize trade. Furthermore, transactions happen over larger distances, with an average distance of 4.88 km per transaction.

This research indicates that with increasing transport and transaction costs, trade between farmers declines. Furthermore, in the presence of a biogas plant, farmers’ connectivity increases and information asymmetry declines leading to lower overall transaction costs. However, silage maize prices increase and transactions are less efficient with regards to travelling distance.