LPIS (Land Parcel Identification System) to manage GM/conventional maize co-existence in the EU intensive agricultural region of Lombardy

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Abstract

Lombardy is a region of Northern Italy, located in the wide and flat Po Valley where arable crops are widespread and agriculture is very intensive. Within this region, the GIS system SIARL (Sistema Informativo Agricolo Regione Lombardia), is used for the registration and management of farmer declarations when applying for EU subsidies.

According to provisions under EU law, land use history referring to the past 5 years is required to be documented. Therefore, land use is registered on the basis of the declaration at the time of its introduction. In particular, farmers applying for public subsidies and growing GM crops are obliged to declare the GM seeds or plants cropped.

The aim of the simulation is to quantify, in a real agricultural context, the potential GM cropping area in 3 different intensively cropped areas (municipalities) in the Lombardy region. This simulation will take into consideration the historical cropping systems, farming systems and size and rotation schemes.

Simulations using 3 different cropping distances, allow for gauging the three municipalities' availability of agricultural land suitable for the expansion of maize cropping to GM cultivars. Results indicated area suitability is very limited in 2 simulations out of 3, but the establishment of an ad hoc procedure for crop declaration prior to neighbours' authorisation could extend the suitable area in all simulations. This suggests that, in this case, land use distribution, more than isolation distances and relative maize area percentage, is the most significant variable.

These results can assist in outlining the features and management of a control strategy, which can be adapted to other crops.

Introduction

LPIS

Land Parcel Identification System (LPIS) is a major instrument for implementing the area-based payments to farmers of the Common Agriculture Policy (CAP) in Europe. The system has two major objectives at an operational level:

- To achieve the unambiguous geographic location of agriculture fields, claimed for aid by the farmer (identification and position of parcels)
- To quantify the area of eligible land at land parcel level to limit any undue payments

The core spatial object in the LPIS is the “reference parcel”, a geographically referenced land unit, as cadastral parcel or production block.

EU Member States (MS) have implemented the LPIS in different ways. Italy, for example, has a central database managed by the National Agency for Agricultural payments, which covers a large number of regions, while some other regions have their own system: SIARL (Sistema Informativo Agricolo Regione Lombardia) is the system used in Lombardy, a region located in Northern Lombardy.

1. Lombardy

Lombardy’s GDP is 2.7% of the whole EU and is comparable to Belgium or Sweden, despite the small area - 0.56% - concerned. While secondary with respect to industry and services, Lombardy agro-food sector is the most important at Italian level, providing 15% of the Italian agriculture value.

Six main products cover 70% of the agricultural sector: rice, maize, feedstock, pork , beef and dairy. Cereals cover 46% (456.000 ha) of the agricultural land, in particular maize, which covers 235 ha. In addition, cereals average yield is superior to the average Italian yield (8.6 t/ha vs 5.2 t/ha) resulting in a relevant weight of Lombardy in terms of national production: 27% of maize production in Italy! Relevant is also livestock, top productions at Italian level: 40% pork, 37 % dairy, 26% beef, 19% chicken and 17.6% eggs. The vocation to livestock industry results also in traditional and transformed quality products (e.g. gorgonzola, grana cheese etc.) In Figure 1 you can find the location of Lombardy within Italy and the location of the three municipalities in this study.

Figure 1

While European corn borer *Ostrinia nubilalis* (Hübner) is endemic, in the last (2009) growing season, for the first time, the western corn rootworm (*Diabrotica virgifera virgifera* Le Conte) has destroyed high quantities of harvest, while in the previous year it was only responsible for a few outbreaks. Therefore, the adoption of GM maize would be very welcome for a large number of farmers.

2. Objective

The objective of the study is to use the LPIS database to assess the potential area available for genetically modified maize crops in this specialised agricultural context, using the system as a management tool, according to different coexistence measures and procedures implemented.

3. Materials and methods

3.1 Locations

Within Lombardy, three municipalities from different provinces, were selected due to their dominant crop of maize: Abbiategrasso, Pompiano and Moscazzano. Of these three municipalities, more than 50% of the arable land is irrigated and has been cropped in the last 3 years (2006-2008) with maize.

3.2 Data source

Farmers applying for EU subsidies provide a declaration of land use on their farm. This is recorded in the LPIS as an attribute to the agricultural parcel. Given that Italy is still applying a de facto moratorium, we assume that so far all maize farmers have been GM-free; in other words they have cropped conventional maize.

3.3 Isolation distances

In the EU, different coexistence measures were proposed, these mainly consisted of isolation distances (http://ec.europa.eu/agriculture/coexistence/index_en.htm#com153). A range of distances can be adopted, according to the MS involved. In this simulation we used the reference distance to be adopted in Italy [300 m + 10 rows (non-GM

maize acting as a pollen barrier) = 7 m] but also the maximum and minimum distance adopted in other MS': 800 m (Luxembourg) and 50 m (France and Spain).

4. Results

Table 1 below illustrates the potential increase of maize cropped land, applying the 3 cropping distances:

	Area (m^2)										
Municipality	Area (m^2)	ACTUAL Maize area (2006-2008)	% of ALL arable	ALL arable area	% of arable land on municipality area	POTENTIAL new maize area (GM) out of the 50 m buffer	% increase of maize on all arable	POTENTIAL new maize area (GM) out of the 307 m buffer	% increase of maize on all arable	POTENTIAL new maize area (GM) out of the 800 m buffer	% increase of maize on all arable
Abbiategrasso	46.765.764	12.648.731	43,03	29.394.203	62,85	7.158.648	24,35	4.912.242,27	16,71	3.699.481,80	12,59
Moscazzano	8.638.593	3.022.977	34,99	6.333.507	73,32	684.182	10,80	206.835,97	3,27	0,00	0,00
Pompiano	15.185.326	10.948.250	72,10	12.319.809	81,13	67.799	0,55	0,00	0,00	0,00	0,00

4.1 General

According to the different municipalities and distances, different rates of arable land become available for GM maize cropping. In general, with stricter conditions low amounts of land become available. Even in Lombardy (study ASSOBIOTEC 2008) where the large majority of farmers (corresponding to 68% of maize cropped area) are in favour of GM maize, we can't exclude irregular distribution of favourable opinion between municipalities. Therefore we are using the worst case scenario, where the usual maize growers want to remain conventional maize growers, This could also be the case in other Italian regions more focused on traditional and typical productions. The shorter isolation distance allows, in all 3 towns, some additional land to be put in production. Abbiategrasso municipality, due to its land use distribution and town borders, allows in all 3 cases an acceptable increase of maize cropped land with a decreased distance effect compared to Moscazzano, even when taking into account a higher percentage of maize 'historical' crops.

4.2 Free-decision farmers' process

In the most limiting option (800m) there is no area available in 2 municipalities, while the rate of 'new land' is just 12.59% in Abbiategrasso. The less restrictive option (50 m) leaves significant amounts of land available to be cropped with GM crops in Abbiategrasso (+24.35%), while the potential new area reduces substantially in Moscazzano (+10.80%) and is practically absent in Pompiano (+0.55%). With the 'intermediate' solution (307 m), Abbiategrasso maintains an acceptable quantity of potential land available for GM (+16.71%) while Moscazzano is down to +3.27% and Pompiano reaches 0% (Dolezel et al, 2005; Devos et al, 2008; Demont et al, 2008).

4.3 Administration-mediated approach

The procedure consists of declaring in advance both the willingness to sow GM crops, by sending a disclaimer signed by the neighbouring farmers, and an acceptance of the GM labelling requirement or a letter of intent specifying liability for any documented negative effect. The time delay required for declaration allows authorities to carry out controls and validation. In this context, the GM crop potential area can exceed the historical area of maize crops in Lombardy. Below illustrates a possible procedure for a potential farmer growing GM varieties:

Table 2?

Pre claim	Control window	approval	Claim introduction
			 

The administration mediated approach has the advantage of integrating cross-checks and control procedures in the overall subsidy claim and approval. Compliance of farmers growing GM varieties could be verified by upgrading the national or regional database with ad hoc features to manage the paying system.

5. Conclusions

In an densely cropped area, where severe (800 m and 307 m isolation distances) coexistence rules apply, very little land area can be freely used to crop authorised GMOs until a wider range of farmers, both organisations and individuals, become involved. However, actual crop distribution, in this particular case, seems to be more significant than the isolation distance (Lecroart et al, 2007). In fact, an extremely high density of maize crops is hardly compatible with a 'free' decision process of farmers about the crop type to be grown (Abildtrup & Gylling, 2003). In these areas, establishing a procedure to inform public authorities and neighbouring farmers could provide a wider range of business decisions to farmers (and investors).

ANNEX

Land use maps reporting (from top to bottom, from left to right) status quo and maize potential areas (in pink) according to isolation distances of 50, 307,800 m respectively.

ABBIATEGRASSO (Milano)

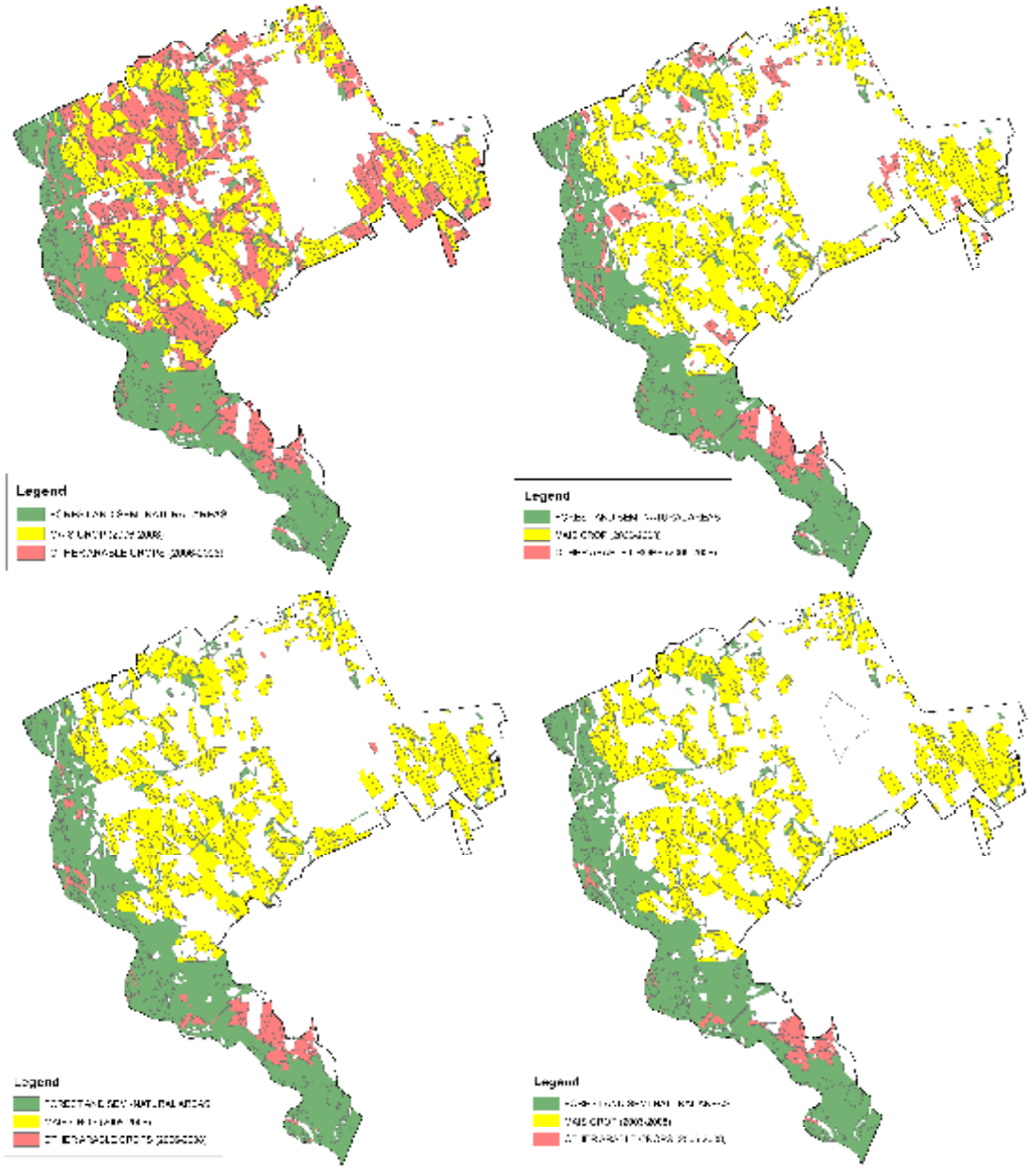

Figure 2

POMPIANO (Cremona)

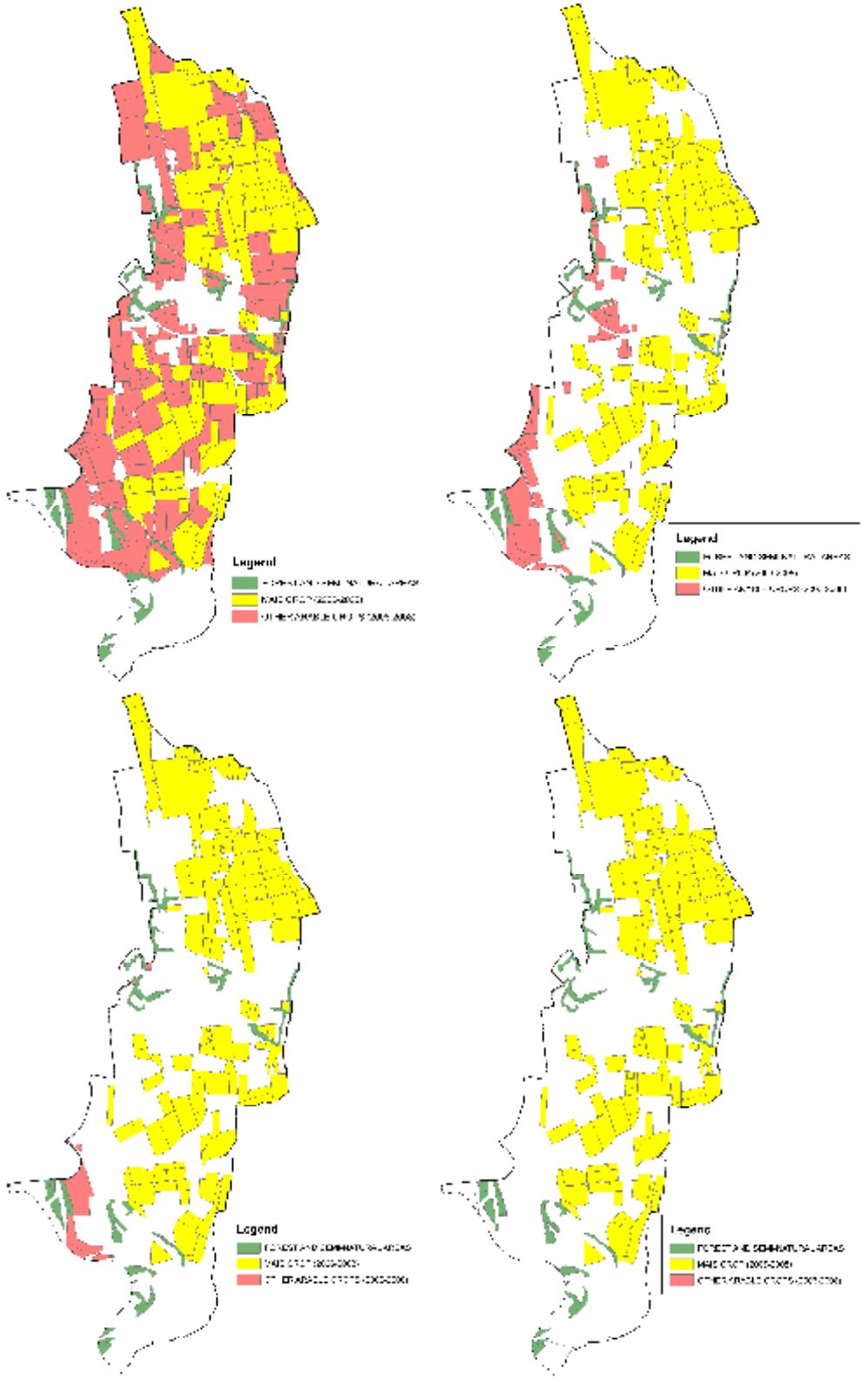

Figure 3

MOSCAZZANO (Brescia)

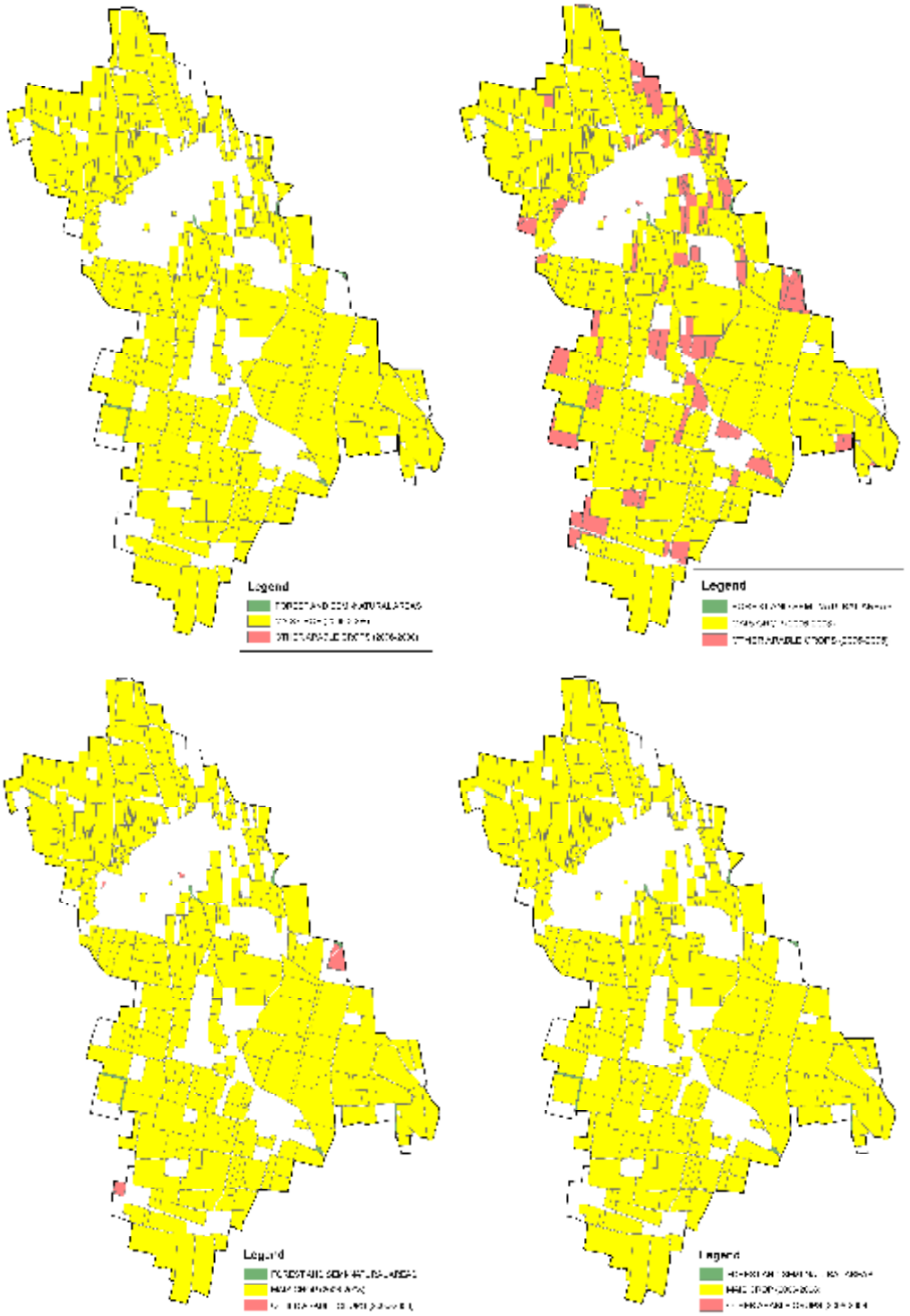

Figure 4

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