Development and competitiveness of bio-economy: the response of Italian farms to the global crisis

M. Broccoli, D. Fusco, P. Giordano, V. Moretti[1]
[1]National Institute of Statistics – ISTAT Rome, Italy

dafusco@istat.it

Paper prepared for presentation at the 2nd AIEAA Conference
"Between Crisis and Development: which Role for the Bio-Economy"

6-7 June, 2013
Parma, Italy

Summary

In EU Countries in the last decade there has been a reduction of the number of farms, combined with a significant increase in their average size. First response to crisis in EU agriculture is the enhancement the competitiveness of farms in bio-economy issues, i.e. quality: EU farmers must build on high quality reputation to sustain competitiveness and profitability. Main goal of this work is to measure the level of competitiveness of Italian farms, focusing on environmental efforts and food quality issues and taking into account rural-urban areas diversity. It has been used two synthetic indices (for environment and for food quality), based on basic indicators. To ensure the comparability of the different target areas, it has been used the NSP 2007/2013 classification with Italian areas aggregated in four major local categories (A, B, C, D). Here it has been chosen to use and exploit the 6th General Agricultural Census data (2010). For the analysis, it was applied the software "Ranker" developed by Istat with three different methods used. Results show that the D area of Sicilia is the first one in the ranking of Environmental Index, while the A area of Sardegna is the last one (69° place); in the Food Quality Index the A area of Bolzano is at the top and the B area of Sicilia is at the last place. In addition, it has been focused on the basic indicators that influenced the final results. Moreover, it has been shown the results of the two indices for each area (A, B, C, D) together with a comparison with their economic value (standard output). This work could be the starting point for considering the possibility to use synthetic indices to study just some aspects of a so complex theme as development, competitiveness and grow for farms.

Keywords: bio-economy, agricultural census, synthetic indices, environment, food quality

JEL Classification codes: Q

Development and competitiveness of bio-economy: the response of Italian farms to the global crisis

M. Broccoli, D. Fusco, P. Giordano, V. Moretti[1]
[1] National Institute of Statistics – ISTAT Rome, Italy

1. INTRODUCTION

Agriculture is an integral part of the European economy and society. In terms of indirect effects, any significant cut back in European farming activity would in turn generate losses in GDP and jobs in linked economic sectors – notably within the agri-food supply chain, which relies on the EU primary agricultural sector for high quality, competitive and reliable raw material inputs, as well as in non-food sectors. Rural activities, from tourism, transport, to local and public services would also be affected. Depopulation in rural areas would probably accelerate. There would therefore be important environmental and social consequences (European Commission, 2010).

Global economic crisis had a severe impact on agriculture sector. Farmers experienced increased exposure to income risks due to factors mainly external to the farm sector, as increased price volatility, trade liberalization, and climate change (European Commission, 2011). Their capacity to respond to competitive pressures is affected by structural issues, as the size of farms: to stay competitive, large farms have a better potential to mobilize resources to focus on increasing efficiency and improving marketing.

In EU Countries in the last decade there has been a general reduction of the number of farms, combined with an increase in their average size. First response to crisis in EU agriculture is the enhancement the competitiveness of farms in bio-economy issues, i.e. quality: EU farmers must build on high quality reputation to sustain competitiveness and profitability. The EU quality policies deal mainly with organic farming and PDO (Protected Designation of Origin)/PGI (Protected Geographical Indication) certifications (European Commission, 2009). Organic farming is a growing subject in European agriculture. As the concern for food quality and agro-ecology deepens, the philosophy and practice of organic farming have taken on new and greater importance in European agriculture (Boulay, 2010). In 2010, 10 million hectares of agricultural land were managed organically; 27% of the world's organic agricultural land is in Europe, with almost 280.000 organic farms. Italy (with 1.2 million hectares) is the second country for organic agricultural area.

Italian farmers’ challenge is the enhancement of their effort in bio-economy: in Italy (2010) there are 45.167 organic farms and 180.947 PDO/PGI farms: moreover (http://dati-censimentoagricoltura.istat.it/), 219 Italian agro-food specialties (excluding the wine sector) obtained quality certifications– the highest number of certifications at the EU level, confirming the growing importance of quality agro-food produced in Italy.

Main goal of this work is to measure the level of competitiveness of Italian farms, focusing on environmental efforts and food quality issues and taking into account rural-urban areas diversity.

2. METHODOLOGY

2.1 Identification of basic indicators

To measure the level of competitiveness reached by Italian farms it has been contructed two synthetic indices (for environment and for food quality), following the OECD methodology (OECD, 2008). The choice of these indices started from the following basic concepts.

Environmental Index has been chosen since a farm management which gives attention to environmental protection and product and/or animals safety, will cause positive externalities. These externalities have not a “short term” income, but they could lead to a profit in term of territorial welfare. So, it could be argued that environmental protection is strongly linked to farm competitiveness. As regard Food Quality Index, is easy to understand that EU farmers must have a reputation of high quality to support the competitiveness and profitability. The EU marketing standards encourage European farmers to produce high quality products in accordance with the expectations of consumers. This encounter between supply and demand facilitates the functioning of the internal market and international trade by ensuring the survival of farms.

Environmental Index:

1. farms benefited from measures for environmental protection/total farms,
2. farms with organic area/farms with Utilised Agricultural Area (UAA),
3. organic area/UAA,
4. farms with certified organic livestock/total farms with livestock,
5. certified organic cattle heads/total cattle heads,
6. certified organic buffaloes heads/total buffaloes heads,
7. certified organic equines heads/total equines heads,
8. farms with storage facilities for manure generated in the farm /total farms with livestock,
9. farms with renewable energy equipment/total farms.

Food Quality Index:

1. farms benefited from measures for food quality/total farms,
2. farms with PDO vineyards/total farms with vineyards,
3. PDO vineyard area/total vineyard area,
4. PDO and PGI area/UAA,
5. Organic area/UAA,
6. PDO and PGI cattle and buffaloes heads /total number of heads,
7. farms with animal housing/total farms with livestock,
8. average number of cattle and buffaloes heads in animal housing/total number of heads.

To ensure the comparability of the different target areas, it has been used the classification adopted by National Strategy Plan for rural development (NSP) 2007/2013 (MIPAAF, 2010) which aggregates agricultural areas with common structural features. In fact, the concept of rurality is highly dishomogenous at territorial level, both for differences between agricultural and agri-food systems and for different forms of integration in urban and industrial contests. The NPS areas have been identified starting from OECD methodology and modified for better underlining inter-provincial diversities. For the definition of the areas it has been considered population, altimetric area and UAA.

The NSP classifies Italian areas in four major local categories: A - urban poles, B - rural areas with specialized intensive agriculture, C - intermediate rural areas, D - rural areas with comprehensive development problems. Since not all the Regions have all the four areas A, B, C, D, totally there are 69 areas for 21 Regions (Trento and Bolzano, Autonomous provinces of Trentino Region, are considered as single entities):

- 18 A areas;
- 14 B areas;
- 16 C areas;
- 21 D areas.

Here it has been chosen to use and exploit just the 6th General Agricultural Census data (2010), for two reasons: the availability of data at municipality level and the prevention of the problem of different sources comparability. Basic indicators have been firstly calculated at municipality level; then it has been used the mean value calculated for the municipalities belonging to each area (A,B,C, D). Moreover, each indicator has been weighted for the number of farms of each area or for their surface areas.

2.2 Identification of multiple methods

In order to perform effective analysis and proper evaluation and comparison of results produced through multiple methods of statistical synthesis of the basic indicators available in the literature, it was decided to apply a generalized software tool, called "Ranker", specifically developed by Istat and implemented on an experimental basis.

Several are the available methods to compute the basic indicators. The most part of application tools that calculates the aggregated indices usually are based on a single methodology. The comparison of the application of different methods is not so easy to obtain with single software. The aim of this generalized tool called “Ranker” is to collect the comparison among the most used statistical methods.

“Ranker” gives to the statistical user the following functions:

- upload as standard format (.csv o .xls), the values of the basic indicators available for each dimension of the pillar;
- compute the value for each pillar among the different methods;
- display the values and the ranking for each method in graphic and matrix output;
- compare the ranking among the different methods.

Let ${}_nX_p$ an ***n*** x ***p*** matrix, where ***n*** is the number of geographical units to be processed (for instance the 110 provinces) and ***p*** is the number of the basic indicators. The statistical user has to define the polarity of each basic indicator giving an upper (positive) or lower (negative) case variable name in the matrix ${}_nX_p$. The computational process is performed in three steps, in each one a function is applied and a transformed matrix is obtained.

The process can be displayed as:

$${}_nX_p \Rightarrow {}_nT_p \Rightarrow {}_nI_1 \Rightarrow {}_nR_1$$

where each arrow represents a function and ${}_nX_p$, ${}_nT_p$, ${}_nI_1$, ${}_nR_1$ represent the input/output matrices.

The first step, denoted as standardization, computes the standardized ${}_nT_p$ matrix of ${}_nX_p$ according to the selected method.

$${}_nX_p \Rightarrow {}_nT_p$$

The second step, denoted as aggregation, computes the matrix ${}_nI_1$ of n x 1 dimension from ${}_nT_p$, where the vector is expression of each geographical unit.

$${}_nT_p \Rightarrow {}_nI_1$$

The third step, denoted as ranking, computes the matrix ${}_nR_1$ of n x 1 dimension from ${}_nI_1$, where the values represent the ranking of each geographical unit. Each method has an embedded definition of polarity; the ranking can be the upper or the lower value of the distribution in the matrix ${}_nI_1$.

$${}_nI_1 \Rightarrow {}_nR_1$$

Three different methods were used for this work:

- Mazziotta-Pareto Index (MPI) method (positive variant);
- Average of the standardized values method (M1Z);
- Method of relative index (IR).

Obviously, any method adopted for the synthesis of elementary indicators, inevitably involves an element of subjectivity and bias. However, this allows realizing spatial relation in a simple way and provides an effective tool to the policy makers that describe extremely complex and multidimensional phenomena.

MPI+ (Mazziotta Pareto Index)

Let T_{ij} be the ij element of the matrix ${}_nT_p$ (i=1,…,n; j=1,…,p) and X_{ij} be the ij element of the matrix ${}_nX_p$ (i=1,…,n; j=1,…,p) , then the standardization step computes:

$T_{ij}=100+\left(\frac{(X_{ij}-\overline{X}_j)}{\sigma_j}*10\right)$ (for the positive polarity basic indicator) and

$T_{ij}=100-\left(\frac{(X_{ij}-\overline{X}_j)}{\sigma_j}*10\right)$ (for the negative polarity basic indicator)

where $\overline{X}_j=\frac{\sum_{i=1}^{n}X_{ij}}{n}$ and $\sigma_j=\sqrt{\frac{\sum_{i=1}^{n}(X_{ij}-\overline{X}_j)^2}{n}}$

Let $MPI+_i$ be the i element of the vector ${}_nI_1$ (i=1,…,n)

The aggregation step gives: $MPI+_i=\overline{T}_i\left(1+cv_i^2\right)=\overline{T}_i+\sigma_i cv_i$

where $cv_i=\frac{\sigma_i}{\overline{T}_i}$ being $\overline{T}_i=\frac{\sum_{j=1}^{p}T_{ij}}{p}$ and $\sigma_i=\sqrt{\frac{\sum_{j=1}^{p}(T_{ij}-\overline{T}_i)^2}{p}}$

The ranking function of the method is positive (the highest value is position 1).

Mean of the stardardized values (Z)

Let T_{ij} be the ij element of the matrix ${}_nT_p$ (i=1,…,n; j=1,…,p) and X_{ij} be the ij element of the matrix ${}_nX_p$ (i=1,…,n; j=1,…,p) , then the standardization step computes:

$T_{ij}=\frac{X_{ij}-\overline{X}_j}{\sigma_j}$ (for the positive polarity basic indicator) and $T_{ij}=\frac{X_{ij}-\overline{X}_j}{\sigma_j}*(-1)$ (for the negative polarity basic indicator) where $\overline{X}_j=\frac{\sum_{i=1}^{n}X_{ij}}{n}$ and $\sigma_j=\sqrt{\frac{\sum_{i=1}^{n}(X_{ij}-\overline{X}_j)^2}{n}}$

Let $M1Z_i$ be the i element of the vector ${}_nI_1$ (i=1,…,n)

The aggregation step gives: $M1Z_i=\frac{\sum_{j=1}^{p}T_{ij}}{p}$

The ranking function of the method is positive (the highest value is position 1).

Relative Index (IR)

Let T_{ij} be the ij element of the matrix ${}_nT_p$ (i=1,…,n; j=1,…,p) and X_{ij} be the ij element of the matrix ${}_nX_p$ (i=1,…,n; j=1,…,p) , then the standardization step computes:

$$T_{ij} = \frac{X_{ij} - \min\{X_j\}}{\max\{X_j\} - \min\{X_j\}}$$ (for the positive polarity basic indicator) and

$$T_{ij} = 1 - \frac{X_{ij} - \min\{X_j\}}{\max\{X_j\} - \min\{X_j\}}$$ (for the negative polarity basic indicator)

where $\min\{X_j\}$ *and* $\max\{X_j\}$ are the minimum and the maximum value of the j-the basic indicator.

Let IR_i be the i element of the vector ${}_nI_1$ (i=1,…,n)

The aggregation step gives: $IR_i = \frac{\sum_{j=1}^{p} T_{ij}}{p}$

The ranking function of the method is positive (the highest value is position 1).

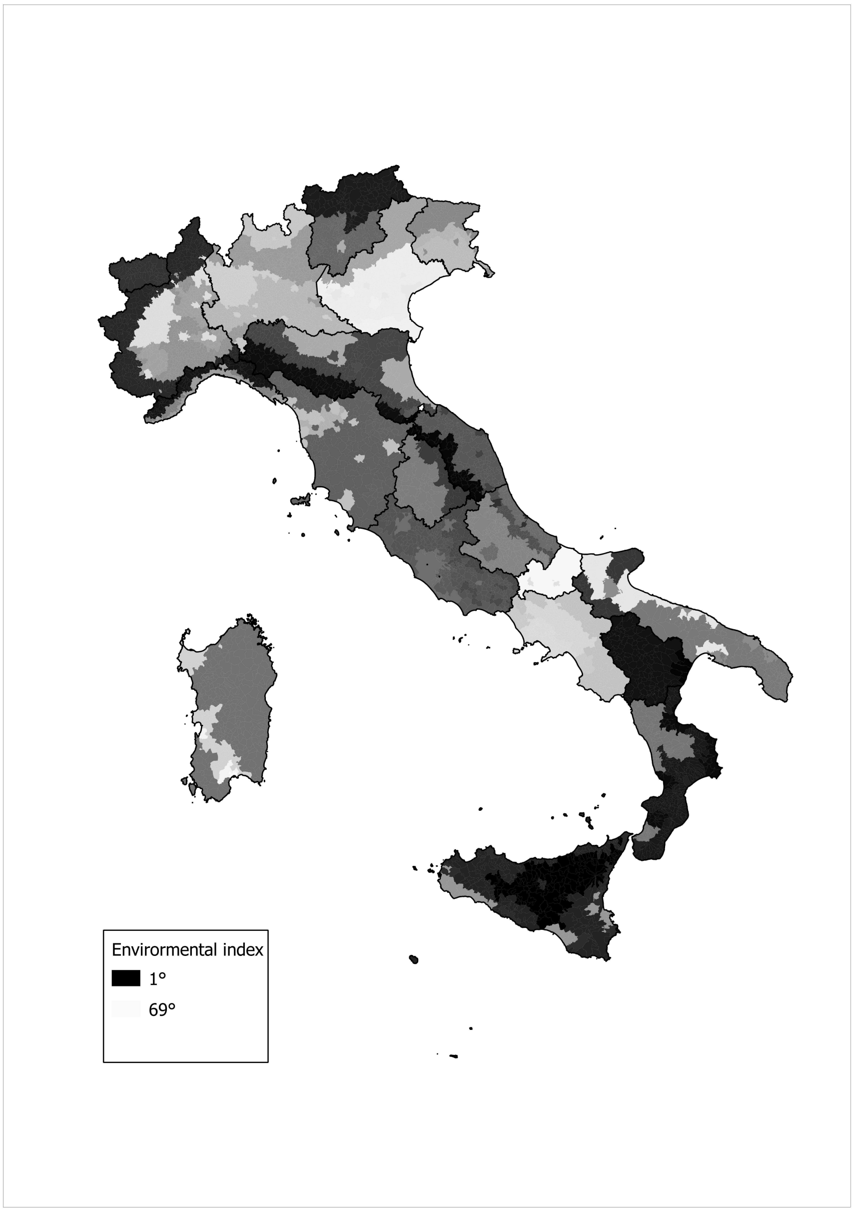
3. RESULTS

General results show the goodness of the synthetic indices adopted, since they are quite similar for all the three methods used (MPI, M1Z and IR). As an example, Figures 1 and 2 illustrate results for IR method.

As regard the Environmental Index (Figure 1), the D area of Sicilia is placed at the first position in the ranking, while the A area of Sardegna is the last one (69° place).

Focusing on the analytical indicators that influenced the final results, it could be noticed that the D area of Sicilia is mostly influenced by two indicators: a) certified organic cattle heads/total cattle heads and b) farms with storage facilities for manure generated in the farm/total farms with livestock.

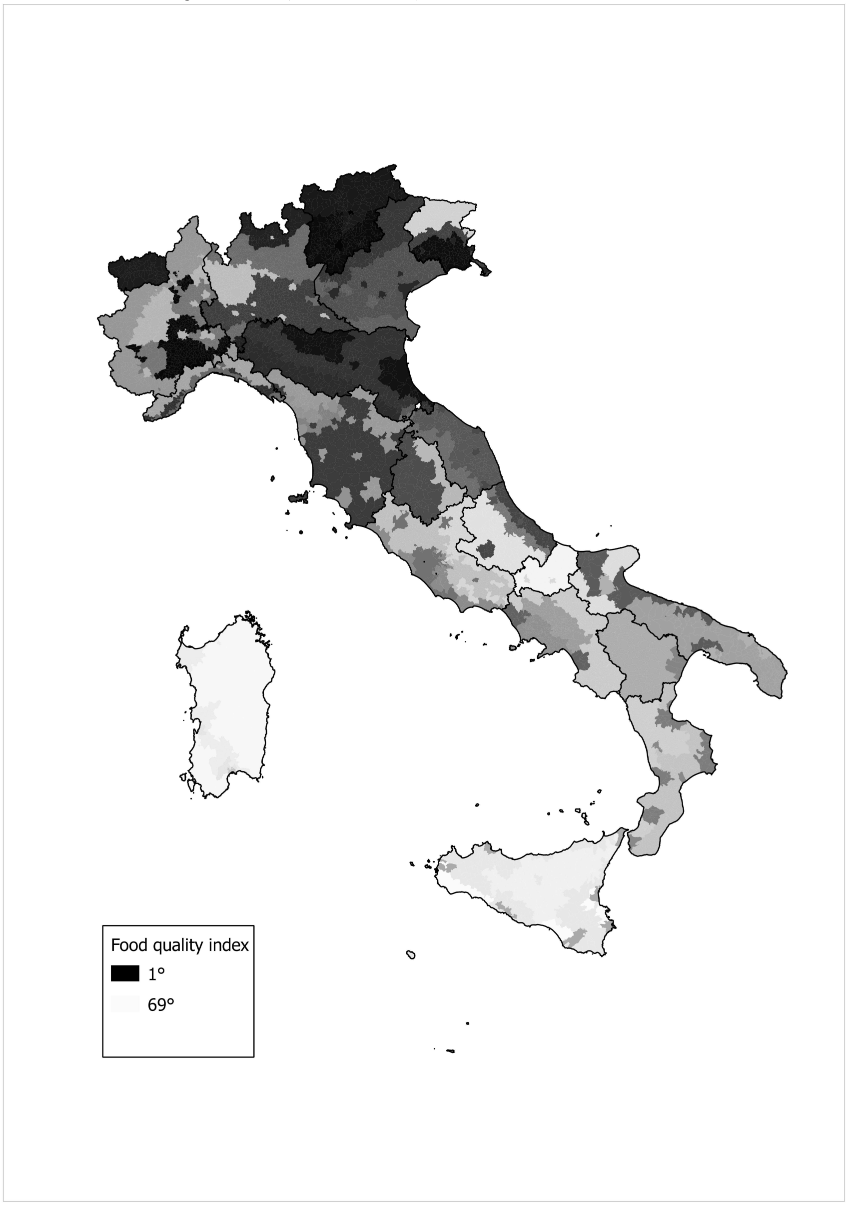
Figure 1. Environmental Index (IR method)



Concerning the Food Quality Index (Figure 2), the A area of Bolzano is placed at the top of the list and the B area of Sicilia at the end of the list (69° place).

The A area of Bolzano is strongly influenced by the following two indicators: a) farms with PDO vineyards/total farms with vineyards, b) PDO vineyard area/total vineyard area. It has been noticed that Sicilia and Sardegna show a white color in the map, since they occupy the last ranking positions. It is mainly due to three basic indicators for which they have lower values: a) PDO and PGI cattle and buffaloes heads/total number of heads, b) farms with animal housing/total farms with livestock, c) average number of cattle and buffaloes heads in animal housing/total number of heads.

Figure 2. Food Quality Index (IR method)



In order to understanding the behavior inside of urban poles or rural areas (Table 1, Table 2), next step has been the analysis of results of the two indices for each NSP area (A, B, C, D). Doing this, synthetic indices have been singularly re-calculated for each area.

Results for the Food Quality Index (Table 1) show a territorial distribution mainly focused in North of Italy (except for B area): Trento and Bolzano (Trentino Region), Piemonte, Liguria, Friuli-Venezia Giulia, Emilia-Romagna, Lombardia, whereas results for the Environmental Index (Table 2) don't show a strong territorial distribution.

It is important to note that, for the second index, Sicilia region is placed at the top position in three of the rankings (A, C, D). It is mainly due to the presence of an extended organic surface and of a high number of certified organic livestock.

Table 1. Food Quality Index: results for each area A, B, C, D

Food Quality Index				
Ranking	**A area**	**B area**	**C area**	**D area**
	Region	*Region*	*Region*	*Region*
1	TRENTO	ABRUZZO	PIEMONTE	TRENTO
2	BOLZANO	BASILICATA	LIGURIA	BOLZANO
3	EMILIA ROMAGNA	CALABRIA	EMILIA ROMAGNA	LOMBARDIA
4	FRIULI VENEZIA GIULIA	CAMPANIA	TOSCANA	VALLE D'AOSTA
5	VENETO	EMILIA ROMAGNA	VENETO	EMILIA ROMAGNA
6	MARCHE	FRIULI VENEZIA GIULIA	FRIULI VENEZIA GIULIA	VENETO
7	PIEMONTE	LAZIO	UMBRIA	PIEMONTE
8	ABRUZZO	LOMBARDIA	MARCHE	MARCHE
9	LOMBARDIA	PIEMONTE	PUGLIA	LIGURIA
10	LAZIO	PUGLIA	ABRUZZO	TOSCANA
11	LIGURIA	SARDEGNA	LOMBARDIA	BASILICATA'
12	CALABRIA	SICILIA	CAMPANIA	UMBRIA
13	TOSCANA	TOSCANA	CALABRA	CAMPANIA
14	SICILIA	VENETO	LAZIO	CALABRIA
15	CAMPANIA	-	SICILIA	FRIULI VENEZIA GIULIA
16	PUGLIA	-	SARDEGNA	MOLISE
17	MOLISE	-	-	ABRUZZO
18	SARDEGNA	-	-	PUGLIA
19	-	-	-	LAZIO
20	-	-	-	SICILIA
21	-	-	-	SARDEGNA

Table 2. Environmental Index: results for each area A, B, C, D

Environmental Index				
Ranking	**A area**	**B area**	**C area**	**D area**
	Region	*Region*	*Region*	*Region*
1	SICILIA	BASILICATA	SICILIA	SICILIA
2	BOLZANO	CALABRIA	EMILIA ROMAGNA	MARCHE
3	CALABRIA	LAZIO	MARCHE	BASILICATA
4	ABRUZZO	PIEMONTE	TOSCANA	LIGURIA
5	MARCHE	SICILIA	LAZIO	EMILIA ROMAGNA
6	EMILIA ROMAGNA	LOMBARDIA	ABRUZZO	CALABRIA
7	LAZIO	ABRUZZO	UMBRIA	BOLZANO
8	PUGLIA	CAMPANIA	PUGLIA	PIEMONTE
9	FRIULI VENEZIA GIULIA	EMILIA ROMAGNA	PIEMONTE	VALLE D'AOSTA
10	LIGURIA	FRIULI VENEZIA GIULIA	CALABRIA	PUGLIA
11	TRENTO	PUGLIA	LOMBARDIA	UMBRIA
12	TOSCANA	TOSCANA	LIGURIA	LAZIO
13	LOMBARDIA	VENETO	FRIULI VENEZIA GIULIA	TOSCANA
14	PIEMONTE	SARDEGNA	SARDEGNA	TRENTO
15	CAMPANIA	-	CAMPANIA	ABRUZZO
16	VENETO	-	VENETO	FRIULI VENEZIA GIULIA
17	MOLISE	-	-	SARDEGNA
18	SARDEGNA	-	-	VENETO
19	-	-	-	CAMPANIA
20	-	-	-	LOMBARDIA
21	-	-	-	MOLISE

The last analysis was the comparison between the results of both two indices with the economic value of the farms for each area (A, B, C, D). It was made to investigate if the choices of the Italian farms in the field of environmental and food quality issues could make the difference in their economic grow.

Making this, it was used the Standard Output (SO means the value of output corresponding to the average situation in a given region for each agricultural characteristic) calculated by Eurostat (European Commission, 2008).

The Standard Output was considered as the average value (the sum of the farm’s SO divided for the number of farms) for each value.

Since by the comparison of both general rankings with the SO there was no evidence of a relation (in term of statistical analyses) between economic results and food quality and/or environmental levels reached by Italian farms, it has been decided to compare economic value with rankings of each area (A, B, C, D) (Table 3).

Table 3. Food Quality Index: comparison between economic value (SO) and A, B, C, D

Food Quality index								
Ranking	A area		B area		C area		D area	
	Region	*Average standard output*	*Region*	*Average standard output*	*Region*	*Average standard output*	*Region*	*Average standard output*
1	TRENTO	35646,57	ABRUZZO	23157,01	PIEMONTE	50079,50	TRENTO	28537,55
2	BOLZANO	47078,08	BASILICATA	24214,28	LIGURIA	19773,02	BOLZANO	27709,85
3	EMILIA ROMAGNA	103874,66	CALABRIA	16971,76	EMILIA ROMAGNA	89032,68	LOMBARDIA	28381,43
4	FRIULI V.G.	21481,29	CAMPANIA	40123,11	TOSCANA	38339,59	VALLE D'AOSTA	16471,90
5	VENETO	49939,71	EMILIA ROMAGNA	96857,37	VENETO	64070,36	EMILIA ROMAGNA	41651,36
6	MARCHE	15729,58	FRIULI V.G.	47356,43	FRIULI V.G.	43651,00	VENETO	53276,61
7	PIEMONTE	48423,18	LAZIO	43757,60	UMBRIA	25244,56	PIEMONTE	30440,05
8	ABRUZZO	9829,84	LOMBARDIA	211582,12	MARCHE	30633,51	MARCHE	24040,84
9	LOMBARDIA	63758,64	PIEMONTE	102316,84	PUGLIA	9533,85	LIGURIA	13181,89
10	LAZIO	45797,67	PUGLIA	21048,90	ABRUZZO	13628,33	TOSCANA	17522,98
11	LIGURIA	19879,34	SARDEGNA	56750,14	LOMBARDIA	48656,39	BASILICATA	13647,94
12	CALABRIA	12516,48	SICILIA	27184,11	CAMPANIA	14756,32	UMBRIA	14732,68
13	TOSCANA	32973,39	TOSCANA	25820,92	CALABRIA	12678,28	CAMPANIA	10743,36
14	SICILIA	30362,32	VENETO	42484,57	LAZIO	17481,65	CALABRIA	13469,34
15	CAMPANIA	24004,22	-	-	SICILIA	19065,68	FRIULI V.G.	25923,85
16	PUGLIA	26002,79	-	-	SARDEGNA	30001,97	MOLISE	16610,14
17	MOLISE	6811,09	-	-	-	-	ABRUZZO	17924,47
18	SARDEGNA	14205,33	-	-	-	-	PUGLIA	15266,20
19	-	-	-	-	-	-	LAZIO	15975,41
20	-	-	-	-	-	-	SICILIA	15661,23
21	-	-	-	-	-	-	SARDEGNA	39001,03

As concern Food Quality Index, top positions in all rankings are related to higher average SO. An exception is in the D ranking, in which Sardegna (last position in food quality) presents a high SO value. This result (for Sardegna) is quite similar for the B ranking.

As regard Environmental Index, it seems that areas at the top positions didn't have a high economic value in term of SO. But these areas seems to be the same with a better "survival" response to crisis: in fact, comparing 2010-2000 Census data, these areas have had a less decrease in term of UAA or in term of number of farms respect on the national values and, very often, they have had a major increase in term of average size respect on the national values. This last factor is an asset in evaluating the Italian farm's "survival" threshold, fixed in 20 hectares.

Analysing Environmental Index ranking for each area is possible to underline some "behavioural" differences.

In the A area ranking the first four positions are occupied by three zone (Abruzzo, Bolzano, Sicilia) with a decrease of farms lower then Italian average one (- 32%) and one zone (Calabria) with an increase of UAA (in Italy there is an average decrease of 2,5% of UAA).

In the B area ranking there are three zone (Basilicata, Calabria, Piemonte) with a lower decrease in term of farms and one zone (Lazio) with a high increase in term of average size.

For the C areas the Environmental Index seems without positive reply. In fact just for Sicilia there is an increase in term of average size higher than the Italian average value. For the other zones in the first positions (Emilia Romagna, Marche, Toscana) there aren't particular benefits, although these zones have the average farm size bigger than national average value (more than 10 hectares).

In the D area ranking the zone in top positions (Basilicata, Marche, Sicilia) have had a high increase in term of average size.

4. CONCLUSIONS

Results show that food quality and environmental protection issues lead to positive effects both in terms of economic growth and farm's survival. It couldn't be possible to confirm that agriculture has a main role in facing global crisis, but farms have been able to exploit the opportunities for fighting crisis at least at sectorial level. For Italian farms, synthetic indices show that the strategies adopted have been successful, although the reaction stirred at areal level was different between urban and rural areas.

This work could be the starting point for considering the real possibility to use synthetic indices to study just some aspects of a so complex theme as development, competitiveness and grow for farms.

REFERENCES

European Commission (2010). The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future. COM(2010) 672 final

European Commission (2011). Common Agricultural Policy towards 2020: Assessment of Alternative Policy Options. SEC(2011) 1153 final/2

European Commission (2009). On agricultural product quality policy. COM(2009) 234 final.

Boulay, A. (2010). Organic farming: a solution to agriculture crisis or a "new" trend to healthy eating? An overview of French and British farmers. *Journal for Geography*, 5-1: 125-134.

OECD (2008). Handbook on Constructing Composite Indicators: Methodology and User Guide. OECD European Commission, Joint Research Centre.

MIPAAF (2010). Piano strategico nazionale per lo sviluppo rurale. MIPAAF, 21 giugno 2010, 172-173.

European Commission (2008). establishing a Community typology for agricultural holdings. COMMISSION REGULATION (EC) No 1242/2008 of 8 December 2008

http://www.fibl.org/en/themen/themen-statistiken.html

http://dati-censimentoagricoltura.istat.it/

http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Standard_gross_margin