

DECISION SUPPORT SYSTEM PROPOSAL FOR DETERMINATION OF MINIMUM PRICE FOR SUSTAINING PRODUCTION

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Abstract

According to the IFOAM 2010 Annual Report, multi-faceted, holistic, agro-ecological approaches exemplified by organic agriculture can significantly contribute to reducing poverty. The one-size-fits-all approach to farming continues to fail because it relies on unaffordable inputs and ignores biodiversity, women farmers and traditional food cultures. Smallholder farming is the backbone of agriculture and food security, not only in developing countries, but also in developed countries; not only in rural areas, but urban settings as well. 90 per cent of farms worldwide are less than two hectares and they provide employment to 1.3 billion people. Ironically, smallholder farmers are among the poorest and hungriest people worldwide; they have insufficient access to resources and lack support to build capacity.

Organic is not yet mainstream but also no longer a niche. It is an industry and a community, but more importantly, it is a movement for global change. Efforts must be made in order to demonstrate that the principles of organic agriculture - health, ecology, fairness and care – when integrated into policy decisions, business relationships and individual choices, create the most credible pathway towards food security and the empowerment of all, especially the poor and marginalized.

The authors introduce a decision support system in an attempt to help small producers make the correct decision concerning the price level of their products.

Keywords: Fair Trade, smallholder Romanian farmers, organic agriculture, decision support system, minimum price for sustaining production, COSP

JEL Classification: L86, O14

Introduction

The Council Regulation (EC) No 834/2007 of 28 June 2007 defines organic production as “an overall system of farm management and food production that combines best environmental practices, a high level of biodiversity, the preservation of natural resources, the application of high animal welfare standards and a production method in line with the preference of certain consumers for products produced using natural substances and processes. The organic production method thus plays a dual societal role, where it on the

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one hand provides for a specific market responding to a consumer demand for organic products, and on the other hand delivers public goods contributing to the protection of the environment and animal welfare, as well as to rural development.”

Organic farming was developed in the first part of the 20th century, mainly in Germany, the United Kingdom and Switzerland. It was only in the 1980s, however, that interest in organic farming really took off, when production methods continued to develop, along with consumer interest in its products. There was a major increase in the number of producers, and new initiatives got under way for processing and marketing organic products. This situation, which was conducive to the development of organic farming, was very largely due to consumers’ keen concern to be supplied with wholesome, environment-friendly products. At the same time, Member States gradually recognised the potential of organic farming, including it among their research topics and adopting specific legislation.

The 1990s witnessed very rapid growth in the sector. In 1985, certified organic production (including areas under conversion) accounted for just 100 000 ha on 6 300 holdings in the EU, or less than 0.1 % of the total utilisable agricultural area (UAA). Currently, the European organic agriculture accounts on average for about 2 % of the value of total agricultural output. The estimated share of organic products in total food sales also amounts to about 2 %.

Despite the many demonstrated benefits of organic farming - for human health, economic growth, and the environment (see Table 1), the current agriculture system is designed to support conventional farming. Some agricultural policies actually work against the interests of organic farming. It is imperative that governments address the growing interests of organic farmers and conventional farmers who are transitioning to organics. Because of the many benefits, it is in the public interest to promote organic farming through a unified set of policies that invest in organic research, build an appropriate farm safety net for organic farmers, help meet market demand, provide transition assistance, and reward organic agriculture’s environmental benefits. Therefore, it is important that policy makers promote policies that support organic farmers, that they view organic agriculture as key to the success of the economy – a growing industry that means more jobs and economic growth while protecting human health and the environment.

The Obsolete Romanian Agricultural Sector

Romania has an agricultural capacity of approximately 14,7 million hectares, of which only 10 million are used as arable land. In November 2008, an evaluation revealed that 6.8 million hectares are not used.

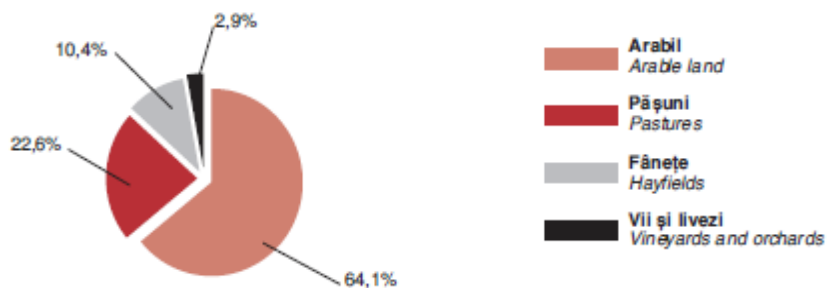
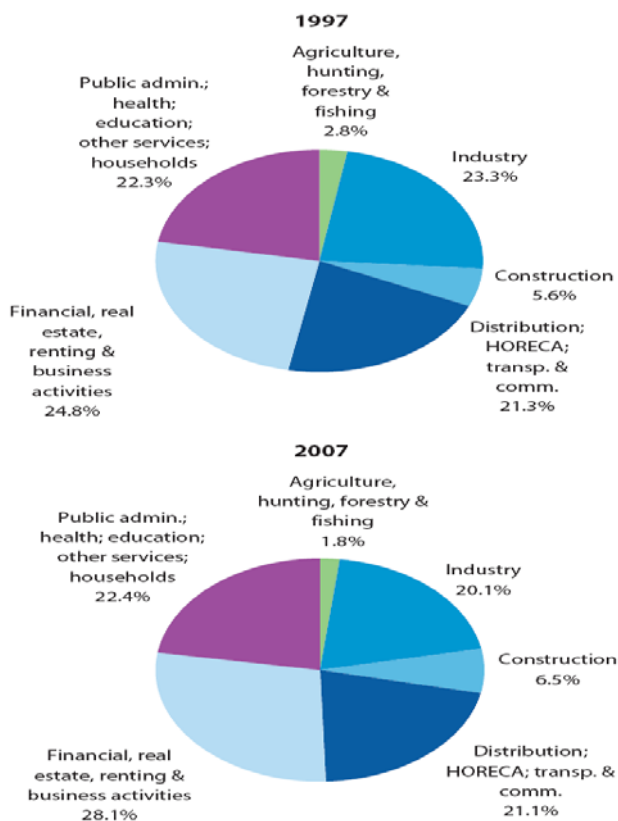


Figure 1. Agricultural area, by use, end of 2009 Source: INS

Agriculture summed up about 6% of GDP in 2010³, down from 12.6% in 2004, whereas in the European Union the contribution to GDP is much smaller (2.8% in 1997 down to 1.8% in 2007).



Source: Eurostat (Economy and finance)

Figure 2. Breakdown of value added in current prices, EU-27 (% of total value added)

³ INS

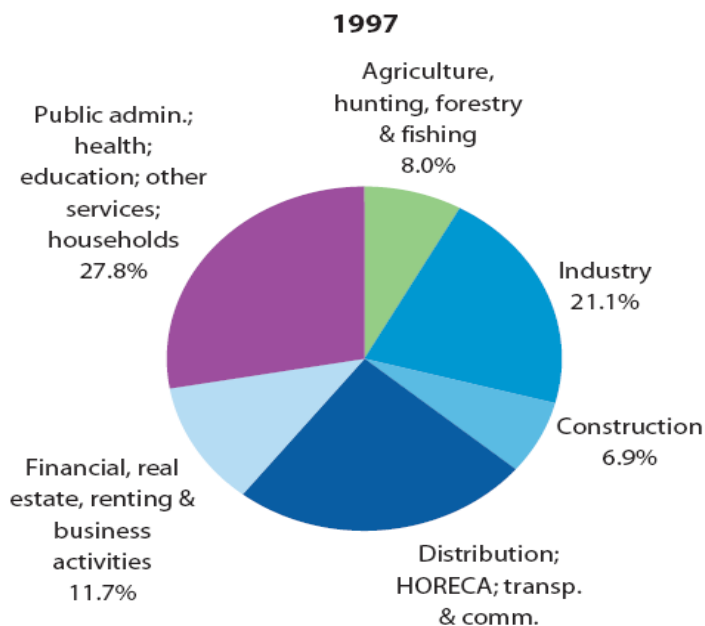
As of August 2009, approximately 3 million Romanians (close to 30% of the country's workforce) are employed in agriculture, compared to 4-5% in other Western countries (see Figure 3).

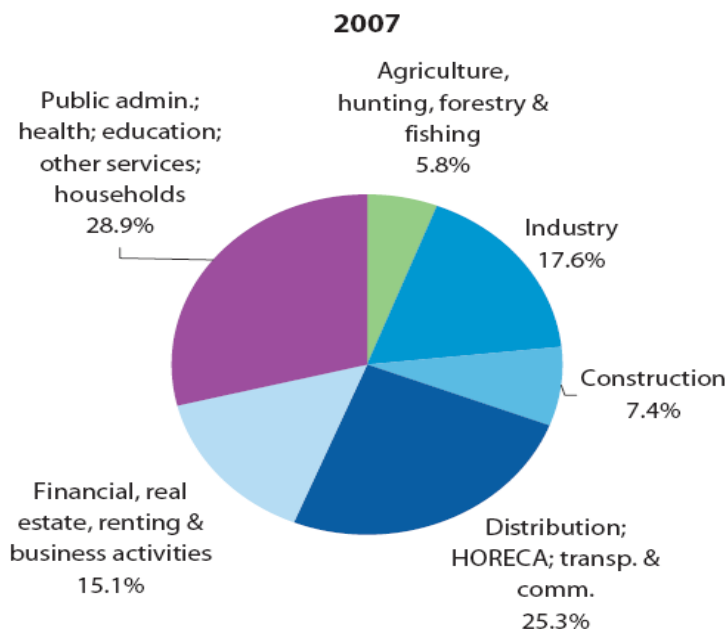
Mechanization is comparatively poor, with one tractor available for every 54 hectares, while the EU average is one tractor for every 13 hectares. Approximately 170,000 tractors exist in Romania, of which about 80% are aging or obsolete. Unlike Western Europe, where tractors are replaced after 3,000-4,000 hours of use, in Romania they sometimes last up to 12,000 hours.

The main problems encountered by Romanian agriculturists are a lack of major investments in agriculture, due to difficulty in accessing available funds, fragmentation and erosion of soil, property-related lawsuits and obsolete technology. Romanian products often fail to meet EU quality standards, which explains their absence on foreign markets, while foreign products are readily available in shops across Romania.

The great number of smallholder farms that exist alongside very large ones underlines the structural disequilibrium that affects the country's agricultural sector, as well as its competitiveness.

It is important to point out the fact that a moderate use of chemical fertilizers actually helps the reconversion of arable lands towards organic and ecological agriculture. The evolution of the organic farming sector in Romania is presented in Figure 4.





Source: Eurostat (Economy and finance)
Figure 3. Breakdown of employment, EU-27 (% of total employment)

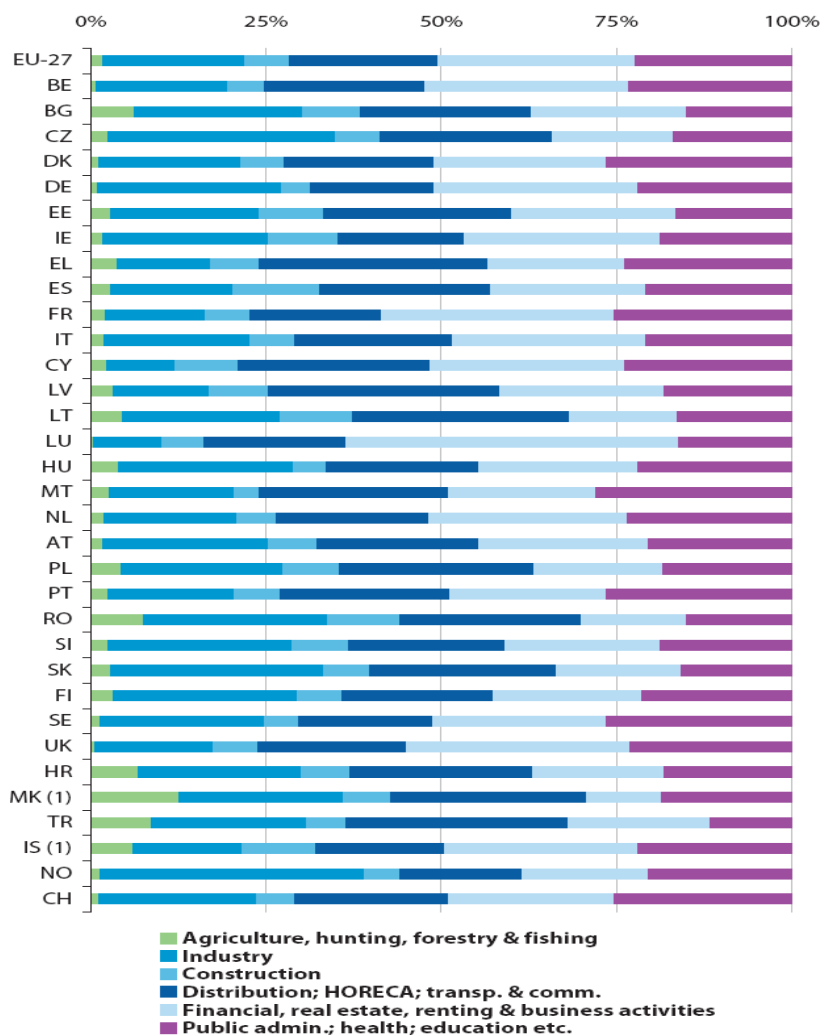
2006	2007	2008	2009
0.8	1.0	1.0	1.2

Figure 4. Share of organic crop areas in the utilised agricultural area Source: INS

The balance of trade regarding agro alimentary products is still deficitary, even though this deficit has been reduced, from 1580 million euros in 2009 to 790.5 million euros in 2010.

Romania's major trading partner is the European Union. In 2010, total exports of agro alimentary products reached 73.7% (value share), while total imports represented 81.6%.

3.098 thousand euros are accessible in order to improve the quality of agro alimentary products and will be given to those farms that reconvert to organic farming.



(1) 2006.

Source: Eurostat (Economy and finance)

Figure 5. Breakdown of gross value added at basic prices, 2007 (% share of total gross value added)

Organic farming, no longer a niche

In 2010, the statistics show 1.8 million organic producers worldwide⁴, up from 1.4 million in the previous year. The vast majority are family farmers. The average size of organic farms has dropped and organic farming has become more interesting for poor smallholders in the global south.

According to the OECD, the organic sector at the beginning of the 21st century is broadly estimated to be worth USD 26 billion annually worldwide – in Europe USD 11 billion and

4 IFOAM Annual Report of 2010.

in the USA USD 13 billion – and is generally the most rapidly growing agricultural sector, at anything between 15-30 % annually, albeit from a very low base.

According to the latest FiBL and IFOAM survey on certified organic agriculture worldwide, there are 37.2 million hectares of organic agricultural land (including in-conversion areas). While the region with the largest areas of organic agricultural land is Oceania (12.2 million hectares), about one quarter of the world’s organic agricultural land (9.2 million hectares) is in Europe. (Figure 6) According to the same survey, 0.9 per cent of the world’s agricultural land is organic. In Europe 1.9 per cent of the agricultural area is organic and in the European Union the percentage is 4.7. Compared with 2008, in 2009 the organic land increased by 2 million ha. (6%). The strongest growth was in Europe where the organic area increased by one million ha.

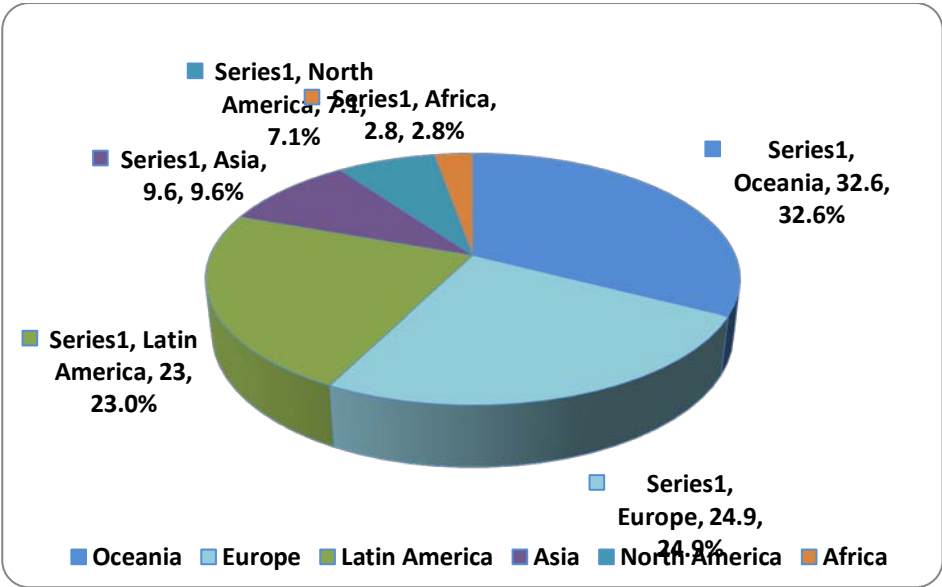


Figure 6 - Distribution of the world’s organic agricultural land by geographical region Source: FiBL & IFOAM Survey 2011

As shown in Figure 7, since 1994 organic agricultural land has developed dynamically in Europe, from 1 million hectares in 1994 up to 6.4 million hectares in 2004 and 9.3 million hectares in 2009. This increasing trend in organic agricultural land is directly related to increasing market demand for organic products. In 2009, despite the current economic crisis, sales of organic products in the European Union reached 18 400 million euros. Although the market grew at smaller rates than in previous years, according to Organic Monitor it seems that the global market for organic food and drink is recovering due to rising consumer spending power and also to their concern to be supplied with wholesome, environment-friendly products.

In 2010, the US was the largest organic market in the world with 20 155 million euros. The top ten countries with the largest organic markets in the world are Germany, France, United Kingdom, Austria and Italy alongside Canada, Switzerland and Japan. In addition,

the European market for organic food accounts for 54% of the global organic market and is thus larger than the North American market (43%).

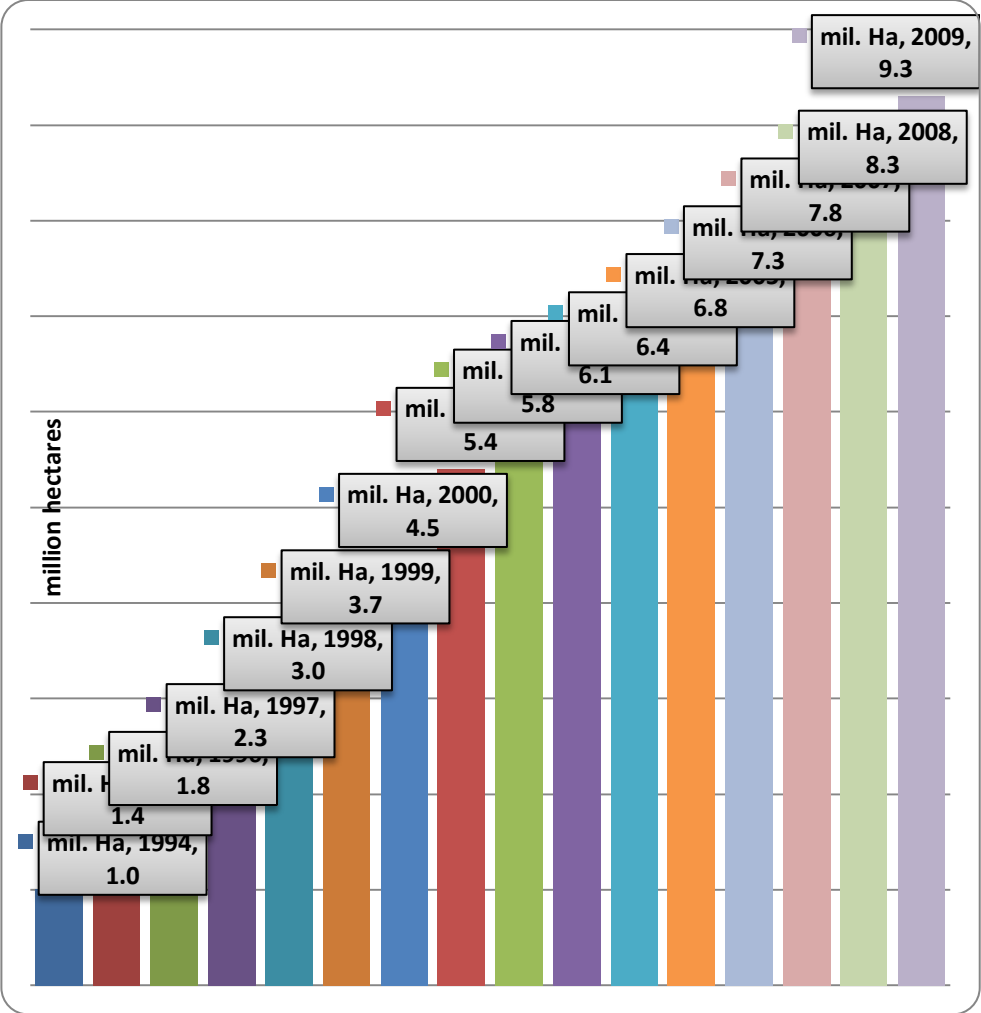


Figure 7 - Development of the organic agricultural land in Europe 1994-2009 Source: FiBL, 2011

Taking into account the high potential of organic farming, the significantly increasing area under organic agriculture in the last years in EU’s Member States is understandable. In the EU-27, during 2000-2008, the total organic area has increased from 4.3 to 6 million ha (+7.4% per year). Taking into account the evolution of the organic area which takes into account all the conditions of production established in Council Regulation (EC) No 834/200, in 2010 the Member States with the largest areas in 2010 are Spain, Germany, Italy and the United Kingdom⁵. Over the analysed period (2001-2010), Spain registered the highest increase of organic crop area of about 0.8 million hectares between 2001 and 2010. In Italy, after the growth of 2007, the organic area declined in 2010 by about 0.08 million hectares. Spain, Italy and Germany are also among the states with the most

5 FiBL & IFOAM Survey 2011

organic agricultural land in the world in 2009, after Australia, Argentina, USA, China and Brazil.

At the same time, there is a large group of Member States (Germany, Czech Republic, Greece, France, Poland, Romania and Slovakia) who registered a steady increase of the organic area. Analysing the share of total utilized agricultural area occupied by organic farming in the EU-27 organic areas amounted to an estimated 4.7% of the total utilised agricultural area in 2009, after a slight increase from 4.4 in 2008. The period of 2001 – 2009 brought for all Member States an increased share of UAA by organic farming. The growth was more significant in the case of Czech Republic, Latvia, Estonia, Spain, Sweden and Slovakia. For the entire analysed period, Austria registered the highest share of organic sector in the total UAA, reaching 18.5% in 2009, from 14% in 2001.

The Organic And Fair Trade Alternatives

Despite the fact that most consumers report that low price is the main reason why they purchase a product in the supermarket, according to a recent study by Context Marketing, 60% of US respondents reported they are willing to pay up to 10% more for food that promises to be healthier, safer or produced to higher ethical standards. Another 12% said they would pay more than a 10% premium.

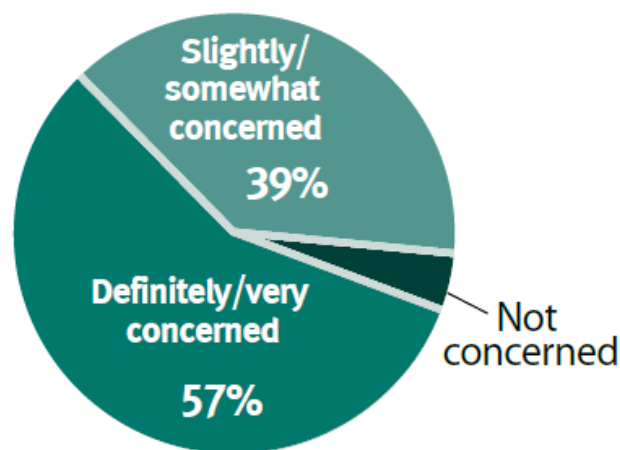


Figure 8. “How concerned are you about the safety of the food supply?” Source: Beyond Organic, Context Marketing, October 2009.

Food safety clearly tops the list of consumer concerns about food quality. When asked to identify the most important issues, those directly involving food safety were ranked highest by the majority of respondents. (Figure 8). The claims consumers found most meaningful have to do with the things consumers do not want to see in their food such as mercury, pesticides, hormones and antibiotics. Consumers also care where their food is produced, which is most likely a result of their assumption that origin influences safety. Claims such as “Produced in the USA,” “locally-grown” and “from family farms” are important to many shoppers.

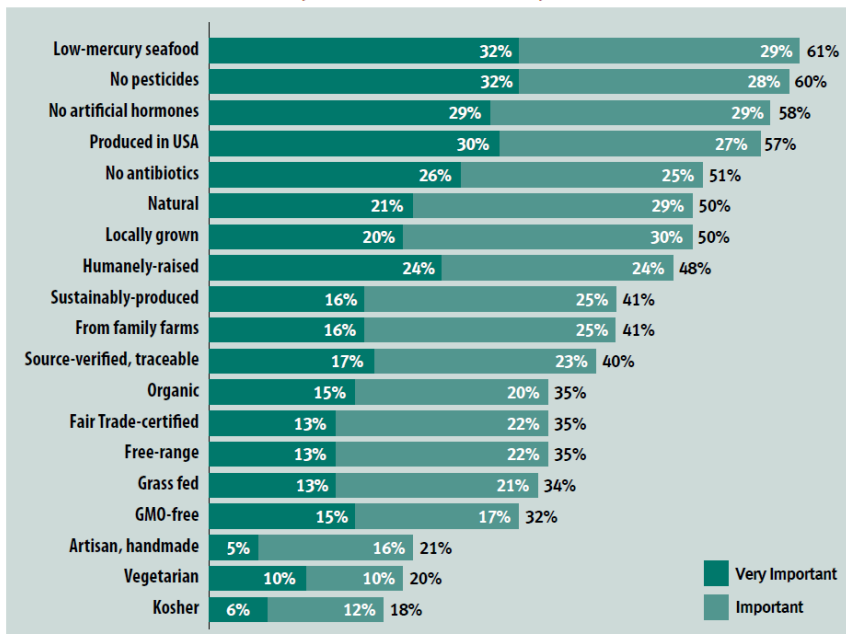


Figure 9. Rating the food package claims. Source: Beyond Organic, Context Marketing, October 2009.

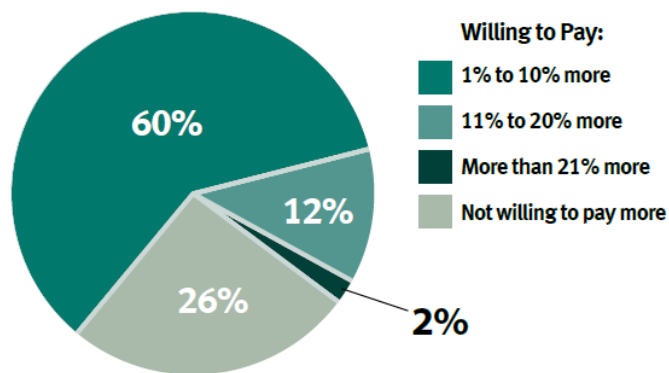


Figure 10. Low price is important, but many consumers will pay more for quality Source: Beyond Organic, Context Marketing, October 2009.

The price premium for organic products differs very much from country to country and from product to product. The typical price premium that consumers have to pay is about 50–60 %.

Fairtrade is a complex trading partnership which seeks greater equity in international trade by creating closer relationships between the consumers and the producers from the geopolitical North and South. From its shy beginnings as an alternative means of selling craftwork in charity shops, Fairtrade products have become highly accessible to the consumers in Europe and the United States.

While sales remain fairly low in global terms, the growth of the Fairtrade market has been phenomenal: in 2008, global Fairtrade sales reached 2.9 billion euros, growing at a rate of 22% per annum. In 2009, this percentage reached 37% and by 2010 4.36 billion euros were spent on Fairtrade products. The Fairtrade market occupies between 0.5-5% of all sales in Europe and the United States. By 2010, over 1.5 million disadvantaged producers were directly benefiting from Fairtrade, while an additional 5 million were enjoying the fruits of infrastructure and development projects financed through the Fairtrade system.

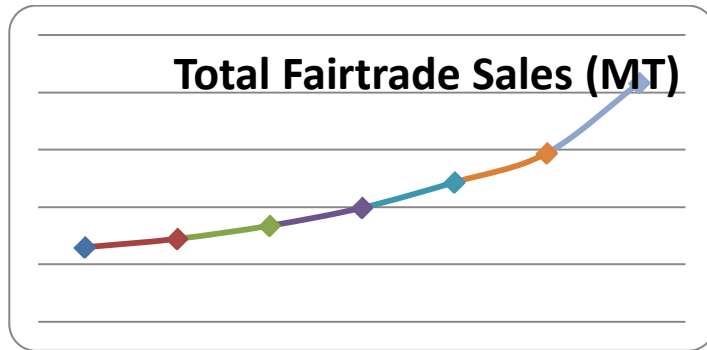


Figure 11. Total Fairtrade sales (metric tonnes). Source: www.fairtrade.net, annual reports.

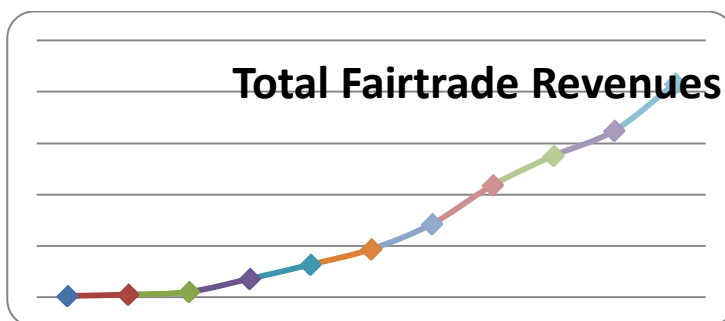


Figure 12. Total Fairtrade revenues (euros). Source: www.fairtrade.net, annual reports.

In order to make these possible, Fairtrade has incorporated a dynamic series of products, standards and certification systems, new actors, new political and organizing alliances and more and more complex governmental arrangements.

The principles of Fairtrade are very simple: the farmers receive for their products fair prices, a function of international market prices. Thus responsible business can be conducted, while those living and working in developing countries can have food security and a decent standard of living in the long run. Consumer of Fairtrade products receive in return tasty products of good quality. These products are exported in a direct and controlled manner by the developing countries mostly to the developed ones, bearing the FAIRTRADE certification that guarantees its origins. Consumers that decide to purchase Fairtrade products are socially responsible, contributing personally and actively to a more equitable world.

Fairtrade revolves around efficient cooperation which is guaranteed to have a positive effect on all those that are involved in it. These participants are the following:

- The farmers and their families, since through Fairtrade they can ensure their very existence and plan their future. The farmers' cooperatives receive in return a premium for social and ecological development, which they use in order to get access to potable water, basic medicine and education etc. Most of the times only through the Fairtrade system was the leap towards ecological farming made possible.
- The workers on the plantations, because Fairtrade makes it possible for them to enjoy decent standards of work and living, a relationship with their employers lawfully regulated by work contracts which include minimum wages, legal work standards, labour protection in order to avoid poisoning with dangerous chemicals used in agriculture, the banishment of labour exploitation and providing a minimum access to medicine, all of which are not the norm in developing countries of the South.
- The consumers, which can thus enjoy qualitative goods produced by natural cultivation. Fairtrade guarantees the origin and controls the exports of FAIRTRADE goods, which come from very limited territorial structures. These products are permanently cared for, this being the main reason for their high quality. Consumers, apart from having access to the good quality products, also act responsibly when choosing a Fairtrade product over another, non-Fairtrade one. If only ten consumers from developed countries opted for FAIRTRADE coffee, a whole family from the South could achieve food security and thus survive.
- Nature, because FAIRTRADE products are traditionally cultivated, respecting the principles of sustainable development: by mixing cultures with other plants for personal use, by planting trees that offer shade, by reducing the use of chemical substances in agriculture, through the use of natural fertilizers and reducing soil erosion. In addition, residues are avoided or ecologically treated. The rain forest and natural water supplies are thus protected. All these efforts have positive effects on our ecosystems, being of great importance to those of us living in the developed world.
- The children living in the southern hemisphere, because child labour exploitation is illegal, while their families' revenues benefit from the Fairtrade system. A certain part of the FAIRTRADE premiums is used for the construction of new schools for these very children.

There are several raw materials that have the FAIRTRADE logo: coffee, tea, chocolate, honey, bananas, sugar and rice.

A Decision Support System For Sustainable Production

Agriculture in Romania was for a long time done by small producers mostly based on tradition than knowledge. Costs on field/operations, harvest/post-harvest, transformation/processing and product preparation/packaging were usually misrepresented, which led to losses instead of profit. To this extent, the authors propose a model for calculation of minimum price for Sustainable Production.

This decision support system is built upon client-server architecture with a simple user-friendly interface, designed for personnel with low experience in IT. The content is both

dynamic and static, organized as displayed in fig. 13, using for client-side HTML, CSS and JavaScript in order to maintain good functionality and compatibility with as much browser versions as possible.

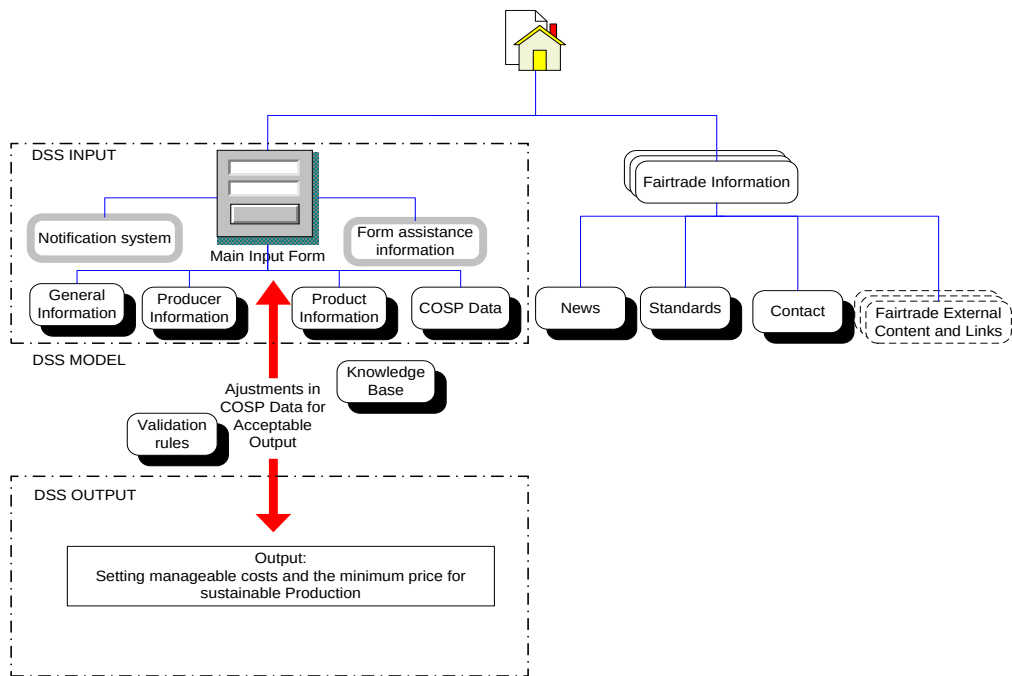


Figure 13. Decision Support System Structure

The DSS system offers assistance over the entire process by contextual help as to increase the probability of receiving good input data. The DSS Model contains processing and validation rules that allow the user to form a decision based on the results received from the application. Best practice, validation and processing rules will be presented in the following lines.

The Cost of Sustainable Production (COSP) form is contained by four sections.

General Information, as seen in fig. 14, states the date for data input, the agricultural period reported and the production cycle. The last field is relevant for perennial crops, as field operations and harvest/post-harvest take place within two or more years. Moreover, harvesting may begin some years after plantation, giving rise to irregular cash flows. Costs of production need to be reported for the entire cycle.

General Information

Date :

Agricultural period reported : -

Production cycle in years :

Figure 14. DSS Interface – General Information

Producer Information sets the name and location for the producer, settles his position in the marketing chain and establishes the product that will be analysed. Depending of the producer's position in the marketing chain, export costs will included or removed from the calculation.

All these fields carry importance, as they are a mean of identification and an index key for grouping and sorting. Records will be stored in a database, so reports can indicate all the products a producer owns or intends to harvest, their COSP, a regional trend for a series of products and so on.

Producers Information

Name of the Producer :

Last step as undertaken in the marketing chain :

Country :

Product :

Figure 15. DSS Interface – Producer Information

Product Information requires calls to 3rd party scripts in order to set the exchange rate to an average of its value for the year reported. A middleware technology we recommend for this task is AJAX. The yield should be expressed as estimation for an average year. The interface in presented in fig. 16.

Product Information

For exportation or transformation/processing :

Conventional or Organic :

Yield in metric ton per hectare :

Exchange rate from \$ to Local currency :

Figure 16. DSS Interface – Product Information

COSP Data

COSP information is classified in function of various stages of production related to:

1. Establishment (initial investment) – refers to the initial investment for land preparation, planting and production expenses plus costs of facilities and investments.
2. Field operations - formed by a range of expenses from labor, irrigation water, seeds or plants to fuel and oil, machinery and the cost of land. Included here is also depreciation, insurance, repairs, taxes and interest charges.
3. Harvest and post harvest – this operations include hand harvest and field packing and also sorting, sizing and grading. If specialized machines are used, then fuel, repairs, maintenance and insurance should be taken into consideration.
4. Transformation and/or processing – total operations and costs for transforming the harvest into a product suitable for consumption.
5. Product preparation and/or packaging – costs for cleaning, sorting, selecting, preparing and packaging the product for deliverance to the final consumer.
6. Central structure (umbrella organization) activities – these are costs for services from an umbrella organization as Fairtrade Standards, that provides a certification.
7. Export costs – costs in this section relate to transport, insurance, taxes (e.g. terminal fees, handling costs, storage costs etc.

The authors designed stages from one to five as showed in fig. 17. Every subsection contains an "Add" button to allow insertion of new fields, changes taking place only client-side. Every new field can be eliminated by pressing „Remove”.

I.1 Labor		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.2. Inputs and Services		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.3. Capital and investment		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value

Figure 17. DSS Interface – Common Elements

When setting the value for labor, one should differentiate between its forms: family labor, temporary hired labor and regularly hired labor. The formula for setting labor costs per activity is $(\text{Man-Days} \times 8 \text{ hours}) \times \text{local wage rate}$. For regularly hired labor, the indicator is the *salary/man-days*.

A brief overview of the costs for Capital and investment is provided as: property taxes, insurance, office expenses, investment repairs (building and machinery), annual depreciation, investments (in buildings, machinery or land) and investment in field tools. For investments there should be also calculated the cost of opportunity in order to estimate its value better.

Business margin is a relative value cost and should be a percentage of the final price that covers the risk and responsibilities connected to the activities of the producer.

In order to determine the Taxes, terminal and commission fees, it is recommended to mind the additional costs in the export process, such as:

- ad valorem tax – applied to merchandise as a percent of the customs value;
- specific merchandise tax – applied to merchandise at a fixed value per unit;
- customs surcharge – its role is to protect domestic industry and it represents a percent of the customs value for a specified period;
- export taxes – paid to the government for every transport carried out.

All fields in the COSP Data are optional, as some activities may not take place at the producer's level. If not applicable, the field should be left empty or completed with a zero.

Next, the fields for Central Structure costs and Exports are presented.

VI. Central Structure costs (costs of umbrella organization)

I.1 Labor		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.2. Inputs and Services		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.3. Capital and investment		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.4. Certification costs		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.5. Business Margin		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value

VII. Exports

I.1 Transport		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.2. Insurance		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.3. Taxes, terminal fees and commissions		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value
I.4. Other costs		Cost per hectare	Cost per metric ton
Insert labor activity	Add	value	value

Figure 18. DSS Interface – Central Structure and Export Costs

After every section, the application creates totals and shows amortization value per hectare and per metric ton, assisting the producer in taking the right decision regarding the minimum price. Once the submit button has been pressed, all values are processed and a recommendation for minimum price for sustainable production appears as a report. The user can return to the input area in the DSS system without losing the values he inserted, thus enabling him to create What-If analysis, to obtain the optimal result for his business.

Conclusions

In order to facilitate the expansion of the organic farming sector, and also to increase its production capacity, new information and, above all, new technologies are required. Providing farmers with easy access to information and with solutions for supporting

scientifically their decisions is therefore an important part of any policy aimed at developing the organic sector. The organic food and farming sector is very dynamic, showing rapid growth and constant development which need to be supported by an effective exchange of information on the availability of new technologies. Therefore, training and research are relevant at all levels, from the adoption of research programmes in universities or other research bodies, to onfarm training to ensure suitable technology transfer to farmers. The transfer of research results into agricultural practice with close cooperation between research, advisory services and farmers is already being carried out in some Member States. There is however a need for improved cooperation in this area in other Member States and between Member States themselves.

It is time that the many benefits of organic agriculture are acknowledged by more policymakers and supported with a new unified policy to support organic farmers and the organic food industry. Over the past decade, modest public resources have been directed toward organic farming in the form of funding for research and data collection, funding to offset a small amount of certification costs, enforcement of the organic standards, and an initiative to ensure fair access to conservation programs for farmers. The resources allocated to date, however, are still far disproportionate to the investment needed to realize the great potential of organic farming.

Policy Recommendations:

- expand organic research funding
- ensure fair and appropriate risk management tools
- meet market demand
- create a robust organic transition assistance program
- reward environmental benefits.

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