

EUROPEAN AGRICULTURE OF THE FUTURE

THE ROLE OF PLANT PROTECTION PRODUCTS

EXECUTIVE SUMMARY



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OBJECTIVE OF THE STUDY

Agriculture and the food industry are sectors characterised by a high level of integration: production and transformation of primary agricultural resources are intrinsically linked. In the European model, these synergies ensure quality and control over production processes and final products as well as the overall competitiveness of the food chains. Thus, in this study the term Agri-food is considered to comprise the aggregation of all branches of agriculture and the food industry (including drinks and beverages).

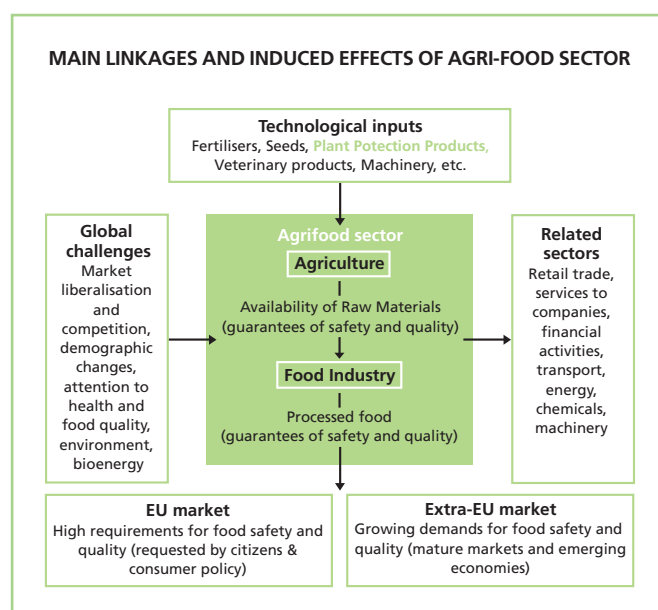
In a global perspective characterised by rapid and far-reaching changes, the main goal of this study is to define the importance of the European Agri-food sector within the socio-economic context of the European Union and to identify possible scenarios for this sector as a result of modifications to the regulatory framework for plant protection products (PPPs).

The European institutions are currently discussing changes to the system regulating the commercialisation of PPPs, products used in agriculture to control pests and weeds in crops. If implemented, the presently planned changes to PPP market-access regulations (revision of Dir. 91/414/EEC) will result in important impacts on agricultural productivity.

The case studies covered in the analysis have shown that the effects of the proposed new regulation framework could lead to significant losses in productivity (expressed in terms of crop yield) that range from 29% for wheat, 20% for cereals, 33% for potatoes and 10% for wine grapes. Furthermore, it can be assumed that similar productivity losses would be experienced by European agriculture in general, thus taking on a

strategic dimension in terms of the direct negative impact on the level of self-sufficiency.

Agricultural technologies such as PPPs, therefore, play a vital role in maintaining the productivity, profitability and competitiveness of the European Agri-food sector with all its attendant societal benefits over the long term. Changes in the framework regulating PPPs will have repercussions not only on the European agrochemical sector, but also will lead to substantial changes in the European Agri-food system and in the overall economic system.



STRATEGIC ROLE OF AGRI-FOOD SECTOR IN EUROPEAN ECONOMY

The economic dimensions of the Agri-food sector demonstrate its primary global importance (world leader in agricultural and food production) and its strategic role in the European economic system (4% of GDP, more than 18 million persons employed – equivalent to 8.4% of total employment). The Agri-food sector, moreover, is closely linked with other sectors (wholesale and retail trade, services to companies, financial activities and transport, etc.). Due to these extensive linkages, growth in the Agri-food sector also has important positive effects on associated sectors, unleashing a virtuous process of value creation that benefits the entire economy. Conversely, the effect of a decline in Agri-food production will not remain limited to the sector, but is likely to have repercussions throughout the value chain involving other associated sectors, generating a negative impact that is much larger in terms of its effects on output, businesses and related employment.

ENVIRONMENTAL PROTECTION AND DEVELOPMENT OF RURAL AREAS

A robust European agricultural sector will provide benefits to the environment and rural areas, reflecting the multifunctionality of agriculture. Besides the production of agricultural goods, agriculture contributes to the preservation and protection of the environment, the territory and the landscape as well as animal welfare. The development of integrated economic activities in rural areas helps in countering depopulation and the consequent growth of urban conglomerations and associated unemployment and social problems.

The effects of climate change and the loss of biodiversity are among the most important concerns regarding the environment at present. Over the past several years, in contrast to the other major agricultural producers, European agricultural policy has emphasised sustainable development, adopting specific policy instruments that contribute to reducing the impact of these phenomena in general and their specific negative effects on the agricultural production cycle (shifting seasonality and precipitation patterns, spread of pests and diseases, and reduction of germplasm for selective breeding, etc.).

COMPETITIVENESS OF EUROPEAN AGRI-FOOD MODEL

In an international context moving toward progressive trade liberalisation, commodities from other regions of the world have a competitive advantage in terms of lower labour costs and

economies of scale. Higher production costs in Europe are also associated with the strict regulatory systems regarding safety and quality that are in place.

The most important characteristic of the European Agri-food sector is its high level of integration (the EU food industry acquires and transforms around 70% of internal agricultural production). For the European Union, the strong linkages between the different parts of the food chain represent an important factor in guaranteeing the food safety and quality of final products since they are controlled by shared production standards. A further factor in the quality of European food is the production of traditional and local products (for example, Champagne, Parmigiano Reggiano, etc.), which represent important elements of European culture and lifestyle. This attention to quality allows the main European food products to gain access to international markets at higher per unit export values compared with those from other main trading countries.

INCREASING WORLD DEMAND FOR HEALTHY AND QUALITY FOOD

Over the next few years there will be a greater interest in food quality and health, contributing to a progressive expansion of the market for high value-added products that are characteristic of the European production system.

EU consumers/citizens have come to expect high levels of food safety, and the European institutions have adopted specific policies to ensure control over food production and to promote food quality.

Yet this trend is also becoming evident at the global level. The increases in world population and disposable income are generating substantial changes in food consumption trends. Recent estimates for 2006 indicated a world population of 6.5 billion people, projected to grow at a rate of more than 1% annually through 2016 (OECD-FAO, 2007). Most of the growth will occur in developing countries – with the largest absolute population increase in Asia (especially in China and India). This continent also is the most populous area in the world and is experiencing growing prosperity (income projected to grow 4% annually through 2016). Increased purchasing power in developing countries will translate into rising food demand and changes in dietary habits (i.e. an increase in meat consumption). An important growth opportunity for European food exports in world markets is represented by increasing demand, accompanied by heightened interest in food quality and health.

The main effect of these trends, coupled with the progressive liberalisation of markets driven by ongoing WTO negotiations and the growing number of bilateral trade agreements, has been the expansion of trade in food products at the global level (from 1995 to 2005, levels of world trade in agricultural products and food have increased by 45% and 51%, respectively).

In such a context it is very important that European agriculture and the food industry strengthen their positions in internal and international markets by relying not on competitiveness of prices (higher than for extra-EU products), but on the high levels of safety and quality of products.

GUARANTEES OF FOOD SAFETY AND QUALITY

High food safety standards have become a major requirement for European citizens, manifested in a wide range of EU and National laws and regulations. Since 2000 (when the EU White Paper on Food Safety was issued), the tools to guarantee food safety have been improved and the entire food chain is now subject to increased traceability "from farm to fork".

As mentioned – above, the high level of integration between the different parts of the EU food chain and shared production standards play a critical role in guaranteeing the quality and safety of final products.

A major concern arising from a potential decline in European agricultural output would be the loss of a secure supply of agricultural produce for the Agri-food sector to process into high quality, affordable food for Europe's consumers. This problem is likely to be exacerbated by ongoing trends in the global balance of food supply and demand.

NEW TRENDS IN EUROPEAN AGRI-FOOD TRADE BALANCE

The EU is the world's largest importer and exporter of agricultural products. From 1999 to 2006 the overall Agri-food trade balance has improved somewhat: the 2006 deficit was valued at € 3.0 billion, 30% lower than the 1999 level. But when comparing agricultural raw materials trade with processed products trade, the balances are quite different. In 2006 the EU-27 was both a net importer of primary agricultural products (€ 17 billion deficit) and a net exporter of processed food products (€ 14 billion surplus).

This trade deficit in primary agricultural products has increased significantly over time (rising 20% from 1999 to 2006), contributing to a progressive loss of self-sufficiency in raw materials, also due to recent market-oriented CAP reforms. In con-

trast, the food industry appears to be a major strength of the EU-27 trading system, given its positive trade balance (up 40% from 1999 to 2006), relying particularly on the high quality of its processed food products.

A drop in agricultural production would translate into a potential decline in food manufacturing output (in terms of both quantity and quality). This would undermine, first of all, the competitiveness of EU-27 exports in general and, secondly, food exports in particular, eroding the future capacity to take advantage of new market segments that are currently developing. A lower level of EU-27 agricultural self-sufficiency could compromise the system of food safety and quality guarantees. In such a situation, Europe would become more dependent on supplies of primary resources from extra-EU sources, which are not able to offer the same safety standards in their production (due to less stringent legislation for plant protection products and food safety). In the last few months numerous indications of supply tensions on international markets for primary agricultural resources have emerged, contributing to additional challenges for European food producers.

BIO-ENERGY: RISKS AND OPPORTUNITIES FOR AGRICULTURE

While increased demand from emerging economies has become the most important driver of the international raw materials market, some of this market tension is also linked to the production of biofuels.

In recent years, at the global level there has been growing interest in using renewable energy sources to respond to increasing demand for energy products, especially in rapidly growing economies, and in reducing pressures in international fossil fuel markets. Agro-energy (used as biomass and biofuels) is an important source of renewable energy, and over the past few years the production of biofuels has gained major global importance (i.e. enormous investments in Brazil and USA).

EU policy has set very aggressive targets for increasing the share of biofuels in transport fuel consumption (5.75% for 2010 and 10% for 2020 in the EU-25). Even though these objectives are very ambitious and partial revisions are likely, significant investments in biofuels are being made throughout Europe. While on the one hand this offers new opportunities for the use of primary agricultural resources (cereals and other starches for bioethanol, oilseeds for biodiesel), on the other hand it generates competition for their use as food. The rising demand for agricultural commodities, especially from emerging economies,

coupled with an expanded use of these supplies for biofuel production, has led to a rapid decline in worldwide stocks of commodities such as wheat and maize.

The study suggests that these developments are highly critical for Europe, especially with regard to its self-sufficiency in primary agricultural materials. With the introduction of more rigid norms on the market placement of Plant Protection Products (PPPs), the productivity of European agriculture will be undermined, due to the decline in the availability of this important factor of production.

ROLE OF AGRICULTURAL TECHNOLOGIES: THE CASE OF PLANT PROTECTION PRODUCTS

Plant protection products (PPPs) assist farmers in reducing disease and pest pressures and competition from weeds that would otherwise destroy or damage crops, which deliver the raw materials for the Agri-food sector. As such, these products are often referred to as preventative medicines for crops or phytopharmaceuticals.

Beginning in the 1960s, the Green Revolution introduced new technologies (fertilisers, seeds, plant protection products, irrigation, etc.) that helped farmers increase crop yields. The gains in production were significant: world cereal yields nearly doubled from 1.4 tonnes per hectare in the early 1960s to 2.7 tonnes per hectare in 1989–1991. Among these technologies, PPPs represent one of the main inputs in farm production.

PPPs are now being combined with new production techniques to improve the agronomic management of crops. In particular, Integrated Crop Management (ICM) is being adopted in order to maximise the effectiveness of different technologies and eliminate any adverse effects on public health and the environment. Used together with modern agronomic techniques, the efficiency and selectivity of PPPs have continually improved. Furthermore, the introduction to the market of selective PPPs has allowed farmers to apply products only when the target organisms are present over a defined economic threshold; such products are more efficient and less harmful than the older generation broad-spectrum plant protection products.

THE LEGISLATION ON PLACING PLANT PROTECTION PRODUCTS (PPPS) ON THE MARKET

PPPs used to protect plants or plant products are mainly regulated by Directive 91/414/EEC “on the placing of plant protection products on the market”. The Directive states that Active

Substances (ASs) cannot be used in plant protection products unless they are included in an EU positive list (Annex 1). An EU programme of evaluation to revise this list is currently under way. Chemical substances or micro-organisms in PPPs are only approved for use if they have undergone a scientific risk assessment, and safe use has been demonstrated through a peer-reviewed safety assessment. The Directive, which went into force a few years after the legislation was adopted by all Member States, was aimed at achieving many objectives, in particular harmonizing the rules applied by each Member State in governing the authorization of PPP use and ensuring that harmonized rules applied by all the Member States provide a high standard of protection. One of the main outcomes of Directive 91/414/EEC was a rapid decline in the number of ASs available on the EU market since 1993. In fact, 57.2% of all the ASs under review (totalling 1,101 ASs) have already been excluded from Annex I and 27.6% are still waiting to be evaluated (at present, only 167 are authorized for use in the EU). Currently, the European institutions are discussing a proposal for a new Directive to adapt the previous legislation to recent demand and supply dynamics. The proposed change in legislation comprises several important elements. In particular, hazard-based requirements (cut-off criteria) will be introduced to exclude ASs from positive lists prior to and regardless of any risk assessment. Moreover, a comparative assessment of substances will be undertaken and updated, with the consequent identification of those that are candidates for substitution. Finally, data protection and data sharing criteria will grant 10 years of protection for studies that are considered as necessary for an authorization (or modification of it), but will not be granted for the revision or renewal of the Authorization.

The impact of the new proposal was therefore evaluated by both the European Commission and the European Crop protection Association (ECPA) in order to understand the likely number of active substances that would be affected by non-approval (“cut-off”) criteria and criteria to identify “candidates for substitution”. There were some substantial differences between the European Commission and ECPA evaluations. The European Commission evaluated the impact as comprising a further 20% reduction in the number of ASs available, which promises to present major challenges to farmers in terms of freedom of choice in their economic activities. A far more serious impact resulted from the ECPA evaluation, which estimated a 60% reduction in the availability of ASs, which would be dramatic for an agricultural system that is highly variegated in terms of crops, pests, soil, climate and growing patterns.

PPP INDUSTRY R&D

A possible answer to the serious challenges posed by the new regulation could be offered by an expansion of R&D activities to develop innovative products that are more effective with lower impacts on health and the environment. However, a major obstacle is presented by the fact that the current proposal does not offer sufficient elements to stimulate further research, especially when considering the high uncertainties in the time to market required and the return on significant investment.

In 2005 the overall R&D intensity of the United States (2.67%, expressed by GERD as a percentage of GDP) was significantly higher than that of the EU-27 (1.84%). However, it needs to be pointed out that in the area of chemical products (including PPPs as a specialised branch of the overall chemicals sector) the differences in R&D intensity between the EU and US are not significant, and the European chemicals industry is actually somewhat larger, with a higher R&D intensity (DG Research, 2007). In particular, the PPP industry in Europe is characterised by high levels of investment in R&D (8–12% of turnover) and generates substantial impacts on employment. In fact, the R&D intensity of the European agrochemical companies (9.3%) is much higher than that in the overall chemical industry (3.1%) and in the global agrochemical industry (7.5%). This industry is also a key actor in the growth of the European economy, and its contribution is fundamental in the pursuit of the objectives defined by the Lisbon Strategy.

The high cost of compliance with the regulations on plant protection products has created increasingly more difficult conditions for the EU agrochemical industry than for competitors in the USA and other countries. In a phase in which many products subject to review are being withdrawn from the market (due to the application of Directive 91/414/EEC), research and development activities become even more essential in guaranteeing an adequate modernisation, effectiveness and safety of the European PPP portfolio and in ensuring that farmers will have appropriate tools to control plant pests, diseases and weeds.

At present, developing new active substances generally takes 8–10 years (ECPA, 2006). Thus, not only must cost be considered in investment decisions, but also the time to market – a critical factor in maintaining competitiveness. During 1995–2000, the average lead time between the first synthesis and first sale of a PPP increased from 8.3 to 9.1 years (Phillips McDougall, 2003). Lengthier and more rigid registration requirements have increased the cost of development and testing.

The industry must be guaranteed an adequate return on investment in order to maintain its current high levels of R&D and innovation capacity – already the R&D base with regard to PPPs for minor crops (such as vegetables) has been eroded, due to the high cost of discovery, development and registration coupled with lengthened registration times and uncertainties in review processes. More rigid regulations on PPP market access will have a negative impact on the innovation activities of the major R&D based companies and consequently on the availability of a key factor in production with direct effects on the entire agricultural market.

ROLE OF PLANT PROTECTION PRODUCTS IN EUROPEAN AGRICULTURE

In order to estimate the possible effects that the current and the proposed new regulations could have on the EU-27 agricultural production system, hence on the Agri-food sector, a quantitative analysis was undertaken (see the methodology in the document). It was decided to analyze several case studies (three different crops) and to create four different scenarios for each of them in order to provide relevant results that can be qualitatively generalised for agriculture as a whole. The three crops selected were wheat, the potato and the wine grape, which are products representative of central and northern Europe and the Mediterranean area, respectively.

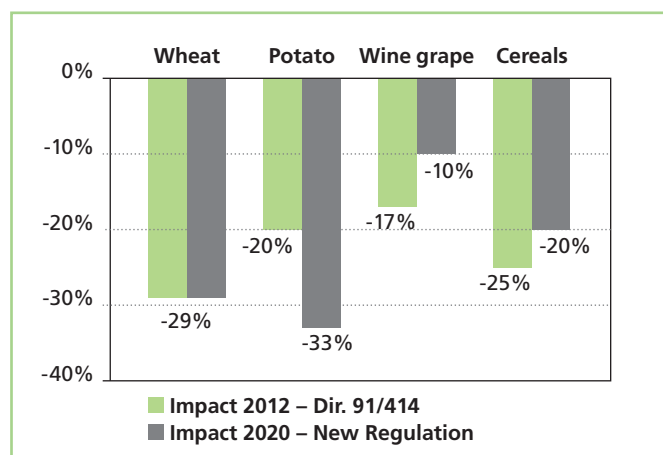
Depending on the scenario, the analysis has generated different sets of results (defined by the values of different indicators selected) for the medium and long term timeframes. Through 2012 (medium term) the effects of the application of the current regulation (Dir. 91/414/EEC) will be prevalent, whereas for 2020 (long term) the impacts of the new regulation will play the dominant role.

Three different focus groups (one for each case study), comprising various experts from the agrochemical industry, evaluated the possible impacts of the two regulatory contexts on the main active substance categories applied to the three crops examined, taking into consideration the rate of innovation in introducing new PPPs. Finally, in addition to the three case studies, an evaluation of the cereals sector as a whole was undertaken, following the same methodology as applied for the individual crops.

The figure clearly shows the direct impacts of the current legislation (2012) and the proposed Regulation (2020) on the different crop yields (thus on their overall production). It should be noted that by 2012 Dir. 91/414/EEC will likely have varying ef-

fects on different crops. In particular, wheat yields and production will decrease by 29%, which represents a higher impact than experienced by the cereal branch as a whole (-25%). The new regulation could cause the same level of reduction in yield and production in 2020. With regard to the potato, it was estimated that Dir. 91/414/EEC will have quite a significant impact on 2012 production (-20%), but even a sharper decline (-33%) will likely occur by 2020 due to the implementation of the new rules. Finally, the impact assessed for wine grapes over the medium term (2012) was a drop in output of -17%, while by 2020 the PPP supply will probably be able to adapt to the new normative framework, and resulted in a far lower loss of productivity (-10%). Given that organic viticulture uses some PPPs that are also subject to evaluation in the context of Dir. 91/414/EEC and the proposed new regulation, the evaluation has applied a conservative approach to the estimation of yield reduction. In sum, cereals (mainly wheat and maize), as well as wine grapes, will experience greater negative impacts from the full application of the current regulation in 2012 than from the new proposed directive in 2020. In fact, cereals were estimated to experience a 25% decline in 2012 compared to a 20% drop in 2020.

Dir. 91/414/EEC and New Regulation: yield impacts on main crops in medium and long term perspectives



Source: Nomisma – Areté elaborations on Eurostat data.

Generally speaking, while there remain substantial differences between the yield and production losses of the various crops (due to reduced PPP availability), it can be stated that the decreases are all quite significant – even if the new proposed reg-

ulation in some cases generates lower negative impacts than the current one.

In any case, the above assessment only provides estimates of one of the impacts resulting from the two different regulatory frameworks, without taking into consideration any future agricultural and economic trends. Thus, to provide a more detailed understanding of the various dynamics that might affect the development of European agriculture in the future, several other important indicators were introduced. For each crop, potential development trends within the two forecasted periods, 2006–2012 and 2006–2020, have been identified (dynamics related to yields, cultivated surface areas, production, domestic consumption and the trade balance). Incorporating these variables into the four different scenarios has permitted observing the likely effects of the PPP regulatory framework coupled with the future estimated trends for the above indicators. Thus, each detailed analysis related to the target crops reflects both the effects of more limited availability of PPPs as well as overall agricultural and economic trends.

The main findings of this research can be summarized as the following:

Wheat: over the medium term (2012 – prevalent Dir. 91/414/EEC effects), wheat production in the EU-27 could decrease by nearly 30%, further reducing the level of self-sufficiency (to 71%) and thus leading Member States to import larger quantities of wheat from extra-EU-27 countries (especially Canada, Australia, the Russian Federation, Ukraine and USA). As to the long-term impacts of the new regulation (2020), domestic wheat output will be seriously affected as well, with a possible 27% reduction and an even worse trade balance. Such a trade deficit would be even further exacerbated by the expected increase in domestic wheat consumption over the period, while self-sufficiency remains around 70%.

Potatoes: over the medium term (2012), potato production in the EU-27 could decline by nearly 32%, further reducing the level of self-sufficiency (to 80%) and thus leading Member States to import larger quantities of potatoes from extra-EU-27 countries (China, Russian Federation, USA etc.). With regard to the long-term impacts of the new regulation (2020), domestic potato output could be dramatically affected by a possible 50% drop in production and a seriously exacerbated trade balance. For both the medium- and long-term scenarios, it is important to point out the significant differences between the “static” and “dynamic” analyses: the

large supply gap is mainly due to the striking decrease in the area cultivated with potatoes (especially in Poland) that will occur over the next several years (although at a lower rate).

Wine: over the medium term (2012), grape production in the EU-27 will decrease by nearly 18%, directly affecting domestic wine production. Such a situation will further reduce the wine self-sufficiency level (to 82%), thus leading member states to import larger quantities of this product from outside the EU-27 (especially USA, Argentina, Australia, and Chile). As to the long-term outcomes of the new regulation (2020), domestic grape and wine output would decrease around 7% with correlated effects on the trade balance and self-sufficiency level (90%). While there is a decline in production, the increase in imports would be somewhat balanced by export growth.

possible 22% reduction in output and a worse trade balance. Such a trade deficit is further exacerbated by the expected increase in domestic cereal consumption throughout the period, while self-sufficiency will be around 85%.

The analysis has demonstrated that the current and the proposed regulations on PPP market access can have potential negative effects on present agricultural trends and could lead to a weakening of Europe's position in world agricultural and Agri-food markets. Indeed, while for wheat and wine grapes the production losses under the two different scenarios are relatively consistent, for potatoes, which are currently undergoing a significant restructuring process, the effects of the new regulation could lead to an even further deterioration of EU-27 productivity.

The crops covered in the present analysis represent a significant share of the total EU-27 utilised agricultural area (UAA).

TABLE I | **NEW PROPOSED PPP REGULATION:**

IMPACTS ON THE MAIN EU AGRICULTURAL CROPS OVER THE MEDIUM TO LONG TERM (2012–2020)

	IMPACT 2006–2012			IMPACT 2006–2020		
	Present Situation (2006)	Dir 91/414/EEC Impact (2012)		Present situation (2006)	New regulation Impact (2020)	
WHEAT						
Production (Mil t)	135	94	–30%	135	99	–27%
Self sufficiency	104%	71%	–33%	104%	70%	–34%
POTATO						
Production (Mil t)	64	44	–32%	64	32	–50%
Self sufficiency	105%	80%	–25%	105%	61%	–44%
WINE						
Production (Mil hl)	179	148	–18%	179	166	–7%
Self sufficiency	102%	82%	–20%	102%	90%	–12%
CEREALS						
Production (Mil t)	293	217	–26%	293	228	–22%
Self sufficiency	119%	81%	–38%	119%	85%	–34%

Source: Nomisma – Areté elaborations on Eurostat data

Cereals: over the medium term (2012), cereal production in the EU-27 could drop by nearly 26%, further reducing the level of self-sufficiency (to 81%), and leading Member States to import larger quantities of cereals from extra-EU-27 countries (especially from Canada, USA, Argentina, Brazil, and India). As to the long term outcomes of the new regulation, domestic cereal production will be seriously affected, with a

Therefore, considering the results of this study, it may be argued that the entire EU agricultural sector could be similarly affected by the changes in the PPP regulatory framework. In other words, the changes in terms of production and self-sufficiency levels estimated for these groups of crops may be considered also to be relevant for other crops not covered in the present analysis.

In conclusion, reduced PPP availability could lead to a decline in overall European agricultural productivity. Cereals – the most important single crop group in the European Union – could register a 20% drop in yield in the 2020 perspective, applying a fairly conservative approach. The reductions in yield will vary for different crops, but generally the lower availability of PPPs will negatively affect the ability of the food industry to produce safe, high-quality, affordable food for European consumers and the dynamic extra-EU market.

This would mean that Europe, which has been experiencing declining levels of self-sufficiency in primary agricultural materials over recent years, could see a further aggravation of this trend. In the case of cereals, the current level of self-sufficiency of around 119% could decrease to a level of only 85%, representing a reduction of 34%. In such a situation, Europe would become even more dependent on extra-EU imports, making it increasingly difficult to guarantee market access, affordability, traceability and quality standards.

It is thus important to understand how regulatory decisions that concern even only one of the different factors of production used by agriculture can generate important repercussions on the more complex system that embraces the entire Agri-food sector, the associated sectors and the final destination markets of food products.