9 Theme 6 – Overall coherence with CAP objectives

Theme six explores the coherence between the CAP measures supporting the hop sector and the overall CAP objectives of making the CAP more market oriented and respectful of the environment. The theme is addressed through two questions.

- To what extent are the CAP measures supporting hops coherent with the objective of a more competitive and market-related agriculture promoted by the 2003 CAP reform?
- To what extent have the CAP measures supporting hops affected the environment?

9.1 Evaluation question 6.1.: To what extent are the CAP measures supporting hops coherent with the objective of a more competitive and market-related agriculture promoted by the 2003 CAP reform?

This question concerns the extent to which the CAP measures in place after the 2003 reform are in line with the global CAP objectives, without prejudice to farmers' income. Market orientation and a higher degree of competition in the hop sector should result in lower prices for the downstream sector - other things being equal. Farms have to be more efficient to face competition and therefore they have to produce close to marginal cost. This entails lower prices if market entry is allowed. As prices decrease, farmers' gross margins should decrease as well, leading to the exit of the least-efficient producers. Least efficient producers can be those technologically lagging behind, but also small producers that have to distribute high fixed cost across a lower output than big farms. We examined in theme 1 and 4 the trend in price, the trend in gross margin for farmers and the number of market entrants and leavers. Also, the relative weight of the EU as a producer on the world market can give an idea of its competitiveness. We also assess whether there has been an increase in productivity, whether the producer groups managed to foster technical developments and whether stability of the markets has been promoted. In seeking to strike a balance between a market-oriented agriculture, and the stability of revenues for growers, the closer the sector gets to a free market, the more farmers are exposed to revenue volatility.

9.1.1 Judgment criterion 1: extent to which market for hops has become more competitive

The competitive position of the EU as a single hop producer has eroded. However, within the EU market some countries such as Germany have definitely gained ground and market share at the expense of others.

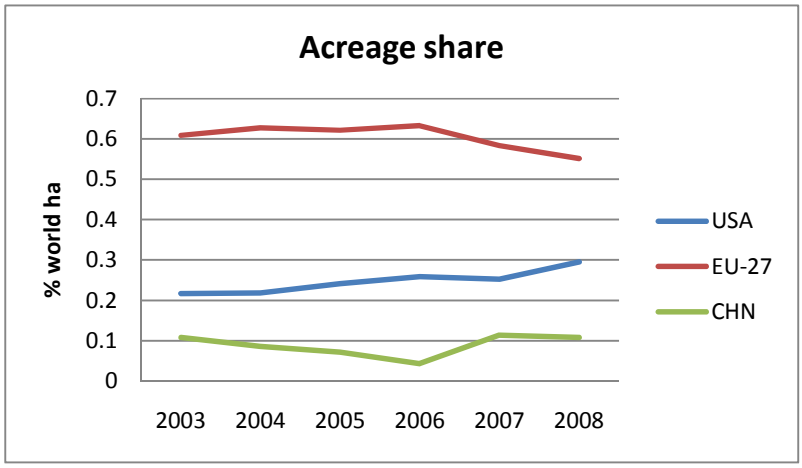
9.1.1.1 Relative position of the EU in the world market for hops

The relative position of the EU in the world market is declining. The EU-27 is still the largest hop producer worldwide, but its share is shrinking compared to the US and China. Large hop producers are aware of this trend and would like the EU to act to improve their competitive position. However, some of the competitive advantages enjoyed by the US are due to their production structure that is based on fewer, larger farms. In this respect the room for EU action is small. Within this context, decoupling makes it easy to switch crops and therefore should promote a better allocation of resources for EU agriculture, by directing farmers' efforts towards more profitable crops. Moreover, decoupled aid is not linked to any conditions and farmers can in principle use it for the purpose they

wish, including investments. The fact that they do not do so could be an explanation on the perceived future profitability of the hops' industry but, according to our analysis under theme 1 and 4, switching to other crops does not take place because of the implied write-off of capital investment and the relative profitability of hops compared to most alternative crops.

The lack of investment trends made by EU-27 hops farms does not allow us to draw strong conclusions concerning the reason why investments are not high enough to keep pace with the US industry. From the interviews it seems that the investment gap is higher for small farms than for large farms, but this scenario varies across the EU. However, the deterioration of the EU competitive position is a fact. The following figure shows the decline of the EU in global hop area.

Figure 1 – EU acreage share compared to main competitors

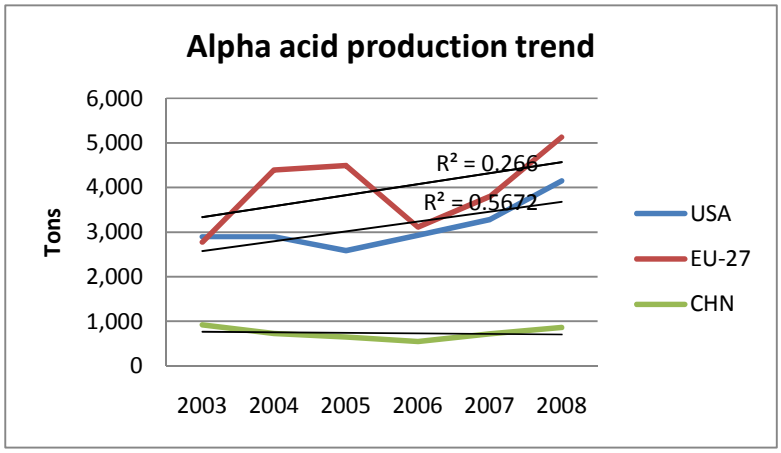


Source: Eurostat, adaptation Deloitte

This trend is accompanied by much higher alpha yields in the US (261 Kg/ha against 173 Kg/ha in the EU in 2008), and by a more competitive US production structure. The improving competitive position for the US is not yet fully reflected in production figures as the new hop areas planted in 2007-08 have still to come into production. The following figure shows the trend of alpha acid production. The EU-27 leads the way, but is tending to experience a more volatile production trend. This is due to a higher vulnerability to weather conditions in some areas and the agronomic environment. The higher volatility is shown by the higher R^2 index[1].

[1] The R-squared is a statistical measure of how well a regression line approximates real data points; an r-squared of 1.0 (100%) indicates a perfect fit.

Figure 2 – Alpha acid production trends



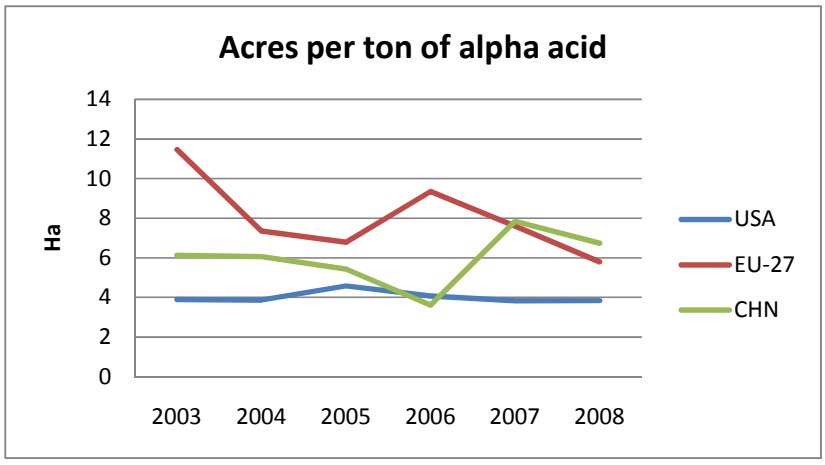
Source: Eurostat, adaptation Deloitte

However, the market share of the EU seems likely to decline, or at best stagnate, in the coming years according to most interviewees. The main structural factors that make the US more competitive than the EU are:

- Lower degree of fragmentation of hop farms in the US: the average American hop farm is as big as 200 ha against an average size of 10-30ha in Europe;
- Higher degree of mechanisation and technology; this is reflected by the economies of scale which are possible in the large American holdings. A solution has been to pool machinery amongst farmers, but this has not always worked optimally.

Another variable that may shed some light is the number of acres needed to obtain one tonne of alpha acid. This is summarised in the figure below.

Figure 3 - Acres need to obtain a tonne of alpha acid



Source: Eurostat, adaptation Deloitte

The gap in productivity still seems rather wide. However, the change in production structure ongoing in Europe is generating productivity increases. This is due to two main effects that come into play:

the introduction in Europe of super bitter varieties that offer higher yield and the increase in the average size of hop holdings in Europe that makes technological innovation easier[2].

Several interviewees have expressed a desire that CAP support be directed towards efforts to improve productivity and to close the technological gap with the US. Measures suggested by the interviewees, such as tax breaks on investments in machinery or subsidies directed at the replacement of machinery, may not always be feasible. However, they point to the increasing perception that producers have of their deteriorating competitive position. With a more fragmented production structure the only way for the EU to stay competitive is to pool resources. The German industry has managed to pool their resources effectively in a number of areas (including R&D) and its competitive position has improved. This was possible because of the presence of active producer groups and the critical mass (in terms of number of holdings) that made it possible to endow the producer groups with a substantial financial envelope.

9.1.1.2 Number of market entries and exits

We showed under theme 2 that market exits greatly outnumber market entries, with more than 500 growers leaving the hop sector in 2004-2007. Only one farmer in the UK entered the market in the same period. Due to mergers and acquisition, the average area of hop farms in the EU is increasing (except in the UK), but the total cultivation of hops in the EU is decreasing (see Table 1: -3,000 ha during the period 2001-2008). The decrease in the number of producers is a direct result of the inadequate European production structure; in Europe the average size of a hop farm is too small to recover the high fixed costs. Small holdings also find it difficult to invest in innovative machinery to stay competitive. Furthermore the size of the hop sector in most countries is so small that they do not manage to find enough money to invest in R&D. Only Germany (and to a lesser extent the Czech Republic and the UK) intensively finance R&D in Europe.

Interviewees see the process of concentration of the production structure as inevitable. Likewise, the decrease in the number of producers is also due to the ageing population of growers, a phenomenon which is not going to be reversed in the short-term.

Findings for the evaluation question are:

- The EU-27 is still the leader in the hops market in absolute terms. However, the EU is lagging behind the US in terms of productivity. This could undermine the leading position of the EU in the long-run;
- The level of the technological development in the EU farms is still lower than in the US;
- European hops growers are exiting the sector partly because of the retirement of older growers who are not replaced by new entrants. Mergers and acquisitions happen, but not to such an extent to keep the cultivated surface at the same level. The total area of hops is decreasing.

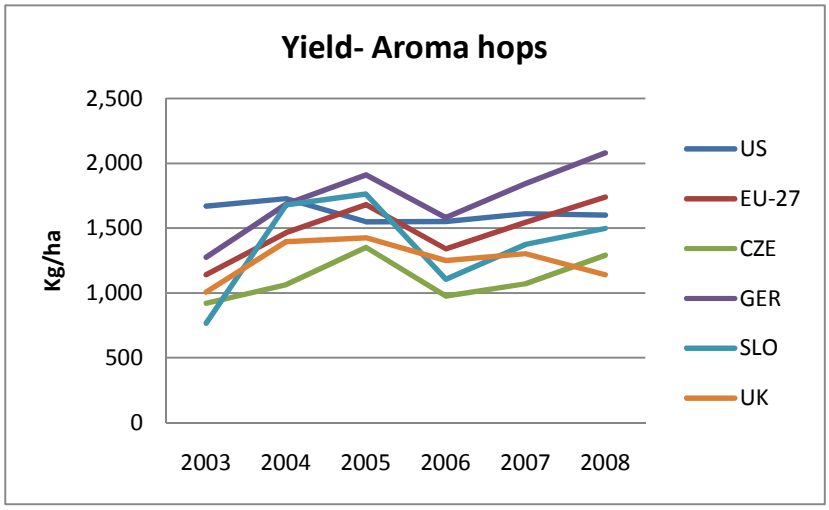
[2] We are aware that this analysis is not conclusive, as it assumes that a higher alpha production per hectare means better productivity and higher income. This is likely to be so, but it is not necessary true as some aroma varieties may be sold at higher price than bitter. However, we do not have data on income or gross margin for the US and China so that an analysis in this sense is impossible.

9.1.2 Judgment criterion 2: extent to which productivity increased

9.1.2.1 Trend in hops yield

We articulate this analysis for both aroma and bitter hops. Productivity in aroma hops has improved in the EU in the last few years. This is not due to the CAP, but rather to the European producers responding to market incentives and trying to catch up with the US. However, the picture within the EU is varied: Germany managed to catch up and surpass the US in terms of yield[3], but the Czech Republic and other main European aroma producers are still lagging behind in terms of yield. This is due sometimes to deliberate strategic choices (the Czech producers insist on growing the Saaz variety despite its low yield, because of its high quality) but also to the difficulty of investing in new hops varieties and new hops gardens.

Figure 4 – Yield for aroma hops

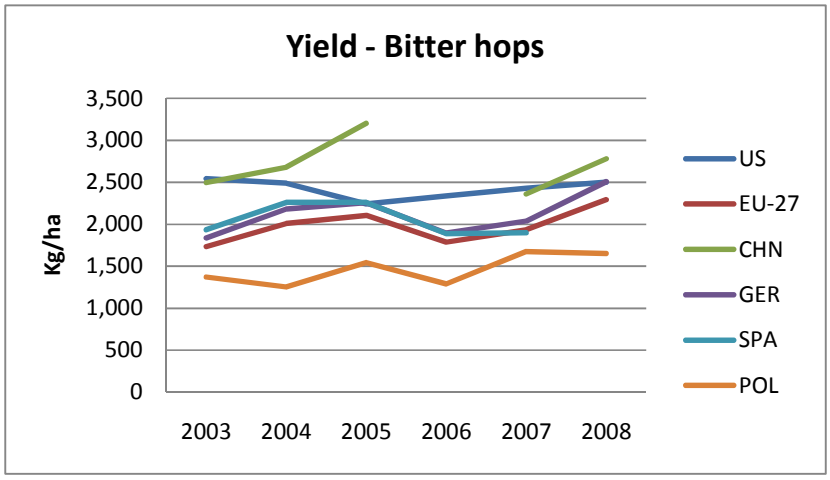


Source: Eurostat, adaptation Deloitte

As far as bitter varieties are concerned, the position of the EU seems slightly worse in terms of productivity. The following figure provides the reader with an illustration of this.

[3] The data series for yield are of course affected by the climate and agricultural conditions of a given year. Our judgment is therefore always based on the main trend calculated over the six years considered

Figure 5 – Yield for bitter hops



Source: Eurostat, adaptation Deloitte

Germany improved its yield considerably in the last five years and has closed the gap with producers in the United States. The other major European producers remain well below the American levels of productivity. This is because of the varieties grown in Europe, which tend to be less rich in alpha acid than American varieties. However, the lower degree of technological development and the lack of irrigation also explain this trend (if we draw a regression line for Spain we find out that the trend is even negative). This seems the most plausible explanation for cases such as Spain that has 90% of Nugget hops, whose yield is potentially amongst the highest (11%-13%) in terms of alpha content.

9.1.2.2 Increase of yield potential in new varieties

Several new varieties have been developed and released in Europe and the United States in the last years. For example, three new varieties were developed and have started being grown in the Czech Republic**:**

- **Agnus:** a high-alpha variety was released in 2001. Its alpha acid content ranges from 11% to 15%. In 2009 Agnus is already the most common bitter variety in the Czech Republic, with 58 ha devoted to it;
- **Harmonie:** a new aroma variety that has an alpha acid content of 5%-8%;
- **Rubin:** another high-alpha variety that has an alpha acid content of 10%-14%.

The **German Hops Research Centre** in Huell is the most active research centre in Europe and the result of a focused co-operation between the German Society of Hops Research (Gesellschaft für Hopfenforschung e.V., a private organisation), supported by its members — mainly breweries — and the Free State of Bavaria, represented by the Bavarian State Research Center for Agriculture (Bayerische Landesanstalt für Landwirtschaft). The aim of setting up such a centre is to develop varieties with excellent brewing quality, good agronomic performance and a high resistance towards several diseases and pests. The main rationale of research on hops is "*to meet the high demands of the hop and brewing industry it is necessary to reduce the long process of the selection and phenotypic assessments of promising breeding lines. In general, it takes 12 to 15 years to develop a*

new hops variety[4]." Several successful varieties have been developed in the Hops Research Centre amongst which:

- **Perle:** a common German aroma hops with high alpha content (6.5%-9%) and aroma similar to Hallertau Mittlefrüher. Germany had 3,400 ha of Perle in 2009. This makes is it the most common aroma variety in the country. Perle is also grown in Austria and Poland;
- **Hallertauer Tradition:** was developed in the 1990s and it is now the second most common aroma hop with 2,700 ha (2009). It has an alpha content of 5%-7%;
- **Magnum:** a bitter aroma variety that has an alpha content of 10.0%-12.6%. It is resistant to diseases and grown in several countries, among which Germany (4,200 ha), Austria, France and Slovenia;
- **Taurus:** another common bitter hop, is extensively grown in Germany, with 1,250 hectares in 2009;
- **Herkules:** it is a recently-developed high alpha variety. Its alpha acid content ranges from 12% to 17% and it very resistant to diseases. Because of these characteristics 2,100 hectares have been planted with this variety in only a few years and it is already the second most-common bitter variety in Germany.

In addition to the varieties developed, the German R&D centre - in collaboration with the Bayern government – has also fostered academic research on hops and has sponsored the production of several seminal papers and scientific articles, as a review of the literature demonstrates.

The **Wye Hops Research Centre** (UK) has traditionally been one of the most active in Europe. However, the lack of funding has disrupted its activity in recent years. In 2007 Defra ceased its funding and since then the centre has survived on grants given by the industry and by the Institute of Brewing and Distilling. We provide more details in the UK case study. Other EU-27 countries do not perform major research activity on hops as there is a lack of state funding. The withdrawal of state funding has had an inevitable impact to the detriment of R&D as the hop sector is not big enough to attract sufficient financing from growers or the private sector[5].

Research and Development is essential to ensure the sustainability of the EU position in terms of productivity in the long-term. If the EU decides to foster R&D in the hop sector –as in other sectors – a case for subsidiarity would emerge. The literature for centralised R&D activities at the EU level is wide[6]. It is mainly based on the concepts of economies of scale and policy externalities deriving from a common R&D policy. Several producers outside Germany have expressed concern at this and have called for the CAP to finance these efforts.

[4] "Genome analysis in hops- a powerful method for improving an essential raw material for brewing"
S. Seefelder, K. Kammhuber et al. (2005).

[5] There are exceptions to this. In England the Institute of Brewers and distillers provided grants to the Wye research centre after the UK government cancelled its grants. However, this does not compensate for the loss.

[6] For all, we mention "Subsidiarity and EU support for innovation" by Lejour, Koskelinska, Sluismans
http://www.proinno-europe.eu/admin/uploaded_documents/Mini-study_3-final.pdf

Findings for the evaluation question are:

- The EU is lagging behind in terms of yield per hectare. This holds true for both aroma and alpha varieties;
- The picture within the EU is rather mixed. Germany has yields which are comparable or even higher than the American standards. Other countries are seriously lagging behind;
- New varieties are still being developed in Europe, but the lack of public funding could become an issue. The German model of research funded jointly by the industry and by government seems to be the one that produced most results so far.

9.1.3 Judgment criterion 3: extent to which technological progress has been fostered

9.1.3.1 Perception of the interviewees on the improvement in agronomic practices

The introduction of **dwarf varieties** in the UK is a noteworthy technological advancement in the hop sector. Dwarf varieties were developed at Wye in the 1990s and released in the first years of the century. Their main characteristic is their height, limited to 3 metres and they are grown on 2.44 metres long wire-works. If introduced in the entire EU, these new varieties may potentially generate huge savings in terms of labour, as mechanical harvesting is easier on low wire-works. Furthermore, dwarf varieties are easier to be inspected by growers looking for diseases and pests and can be more easily treated with pesticides if necessary.

First Golding was bred in 1995 and this is nowadays the most common dwarf variety developed so far and it was grown on 173 ha in England in 2007. In a few years since its introduction, First Golding had therefore become the second most common aroma variety in England, mainly because of its high alpha acid content (8.1%) and its resistance to Verticillium Wilt.

Breeding of dwarf hops adapted to new trellis system is crucial, and efforts in breeding such kinds of varieties are ongoing in most of current breeding programs. As it takes several years to breed such varieties, their EU-wide commercial release is not expected shortly. Besides the introduction of dwarf varieties, no other technological breakthroughs were reported. Interviewees reported that significant efforts have to be made in order to deal with evolutions in pests and diseases. The ongoing climatic changes lead to the appearance of new plant pests (e.g. *Psylliodes attenuate*) which were previously not a significant problem in hop gardens. Interviewees expressed their concern that no financial aid exists to cope with such developments. Several other phytosanitary issues have been mentioned such as the resistance of aphids to Imidacloprid in the Czech Republic.

The renewal and acquisition of new harvesting and processing machines is a serious concern for small producers who have difficulties in obtaining the necessary loans from the banks. Banking conditions discourage the renewal of harvesting equipment and this sometimes condemns small producers to low productivity.

The solutions proposed by producers vary from loan guarantees given by the producer groups, to collective ownership of the means of production, to direct CAP investment support. Collective ownership is viable for processing machinery, less for harvesting and seasonal work tools because farmers need access to the machines at the same time.

Findings for the evaluation question are:

- There are models in the EU hop sector for technological innovation, but small farms are suffering from under-investment in harvesting and processing machinery;
- Dwarf varieties – more resistant to diseases and pests - may reduce the labour costs associated with hop growing in the near future, but their commercial release cannot be envisaged shortly because of the new investments that have to be made (e.g. new machines and change of infrastructures).

9.1.4 Conclusions for the evaluation question

The EU's dominant position in the hop sector is threatened by the United States where producers enjoy higher productivity and where the productive structure is more competitive. The CAP measures do not play a direct role in this. Decoupling and other CAP measures have not influenced the process of restructuring that is taking place in Europe[7]. This market-driven process has obliged a number of producers to abandon hops[8], and has resulted in an increase in the average size of hops farms. Nevertheless the cultivated surface is decreasing. The new entities that have emerged should be more efficient thanks to the economies of scale. European researchers managed to develop new varieties; growers have renewed hop gardens and have recovered much of the ground lost to the US in terms of productivity. This is the case for Germany, but not for other EU countries that are still lagging behind in terms of productivity. Germany has been successful because it managed to innovate and to quickly shift to high alpha varieties.

Technological development and the low degree of mechanization of most European farms seem to be a major obstacle. According to our analysis, income subsidies have not triggered the investments needed to overcome these challenges. Greater capital intensity in hop production would require more targeted investment incentives and loan guarantees.

Research and Development is a vital variable for maintaining the competitiveness of the European hop industry. The evidence gathered shows that when the public sector withdraws from R&D, the remaining funding is not sufficient to keep the research activity at full-speed.

In the evaluation period decoupling did not have a significant positive impact on the level of competitiveness and the degree of market orientation since the hop market was already competition-based and market-oriented before the reform. However, as decoupling facilitated farmers to switch to other crops or to sell their land to other hops farmers, these enhancing effects can be expected over time and therefore the new measures related to the hop sector have been coherent with the reform objective of increasing competitiveness and strengthening market orientation.

[7] In this chapter we only presented figures on yield, which show the higher productivity of the US. Concerning the production structure, more information can be found under Theme 2.

[8] Decoupling in principle allows farmer to get subsidies even if they do not produce anything. This may have a role in some cases in causing early retirement, but we assume it is minimal due to the small entities of the subsidy compared to hops' growing costs and revenues. See Theme 1 for more information on this.

9.2 Evaluation question 6.2.: To what extent have the CAP measures supporting hops affected the environment?

In order to answer this question we analyse the extent to which the new CAP measures had an impact on the environment. Our analysis will concern the aspects that may impact the environment and will be threefold:

- Analysis of the impact of production techniques of hops;
- Analysis of land abandonment trend;
- Analysis of the usage of fertilisers and pesticides in the hop sector.

At the end we will draw common conclusions for the overall impact of the CAP measures on the environment in the extent they are linked to the reform.

9.2.1 Judgment criterion 1: extent to which rural maintenance has been promoted

9.2.1.1 Effects from irrigation

No new techniques have emerged in recent years beyond the emergence of the dwarf varieties we have discussed in the previous section. Breeding new varieties is part of the usual R&D process and is not due to the new CAP measures. Likewise, new varieties (both dwarf and normal varieties) generally have a positive effect on the environment as they are resistant to a higher number of diseases and parasites, and thus reduce the need for pesticides.

The adoption of modern irrigation systems is not linked to the CAP measures, but has nevertheless had positive impacts on the environment as water consumption has been reduced. The application of progressive economical irrigation systems is recommended to produce an efficient irrigation system. Drip irrigation for hops can be placed on the ceiling of a wire-work (irrigation detail is placed above rows of hop plants) or underground (in which case irrigation detail is placed 60 cm under the ground level in the space between hops plants). Drippers can be used to provide a uniform rate of irrigated water (2 l/hour).

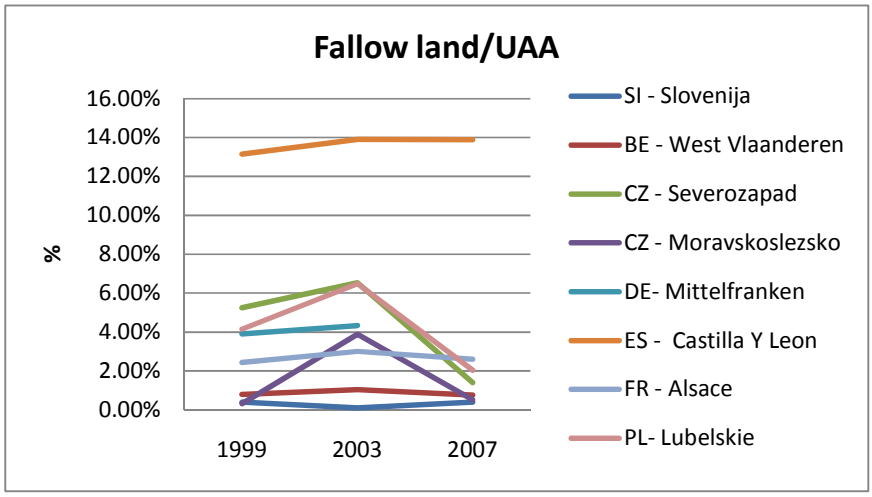
Irrigation is nevertheless a local problem as not all hop producing Member States require it. Farmers who decide to invest in better irrigation could have a positive effect on the environment, but on the other hand, farmers who start irrigating have a negative effect as they consume more water than before.

9.2.1.2 Trend of land abandonment before and after the reform (distinguishing from set-aside)

Land abandonment does not seem to be an issue according to the great majority of interviewees. Interviewees in the United Kingdom and Germany noted that land abandonment is not an issue in their respective Member States. The only producing region where some problems were reported was the León region in Spain. Indeed, hops are mostly grown in areas endowed with a diversified agricultural sector and buyers of land can easily switch to other crops. In the other countries, farmers who decide to stop growing hops usually sell their hop gardens to new owners, many of whom are already in the sector. Nevertheless, the total EU hop area is decreasing.

The Eurostat database does not contain regional data for land abandonment. It does so for fallow land, but no increase can be seen in the last years. The following figure shows the percentage of fallow land on the Utilised Agricultural Area (UAA).

Figure 6 – Percentage of fallow land on UAA



Source: Eurostat, adaptation Deloitte

Again, the percentage of fallow land in the hop producing regions is generally well below the European average of 6%. The only exception seems to be Castilla y Leon, thus confirming the reports of interviewees. We do not have data for the UK, but we are confident that land abandonment is not a problem here. However, it must be highlighted than the observation period is rather short and the effects of the reform may not yet be visible.

9.2.1.3 Usage of fertilisers (volumes) before and after the reform

Here we want to assess whether the CAP reform has provided an incentive in adopting less intensive production schemes.

Fertilising hops improves yield and quality by supplying the crop with ample nutrition in advance of demand. In highly intensive hop production systems, fertilisers are used in large quantities for optimising the yield. Since one-third to one-half of the nitrogen (N) in hops is found in cones, a higher yield requires more N than a lower yield. Fertiliser rates for the 3 main nutrients (Nitrogen, Phosphorus (P) and Potassium (K)) depend also on the availability of each nutrient in the soil and uptake capabilities which are based on climatic conditions.

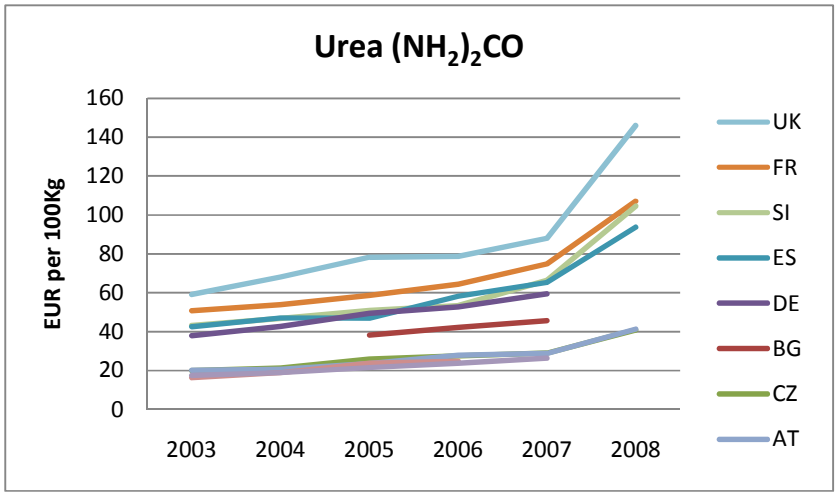
Hops require about 100-150 U/ha of N, 20-50 U/ha of P, and 80-150 U/ha of K depending on cultivar, age, and expected yield. In addition to commercial fertiliser, soil organic matter, manure, cover crops, and returned hops vines can supply substantial N for hops production. As such a large part of the yield depends on fertilisers; growers are very unlikely to reduce the amount of fertilisers consumed, irrespective of the cost.

The producers we met during fieldwork praised the effects that stringent CAP measures are having in terms of fostering a more responsible use of fertilisers. There is a widespread awareness of cross-

compliance and on the fact that farmers should comply with environmental protection requirements as a condition for benefiting from CAP payments. Concerning fertilizers we could not obtain any data on the reduction of fertilizers use per hectare. The interviewees reported that the absolute quantity of commercial fertilizers has decreased, but this could be linked to external factors, such as the reduction in area.

Hop producers also complained about the rising price of fertilizers: this is easily verifiable as Eurostat provides figures on the cost of the most common fertilizers used in hop growing and the price increase in the last few years has been dramatic. We present below a figure showing the cost trend of one of the most common fertilizers as an example[9].

Figure 7 – Cost of most common fertilizers for hops



The costs of fertilisers are rising in the EU[10]. This trend is particularly marked in the UK where fertilisers are especially expensive, particularly ternary fertilisers[11].

[9] For this graph it was not possible to build a EU-27 series

[10] Fertiliser price per Unit of nutrient is correlated to oil prices (especially Nitrogen) Therefore increases in price follow the oil price evolution. It is expected that prices will decrease slightly in 2009..

[11] Loosely defined specifications, or the use of unit values, may cause considerable "unit value bias", i.e. distortions due to the fact that for instance quality or variety changes are treated as price changes. For example of ternary fertilizers, is loosely defined (i.e. 1 -1-2) and an important quality characteristic such as the concentration of N-P-K is omitted from the definition, and the price observed is the average price (unit value) of the same product with different ratio of N-P-K, then this average price may increase simply for the reason that the concentration of N-P-K was increased between the two periods.
http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/apri_pi_sm1_an1.pdf

9.2.1.4 Usage of pesticides (volume, tox and eco-tox products profile) before and after the reform

The usage of pesticides has been at the centre of policy debate in the EU. This is the aspect of environmental protection to which hop producers have been the most exposed. The decrease in the number of pesticides available to protect hops is due to the reduction of active substances included in the Annex I of Commission Directive 91/414/ authorised within the EU[12][13], but not particularly to the CAP measures. Several studies have been carried out on the residuals from pesticides that remain in the processed hops. A German study[14] concluded as early as 1991 that "*pesticides are partially and differently removed from the hops, however, there is no total decontamination. Primarily, only few quantities of pesticides should be used, more resistant hops varieties should be bred. In view of the possible interactions with other substances, the estimation of the toxic potential of an active substance is nearly impossible*". More recently another study[15] examined seven agrochemicals used in hops (chlorfenapyr, quinoxyfen, tebuconazole, fenarimol, pyridaben, and E- and Z-dimethomorph) to conclude that no dangerous residues from these pesticides exceeded 0.0005 ppm (parts per million) in beer except for Z-dimethomorph. This is well below the accepted threshold.

There are also no data available on the current use of pesticides. Interviewees have mentioned a substantial decrease in the use of pesticides, partly resulting from the introduction of more resistant hop varieties. In particular they have pointed out a more responsible approach towards spraying near to water courses and inhabited areas. However, without specific data collected, this information cannot be verified. Moreover, the composition of pesticides has changed as the continuous review of the active substances to be included in Annex I of Commission Regulation No. 91/414 leads to the consequence that authorised active substance have a more positive toxicity and eco-toxicity profile today than 5 years ago. Therefore it can be concluded that pesticides in use today are more environmental friendly than in the past.

Another element to be considered when talking about fertilizers and pesticides is the correct usage of these agricultural inputs. Environmental effects can be evaluated by measuring volumes and composition of each individual input, but also by the way farmers apply them. In most agricultural crops, "good farming practices" have been developed to use these inputs efficiently, thus leading to volume reduction and, for example, less leaching of fertilizers.

The interviews have not permitted us to identify any activity leading to the development of good farming practices for the cropping of hops and that could have a positive effect on the environment by a reduction of volumes of these inputs.

Findings for the evaluation question are:

[12] The current list of pesticides allowed can be found in DG SANCO website: http://ec.europa.eu/sanco_pesticides/public/index.cfm?event=commodity.resultat

[13] Council Directive 91/414/EEC concerning the placing of plant protection products on the market

[14] Forster, A., Beck, B. Gehrig, M. Pesticides remaining in hops at the production of hops products (1991). http://www.barthhaasgroup.com/cmsdk/content/bhg/research/scientific1/38.html

[15] Method development and fate determination of pesticide-treated hops and their subsequent usage in the production of beer HENGEL Matt J.; SHIBAMOTO Takayuki, (2002)

- New dwarf varieties have been bred recently. Hop producers have tried to increase profitability by increasing irrigation and by adopting more modern irrigation systems that could have a positive influence on the environment where existing irrigation systems are more water consuming ;

- Land abandonment does not seem to be a major issue in most of the areas where hops are grown. Spain is a possible exception, but the data in our possession is not conclusive in this sense as the observation period is short;

- The use of pesticide and fertilisers has become much more expensive for hop growers, mainly due to the production cost increase due to oil price increase;

- Positive effects on the environment are also observed as volumes of consumption of fertilisers have decreased but, also, because authorised pesticides have a more positive environmental profile. Toxic and ecotoxic active substances are progressively banned in the EU under Commission Regulation No. 91/414;

- The reform of the CAP measures related to hops has had no particular influence on the environment.

9.2.2 Conclusions for the evaluation question

The impact of the change from coupled production aid to decoupled aid does not seem to affect the hop sector in respect of environmental protection. Overall, the available evidence points towards better environmental practices, thus confirming what has been reported by the interviewees. However, this is not due to the introduction of the new CAP measures related to hops. The introduction of new varieties is independent of the CAP measures in force and contributes to reduce the need for fertilizers and pesticides. In the case of irrigation, better environmental practices could coincide with cost reduction (less water consumed by more efficient systems). In the case of land abandonment the trend is decreasing except for Spain, but the observation period is too short to notice any change due to the new measures.

Fertilizer use has a significant impact on yield so it is unlikely than a price increase will cause a substantial decrease in consumption. Generally, producers may well choose to use less fertilizers and to reduce their yield (and absolute production), as subsidies are not linked to production anymore. However, since hop production is driven by market demand and price it is unlikely that producers will sacrifice yield.

The development of new hop varieties with greater resistance to pests and diseases is likely to decrease the consumption of pesticides.

The fact that the list of active substances of fertilizers and pesticides allowed by the EU is getting tighter at every review has certainly had a positive effect in terms of environmental impact. Moreover, good farming practices are more and more widespread in the EU, causing a more responsible use of fertilizers and pesticides.