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PELDEX

A global pellet price and storage volume index

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Abstract

PELDEX is a long term project with the goal to create an index on global scale for prices and storage volumes of pellets. Its aim is to increase the transparency in the bioenergy market. The aim of the current thesis was to evaluate different ways to collect price information from pellet producers. For that a database of global pellet producers was updated and used. Information was obtained by two methods: Sending online questionnaires and checking company websites. To evaluate and verify the obtained results and as an additional source of information, national indices and price series already available were collected and compiled.

As the response frequency of the price questionnaire was relatively low it was concluded that questionnaire design and timing of questionnaire submissions could be further developed as well as other ways to strengthen the links between the investigators and the respondents. By weighting the compiled pellet price statistics a global pellet price index was nevertheless constructed. The gathered statistics also indicated some other interesting results, e.g. that the price developments of the Swedish and North American markets differed from other markets, and the similarities of the central European price curves.

1 INTRODUCTION

1.1 Bioenergy

Bioenergy is energy extracted from biological or organic material which has not passed any geological process. That material is called biomass or biomass fuel when it is meant to energy extraction, and it is a renewable source of energy because it will never run out as long as it is replanted after being harvested. The biological materials which have passed a geological process are called fossil fuels and they are not considered renewable since that process takes millions of years in most of the cases. The annual consumption we make from them is higher than the amount produced every year by natural processes so eventually they will run out. Another important advantage of biomass fuels is that their combustion does not increase the CO2 levels in the atmosphere as long as they are managed in a sustainable way. The reason is that the same CO2 emitted, when burned, was firstly absorbed by the living being for its development and growth, therefore it is a closed circle that in the long run will not increase atmospheric climate gas levels.

The raw materials used for bioenergy production have mainly three different sources: Agriculture, forestry and urban waste.

In agriculture there are cases where the production is focused on biofuels, for example sugarcane plantations and other cases where only the by-products of other production are used, e.g. from food production. In forestry the situation is a bit more complex since one single forest could have many different uses depending on many different factors like the age of the trees or the market situation. In this industry by-products have also other uses, for example pulp or board production.

Biomass from urban waste can be used to produce biogas or to be burned directly. Finally it is important to mention sea or hydroponics as a source. They have a great potential since the raw material produced there (algae) has, under the right circumstances, a fast growth and also good properties for chemical processes that would make easier their use as a biofuel in liquid or gaseous state. However it is not a commercial option yet since that industry still has to be developed.

For instance, in South America part of the sugarcane plantations are destined to bioethanol production which is used as a fuel for cars. That has managed to make those countries more self-sufficient in vehicle fuels, especially Brazil, where a high percentage of the cars run on this fuel. Cereals could also be used as raw materials for biofuels in other countries and regions.

In Europe, however, the most consumed biomass fuel is wood, and that is an important fact because forestry has advantages compared to agriculture when providing raw materials for energy. First of all agricultural products compete mainly in the food market so a growing demand of them due to their new use as biofuel could make prices of food go up. But also it can cause that lands in undeveloped countries previously used for food production, become energy producing ones for the developed countries. That could make harder the subsistence of some populations in the third world. On the other hand forest products, though they also have

the problem of change in the use of land, generally do not compete in the food market so they would not affect significantly its price. In addition sustainable forestry has several environmental advantages that agriculture does not have: Protection against soil erosion and desertification, regulation of the climate and the hydrologic cycle and favouring biodiversity since many species requires forests for their subsistence.

1.2 Wood fuels

There is a variety of fuels that could be produced from forestry. Forest fuels e.g. firewood or industrial by-products, such us sawdust, dry chips, bark… Those products are sometimes used as biomass fuels but they have a main disadvantage compared to fossil fuels and that is their comparatively low energy density, because of a high moisture content, which makes the transport more expensive in relative terms (money/energy) since a smaller amount of energy can be transported in the same volume. For that reasons, upgraded woody biomass fuels like pellets and briquettes are produced. These are densified packs made out of dried and comminuted biomass raw materials of any kind or origin, but most commonly sawdust, planer shavings, dry chips or even round wood.

One important feature of upgraded biomass fuels is that they are easier to standardize compared to unrefined fuels. As an example, briquettes do not have a specific shape but the length must be less than five times the diameter according to Swedish standards (SS 18 71 23). The maximum diameter for pellets is 25 mm (SS 18 71 20), that figure could change depending on other standards though. Nevertheless, their shape is most often cylindrical and the moisture content use to be 5-15% (Porsö C. , 2010). There are different standards in different geographical regions. Their aim is to control all the different features facilitating both design of combustion equipment and fuel trade. Fuel parameters which are commonly used in standards are size, bulk density, fines share, moisture content, ash content, calorific value, ash melting point, additives, sulphur, nitrogen, chlorine and other chemicals. In Europe the most common ones are: Austrian (ÖNORM M7135); Swedish (SS 18 71 20); German (DIN 51731 / DIN plus); CEN (CEN/TS 14961:2005 Annex A) which is a suggestion for European Classification. But there are others such as the North American one Pellet Fuels Institute. (European Pellet Center, 2013)

1.3 Wood pellets

Consumption of wood pellets can be divided in three different market segments, small scales (e.g. private homes), medium scale (school, hospitals etc…) and large scale (district heating plants, combined heating and power plants (CHP) or industry). At homes they are burned in individual stoves or boilers which provide heat and warm water to the house. Medium size buildings, such as schools, sport centres etc… have bigger individual boilers. In the industry they are burned in large scale boilers with different uses. The largest ones are often supplying district heating systems or combined heating and electricity production. For that different pellet fuel qualities use to be produced: residential and industrial, each one with special characteristics. In some cases a medium quality is produced as well, for example in Sweden

where there is a separate class in the standard class for it. The way of packing can change between small bags (15 or 16 kg are common), big bags (many different options) or just bulk.

1.3.1 Overview of the global market situation

The biggest pellet market in the world is Europe. This is where the main consumption is found and where most of the production was done, at least until some years ago. But in the last few years, due to fast growth of consumption, other parts of the world have started to produce pellets with the aim of exporting it to Europe. This is the case of North America (Canada and USA) or Russia that, for example, exported more than 2 million tonnes together in 2010. (Bioenergy Trade, n.d.)

Biggest importers are: UK, Netherlands, Italy and Sweden, Belgium and Denmark. (Wood Pellet Services, n.d.)

1.4 Wood bioenergy policy background

On March 3rd 2010 the "Europe 2020" strategy was proposed by the European Commission aiming at a more sustainable growth and development, following the Kyoto Protocol and the Lisbon Strategy and fixing clear goals for the year 2020. After some months all the objectives were already fixed for each country including the well-known "20-20-20". This is one of the most important goals concerning to energy policies where it is stated that for the year 2020: Greenhouse gas emissions must be 20% lower compared to 1990; the share of renewable energy at least 20%; and primary energy use must be reduced by 20% compared with projected levels, by means of improving efficiency.

Tools to achieve those goals are active policies of legislation including subsidizing or taxing strategic sectors but also market-based tools. Under this context the renewable sector is expected to grow fast, changing the energy market and contributing to development towards a more sustainable society.

In the reality of 2013, due crisis, not all the original policies have been kept, such as supports to renewable electricity production in some countries. However the pellet sector has increased steadily in Europe and the global pellet market has expanded as well. Global production, consumption and production capacity have all developed since 2000 (figure 1). The reasons of this fast growth were the high end user prices of oil in Europe, the policies for CO2 reduction that some countries in EU already started several years before "Europe 2020" was signed. Those policies consisted mostly on special taxations for fossil fuels.

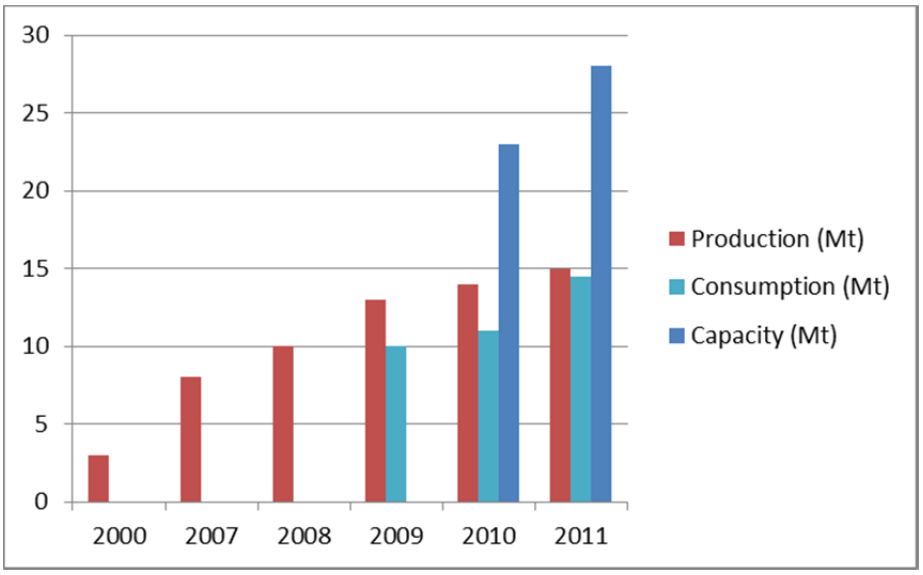

Figure 1. Global pellet market evolution (Quebec Wood Export, n.d.) (Pirraglia et al, 2010) (Pellets Wood) (Biomass Magazine) (Bioenergy Trade)

However taxes and policies in general depend on political decisions and those could change depending on circumstances such as governments, market situation or the general conjuncture. Therefore as long as the sector is not competitive without those supports its situation could become more unstable in a certain moment. Some solutions have to be found hence to improve the competitiveness of the pellet sector.

1.5 Reaching competitiveness

For achieving more competitiveness it is necessary that pellets prices decrease, that fossil fuels prices increase, or both.

1.5.1 Fossil fuel prices

As has already been mentioned these fossil fuel prices have been high in the European Union in the last years which is an important explaining factor why the pellet market has been growing. If the reasons of those high prices are analyzed we could conclude that: most of the EU member countries do not have many natural reserves so these resources have to be imported from other regions of the world. In some cases those regions often are unstable and conflictive areas, for example the Middle East which currently has frequent wars, revolutions etc…making future oil supply insecure. In other cases though some countries are more stable, they are not very compatible with the market economy we have in Europe since they apply policies of nationalization. This is e.g. the case of some countries in South America. However a few exporting countries are stable and follow the same economic "rules", the clearest cases could be USA or Norway. But, in spite of those cases, prices have increased without any sign of opposite trend in the last years.

In fact it is quite accepted that prices of oil will not decrease and probably neither prices for the other fossil fuels. That is due to the reaching of "the peak of oil", a point in time when reserves of oil start to be less profitable to be exploited so the extraction decreases and the

prices therefore only go up. According to different surveys that moment could have already passed or it is going to be soon. The International Energy Agency, for example, dated that moment in 2006 (International Energy Agency, 2013). This theory can be applied to every kind of fossil fuel but the moment in time of that pike would be different depending mostly on the available reserves.

The improvement of the technology could delay the peak, in the case that the expensive reserves become cheaper thanks to a new system or new machinery but sooner or later the peak will be reached and a substitute material will have to be found eventually. Anyway, that possible new technology would not solve the environmental problem of CO2 high levels and other substances in the atmosphere. Whether the peak of oil theory is true or not, the reality is that the trend of oil price is always increasing more and more (Figure 2), therefore competitiveness could be achieved for pellet market. However in the market economy every price is connected so maybe pellet price could increase as a reaction and no competiveness will be achieved.

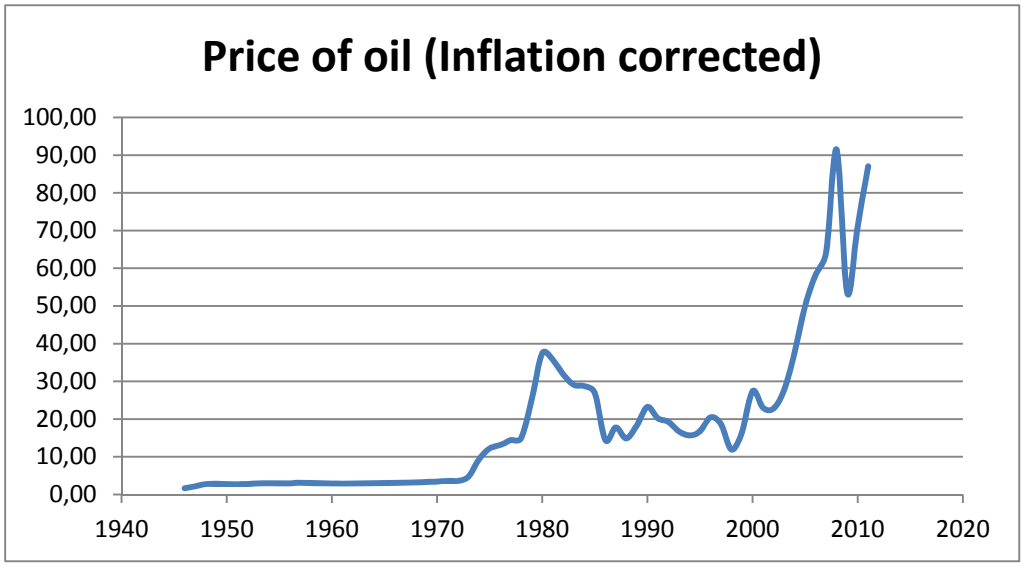

Figure 2 Average oil price evolution in $/bbl (Inflation Data, 2012)

1.5.2 Pellet prices

According to (Govan, 2013) survey, important factors affecting price are: seasonality; cost of raw materials; freight; exchange rates; emergence of new supply and plants; subsidies and legislation; outages and plant maintenance; correlation power-coal-gas-emissions. However "Subsidies and legislations" is excluded in the following explanation since the aim is to analyze competitiveness under the hypothesis of a lack of them. Only two factors are going to be analyzed: Production cost and transport cost. The reason is to exclude factors affecting only punctual moments in time and to focus rather in the long term important ones, which has to do more with competiveness.

Therefore to make prices lower in the long term only two options are possible: cheaper industrial process and transport cost (directly related with oil) or cheaper raw materials (also related with other industries) which mean about 52% of the pellet price (Olsson & Vinterback,

2010). Industrial cost and raw material cost can be joined into production cost. Both industrial cost and raw materials cost are influenced by oil prices since it is used in different parts of the process, for electricity production, for running machinery etc. But raw material price is also influenced by its availability in the market, the more available the lower the prices are. Transport cost is also clearly related to oil. But, how much related to oil they are? What are the possibilities for better availability of raw materials?

Production and transport costs: After studying some surveys about it (Olsson, 2009) (Olsson & Vinterbäck 2010) some conclusions were drawn on how oil prices affect pellets prices:

The price of oil or other fossil fuels does not affect to pellets price very much in the short term. In the production process, oil is needed but this cost is generally relatively small so it does not make important impacts on it. The transport cost is usually also relatively small but this depends on the distance (and indirectly the oil price). In the case of far distant international trading this cost component could rather increase.

However we must not forget the relation of substitutability between oil and biomass. Within a market economy that means that both prices affect each other, at least in the long term. (Olsson & Vinterbäck 2010)

After these conclusions, if we accept that oil price will continue to increase, it is hard to say that pellet production cost will decrease. Nevertheless, some options could be the development of a higher degree of mechanization, but wood and pellet industry is already quite mechanized, so no big changes are expected here at all. Another option is increasing the size of production units and thereby reaching scale advantages.

Raw materials influence (wood): As it was mentioned the more available materials are the lower the prices will be. For that reason some surveys have been done about new raw materials.

In Sweden, a country with a well developed forest industry, there are still surplus or residue materials that could be used for pellet production but they are not yet: From the forest still only by-products are used but not energy wood (pulp) or wet sawmill chips (Porsö, 2010). After a strict survey about production costs Porsö concludes:

“Both energy wood and wet sawmill chips could hence decrease the production costs and thereby the price for pellets. Even though there is a much greater maximum potential for wet sawmill chips than for sawdust. The available raw materials will depend on the development in the pulp industry” (Porsö, 2010) The pulp industry is thus a strong competitor for new and suitable raw material assortments.

The adjustments in the pellet factories for using raw materials such as energy wood are expensive so it takes a while for them to do it. But some big producers have already started making them and probably some smaller ones will soon start doing it as well.

After all, we could say that wood biofuels have further possibilities for the future and competiveness can in many cases be achieved. But the pellet market is still a young one and

with relatively little transparency. Not many general statistics are regularly published about it and compiled price information or availability information are almost impossible to find. That situation makes it more difficult for new investors since the risk is high. Transparency, besides decreasing the risk, also avoids unfair deals and abusive situations. This is an issue that this project to some extent tries to find a remedy for.

1.6 Other price statistics

Despite a lack of transparency in wood pellet markets, some limited (geographically or other) price statistics is already available. Most of them are made by national institutes or pellet producer associations on a country level, but also some private companies provide statistics in different scales. Some of these statistics is publicly available for free, but for some others a fee is required.

The countries where some kind of official or business statistics is available are: Austria[1], Belgium, Denmark, Finland, Germany[2], Latvia, Lithuania, Norway, Sweden[3], UK, USA[4], Switzerland[5], Estonia and France. (Porsö & Vinterbäck, 2011).

Pellets@las[6] was a project supported by the EU that collected prices and other information from European countries and made them available online for market actors. (PELLETS@LAS) (Porsö & Vinterbäck, 2011).

EUBIONET III[7]: Was a European project supported by the European Commission where universities and other institutions in the EU participated. Their aim was to facilitate the use of bioenergy by overcoming market barriers. They have made several market surveys with different approaches. Price statistics in a European scale has already been published in their website during some years. (EUBIONET3, 2021) (Porsö & Vinterbäck, 2011).

1.6.1 Commercial wood fuel price statistics:

Argus Media Ltd[8]: company based in London. It provides information on energy market, especially gas and oil but also works on coal, electricity and emission rights. They have 500 staff working in 19 offices all over the world. In 2009 they started including wood pellets market. For this fuel they publish comments on the development of the fuel market, an index

[1] Statistics in Austria: http://www.propellets.at

[2] Statistics in Germany: www.devp.de; https://www.destatis.de; http://www.pelletshome.com

[3] Statistics in Sweden: http://www.pelletsforbundet.se

[4] Statistics in USA: http://pelletheat.org/

[5] Statistics in Switzerland: http://www.pelletshome.com; http://www.pelletpreis.ch

[6] Pellets@las: http://www.pelletsatlas.info

[7] EUBIONET3: http://www.eubionet.org/

[8] Argus: http://www.argusmedia.com

weekly updated and information about actual trades during the week. The information is collected from market actors which provide current price levels and traded volumes. (Argus Media, n.d.:) (Porsö & Vinterbäck, 2011).

Endex[9]: based in the Netherlands. This company provided price information about the Netherlands, United Kingdom and Belgium in different fields of the energy market since 2002. In 2008, as the demand grew, they also started providing weekly price information for industrial pellets quality. An index is published each week based on market actors' information. (APX ENDEX, n.d.:) (Porsö & Vinterbäck, 2011)

FOEX[10]. Finnish company which basically provides indices for the pulp and paper industry. From 2009 they started providing a price index for industrial pellet in the Nordic market. In December 2011 they started up a new index for Continental pellet prices, made with information from Austrian and German medium scale consumers. In March 2012 a new index came up with forest residues and sawmill products for Finland. The information is based on sellers and buyers. The index can be found in the company website. Their plan is to publish indices for new markets in the future like Sweden and Baltic Countries but also for different biofuels (e.g. woodchips) and qualities.

(FOEX, n.d.:) (Porsö & Vinterbäck, 2011).

1.7 PELDEX

The aim of the PELDEX project is to increase transparency in the market situation to decrease the risk of investments and to avoid abusive situations.

The goal of the PELDEX project is to create global price and storage volume indices published monthly which would work as a tool for e.g. the pellet producing companies to do business. This way they will be able to fix the price in a relevant way instead of using other and not very accurate tools**.** However this information is not only useful for pellet producing companies. Every market must be known and monitored in order to make forecasts, to control or to intervene it if it is necessary. If sufficient information is collected, also continental or national scales could be regarded.

For that, three different sources of information are used:

- Online pellet producer questionnaires.
- Prices published on company websites.
- National price series and indices already available.

For the moment it is not decided how these sources will be combined to create the final index because the project is still in an early phase. When more information is gathered for more

[9] Endex: http://www.apxendex.com

[10] FOEX: http://www.foex.fi

months that decision could be done. Anyway the most important part probably will be the "Questionnaires" since they have been sent to quite a representative number and it is information nowhere else available. Those data can also be combined with "Prices online" if it is necessary and even with "Other indices", but only the ones concerning to prices since no storage information expected to be found there.

The importance of collecting storage volumes is to study how they possibly affect the price as well as the relationship with the supply/demand balance.

1.7.1 Why an index and not real prices?

Indexing is a method to show relative fluctuations of a magnitude over time, weighted price fluctuations, in this case. Different kinds exist but for this project probably the best one is "price weighted index" so this is the one we work with in the thesis.

Monthly weighted averages of the prices are done weighting against the share in the market of each component (production or capacity), then a reference in time is decided and its figure becomes equivalent to 100, the "index number". After that, relative changes are showed as a percentage. (Ex: January 100; February 105; March 101; April 98...). In this way, currencies and other unit changes does not have to be regarded by the users of the information, which in some cases is a great advantage. Those unit changes sometimes are confusing but also because the currencies change along the time (more information is explained about the influence of the currency (section 4.1)). In this case the currency conversions are done in the internal system, PELDEX makes them.

Another advantage, perhaps more subjective, is that most of the people are used to think of the relative variations as percentages, on 100 base, which means that it is easier to realize the proportion of a change when you read +30% rather than Δ (350 – 455).

More discussion about this can be found in section 4.2 (About the "price details").

2 MATERIALS AND METHODS

Different sources of information were used to make the index and to get some other statistic results. In this section they are stated as well as the way the information was treated and why.

2.1 Producer database

For getting prices and storage information and to begin developing the project it was necessary to establish a database with pellet manufacturers, as complete as possible. Names of companies needed to be known as well as their email addresses and some other producer specific technic information. For that, and for some other projects, a database of pellet producers was created before the PELDEX project started.

Using the information published every year by "The Bioenergy International" magazine (n.d.) which in turn was developed based on a list produced within the EU INDEBIF[11] project managed by SLU, a list of companies sorted by countries was already created by the Energy and Technology department of SLU. Other information about those companies was also included in the list, in different proportions depending on each variable:

Production capacity in 2009 and 2010; production in 2009; website address; email addresses; phone and fax numbers. The writer of this thesis completed that list with more information: More companies for 2008 and 2011 with their website and email addresses; capacities in 2008 and 2011 and actual production in 2008.

Addresses, phone and fax numbers were searched on the internet using search engines and other open sources.

2.2 Questionnaires

There are different methods to get the information directly from companies, like phone calling, personal interviews or sending questionnaires by traditional mail. Those ways are tools used traditionally to make market surveys or other statistics, however, nowadays there are simpler and more efficient methods, accessible for everyone thanks to the internet. Therefore the tool used was Netigate, a service provided to SLU by same name company which allows creating online questionnaires in a very easy way. With such an online tool it is possible to send links to those questionnaires to hundreds of email addresses at the same time and also to gather all the information replied automatically to a database. However, every questionnaire takes some time for the replier to complete, this is time they could use to work or to enjoy their free time in. For that, psychological tips should be used to make the replying easier and faster.

Anyway information about companies is not always easy to get. They do not use to like others to have full access to it, for example data concerning actual production or price. For that reason a good way to get that information could be offering something in exchange that they can take advantage of. A natural exchange that could be offered is fist hand access to

[11] EU ALTERNER Contract 4.1030/Z/99-520

PELDEX, delaying open publication of the index a certain time period so meanwhile the responding companies will have free access to it on the Internet by means of a log-in system. After that period monthly information will be open to the public.

One risk in this specific kind of questionnaire is that the respondents can drop off much easier than other methods such as a personal interview where an interviewer tries the questionnaire to be completed. The most important thing that must be avoided is frustration while the respondent is filling. The main criterion was making it as short as possible and trying to ask only for the information that is really necessary. Some other tips were used too, such as giving very accurate instructions, making different pages avoiding scrolling down, or including a progress indicator. (Brace, 2008). Asking for the name of the person who replies and his position in the company could make him take it more seriously and also allow the investigators to know how reliable the information is and who to contact for possible clarifications.

Criteria: The price and storage information asked was the one concerning to the 15th of each month. Both common qualities, residential and industrial, were asked for though for the moment only one index is going to be created. The price for residential quality was asked for an amount of 3 tonnes and open option for package. The price for industrial quality is asked for a minimum amount of 15 tonnes in bulk. Transport information was collected too.

Other information was also necessary to be asked for: Production capacity, produced amount and quality ratio of production (residential/industrial). The data was gathered in an Excel file where prices were weighted against the actual production in the preceding year. Weighting against current production of each month could be more accurate but the variation of the results would not be too relevant and moreover the chosen system is much simpler and more comfortable for the respondents. Transport, package, currency and country are also asked for.

The questionnaire was sent monthly and the results will after an initial period of waiting time be published with the same frequency.

For better understanding of the mathematic process the used formulas were the following showed:

The given prices were converted to Euros and taxes were removed to calculate “Price i”

$$Monthly\ Weighted\ Price_{Current\ month} = \frac{\sum(Price_i \times Production_i)}{\sum Production_i}$$

Formula 1. Monthly Weighted Price (Quest)

$$Monthly\ Index\ Figure = \frac{Monthly\ Weighted\ Price_{Current\ month}}{Monthly\ Weighted\ Price_{Base\ month}}$$

Formula 2. Monthly Index Figure

$$i = replying\ company$$

$$Base\ month = January\ 2013$$

The mathematical/statistical system for presentation of storage volumes is not finally decided yet.

2.3 Prices online

To complete and verify the price information collected in the producer "questionnaire" an alternative method for collecting price information was done: Gathering prices from website pages.

Most of the companies choose not to publish their prices online. However some of them do publish them, mostly in European countries. The criteria used for collected prices are the same as in the previous section.

In this case no storage volume or actual production in 2012 were collected since they were never published. If no storage volumes are collected then it is not possible to calculate storage volume index. Therefore this is something we had to give up in this survey. If no actual production in 2012 is collected then prices cannot be weighted with the same mathematic method as in "the producer questionnaires" survey so other method must be developed.

Two options raised here: Either weighting against 2012 capacities or against estimated production. Finally the second option was chosen since the relation between capacity and production could be very variable. The database information in capacities was considered less reliable.

For estimating the production in 2012, the best information available was production for 2008 and 2009 for a good number of companies but not all:

- In cases of companies with enough information a "production rate" was calculated for each and then it was applied to capacity 2012.

$$Estimated\ Production_{2012} = Production\ rate \times Capacity_{2012}$$

Formula 3. Estimated production 2012 opt.1

$$Production\ rate = \frac{\frac{Production\ 2008}{Capacity\ 2008} + \frac{Production\ 2009}{Capacity\ 2009}}{2}$$

Formula 4. Production rate

-In cases without information three options were raised:

1. Applying a country coefficient, average of known production rates (2008 and 2009) of other companies in the same country.

$$Estimated\ Production_{2012} = Country\ coefficient \times Capacity_{2012}$$

Formula 5.Estimated production 2012 opt.2

$$Country\ coefficient = \frac{\sum Production\ rate_c}{C}$$

Formula 6 Country coefficient

$C = Number\ of\ companies\ with\ information\ in\ each\ country$

2. Applying a global coefficient, average of known production rates (2008 and 2009) of all the companies with information.

$$Estimated\ Production_{2012} = Global\ coefficient \times Capacity_{2012}$$

Formula 7.Estimated production 2012 opt.3

$$Global\ coefficient = \frac{\sum Production\ rate_g}{G}$$

Formula 8. Global coefficient

$G = Number\ of\ companies\ with\ information\ in\ the\ world$

3. Creating an equation: *"company coefficient = f(company capacity)"* if some relation was found among the known production rates.

In the results (section 3.3) it is explained which one of the last three options was the best and why. The average price is:

$$Monthly\ Weighted\ Price_{Current\ month} = \frac{\sum(Price_i \times * Production_i)}{\sum * Production}$$

Formula 9. Monthly Weighted Price (Pr-On)

$$* Production = \begin{cases} Available\ information\ (08-09) \\ Not\ available\ and\ estimated\ in\ other\ way. \end{cases}$$

Monthly index figure was calculated in the same way as in last section, see section 2.2.

2.4 Other indices and price series

For contrasting more the information and to have some auxiliary sources, it was decided to collect indices and tables of prices published on the internet. There are some associations and companies previously mentioned which sell statistics but only free information is included here.

2.4.1 Non commercial indices

The tables of prices were transformed to indices and the available indices were re- referenced to the new base month. For both the base month was January 2012, the same as in the last two sections. The final index was made weighting each national one against estimated country productions, the same way as in "option 1" (section 2.3).

Months without information were extrapolated.

The following countries included in this section are stated here with the corresponding source and the details of the information:

Austria: (ProPellets Austria[12])) Two price series were collected for this country:
Bulk: Index by order of 6 tonnes.
Small bags: Prices in € for each 15 kg bag by order of one pallet.

Since no information about volume relation between bulk and bags was available both series were weighted by 50% each.

Germany: (DEPV[13]) Average price for different amounts in €/tonne

Italy: (Pellets Home[14]) Prices for unknown amount in €/tonne

Sweden: (PelletsForbundet[15]) Three series were collected for this country:
Bulk: Index for residential pellets by order of 3 tonnes. Free delivery within 100 km.
Bulk: Index for industrial pellets by order of 15 tonnes. Free delivery within 100 km.
Bags: Index for residential pellets by order of 4 pallets. 16 kg bags. Free delivery within 100 km.

The final index was made weighting 50% for residential and industrial. The residential one was made weighting 50% each for bags and bulk.

Switzerland: (PelletPreis[16])Average price for different amounts in CHF/tonne.

USA: (Pellet Fuels Institute[17]) Four tables were collected, each one concerning to one region of the country: Northeast, Midwest, Southwest, Northwest & Mountains. Each one was weighted against its capacity. (In the USA the production is sometimes similar to the capacity). Prices were published quarterly.

Average price for different amounts in $/tonne.

2.4.2 Commercial indices:

FOEX: Nordic Market. Industrial quality. No minimum amount stated.

[12] www.propellets.at

[13] www.devp.de

[14] www.pelletshome.com

[15] www.pelletsforbundet.se

[16] www.pelletpreis.ch

[17] Pelletheat.org

3 RESULTS

3.1 Producer database

Not all the information is available for every company in the sources as already mentioned and the proportion for each variable is different. Therefore some of the results calculated in this thesis are more accurate than others. For every calculated figure the formulas have been showed so it is possible to know what variables were used and how accurate they are. See table 1.

Year	2011	2010	2009	2008
Capacity	79.77	76.52	72.76	44.23
Production			39.43	24.12
Production rate			39.04	21.40

Notes:

Companies: 771
Email address: 52.85%
Prices online: 3.11%

Table 1. Producer capacity, actual production and production rate (%)

Some of the data required for the "Prices online" survey were processed here and that information is also interesting in itself therefore it is included here separately. That is the case of the "production rates". The ones calculated for each company with available information are not showed here due to anonymity reasons. But the "country production rates" for options number 1 (see section 2.3) are published. (see Appendix 1). Also the "global production rate" is included there, for the second option.

The third option (see section 2.3) was to relate production and production rates not with the countries but with the production capacity of each company. For that some graphs were made with the aim of creating an equation *"Production Rate = f (capacity)"* (Figures 3 and 4)

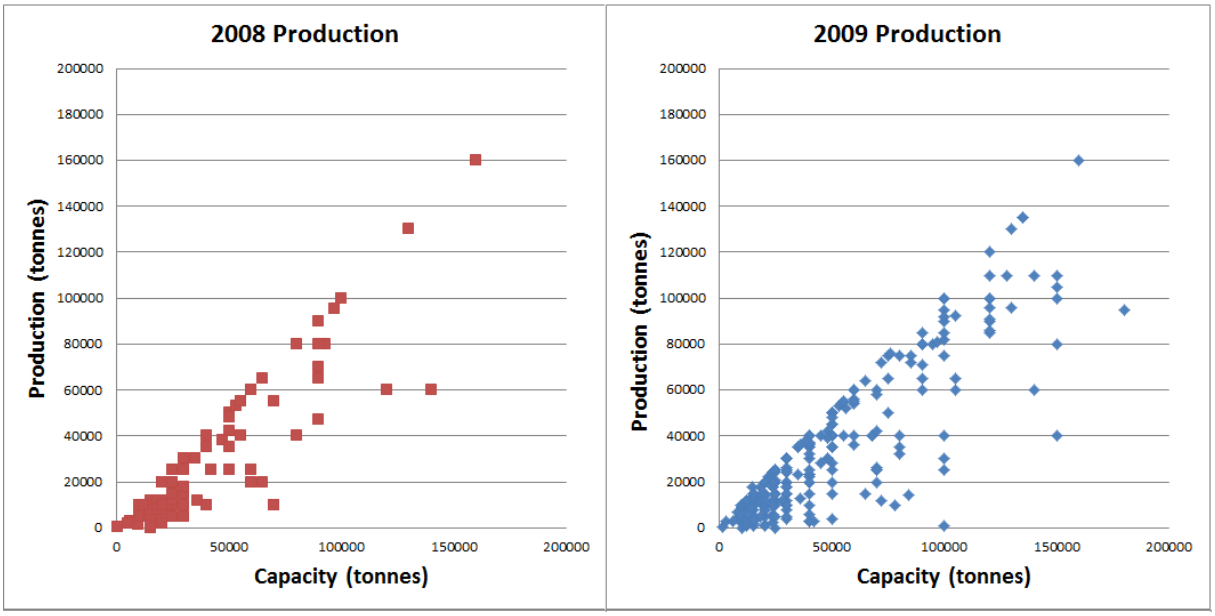

Figure 3 Production – Capacity (Own database)

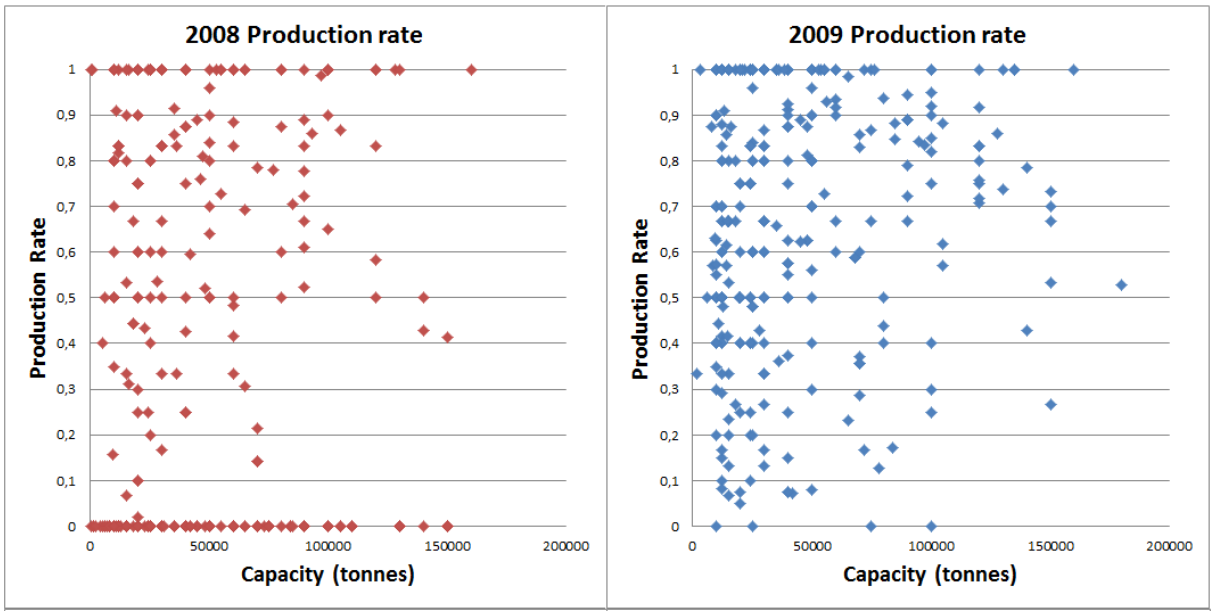

Figure 4 Production Rate - Capacity (Own database)

After making the corresponding graphs it was concluded that there is no clear correlation between company capacity and company actual production. In the production-capacity graph, where the bisector represents the complete use of the capacity, the possibility of a linear regression under the line seems to be possible, however when the "production rate-capacity" graph is analyzed an horizontal line equivalent to the last one should be intuited and that does not happen. Hence, with the tools used, we cannot affirm the existence of a direct relation between. *(Anyway this information could be processed with statistics programs for calculation of regressions and so a definitive conclusion could be done).*

Finally option 2 (see section 2.3) was chosen due to the high dispersion of the other ones.

Global Production Rate 2008: 0.66
Global Production Rate 2009: 0.71
Average: 0,68

3.2 Questionnaires

Before sending the definitive questionnaire two test phases were done. In the first one the questionnaire was sent to people in the SLU, Energy and technology department with experience in similar surveys. In the second one it was sent to some companies that could be interested in participate due to their big production or their participation in previous similar projects.

The first questionnaire was sent out on 30-03-2013 with a reminder one week after and a deadline of 10 days. The number of receivers was: 407. Number of answers: 14. Response frequency: 3,44%

January: Average price 126.93€/tonne

3.3 Prices online

After checking all the websites of the companies in the pellet producer database price information in the following countries was found in February 2013: Belgium (2 producers); Chile (1); Czech Republic (1); France (1), Germany (1); Italy (1); Latvia (1); Norway (1); Romania (1); Slovakia (1); Sweden (8) ; Switzerland (2); UK (2) ; Uruguay (1); USA (1).
Success: 3.11%

In March 2013 it was not possible to find information about 2 of them.
Dates: 27-02-2013; 27-03-2013.
Not in every case it was possible to use the criteria mentioned in section 2.2. The currency exchange values used were the ones for the 1st day of each month.

February = Average price 220.69 €/tonne;
March = Average price 220.83 €/tonne

(This small change could be due to the few small samples but also to the fact that many companies in Europe keep the same price for the whole winter. From April on new prices will probably affect this survey. Since all the currencies were changed to Euros this index is bound to that currency trend and so those fluctuations are included in the results.)

3.4 Other indices and price series

Indices for Austria, Germany, Switzerland, Sweden, Italy and USA (divided into four regions) already calculated with base month January 2012 are shown in Figures (5-8).

EUROPE

Austria		
	2012	2013
Jan	100.00	107.31
Feb	100.05	
Mar	99.76	
Apr	98.00	
May	96.33	
Jun	96.49	
Jul	96.56	
Aug	97.22	
Sep	98.85	
Oct	100.48	
Nov	102.74	
Dec	104.38	
Cap2012	1221000	tonnes
PR	0.76	%
*Prod2012	926188.4	tonnes

Germany		
	2012	2013
Jan	100.00	112.42
Feb	101.85	115.59
Mar	102.78	116.78
Apr	98.91	
May	97.06	
Jun	96.40	
Jul	96.40	
Aug	98.06	
Sep	99.95	
Oct	103.63	
Nov	106.30	
Dec	110.01	
Cap2012	4126400	tonnes
PR	0.82	%
*Prod2012	3364273	tonnes

Figure 5 and 6 Indices (Austria, Germany)

Switzerland		
	2012	2013
Jan	100.00	101.26
Feb	99.68	102.17
Mar	100.20	103.79
Apr	98.22	
May	95.24	
Jun	95.02	
Jul	94.61	
Aug	95.09	
Sep	95.38	
Oct	96.86	
Nov	97.72	
Dec	99.95	
Cap2012	242000	tonnes
PR	0.60	%
*Prod2012	145200	tonnes

Sweden		
	2012	2013
Jan	100.00	96.92
Feb	98.61	
Mar	99.36	
Apr	99.48	
May	99.89	
Jun	99.62	
Jul	97.74	
Aug	98.86	
Sep	93.65	
Oct	94.74	
Nov	94.92	
Dec	95.14	
Cap2012	2909000	tonnes
PR	0.76	%
*Prod2012	2225063	tonnes

Figure 7 and 8 Indices (Switzerland and Sweden)

Italy		
	2012	2013
Jan	100.00	
Feb	100.00	
Mar	100.00	
Apr	100.00	
May	100.00	
Jun	106.25	
Jul	106.25	
Aug	106.25	
Sep	106.25	
Oct	106.25	
Nov	100.45	
Dec	100.45	
Cap2012	630000	tonnes
PR	0.73	%
*Prod2012	459375	tonnes

Figure 9 Index (Italy)

USA

Northeast		
	2012	2013
Jan	100.00	
Feb	100.00	
Mar	100.00	
Apr	96.06	
May	96.06	
Jun	96.06	
Jul	96.34	
Aug	96.34	
Sep	96.34	
Oct	91.83	
Nov	91.83	
Dec	91.83	
Cap2012	887000	tonnes
PR	0.81	%
*Prod2012	714515.7	tonnes

Midwest		
	2012	2013
Jan	100.00	
Feb	100.00	
Mar	100.00	
Apr	93.55	
May	93.55	
Jun	93.55	
Jul	103.23	
Aug	103.23	
Sep	103.23	
Oct	93.55	
Nov	93.87	
Dec	93.87	
Cap2012	625000	tonnes
PR	0.59	%
*Prod2012	367647.1	tonnes

Figure 10 and 11 Indices (USA: Northeast and Midwest)

Southeast		
	2012	2013
Jan	100.00	
Feb	100.00	
Mar	100.00	
Apr	81.54	
May	81.54	
Jun	81.54	
Jul	90.77	
Aug	90.77	
Sep	90.77	
Oct	98.15	
Nov	98.15	
Dec	98.15	
Cap2012	2378000	tonnes
PR	0.82	%
*Prod2012	1949960	tonnes

Northwest&Mount.		
	2012	2013
Jan	100.00	
Feb	100.00	
Mar	100.00	
Apr	105.80	
May	105.80	
Jun	105.80	
Jul	112.76	
Aug	112.76	
Sep	112.76	
Oct	108.87	
Nov	108.87	
Dec	108.87	
Cap2012	906000	tonnes
PR	0.79	%
*Prod2012	717417.8	tonnes

Figures 12 and 13 Indices (USA: Southeast and Northwest&Mountains)

Base month in this country statistics is January 2012. Prices for 2013 are not collected yet for some months in some countries due to the delay of statistics. To calculate the final index each national index was weighted against estimated country productions. Those are showed below each figure.

In this first European graph (Figure 9) it is possible to realize how Austria, Germany and Switzerland have a similar trend along the year and however Swedish trend is different. (*The reason could be the integration of the markets in central Europe but not with Sweden. An other reason could be that there is a much higher rate of large scale customers in Sweden. These tend to have long term contracts which might level out the statistics over time.)* Italy is not included in the graph because most of the months were extrapoled.

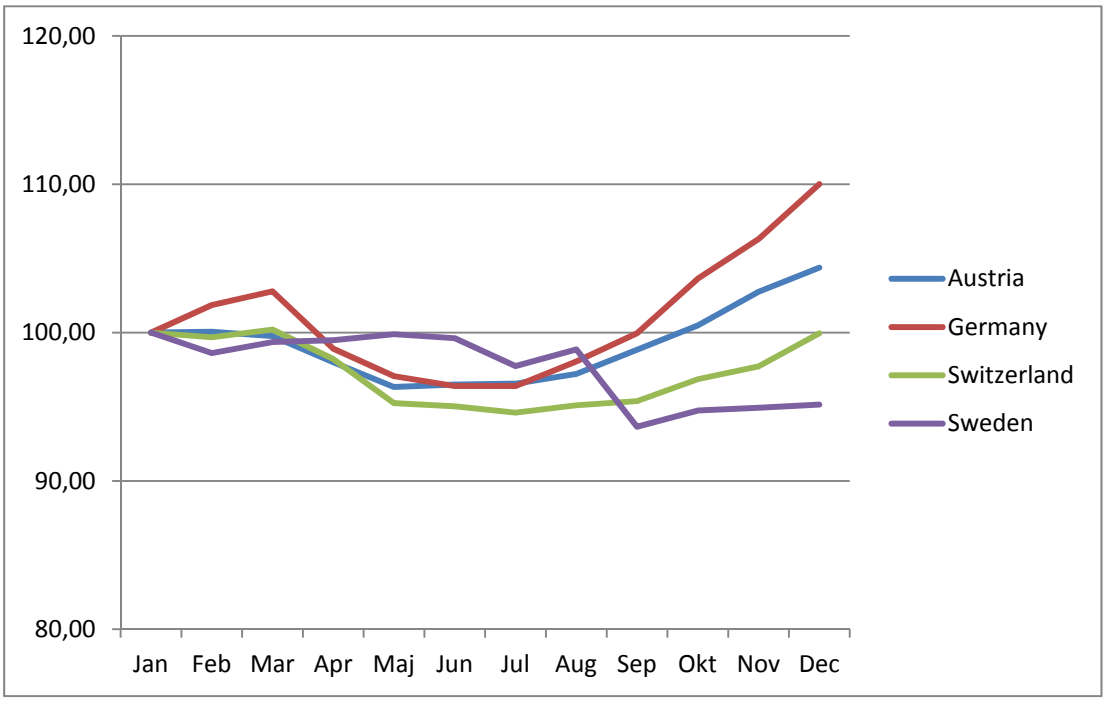

Figure 14 European Indices 2012

In the USA graph (Figure 10) the trends are more abrupt because the data is for each quarter of year. Maybe some integration could be noticed but is not clear at all. Anyway the aggregated trend is definitely not similar to the European one.

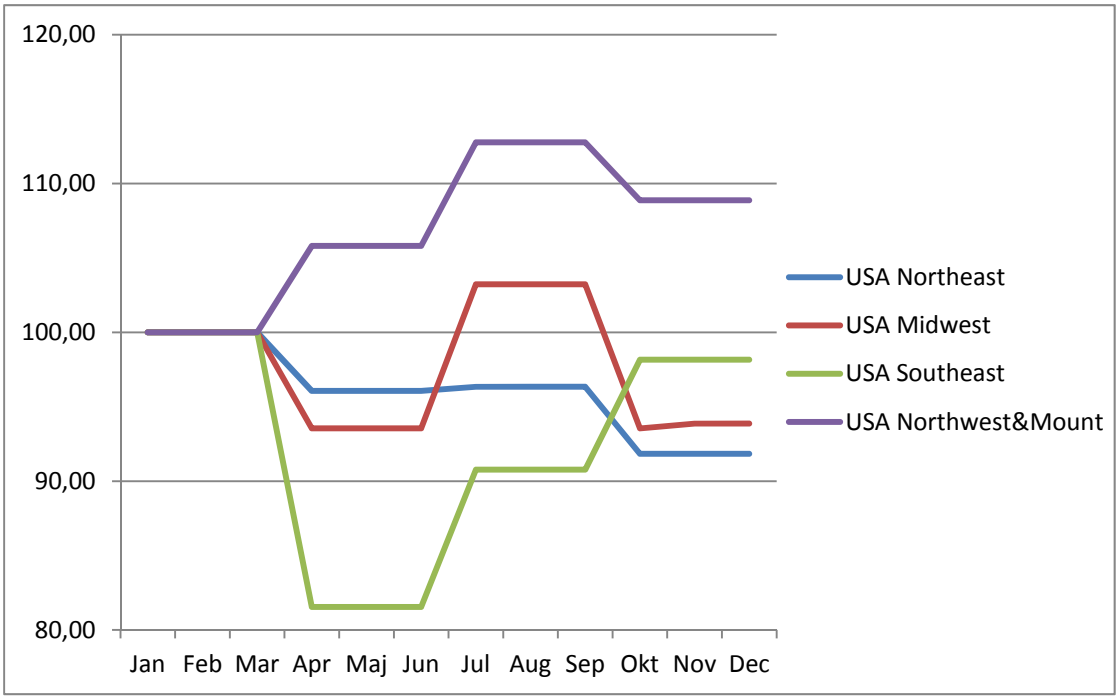

Figure 15 USA Indices 2012

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Final		
	2012	2013
Jan	100.00	
Feb	100.29	
Mar	100.71	
Apr	95.96	
May	95.29	
Jun	95.30	
Jul	97.38	
Aug	98.18	
Sep	97.85	
Oct	99.81	
Nov	100.64	
Dec	102.01	
Total prod	10869640	tonnes

Figure 16 Final Index 2012

The final result (Figures 11 and 12) shows a trend quite similar to the Central European one. That can be explained by the higher weight that region has. The shares are showed below (Figure 13).

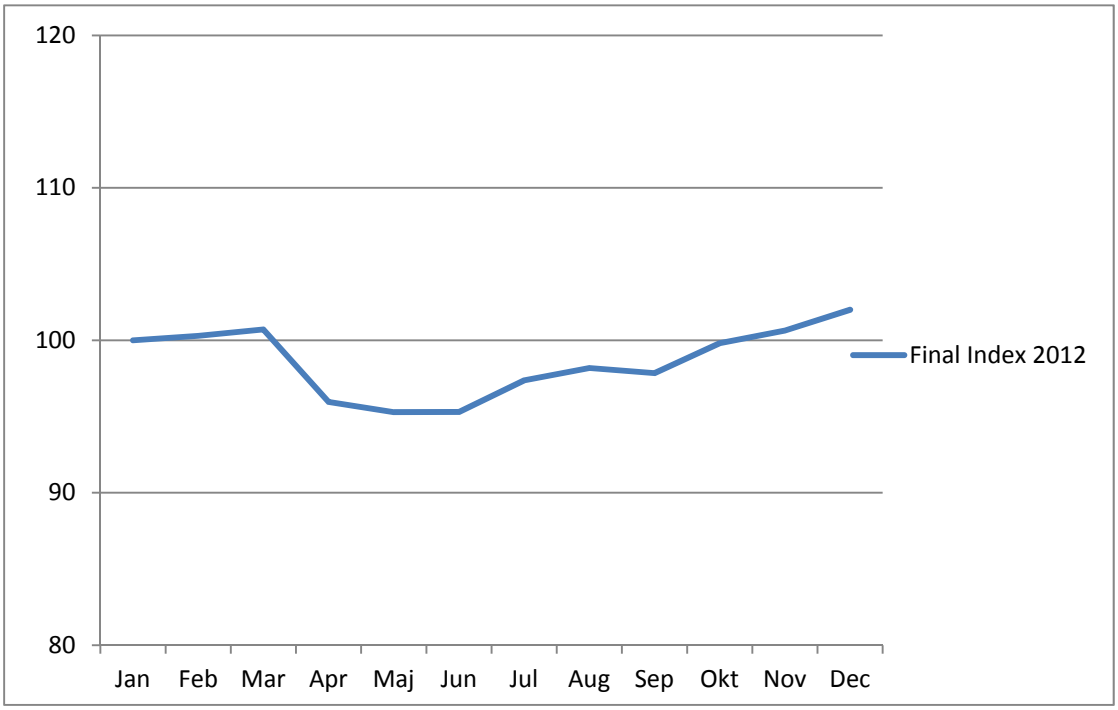

Figure 17 Final Index 2012 Graph

	*Prod2012	Share
Germany	3364273	30.95
Sweden	2225063.4	20.47
USA SE	1949960	17.94
Austria	926188.4	8.52
JSA NW&M	717417.78	6.60
USA NE	714515.7	6.57
Italy	459375	4.23
USA MW	367647.06	3.38
Switzerlan	145200	1.34
Total	10869640	100
Unit	tonnes	%

Figure 18 Contributions

4 DISCUSSION

4.1 About the currencies

A theoretic problem that rises here is the currency one. Their values always change in respect to each other along time and so they influence the value exchange (price) of the goods stated in those currencies when they are exchanged between two places in the world. In other words, for a product with a price stated in US dollars (USD) and kept constant, it could turn out that in practical, if that currency is going up, for a buyer in Europe, that product becomes more expensive and vice versa. Therefore when series of prices are transformed to the same currency and then compared (which is done in this thesis), not only the difference of the prices themselves is being analyzed but also the difference of their original currency values. Actually transforming prices to the used currency is a practical way for a trader to know what is actually costing him his purchases, without caring about the different inherent factors.

In the case of this thesis Euro has been decided to be taken as a reference currency, basically because it is in Europe where the biggest pellet market is placed. The mathematic method developed for the "questionnaire" and "online prices" surveys transforms firstly all the prices to Euros and after making the other calculations already explained the index figure is obtained. Hence, it would be interesting here to compare the fluctuations of the index with the exchange currency value fluctuations, at least with the most used ones in the thesis (SEK, USD, Canada Dollar…) and to analyze in what proportion they are affecting the index. Maybe it would be possible to come with good conclusions from that.

In the "other series" survey some of the series collected were already indices, and the ones which were not were transformed into indices. Each one was using different currencies and with different time references. Therefore, after referencing all the series to the same moment in time, an only average index was done where no exchange currency value was regarded. Hence only fluctuations of the prices themselves were showed there. This way of making an index could have some application, for example comparing it to the previous ones, but if this index is wanted to be merged in a final one with the previous results currency factor must be regarded. Maybe someone with specific knowledge in currency issues could study the problem that at a glance does not seem impossible to clarify or solve.

4.2 About the "price details"

When a manufacturer is giving a price of his/her product, normally it is given in (currency/tonnes) since it is asked in that way. But behind that figure there are more hidden details: Quality, quantity, transport, package etc. In this thesis prices to some extent have been mixed without taken into account those factors for the calculations. Except for "questionnaires" survey where quantities were fixed for each quality (see "criteria" in section 2.2). All the other information is collected with different "details", which were noted though. The reason why they have been mixed is that not enough data is available to distinguish. But is that rigorous and accurate? As it was explained, the point of the index is to show the relative changes of each price but not the average. Let´s see an example:

-Manufacturer1 (industrial, order of 15 tonnes, transport is not included, bulk)

Price January =100€/tonne; Price February =110€/tonne;

-Manufacturer2 (residential, order of 3 tonne, transport is included, small bags)

Price January=200€/tonne; Price February=220€/tonne

Each manufacturer sells with totally different conditions , however if we calculate the relative difference we find that from January to February of this year both have increased 10% of the price so independently of the other variables, the average difference is also 10%. It does not make sense to give a result like: “Price January = 150 €/t; Price February = 165 €/t” just because it is not real. However the figure of +10% is still representative.

The advantage of this system, besides the ones explained in “Why an index?”(section 1.7) is the possibility of mixing data with different details without an important deviation of the results. Nevertheless that does not mean that the differences between data with different details cannot be studied. In fact that would be very interesting to do. Some of the criteria could be:

-Transport: To compare the evolution of the price with the oil one and come up with conclusions. How much are the punctual increases of the oil price absorbed by the companies?

-Quality: Residential, industrial. Do differences in the relative changes exist? Why are they produced? Maybe the seasonality, for example, all the residential quality pellets are used for heating but the industrial ones are also used as power, therefore seasonality could influence more the residential quality price than the industrial one. That could happen with all the other factors too.

-Amount and package: What relation exists between both variables and the price? Is this the same one for all companies?

For finishing I would highlight the discussion that could be done about giving a variance or a variation coefficient together with the index. That could be interesting from the point of view of the accuracy of it, but in this case it is quite nonsense. The reason is the mixture of different detailed data that would make the variability much higher than the real one. For doing that properly a certain criteria for the details must be taken for all the data used for the calculation of that figure. In this case it would be interesting for instance to analyze how this variance change depending on the country or the continent for example. It could be used also as an indicator of integration of the markets in a certain region.

4.3 Seasonality and prices

Pellet industry is characterized by its seasonality. The traded good is a fuel used for power or heating systems; therefore it is logical to think that the months with more demand of this product are the winter ones. In fact if traded volume graphs are checked it is noticed that a peak is produced in winter and a valley in summer, which means that most trade gobally is done during the winter months of the northern hemisphere. But not in every case the peak is the same. Different factors influence that but the most important ones are the climate and the toughness of each winter. Higher peaks are found in Nordic countries like Sweden or Finland, where winters are colder, and lower peaks are found in Mediterranean countries like Italy, with milder winters. The toughness of each winter or the annual variability would increase those peaks or decrease them depending on the year.

According to the traditional supply and demand model by which prices are set within a market economy, the pellet price increases proportional to the demand in winter and decreases during the warm season. Therefore price fluctuations would be more or less exaggerated depending on the temperature of each winter, since that influences the demand. The colder the winter is, the higher the price is. There are however lags, as the buyers need to buffer.

By means of price indexing, when enough series are collected, it will be possible to survey how the period of the year influences the global storage volumes, how it influences the price and how much this price can change from one year to another. Obviously storage volumes play an important role here since they influence the balance of supply and demand.

It might even in the future be possible to create a formula that relates the mentioned variables, and probably several others, to forecast a price that would be similar to the real one. That formula would be something like this: Price = f (latitude, month, winter toughness, storage volume, distance to producers, distance to major harbors …).

4.4 Factors affecting replying success

Since the response frequency success was only 3.44% in the global questionnaire survey we must analyze the reasons of such a low figure and once the reasons are found try to improve the results. For that some explanations why a respondent would not reply are stated here and afterwards explained:

They cannot do it.
They can do it but they do not want.
They want but the email presentation text deters them.
They click on the link but they drop the questionnaire.

The explanations are presented in the opposite order so it is possible to first discard some of them:

-They click the link but they drop the questionnaire: A bad feeling of the questionnaire could cause that reaction for example if the appearance is not good or if it is confusing. That could also happen if the questions are inappropriate in quality or quantity. However the obtained

data thanks to the Netigate program shows that the share of accesses is only 6.4% so the problem does not seem to be here but from a previous phase. More than a half of the people who access the questionnaire fill it. So the success level of the questionnaire itself is higher than 50%. That would be a very good figure if the absolute number of accesses were much higher.

They want but the email presentation text deters them: This could happen in case that text is too long so the possible replier becomes tired of reading it. It could happen as well if this text is too brief and not all the necessary information is included or it is not clear enough so the possible replier will have doubts and will not go on. However that reason can be discarded since in the test phase a text with accurate information was sent to 12 companies with possibilities to be interested and only 1 replied. As a consequence a much shorter text was sent in the definitive sending. No mail with questions was received in any of the phases so we can conclude that the text in the email was not the main reason of the low success of replies.

They cannot do it: We could give here two possibilities.

-They are not allowed. In this case the email was not the right one, however it is not easy always to find the right addresses on the internet. Maybe it could be considered in the future to include a note asking for the address of the most appropriate person in the company or asking for a forward of the email to that person.

-They do not have time. As it was explained in the last section, pellet industry has a high seasonality so during the winter the small administrative staff that these companies use to have is completely busy. It is normal hence to have lower levels of participation during this season. In fact two non-respondent interviews were done to European companies and both stated that the reason why they did not reply was not a lack of interest but a lack of time “We do not have time for questionnaires in this period of the year”. We could consider for the moment this reason being the main one of the low success of replies, therefore we believe that within some months the results will be better. Otherwise this hypothesis will have to be discarded and to step on the previous ones or to come up with new ones.

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APPENDICES

Appendix 1. Production rates

Abbreviations explained below.

	N	n09	n08	Rep09(%)	Rep08(%)	PR09	PR08	**PR**	Δ
Argentina	5	0	0	0.00	0.00				
Australia	2	2	1	100.00	50.00	0.33	0.40	**0.37**	-0.07
Austria	27	11	11	40.74	40.74	0.82	0.69	**0.76**	0.13
Belgium	9	4	2	44.44	22.22	0.66	0.78	**0.72**	-0.11
Belarus	7	6	1	85.71	14.29	0.73	1.00	**0.87**	-0.27
Bosnia I Hercegovina	7	0	0	0.00	0.00				
Brazil	1	1	0	100.00	0.00	0.08	0.00	**0.04**	0.08
Bulgaria	12	1	1	8.33	8.33	0.33	1.00	**0.67**	-0.67
Cameroon		0	0	0.00	0.00				
Canada	60	7	1	11.67	1.67	0.70	1.00	**0.85**	-0.30
Chile	3	0	0	0.00	0.00				
China	21	4	0	19.05	0.00	0.55		**0.55**	0.55
Colombia	1	0	0	0.00	0.00				
Costa Rica	1	0	0	0.00	0.00				
Croatia	7	7	0	100.00	0.00	0.99		**0.99**	0.99
Czech Republic	9	1	1	11.11	11.11	0.80	0.65	**0.73**	0.15
Denmark	10	3	3	30.00	30.00	0.73	0.89	**0.81**	-0.16
Egypt	0	0	0	0.00	0.00				
Estonia	7	5	1	71.43	14.29	0.90	0.87	**0.89**	0.04
Finland	19	7	4	36.84	21.05	0.67	0.38	**0.53**	0.29
France	41	29	11	70.73	26.83	0.38	0.52	**0.45**	-0.14

Germany	58	21	29	36.21	50.00	0.80	0.83	**0.82**	-0.04
Greece	2	1	1	50.00	50.00	0.90	0.80	**0.85**	0.10
Guatemala	1	0	0	0.00	0.00				
Hungary	7	3	1	42.86	14.29	0.75	1.00	**0.88**	-0.25
India	3	0	0	0.00	0.00				
Indonesa	1	0	0	0.00	0.00				
Ireland	3	1	1	33.33	33.33	0.36	0.21	**0.29**	0.14
Italy	33	15	10	45.45	30.30	0.83	0.63	**0.73**	0.19
Japan	5	1	0	20.00	0.00	1.00		**1.00**	
Latvia	23	10	2	43.48	8.70	0.81	0.51	**0.66**	0.30
Lithuania	4	3	1	75.00	25.00	0.90	1.00	**0.95**	-0.10
Malaysia	0	0	0	0.00	0.00				
Mexico	0	0	0	0.00	0.00				
Moldavia	0	0	0	0.00	0.00				
Mozambique	0	0	0	0.00	0.00				
New Zealand	4	0	0	0.00	0.00				
Norway	9	3	0	33.33	0.00	0.68		**0.68**	
Panama	1	0	0	0.00	0.00				
Poland	24	8	14	33.33	58.33	0.85	0.71	**0.78**	0.15
Portugal	14	6	0	42.86	0.00	0.67		**0.67**	
Romania	4	2	0	50.00	0.00	0.72		**0.72**	
Russia	82	52	18	63.41	21.95	0.62	0.69	**0.65**	-0.07
Rwanda	0	0	0	0.00	0.00				
Serbia	6	0	2	0.00	33.33		0.44	**0.44**	
Slovakia	16	5	2	31.25	12.50	0.47	0.83	**0.65**	-0.35
Slovenia	4	1	1	25.00	25.00	0.96	0.96	**0.96**	0.00

South Africa	2	1	0	50.00	0.00	0.13		**0.13**	
South Korea	9	3	1	33.33	11.11	0.35	1.00	**0.67**	-0.65
Spain	30	10	8	33.33	26.67	0.31	0.31	**0.31**	0.00
Sweden	46	27	27	58.70	58.70	0.76	0.77	**0.76**	-0.01
Switzerland	12	4	4	33.33	33.33	0.51	0.69	**0.60**	-0.18
Thailand	0	0	0	0.00	0.00				
The Netherlands	4	1	1	25.00	25.00	1.00	1.00	**1.00**	0.00
UK	15	6	1	40.00	6.67	0.55	1.00	**0.77**	-0.45
Ukraine	15	9	1	60.00	6.67	0.63	0.50	**0.56**	0.13
Uruguay	1	0	0	0.00	0.00				
USA	102	20	3	19.61	2.94	0.79	0.81	**0.80**	-0.02
Venezuela	1	0	0	0.00	0.00				0.00

Average:	0.66	0.71	**0.68**

Abbreviations:

N	Number of companies
n08	Number of companies with production information in 2008
n09	Number of companies with production information in 2009
PR08	Production Rate 2008
PR09	Production Rate 2009
PR	Average Production Rate
Δ	PR09-PR08
Rep08(%)	(n08/N)x100
Rep09(%)	(n09/N)x100

Appendix 2. Capacities

Capacities in tonnes by country

	Capacity 2011	Capacity 2010	Capacity 2009	Capacity 2008
Argentina	93000	0	0	0
Australia	0	256000	256000	255000
Austria	1221000	1187000	1255000	1033000
Belgium	542000	532000	544000	450000
Belarus	71400	71400	99000	24000
Bosnia I Hercegovina	164000	164000	152000	152000
Brazil	40000	40000	40000	0
Bulgaria	119350	119350	1500	3100
Cameroon				
Canada	3637000	2958000	2243000	1760000
Chile	100000	100000	100000	0
China	882000	752000	313000	0
Colombia	10000	0	0	0
Costa Rica				
Croatia	166000	166000	241000	208000
Czech Republic	202000	184000	171000	128000
Denmark	492500	492500	498000	418000
Egypt				
Estonia	372000	417000	410000	385000
Finland	440000	645000	735000	1580000
France	1380000	910000	866000	256000

Germany	4126400	2833000	3020000	2592000
Greece	30000	30000	30000	30000
Guatemala				
Hungary	144700	87000	124500	10000
India	200000	200000	0	0
Indonesa	100000	100000	100000	0
Ireland	40000	72500	72500	70000
Italy	630000	725000	613000	418000
Japan	105000	95000	65000	65000
Latvia	1010000	757000	863000	891000
Lithuania	107000	115000	115000	95000
Malaysia				
Mexico				
Moldavia				
Mozambique				
New Zealand	61000	110000	120000	0
Norway	142000	142000	151000	164000
Panama	150000	0	0	0
Poland	937000	971000	865000	652000
Portugal	855000	875000	885000	367000
Romania	200000	200000	180000	0
Russia	3290000	3093000	1967000	793500
Rwanda				
Serbia	87000	112000	97000	129000
Slovakia	153000	153000	157000	82000
Slovenia	80000	99000	89000	89000

South Africa	143000	143000	143000	145000
South Korea	101000	108200	77000	300
Spain	692000	651600	552000	439600
Sweden	2909000	2355000	2265000	2030000
Switzerland	242000	260000	193000	108000
Thailand				
The Netherlands	285000	195000	100000	100000
UK	616000	610000	492000	282000
Ukraine	475400	430400	284000	119000
Uruguay	20000	0	0	0
USA	4893000	5441000	5680000	1154000
Venezuela	25000	0	0	0

Total	32781750	29957950	27224500	17477500

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