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Master Thesis

Chances and Limitations of European Soybean Production:

Market Potential Analysis

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List of abbreviations

AT	Austria
BG	Bulgaria
BLE	Bundesanstalt für Landwirtschaft und Ernährung (Federal Agency for Agriculture and Food)
BLL	Bund für Lebensmittelrecht und Lebensmittelkunde e.V. (Federation of Food Law and Food Sciences)
BMEL	Bundesministerium für Landwirtschaft und Ernährung (Federal Ministry for Food and Agriculture)
CAP	Common Agricultural Policy
CBoT	Chicago Board of Trade
CCM	Corn-Cob-Mix
CIS	Commonwealth Independent States
CP	Crude Protein
ct.	Cent
CZ	Czech Republic
DE	Germany
DK	Denmark
DNA	Deoxyribonucleic acid
DLG	Deutsche Landwirtschafts-Gesellschaft (German Farming Society)
DVT	Deutscher Verband Tiernahrung e.V. (German Association Animal Feed)
EFA	Ecological Focus Area
ES	Spain
ESA	European Seed Association
EU	European Union
FAO	Food and Agriculture Organization
FAR	Food and Agribusiness Research
FAS	Foreign Agricultural Services
FR	France
GATT	General Agreement on Tariffs and Trade
GB	Great Britain
GMO	Genetically Modified Organism
GM	Genetically Modified
ha	hectares
HP	High Protein
HR	Croatia
HU	Hungary
IP	Identity Preservation
IE	Ireland
ISAAA	International Service for the Acquisition of Agri-Biotech Applications
IT	Italy

LEL	Landesanstalt für Entwicklung der Landwirtschaft und der ländlichen Räume Schwäbisch Gmünd (State Institute for Agricultural Development and Rural Areas Schwäbisch Gmünd)
LfL	Bayerische Landesanstalt für Landwirtschaft (Bavarian State Institute for Agriculture)
LfU	Bayerisches Landesamt für Umwelt (Bavarian Environment Agency)
LP	Low Protein
LTZ	Landwirtschaftliches Technologiezentrum Augustenberg (Agricultural Technology Centre Augustenberg)
MG	Maturity Group
mmt	million metric tons
mn	million
MS	Member States
NFC	Nitrogen Fixing Crop
NGO	Non-Governmental-Organization
NL	Netherlands
OECD	Organization for Economic Co-Operation and Development
PL	Poland
RKW	Raiffeisen Kraftfutterwerk (Raiffeisen Feedstuff Factory)
RM	Relative Maturity
RO	Romania
R&D	Research and Development
RS	Serbia
t	(metric) ton
tmt	thousand metric tons
tsd	thousand
USA	United States of America
US	United States of America
USD	United States Dollar
USDA	United States Department of Agriculture
VCS	Voluntary Coupled Payments

1 Introduction

1.1 Statement of the study

The EU harvested in 2015 more than 0.89 million hectares (mn ha) soybeans, which represents about 1 % of the harvested areas in large soybean producing countries which was in 2015 around 85 mn ha for the US, Brazil and Argentina collectively. (Eurostat, 2016; Oil World, 2016). Reasoned by that, the EU imports over 33 million metric tons (mmt) of soybean commodities from North and South America each year (OVID, 2015). But there are concerns in doing so, because the exporting countries like for example Brazil, Argentina or the US mainly cultivate glyphosate tolerant genetically modified organisms (GMOs) varieties (ISAAA, 2016). If we consider the economic aspects, Europe is totally dependent on the soybean imports from the US, Brazil and Argentina to bridge the existing protein gap mainly in animal feed (Oil World, 2016), because Brazil is currently the only reliable non-GMO soybean producer. China uses the majority of its non-GMO soybean commodities for own consumption. The overall European consumption of soybean crush is almost three times as high as the world's currently available non-GMO soybean crush (OVID, 2015). Additionally, Chinas increasing import demand represents a leading factor for the level of prices in the world market. Imported soybean and soybean meal became expensive due to the consequent overall growing demand (USDA, 2016a; Rabobank, 2014).

Also, ecologically and socially the intense importation of soybeans creates problems. NGOs have concerns about the local consequences in exporting countries. This includes deforestation of tropical rain forest, loss of biodiversity, soil and water pollution and the negative impact on small farmers and the native population (Wilhelm, 2012; Castanheira and Freire, 2013).

In Europe, also the topic of GMO versus non-GMO is an important factor promoting the idea of a domestic soybean market. Imported soybean should be conform with European criteria. The European Seed Association (ESA) (2012) stated that the EU Commission affirmed already 14 years ago to realize thresholds for GMO traces in seed. The claim is based on the globally continuous spread of GMO cultivars as well as the increasing number of authorized GMOs in Europe. There are 95 GMO crop events approved in the EU of which 15 soybean events are indicated by the ISAAA

(2016). Inconsistent regulations within the EU due to the absence of binding rules for GMOs in seed in European countries cause uncertainties for farmers and the plant breeding sector. Furthermore, the ESA (2012) argued that these facts are dividing the farming in the European community. Until today, the situation is still the same. Although the ESA and EU Member States (MS) criticized the outdated GMO legislation on seeds already in 2012, as there are different GMO threshold values. However, for food and feed consistent threshold values within the EU are valid (EU Commission, 2003).The EU law requires that products, which contain or consist of authorized GMOs or are products from GMOs, must be clearly labelled as such (EU Commission, 2015). For the food retail industry in Europe non-GMO soybeans are much more attractive due to the bad reputation of GMOs among consumers (Stoll and Marquart, 2016). In general, unavoidable traces of EU approved GMO events up to 0.9% are legal without any labelling for food and feed (EU Commission, 2003).

In contrast, in the most countries within the EU, a strict zero-tolerance is valid for GMO contaminations in seed. This means if the competent authorities detect any GMO contaminations in seeds, the seed will be non-marketable regardless of the measured ratio of GMO content. However, the regulation of the threshold value for seeds can differ in a small range from country to country because the threshold value is up to the respective competent authorities. (EU Commission, 2015; transGEN, 2016). The zero-tolerance is a fundamental handicap in the seed industry. It makes the import and trade of soybean seeds increasingly difficult and involves additional costs for quality controls in terms of harmonized sampling and testing protocols. It has been experienced that seed imports from the US, Canada or Brazil to the EU involve a high risk of GMO contamination (Miersch and Hahn, 2015) as the global share of GMO soybeans is 83 % (James, 2015).

From this situation, it can be concluded that non-GMO soybean seeds produced in Europe would be of great interest for the agricultural industry. Yet, there is still a gap of higher-quality non-GMO varieties in terms of a high protein content and early maturity in the European market (transGen, 2015, LfL, 2015a). This could be an opportunity for the market entry of European breeding companies as well as an extension of a non-GMO soybean value chain in Europe and a value creation depending on how and if existing market barriers could be managed.

Nearly the whole amount of soybean meal is used for animal feed. On average of Europe’s soybean supply only 0.3 % is used for food (FAO STAT, 2012). Thus, this study will mainly concentrate on the conventional non-GMO animal feed market regardless of biological or organic markets. For a greater demand of commodity purchasers in this sector leading obstacles must be overcome. These are especially unreliable yields and lower protein contents of European produced soybean commodities compared to imported commodities, as well as a lack of significant larger and more homogenous soybean commodity lots in terms of quality (Van der Poel, 2016; LfL 2015). As a result, price reductions on the market for a lower quality of European soybeans represent a market entry barrier. Because market actors prefer larger and more uniform lots, purchasers or processors would rather decide for cheaper and reliable Brazilian commodities in a good quality. (Van der Poel, 2016). Therefore, European non-GMO soybean prices should be competitive with world market prices from the Chicago stock exchange (CBoT) and with commodity prices of non-GMO imports from Brazil.

In terms of competitiveness, other major cash crops as well as alternative protein supplying substitutes among regional crops need to be considered in this thesis. As soybeans being one of the most important agricultural trade goods in Europe (EU Commission, 2014), the local cash crops would enter in competition to soybean regarding the worthiness of cultivation on arable land. To grow larger acreages of soybean in Europe profitability, adapted varieties are required. This includes breeding goals like earlier maturing varieties with higher protein contents, higher grain yields and a better cold tolerance (LfL, 2016; Hahn, 2015; Mayr, 2016).

From various market actors, the requirement for adapted soybean varieties were mentioned (LfL Soybean Conference, 2015). Furthermore, estimations raised regarding a general soybean growing potential with respect to available acreages within Europe. Since 2015 Soybean acreages increased significantly along with politically implemented coupled payments on ecological focus acreages in the frame of the Common Agricultural Policy (CAP) (USDA FAS, 2016a). Even the Danube Soya association reports a sustained growth in 2016 forecasts (Kruppa, 2016) for European soybean acreages. These facts evolve an interest for the theoretically expansion of soybean acreages within Europe. Thus this will be considered as well in this thesis.

From an ecological point of view, there are also some driving non-monetary aspects. For instance, the biological nitrogen fixation is of increasing interest in ecological oriented crop rotations and as a side effect soybean can lower the risk of diseases for successional planted crops (LfL 2015a; BMEL, 2015).

All these mentioned factors represent the base of several pros and cons on competitiveness for soybean production within Europe. Political measures and associations which pursue the common goal of implementing an independent European protein strategy aim to overcome these market fluctuations (LfL, 2015a; BMEL, 2015).

1.2 Research objectives

The Thesis will reflect the field of tension of the current situation of the European non-GMO soybean market development. It shall be a market potential analysis highlighting promoting or limiting aspects on the European soybean market. From this overall research aim, the following objectives evolved:

Objectives:

1.) Analysis of the interest and expected market developments of market actors for European produced soybean under given political conditions.
2.) Determination of most important chances and limitations of a European soybean market from the view of market actors.
3.) Usage of market forecasts to make statements about the potential for a noticeable long term business trend of European soybean production.

4.) How much of total soybean imports could be replaced by a European soybean production?

1.3 Conceptual framework

This work will initially analyze the current situation of the European soybean market along the value chain mainly covering the first segments such as equipment producers and wholesale, import wholesale and Acquisition and distribution. Each of these segments is analyzed by market observations and expert interviews in consideration of the major market influencing aspects.

The research approach and applied research methods will be described in chapter two.

In chapter three the actual world trade situation and Europeans soybean imports, demands and uses will be described as well as basic knowledge about soybean characteristics and the structure of the soybean industry. Furthermore, the use of soybean in animal feeding and the European political framework will be explained and information on soybean commodity prices will be specified. In the second part of chapter three, the focus is on the growing potential of soybean as crop within Europe.

The statements of the expert interviews are presented in chapter four. The results are discussed and compared to the results of the market analysis. The market analysis is based on actual market situations that are relevant for the non-GMO soybean sector and outlooks which are performed under chapter three. In addition, the market analysis contains a usage and attitude study which is presented by expert interviews and a market forecast (see chapter 2.4).

2 Methodology

This chapter is representing the methodological procedure of the work. First of all, the own research process is described followed by the interviews which have been prepared, conducted and analyzed. In the last part of the methodology chapter the structure and the own approach of the strategic market analysis is presented.

2.1 Own research process

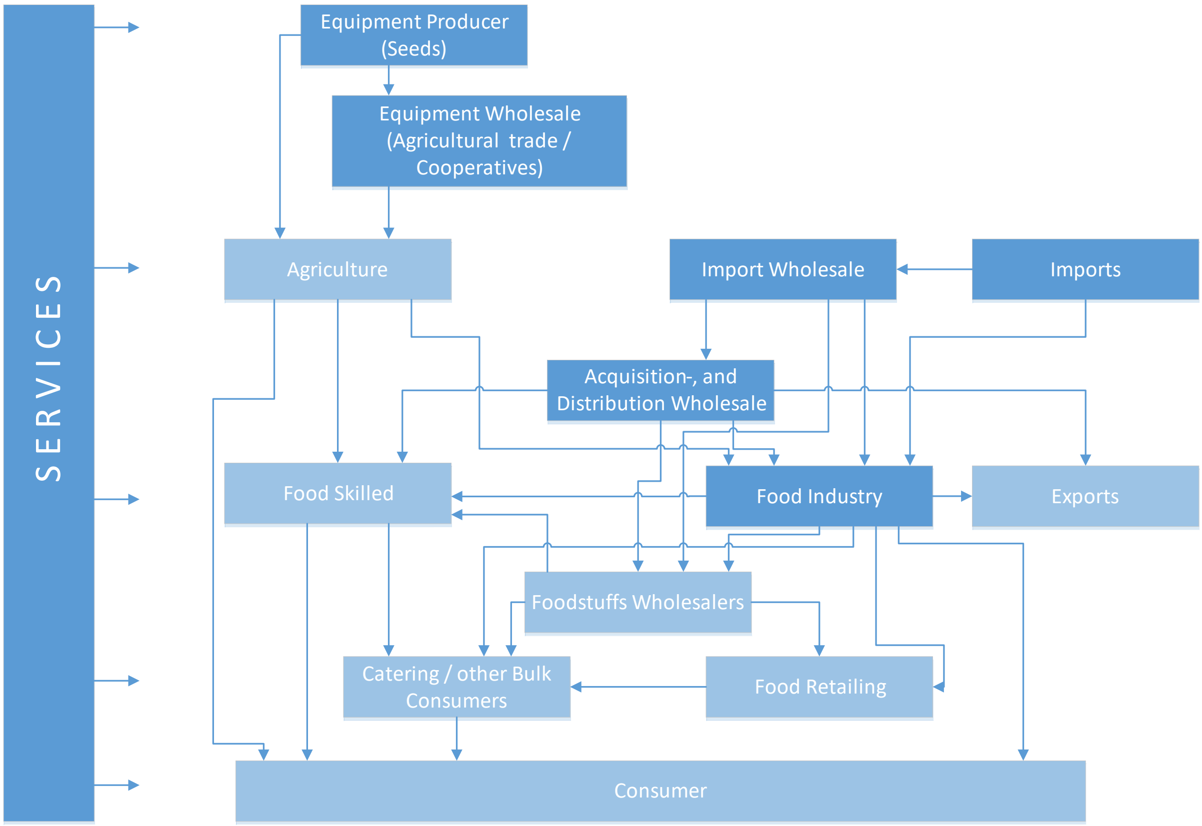
At first, via literature review and practical experience in the plant breeding company NPZ (Norddeutsche Pflanzenzucht Hans-Georg Lembke KG) important theoretical principals were established in order to determine the relevant research objectives. The company NPZ is an international operating plant breeder and distributes varieties in over 30 countries. Their main business is the breeding and sales mainly of winter rapeseed and legumes like field bean and field pea seeds. In the last four years NPZ is also active in the commercialization of soybean seed.

To provide specialized knowledge in this subject, the own observation process also includes field visits, field days and the attendance at expert conferences at which important personal contacts with specialists could be established. This served for setting a frame around the soybean branches along the agricultural value chain which are to be analyzed.

Figure 1 shows a scheme of the value chain according to Strecker et al. (2010). The areas shown in light blue will not be investigated in detail because the focus was laid on adjacent sectors of the seed industries from the first and second stages of processing. The first stage includes manufacturing of oils and meals; the second includes the manufacturing of compound feed or tofu for human consumption. As there is the requirement of non-GMO seeds adapted to European regions the plant breeding and seed producing industry will be included as well.

For the areas shown in dark blue, at least one representative expert of that sector has been interviewed.

Figure 1: Agriculture and food value chain



Source: Adapted from Strecker et al. 2010, p. 28

A market development is dependent on much more aspects and market interdependencies particularly on its actors and consumers. There are for example lobbyists of various interest groups. Political interventions often serve to force markets in certain directions. Therefore, views from different market segments can be very revealing in terms of intentions and assessments on market chances and limitations (Strecker et al. 2010).

Since the market for soybean seeds is not yet fully established as a common crop in several countries within the EU, the first investigated segment was research and development. Research and development is a substantial upstream sector of the agricultural- and food value chain structure depicted above. For the part Equipment Producer, experts of the plant breeding industry had been interviewed. For the part Equipment Wholesale, a large feedstuff producer as well as an oil mill were chosen in order to cover the main transformation processes. Moreover, the oil mill business involves also the sections Import Wholesale and Acquisition- and Distribution

Wholesale. Regarding the Food Industry a large European tofu producer, who is delivering food to wholesale and retails, was chosen to give information on that part.

Afterwards, the interviews form the data base on expert opinions, which are then discussed in a market analytical context. This includes the independent soybean market observation before and during the period of analyzing the interviews.

2.2 Analysis of Europeans soybean growing potential

In order to investigate the soybean growing potential in Europe and therewith, answering the research question 4 about acreages, which could be replaced by soybeans, the expiration is as it follows. In a first step the growing conditions of the largest soybean growing countries, the US and Brazil, will be compared to Europe to capture its growing conditions in general. Within a second step a possible crop substitution by soybean will be examined on the basis of revenue situations and further crop cultivating influencing factors.

2.3 Systemized expert interviews

The epistemic goal of systematizing expert interviews is an extensive and comprehensive collection of expert knowledge regarding the research topic. This form of interviews has been chosen because it can systematically provide information where the interviewed expert functions as advisor. This regards technical knowledge as well as knowledge on processes. In both cases it shall be acknowledged which is reflexively available to the interviewees. Thus, the knowledge can be more or less directly requested without requiring specific hermeneutic techniques. Hence, the interviews are conducted with a very differentiated guideline. In that way, all information gaps shall be closed.

Each expert has been chosen as representative for a certain branch and the interview refers to a clearly defined section. This means that the expert knowledge shall help to inductively conclude generalizable information (cf. Mayring, 1999 in Mayer, 2013). For the evaluation of the expert interviews the qualitative content analysis is suitable (Bogner et al., 2014) which will be discussed in chapter 2.3.4.

2.3.1 Preparation of the interviews

As expert interviews require careful planning, initially a comprehensible selection of experts was done – the so called sampling. Criterion for the selection of interview partners was, first that soybeans play a role within their product range and, secondly that the companies have notable market shares. When selecting the interview partners, their individual relevant position, within the company and the relation to the soybean market have been identified. Additionally, the interview partners have been chosen with respect to their international network to clients and suppliers. Also knowledge on the organizational structures and the distribution of developmental competences in the respective developmental field are required. Thus, for example the plant breeding company Saatzucht Probstdorf is active in Romania, Slovakia, Czech Republic, Hungary and the Ukraine. RKW and Josera already made partial use of soybean commodities from the EU and Danube Soya has a great network within the EU via own on site workers and numerous projects. This information was gathered via theoretical preparations and considerations (Mayer, 2013) which forms the basis for a flexible concept. This shall fully give account to the chosen reality section and shall function as the basis of the guideline.

Eventually, two experts from different branches, connected to the seed industry were selected as an GMO-free production can only start with GMO free seed and is therefore crucial for the value chain. This means the interviewees are from the segments of plant breeding, research and development (R&D) and feed and food industry. Regarding the policy relevant activities, also chairmen of non-governmental organizations, associations and the processing industry should be part of the survey. These sectors form the close environment to the plant breeding industry and are therefore more relevant than downstream sectors. Covering all sectors would go beyond the scope of this master thesis. Table 1 shows the companies or organizations with the corresponding experts.

After selection of expert interviewees contact was immediately established. This took place via telephone or e-mail.

Table 1: Overview of interviewed partners and sectors (sample structure)

Sector in the agricultural value chain	Company / Organization	Interview Partner
Research and development	University of Hohenheim - Regional office for plant breeding Taifun Tofu- Life Food	**Mr. Miersch**, head of the agricultural centre for soybean cultivation and development
Plant breeding industry	NPZ- Norddeutsche Pflanzenzucht	**Ms. Beyermann**, International sales manager
	Saatzucht Donau Probstdorfer Saatzucht	**Mr. Birschitzky**, general manager **Mr. Mayr**, soybean breeder
Acquisition and processing - Feedstuff industry - Food industry	RKW – Raiffeisen Kraftfutterwerke Kehl Josera – Quality fodder supplements	**Mr. Stoll**, general manager **Mr. Marquart**, head of purchasing
	Taifun Tofu – Life Food	**Mr. Miersch**, head of the agricultural center for soybean cultivation and development
Oil mill	ADM – Archer Daniels Midland Company	**Mr. Van der Poel**, general manager
Non-Governmental Organization	Bioland- Action Group Genetic Engineering-Free Agriculture	**Dr. Eichert**, head of the Bioland state association
	Danube Soya	**Mr. Krön**, general manager

Source: Own table 2016.

2.3.2 Development of the interview-guidelines

When carrying out interviews with experts in the context of qualitative research, these are usually semi-structured interviews. For the preparation and implementation of these interviews guidelines are developed, which fulfill a dual function: they serve the structuring of the investigated topic as well as function as specific aid and orientation guide in the interview situation. Hence, prior to the survey as well as during the survey guidelines are an important tool within the interviews (Bogner et al., 2014).

Questions are formulated in an open manner during the interview which gives the interviewee the possibility to reply freely. With the consistent usage of the guideline the comparability of gained data shall be increased. The guideline shall ensure that all important aspects of the research question will be included during the interview.

Nevertheless, this method is characterized by openness of the qualitative research. This means that the guideline does not have to be strictly followed in any situation. The interviewer has to decide if and when additional inquiries towards statements of the expert are suitable (Mayer, 2013).

First of all, central topic clusters were set based on systematic preliminary considerations. For this matter prior intensive branch and topic research was done. This resulted in groups of the guideline interviews into the following categories: regionality, pricing, agricultural policies, countries, markets, feed and GMOs. All questionnaires can be found in the annex III-IX.

2.3.3 Interview process

To ensure a relaxed interview atmosphere, the interviewee was confirmed confidential treatment of all information. This is guaranteed by personal verifying and agreement of the final interview excerpts which are part of the thesis. After approval of the interviewee, the conversations were recorded as memo. This created the possibility for the interrogator to handle the guideline with flexibility, because it was possible to fully concentrate on the interview. The aim is to give the interviewees space for possible additional relevant topics from their point of view (Kaiser, 2014; Bogner et al. 2014).

Monitoring and comprehension questions during the interview served the completeness and accuracy of data collection. At the end of each interview, the interview itself was made subject in order to gain the view of the expert towards the choice and completeness of the questionnaire. This procedure is recommended by Mayer (2013) to verify the quality of the questionnaire for the specific research area.

2.3.4 Qualitative content analysis

In the previous chapters it was shown how the theoretical frame as well as the collection of data were carried out. In this chapter, the methodological procedure regarding the empiric data analysis will be introduced. The following steps, which are based on Mayring´s structuring content analysis, were carried out in order to examine and evaluate the gathered data. Mayring suggests an open procedure in which possible categories shall evolve from the existing material. For the specific practical approach Mayring designs a *general content analysis flow model* (Mayring, 2003), which structures all activities of the qualitative content analysis in the following eight steps:

1. Determination of the material

This step serves the primary reduction of the data material which is to be investigated. Only those parts of the interviews, which aim at answering the research questions, are selected. In the case of this study all interviews, which had been carried out, were also relevant.

2. Analysis of the formation situation

In this step the context, in which the interviews were carried out, is of interest. This includes who gathered the material, who took part in the interview and what position the interviewees have in the company. Information regarding these questions were already given in the previous part of the methodology (chapter 2.3.1).

3. Formal characterization of the material

This step is about accurately determining and documenting the material. Transcribed interviews are often the basis of the content analysis, which also applies for this study. It is of importance to designate the type of transcription and their conventions. In this study, no pauses, tones of voice or para linguistic elements have been included into the evaluation, as in this case the data analysis is about the commonly shared knowledge. The transcription of the interviews included the entire interview contents (questions and answers) (Mayring 1999) in (Mayer, 2013)

4. Determination of the course of analysis

It must be determined, on which aspects of the existing material statements shall be made. Hence, it will be possible to align the analysis to the thematic contents of the gained material.

5. Theoretical differentiation of the research question

In order to act according to all scientific requirements, it is important to meet precise rules and systematization. The result must be intersubjective verifiable. The information arising from the content analysis shall be presented within a frame of existing scientific results and discussions on the topic. In order to guarantee this requirement, current market reports about the soybean market situation, projects and other studies were constantly followed (Mayring, 2003).

6. Determination of the analytical technique

It has to be decided which type of content analysis procedure is most suitable to be applied. In this study the qualitative content analysis according to Mayring is used, because the questionnaire was already structured with the respective background knowledge. The aim is to filter out certain aspects of the material and to estimate the entire material based on certain criteria (Mayring, 2003). Therefore, categories were defined, which are adapted and modified to the own data set in order to answer the objectives of this work. In the chapter 4.1 Analysis of the expert interviews examples will be presented for illustration.

7. Definition of units for the analysis + 8. Conduct of material analysis

The Expert Interviews were implemented by means of a content analysis, particularly by applying a coding scheme. Qualitative research is defined by Patton (2002) as follows:

> *More generally, however, content analysis is used to refer to any qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings (Patton, 2002, p. 453).*

The collected primary data for this case study was transcribed into rich text format and then evaluated in terms of a content analysis with the computer-assisted qualitative data analysis software (CAQDAS) Atlas.ti. The data is coded first and then structured and retrievable (Bryman, 2004). The researcher is assisted with the handling of lots of information. Coding data with Atlas.ti was the focus of this qualitative data analysis. Thus, data chunks and text passages from one or different documents as well as emerging topics are connected (Gibbs, 2004).

First and second cycle coding is differentiated by Saldaña (2009). In the first cycle coding, pieces of data are assigned to codes, as for instance paragraphs or sentences.

Second cycle coding categorizes the first cycle codes according to themes or constructs which results in pattern codes (Miles et. al., 2014).

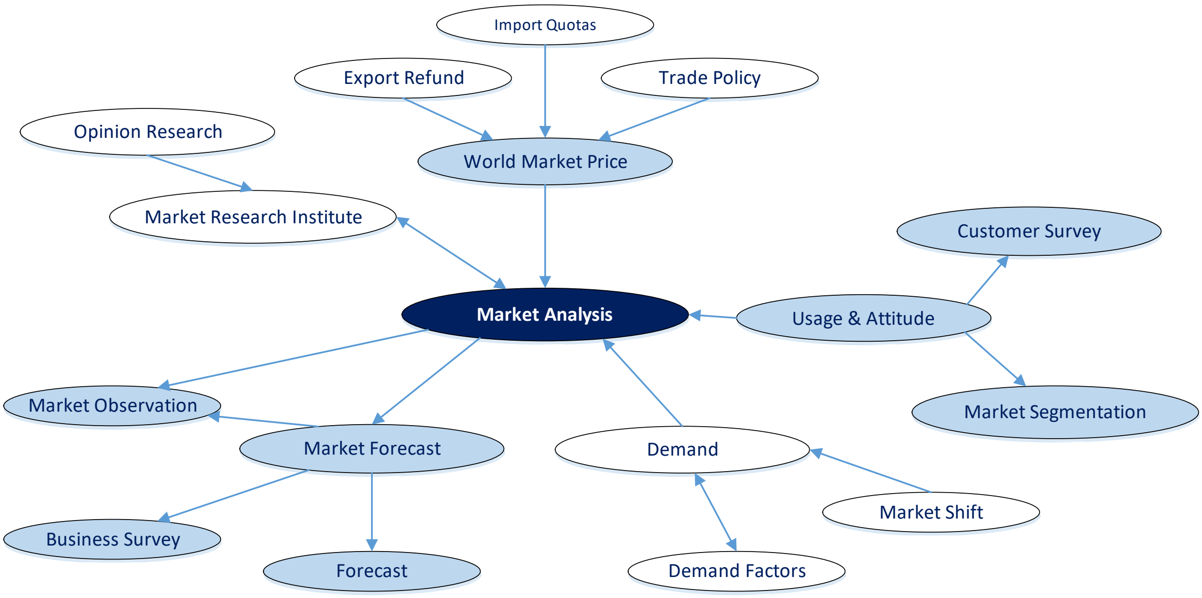
The coding followed the methods described by Saldaña (2009). Descriptive coding was one of the different coding methods that were chosen for the first coding cycle. ‘Descriptive Coding assigns basic labels to data to provide an inventory of their topics. Many qualitative studies employ descriptive codes as a first step in data analysis’ (Saldaña, 2009). Furthermore, sub codes can be used when they are applicable (e.g. chance/ policy/ greening or limitation/ policy/ threshold values). The method provides a base for further content analysis in qualitative studies. It supports the user with an organizational structure for the study and categorizes the data at an easy level. Thus, the method is especially suitable for first-time users of CAQDAS (Saldaña, 2009).

The pattern codes in the second cycle coding were composed closely along the study’s aims and the interview guideline. This helped to put the recorded data into a few analytical units, so that information could be processed easier and to refocus the analysis on the research question.

2.4 Strategic market analysis

In doing a market analysis one is analyzing the standing of a business on the market. A methodical investigation assists the observation of the market and should create a market transparency. In order to have strategic proceedings, the market analysis bases itself on Wübbenhorst's model (2016) (figure 2). Because a market analysis is a very extensive undertaking, chosen sections were worked on, since a complete scheme would be beyond the scope of a master thesis. The areas that are covered in this work are: World Market Price, Usage & Attitude including the sections of Customer Survey and Market Segmentation as well as a Market Forecast with the sections Market Observation and Forecast.

Figure 2: Mind map of a market analysis



Source: Adapted from Wübbenhorst 2016.

In doing a market analysis there is always a specific market that is of interest. In this case the product is the non-GMO soybean commodity market in Europe. In looking into individual sectors of the soybean agricultural and food value chain also the business politics are of interest. This assists in understanding the attraction and influence on the commodity market as well as recognizing the driving and impeding forces of today and in the nearest future.

Methodically, market analyses are based on statistics and opinion polls (Wübbenhorts, 2016), which are presented in chapter 4 as the second part of the market analysis. Therefore, experts, that showed interest in the intended market, were intentionally chosen from different branches and they were interviewed based on the in 2.3 described method. Identical questions to the macro environment, political, economic, socio-cultural and technological factors, allow a statistical evaluation, which is part of chapter 5. On this occasion, major contributing findings with regard to chances and limitations of a European soybean market are listed and discussed. To gain a different understanding of the macro environment, the first step includes the segmentation of the market (Hungenberg, 2014). This was already considered as much as possible in the selection of the interviewee (see chapter 2.3.1). Therefore, the given interviews of the experts represent the field Usage & Attitude.

The field Market Forecast is made up of the expert's prognosis statements and the continued independent Market Observation. The online and literature inquiries in chapter 3 The European soybean market analysis includes current basic market information as well as outlooks that will assist the market observation. Thus, chapter 3 and 4 are the evaluation of the expert's opinions and the following discussion about the current state of the market is the basis for a possible forecast.

3 European soybean market analysis

This chapter provides basic information to understand soybean market developments. Soybean production, consumption and trade are covered in the first section, while the second part provides data on European soybean growing potential.

3.1 Soybean production, consumption and trade

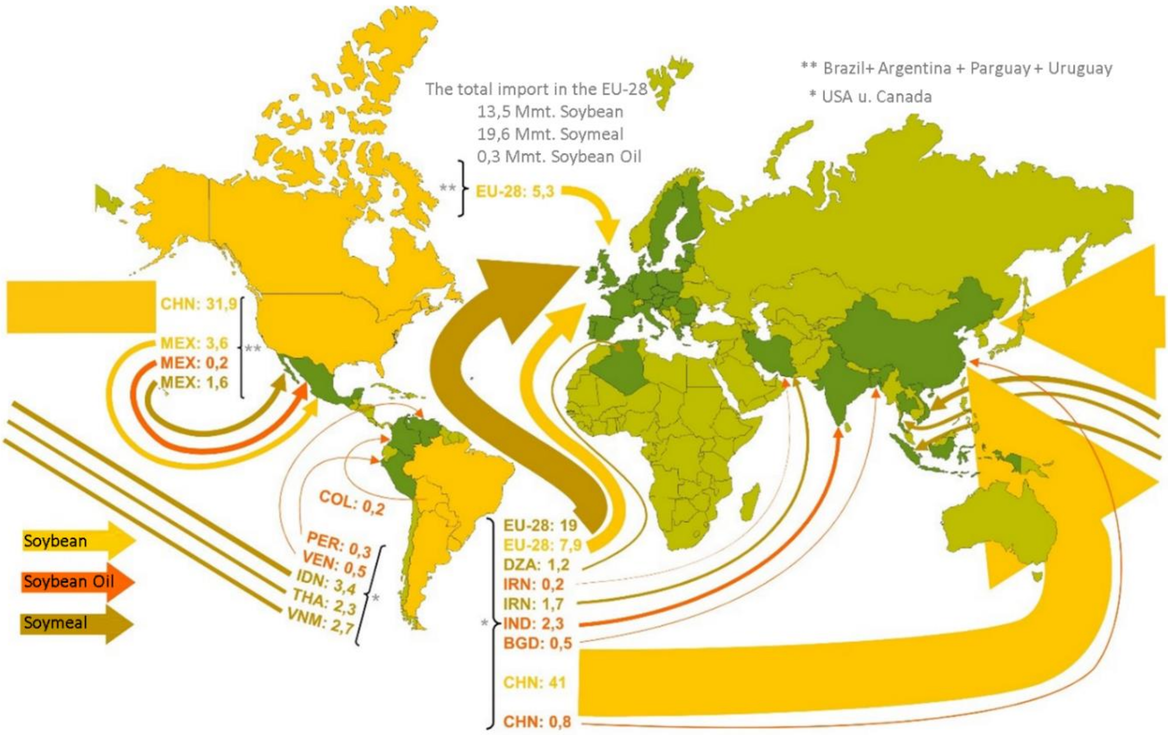
First, the global soybean production and its trade are described. Then the soybean complex is introduced, so the reader can understand the crop and its characteristics. Furthermore, this chapter includes background information on the use of soybeans in the animal feeding sector as well as the frame of agricultural politics and their historical backgrounds. Additionally, the function of organizations and associations, which are involved in protein strategies, are represented. The chapter will finalize with the current pricing situation of European non-GMO soybean commodities.

3.1.1 Global soybean production

The United States of America still dominate the global soybean trade, holding a market share of 33 %, closely followed by Brazil with 30 % and distantly Argentina with 19%. Worldwide 319,730 thousand metric tons (tmt) of soybeans are produced, of which approximately 40 % (126,155 tmt) are intended for trade. Thereof in the year 2014/15, the US exported 54 tmt, Brazil 50.6 tmt and Argentina 10.5 tmt (USDA FAS, 2016). The fastest growing exporters from 2007 to 2014 were India (+ 103 % per year) and Uruguay (+ 34 % per year) (IndexBox, 2015).

China is by far the biggest consumer with imports of more than 72 mmt soybeans and only small quantities of soybean meal as China is processing soybeans itself. Europe has an overall import of 33 mmt soybeans and meals collectively of which Germany is one of the top four trading partners to the US. The significant increase of Chinas shares of imports continue to rise (+ 20 %) (OVID, 2015; IndexBox, 2015).

Figure 3: World trade flows of soybeans, -oils and -meals (2014)



Source: Adapted from OVID 2015.

Figure 3 pictures the described situation of the major imports to China as well as considerable soybean meal imports of 33 % (19.6 mmt) and of 12 % (13.5 mmt) of soybeans to the EU-28. Therewith 95 % of the EU's overall consumed soybeans and derived products are imported (Tillie and Rodríguez-Cerezo, 2015). About 25 mmt are used for animal feeding in form of soybean meal. In Europe, soybeans were processed into soybean meal as well and 0.5 % of the world's traded soybean meal were even re-exported by EU-28. The biggest European demands are coming from Germany, France and Netherlands. This correlates with the intensive factory farming in these countries (FAO, 2012). Germany had an import demand of 3.7 mmt soybeans and 2.7 mmt soybean meal in 2014.

Table 2: Major exporting countries to the EU-28

Export to the EU-28: Soybeans and –soybean meal in mmt (2014)				
			Exports to EU-28	
Rank	Exporting Country	Area of GMO Soybeans (%)	Soybeans (mmt)	Soybean meal (mmt)
1	Brazil	93 % GMO	5.3	8.3
2	Argentina	100 % GMO	0.1	8.7
3	USA	94 % GMO	4.4	1.0
4	Paraguay	95 % GMO	1.7	1.0
5	Canada	95 % GMO	1.2	0.1
6	Uruguay	100 % GMO	0.9	0.0

Source: Adapted from data obtained from OVID 2015.

As shown in table 2 the most important exporting countries for soybean meal are Brazil and Argentina. Moreover, the table reveals information about the acreages in percentage of GMO soybeans. The 7 % of non-GMO production in Brazil stand for 93% of grown area with GMO soybeans, Brazil is the largest non-GMO producer. Also the export numbers of soybeans and soybean meal to the EU-28 in 2014 are given in the table. Again Brazil can be noticed as the most important non-GMO soybean producer due to the country's large export amounts compared to other countries.

Table 3: Available amounts of non-GMO soybeans and -meal for the EU-28

Countries	Total Production	GMO	Non-GMO	For the EU-28 theoretical available amounts of non-GMO soy-		
				-beans (mmt)	-beans meal (mmt)	% of non-GMO available amounts
Brazil	95.1	88.6	6.5	6.5	5.2	100%
India	8.7	0.0	8.7	2.2	1.8	25%
Paraguay	8.6	8.2	0.4	0.4	0.3	100 %
Bolivia	2.6	2.2	0.4	0.4	0.4	100%
EU-28	1.8	0.0	1.8	1.8	1.5	100%
Sum	116.8	990.	17.8	11.3	9.2	

Assumption: Non-GMO soybeans are completely available for meal production.

Note: Derivation of GMO soybean production is based on percentage of the grown soybean area. Thus, there is no division between yields per hectare of GMO and Non-GMO production which leads rather to an overestimation of Non-GMO soybean production.

Source: Adapted from data obtained from OVID 2015.

To get a better idea of the globally available quantities of non-GMO soybeans and soybean meal, table 3 shows the biggest producing countries of non-GMO soybeans and – soybean meal. Other countries grow non-GMO soybeans as well, but these soybeans are not available for exportation to Europe for different reasons. In North

America for example, non-GMO goods are only produced for groceries. In Ukraine and Russia, a separated detection of non-GMO goods is not guaranteed (Ovid,2015), mainly caused by illegal cultivation of GMO varieties (Danube Soya, 2016). China produced 12.2 mmt non-GMO soybeans for its own use. India has the biggest amount of non-GMO soybeans available, but ways of detection and ways of transportation have to be developed (cf. Ovid, 2015).

Market Situation

For the marketing year 2015 a decline can be reported for the oilseeds rapeseed, sunflower and groundnuts compared to the previous year. However, global soybean production continued to increase. The growing share of soybeans lead to lower production of vegetable oils reasoned by lower oil content in soybeans compared to the others. Furthermore, the contracting of biodiesel production from vegetable oils last year have slowed demand for vegetable oils. The expansion of soybean production over other oilseeds (due its high protein content) is a result from the constantly increasing demand for protein meals. Prices for protein meals have declined to historically average levels and are 1.5 to 2 times those of corn (OECD FAO, 2016).

Outlook – global yields and production

According to the OECD forecast the global soybean production will continue to grow for a rate of 2.4 % yearly in the projected period to 2025. Soybean meal represents the largest part of soybeans usage, which will result in more intensive crushing. For 2015 it is expected that 91 % of the total soybean production will be crushed. Soybean oil as another component increases at the same time. However, the demand for the oil component will decline within the next decades reasoned by limited growth of biodiesel production (OECD FAO, 2016).

The demand from China for protein meals is expected to grow more slowly by 2.7 % annualy with less than half in the previous decade. In correlation, the declining demand from the Chinese for soybean meal ease soybeans world trade drastically within the next decade. But, within China the usage of protein meals is expected to increase due to more intensive livestock production (OECD FAO, 2016).

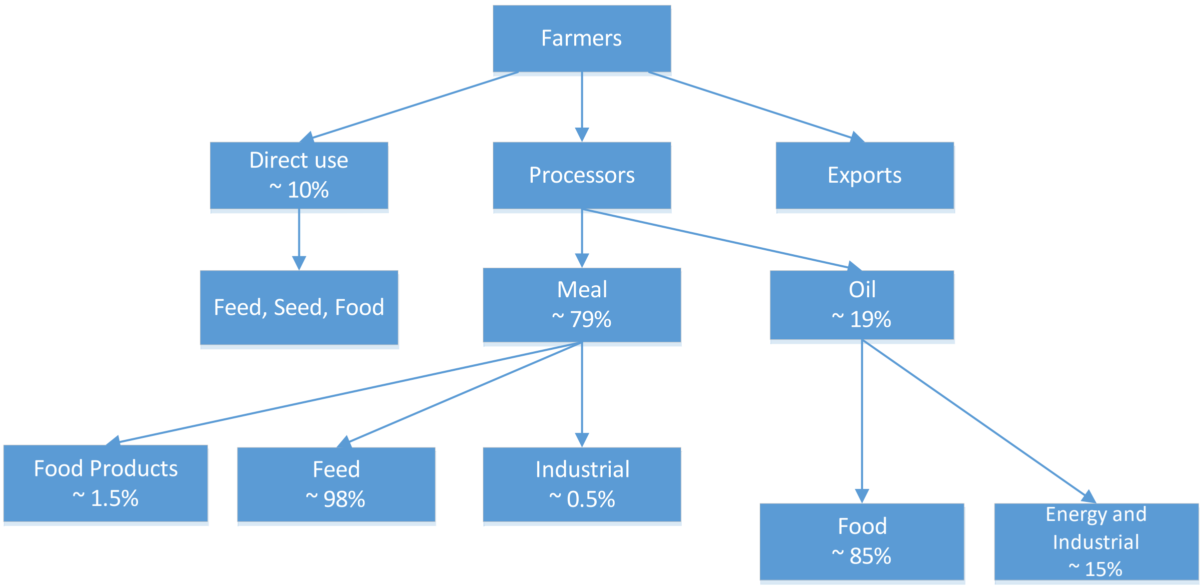
3.1.2 Soybean characteristics

Soybeans (Glycine max (L.) Merr.) are the world's leading produced and consumed oilseed crop of today. The largest amount of soybeans is produced in the US with 29 mn ha of land used for soybean cultivation. As a member of the legume family, soybeans originated from northeastern China around 25 000 B.C. (Palle and Licht, 2014). Until today, soybeans are primarily used for human consumption in Asia (Wilhelm, 2012; Lieberei et al., 2007). The legume can be characterized as a self-pollinating short-day plant, whose days to flower are also dependent on accumulated temperature. Thus, genotypes differ in photoperiod requirements for flowering. Varieties are adapted for growth in a relatively narrow area. This means, depending on the regions conditions rather early or late-maturing varieties are chosen to reach soybeans full maturity.

The topic of the adaptability of suitable genotypes of soybeans in certain regions and growing seasons will be analyzed in chapter 3.2.

The bacterial N-fixation in the nodules is a well-known advantageous attribute of the species from the legume family. Via symbiotic root bacteria, atmospheric nitrogen can be fixed, which contributes to a more sustainable agriculture (Palle and Licht, 2014). Additionally, the soybean is known as a high protein (30-48 %) and oil (18-23 %) containing crop, which allows divisive areas of its usage and makes the soybean quite unique compared to other crops. Principally, the plant is used for food, feed, industrial and pharmaceutical needs as well as for energy production in terms of biodiesel. There is an increasing usage in form of concentrates, isolates and textured protein for human consumption. Especially in Asia liquid, powder and curd forms are manufactured from soybeans and consumed as paste, sauce, cheese and other forms. The rising trend in western regions for vegetarianism is causing an increasing demand for these products (Hartman, 2015).

Figure 4: Structure of the soybean industry



Source: Adapted from Goldsmith in Johnsons et al. 2008, p.119.

In figure 4 the structure of the soybean complex illustrates the soybean production chains starting from farmers separated in direct use or further processing into oil and meals. The most important components of processed soybeans are soybean meal and soybean oil - with oil being the most valuable part. The leftover after solvent extraction of oil is about 80 % soybean meal, which is used almost completely as feedstuff in animal production due to the high protein content (Hartman, 2011), primarily for poultry and pork. Since soybeans contain all essential amino acids (39% of their protein content) they are a very important almost full-fledged protein source. In particular, the limiting amino acids Lysin, Threoninand and Thryptophan play an important role for animal feeding (BLL, 2001). However, a heat treatment in form of a toasting process is necessary to enhance the digestibility for humans as well as for animals. Otherwise, the digestibility of soybeans is restricted by anti-nutritive substances like oligosaccharides and trypsin inhibitors (Ali, 2010).

3.1.3 Animal feeding

As mentioned in the previous chapter the amount of soybean meal is nearly up to 100% worldwide - as well as in Europe - used for animal feeds (world: 98.3%, EU 99.3%), far before human consumption (Hartman, 2015; Soyatech, 2016). Therefore, the mainly derived products from soybean meal are beef, butter, eggs, fish, lamb, milk and pork

(Hartman, 2015). Reasoned by that, this part will provide some information on European regions, which are most important for animals' production and therewith major consumers of soybean meal. Furthermore, the specific areas of application in poultry, cattle and pork will be investigated and pointed out.

For feed, the most effective type of soybeans is HP 48 (High Protein), which contains crude protein and 2-3 % crude lipid. The type LP 44 (Low Protein) is rather a normal value, but frequently protein contents are below the target set point (Marquart, 2016). According to the EU-feed law the value indicates the total percentage content of crude protein and crude lipid together. HP 48 is made of peeled soybeans and has therewith a higher protein content compared to HP 44, which still contains peels (fibers) (Pistrich et al., 2014). The protein content of soybeans is significantly higher compared to alternative protein crops such as rapeseed, sunflower, field bean, field pea and blue lupine. This fact, as well as the qualitative mixture of limiting amino acids makes soybeans besides corn and wheat the most important resource of the modern animals production industry (Salim, 2010).

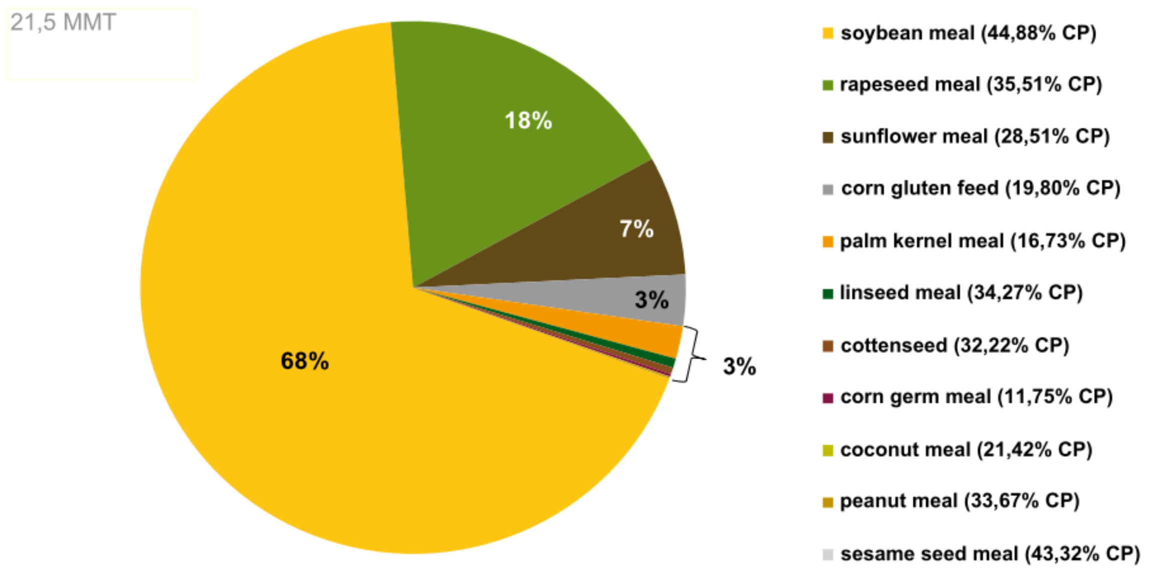
Soybean meal HP 48 provides the best digestibility[1] for all animal categories and is mainly used for feeding pigs and fattening poultry. The relative amount of soybeans in energy- and mixed fodder components is with 15 % higher in pig- and fattening poultry feed as compared to cattle (dairy cows included) and laying hens with 10 % (Jeroch et al., 1999). Especially in the intensive poultry nutrition the highly digestive protein source of soybeans is by far the first choice and reaches often up to 30 % in laying hens as well as in fattening poultry feed rations (Fefac, n.d.).

To illustrate a comparison to other oilseeds, figure 5 shows the percentage share of the protein consumption in form of oil meals in the EU-28. The given values have been rounded. The percentage in brackets in CP means Crude Protein related to fresh mass. Here soybean meal consumption shows with the yellow part by far the highest share. Additionally, soybean meal points out the highest CP values (OVID, 2015).

1

The digestibility determines the amount which can be absorbed by animals and is therewith responsible for the nutrients availability and the animals growth or reproduction.

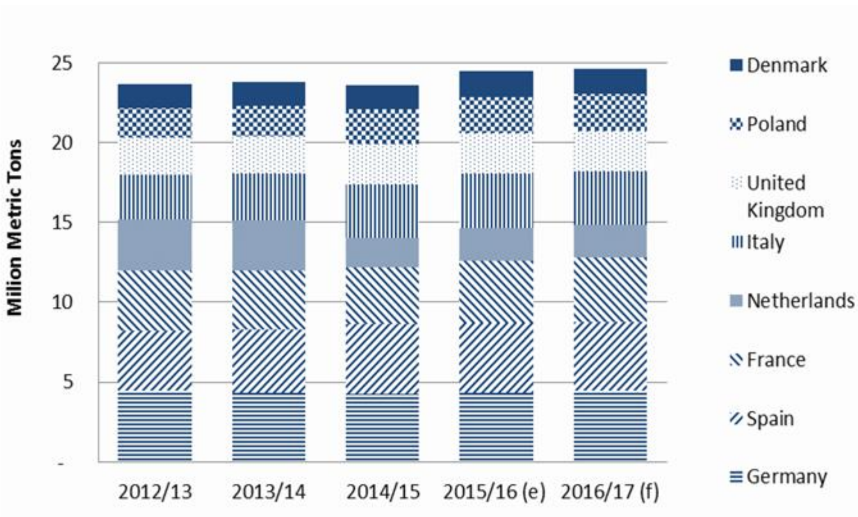
Figure 5: Europeans consumption of protein out of oil meals (Ø 2004-2014)



Source: Adapted from OVID 2015.

The European total amount of consumed protein feed in 2014 was 64 mmt. Almost half of this amount (30.30 mmt) consisted of soybean meal (OVID, 2015). An overview of the main countries, which use soybean meal for feed, is given in figure 6.

Figure 6: EU-28 feed use of soybean meal (main countries only)



Source: USDA FAS 2016a.

Besides the mentioned countries of Germany, France and the Netherlands also Spain, Italy, Poland as well as Denmark and the UK are feeding considerable amounts of soybean meal. As meat consumption is increasing constantly, an increase in feedstuff demand can be noticed (USDA, 2016a).

Regarding the total amounts of produced animal products within the EU, the sector of milk and milk products is leading with 15 % of the agricultural output. The production of pork follows with 9 % of the total agricultural output and poultry with 5 % of the output for the EU (EU Commission, 2016a).

Since in this study the potential for European non-GMO soybeans shall be analyzed, at this point the interests of the major non-GMO fodder producers will be briefly presented.

The EU's leading demand for non-GMO IP certified soybean with about 21 % of the volume of produced feedstuff is the poultry subsector, while the dairy and beef cattle subsectors dispose a share of 9 % and less than 5 % for the pork subsector* (Tillie and Rodríguez-Cerezo, 2015). The following table 4 provides the main facts in order to summarize the changes happening in the feeding industry. The table shows a summary of the European total output per animal sector to stress the size and importance of each sector. Moreover, the third column lists the main producing countries of each animal sector in declining order. It is especially interesting to compare the third and last column which shows the countries, that mainly produce non-GMO feedstuff, compounds.

Table 4: Summary of total outputs in animal sectors in the EU-28

Animal subsector	EU's total output in (%)	EU's 5 major producing countries	Volume of produced non-GMO industrial feedstuff compounds in EU (in % / Country) *	
Poultry	5 %	FR/ IT/ RO / PL/ DE	21 %	AT/ DE/ IE/ DK/ GB
Dairy and beef cattle	15 %	DE/ FR/ GB/ NL/ IT	9 %	HU/ AT/ FR/ IT/ DE
Pig	9 %	ES/ DE/ FR/ DK/ NL	5 %	HU/ FR/ IT/ AT

*This numbers are based on a sample of 14 EU Member States which are responsible for 93%, 93% and 91% of the total EU production of cattle, pork and poultry industrial compounds, respectively.

* Sweden and Hungary produce almost exclusively non-GMO feeding compounds.

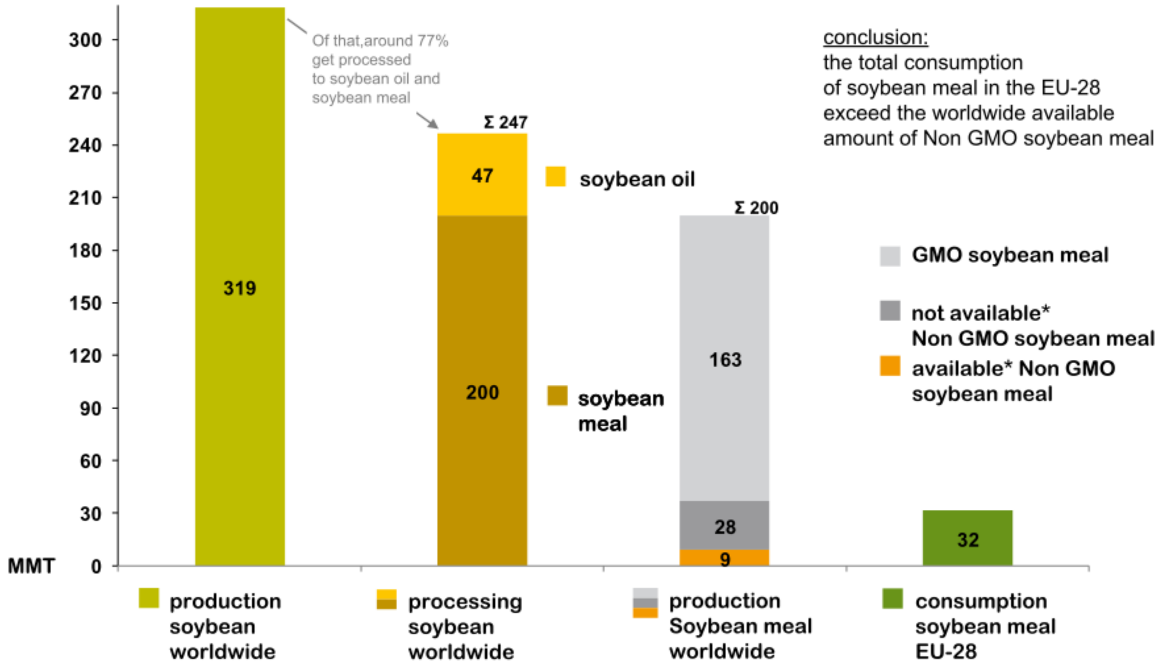
(Countries are in declining order)

Source: Adapted from data obtained from Eurostat 2015, Eurostat 2016, EU Commission 2016, FAO STAT 2016, Tillie and Rodríguez-Cerezo 2015.

When comparing the numbers, it is obvious that France and Italy are the main producers for poultry. With a share of 21 %, non-GMO feeding compounds for poultry are leading in Austria and Germany. In particular, the main producing countries of specific animal subsectors do not very often produce non-GMO feedstuff compounds for their large animal sector. Smaller producers, such as Austria and Hungary, have already adapted to a larger amount of non-GMO feedstuff.

Especially in the largest output areas of European dairy, cattle and pig production currently below 10 % of non-GMO feeding compounds are produced. Hence, Germany, the Netherlands and Spain are missing as important participating producer countries of non-GMO feedstuff. While France and Italy are already using non-GMO feedstuff in all areas, feed which is subject to labelling because of GM-contents can only be found in the poultry production (Tillie and Rodríguez-Cerezo, 2015). Spain and the Netherlands, being major importers of soybean meal and animal producers, are not using noticeable amounts of non-GMO feed which will probably not change in the foreseeable future.

Figure 7: Production, availability* of soybean commodities (2014/15)



*Assumptions for a theoretical availability

Source: Adapted from Ovid 2015.

For the year 2014 Pro Terra and Danube Soya indicated the European consumption of non-GMO soybean meal with 5 mmt including Germany with 1 mmt, France with 0.7 mmt and the Scandinavian countries with 0.75 mmt (Kruppa, 2015). The global amount of available non-GMO soybean meal of about 9 mmt (figure 7) would not be sufficient to cover the total soybean meal needs of the EU-28. Thus, if the EU theoretically would like to change animal production systems into non-GMO, there would be 23 mmt, which could not be covered yet. When total European non-GMO soybean meal consumption is approximately 5 mmt, this represents about 60 % of global available amounts of non-GMO soybean meal (Ovid, 2015).

In general, the demand for non-GMO soybean meal for livestock feeding increases in the EU (USDA, 2016.a; FAO Stat, 2016). Especially the high demand in the farming sector for dairy cows (Peter and Krug, 2016; FAO Stat, 2016).

Outlook

Some EU countries, for example Germany, have become a net exporter of animal products. Therefore, movements in export markets are crucial for domestic markets and price trends. Especially the poultry sector with fattening broiler gains more importance since the last decade (DVT, 2016). Also from a global view fattening broiler is predicted to gain more importance in the future regarding an increasing meat consumption (OECD FAO, 2016).

For 2016/17 the dairy industry is still forecasting a rising demand for non-GMO compound fodder. This is reasoned by discounter brands, like Lidl switching to label their dairy products as Non-GMO (LZ, 2016). These changes in the market may lead to an increased demand for rapeseed meal which is justified by a decisive advantage (DVT, 2016). Additionally, for the trend in non-GMO feeding of dairy cows in single EU countries, rapeseed meal represents the often-favored option as GMO soybean compounds substitution, because dairy cows physiological feeding demands are less dependent on soybeans specific amino acids. The good availability and lower prices on the European market for rapeseed could favor rapeseed before non-GMO Soybeans for substitution (Stopp et al., 2013; DVT, 2016).

3.1.4 European agricultural policy

The four major soybean trade partners for Germany are Brazil, the Netherlands, the US and Argentina. Considering that most soybean commodities (imported from the Netherlands) is only re-imported, it becomes clear that Brazil is by far the most important state of origin of soybeans and soybean meal used for Germany. One of the historic reasons for the intense soybean trade are the 1960s negotiations on the General Agreement on Tariffs and Trade (GATT), where soybean was excluded from import quotas when sold to the EU. Consequently, soybean meal was predominantly used as protein feedstuff within the intensifying animal husbandry. The demand for soybean meal drastically increased while domestic feedstuff was demanded less and less (EU Commission, 2011).

Another reason for this development was the Blair House Agreement in 1992. This memorandum allowed the supported production of certain oilseeds but only under restrictions. Thus, limits were not to exceed 5482 hectares of supported area and not to produce more than 1 mmt of by-products (for example soybean meal). In 2008 the payments for the set-aside regime and energy crops have been abolished under the CAP Health Check. Thus, there were no longer restrictions on oilseeds for the EU in the context of today's CAP, although the Blair House Agreement still is in force (EU Commission, 2011).

Principles of Europeans GMO-legislation

Since the introduction of green genetic engineering in 1996, soybean being one of the most important commodity markets is split in two market segments, GMO and non-GMO. Through segregation along the whole value chain by a system called Identity Preservation (IP) the public policies do justice to obligatory labelling standards in some sectors. For instance, the rejection of Genetically Modified Plants in the majority of European countries is such a contrary to the worldwide increasing adaptation and usage of this technology (Tillie and Roríguez, 2015).

Thus, the EU-28 MS are subjected to the same valid GMO legislation which has been intensified in 2003. This comprises a general permission for the application of GMOs in agriculture and food production - as long as the product is authorized in the EU. According to the ISAA (2016) there are 95 authorized GMO events of which some are limited in terms of their use.

The joint EU-legislation includes the following requirements in order to secure and control the market regarding the placement of GM food, feed and crops. Special labelling is required for all GM products where GMOs have been deliberately used. This aims at the request of consumers to secure the freedom of choice to decide consciously for or against GM products. Furthermore, traceability must be ensured by companies due to appropriate documentation- and information systems. Irrespective of whether GMOs are detectable in the product or not. However, this regulation only refers to the conscious use of GMOs. Unavoidable traces and admixtures are regulated in the EU by threshold values. This implies a GMO content in food and feed up to 0.9 % except the labelling regulation for conventional products. For seeds and the cultivation of GM plants, the situation is different. Since 2015, each single MS of the EU can decide whether authorized varieties are allowed to be grown or not (EU Commission, 2003). Furthermore, the definition of a threshold value for GMO admixtures in seeds is up to the MS. In consequence, Germany has a zero tolerance compared to Austria where a threshold value up to 0.1 % is valid (transGEN, 2015; Birschitzky and Mayr 2016).

CAP – greening payment

In 2015, at the same time when the greening regulation came into force, there was a noticeable sharp increase of soybean cultivation in Europe. The rise is mainly driven by public policies (Common Agricultural Policy ecological focus areas and coupled payments) (USDA, 2016a).

As a mandatory component of decoupled payments this policy has been implemented by EU MS to be given to farmers meeting requirements like the diversification of arable crops grown on their farms.

If farmers want to receive direct payments, they have to fulfill three elements of greening: crop diversification, conservation of permanent grassland and the ecological focus areas (EFA). These elements can be summarized as the greening component of the Common Agriculture Policy (CAP). EFAs are required to be established on 5 % of the arable land where specifically environment beneficial elements are needed. These elements (EFA types) are specified in the legislation and it is for MS to select EFA types they offer to their farmers to choose from. Where MS selected nitrogen-fixing crop (NFC) as EFA, they were also to define which NFC crops will be acceptable for this purpose with a view to optimizing their agronomic and environmental contribution to biodiversity.

Also soybeans can be applied since they are nitrogen-fixing crops. According to the European Commission (2016), 16 MS selected soybean as a nitrogen-fixing crop qualifying for EFA (BE, BG, CZ, DE, FR, HR, IT, HU, AT, PL, RO, SI, SK, FI, SE and UK). In these countries, and only there, soybeans can be declared by farmers as an EFA nitrogen-fixing crop. To count the area concerned regarding the obligation of having 5 % of EFA, the weighting factor of 0.7 must be applied. The weighting factor can be explained, as 1 hectare of soybeans equaling 0.7 hectare of an EFA area (Kruppa, 2016; European Parliament, 2015).

The CAP supports MS with their production of soybeans or other protein crops with up to two percent of their national envelopes. Additionally, MS have the possibility of coupled payments, which includes an extra payment for protein crops on top of the basic payments. These levels of coupled payments are shown in table 5 (Kruppa, 2016; European Parliament, 2015).

There are significant differences between subsidy payments in countries where soybeans are allowed on EFA areas. Beginning from 40 € per hectare in Spain up to 417 € per hectare in Slovenia. Also the requirements can vary for receiving voluntary coupled payments (VCS) as it is listed below the table (Kruppa, 2016).

Table 5: Voluntary coupled payments for soybean

Countries	Estimated rate
Bulgaria	157,00 €/ha
Croatia[a)]	260,00 €/ha
Czech Republic	n/a
France	116,00 €/ha
Hungary[b)]	209,00 €/ha
Greece[c)]	n/a
Italy	53,00 €/ha
Poland[d)]	98,00 €/ha
Romania[e)]	335,00 €/ha
Spain	40,00 €/ha
Slovenia	417,00€/ha

Requirement for receiving VCS:

a) only for fodder soy, min 4 livestock units/ha required
b) certified seed for sowing and minimum 1.0 t/ha yield
c) only for seed production
d) payment is granted up to a 75 ha max. area on a farm
e) certified seed for sowing, min 1.3t/ha hayfield and contract with processor

Source: Adapted from data obtained from Kruppa 2016.

Apart from the mandatory green payment, the MS can be flexible in other areas, such as equivalent practices in the agri-environmental programs, whether they want an individual or flat payment and if they want to apply it at international or regional level (Article 47.2; European Parliament, 2015). The Implementation of the greening payment of the CAP 2014-2020 in the EU MS refer to annex X Implementation of the green-payment in MS.

Outlook for the greening regulation

After a year of experience with greening payments the EU, Commission has made more suggestions for the Agriculture Council in terms of further development. Their statement was clear: The original goal of greening, namely more biodiversity, should regain more attention. This is important, because greening measures have been implemented to only one quarter of the land so far. Measures that are particularly beneficial for the environment should be chosen primarily i.e. follows. About one quarter of the area was used for catch crops and half of them were legumes. Especially the latter should be less attractive as greening measure. The commission proposes to ban pesticides on greening surfaces. So they deprive the ground from faba beans, field beans or soybeans. This counteracts the efforts at retail to offer more non-GMO products.

Some agriculture ministers, including the German minister, see this critically. The closure period for fallows should be extended in the calendar year from six to nine months. Thus, the crop rape would be dropped as a subsequent crop. Furthermore, the commission proposes the setting and control of buffer-, flowering and edge stripes (DLG, 2016).

3.1.5 Clubs and associations involved in the European protein strategy

Protein initiatives make a contribution to promote the European protein supply, which also supports the European soybean production. Today, the Austrian association Danube Soya is active in 19 signed states today according to the associations own information (Krön, 2016). The goal of the non-governmental organization (NGO) is the support of non-GMO soybean cultivations and the processing in the Danube region in Europe – for the brand Danube Soya. The focus is on reliable supply with non-GMO soybeans from the Danube region- and creating value chains via association members. Moreover, the guidance of a supported breeding, research, and control program for non-GMO soybeans is part of the members. Therefore, Danube soya is especially important for the EU as a base for about 200 members from 19 European Danube countries. The association is mainly funded by its members (Danube Soya, 2016a).

As opposed to Danube Soya, the protein strategy also aims at supporting protein plants to improve their competitiveness. It's important that international standards are considered. Therefore, legumes are promoted since 2013 by agricultural policy arrangements like the CAP and by projects like the National Demo Network" (Bundesweites Demonetzwerk) or the Bavarian strategy on proteins (Bayerische Eiweißinitative). The aim is to improve the cultivation and use of soybeans or other legumes like field bean, peas and lupines to support the legume research. This is organized by expert congresses, field trips, cultivation advices and online platforms. Most research projects are funded by the Federal Institute for Agriculture and Food (Bundesanstalt für Landwirtschaft und Ernährung (BLE)), whose funds will end in 2018. Furthermore, there are other associations such as the National Soy-Network called Sojaförderring, which is active since 1980 in regard of soybean cultivation. The financial support by BLE started in 2012 since the importance of soybean as a protein plant has been recognized.

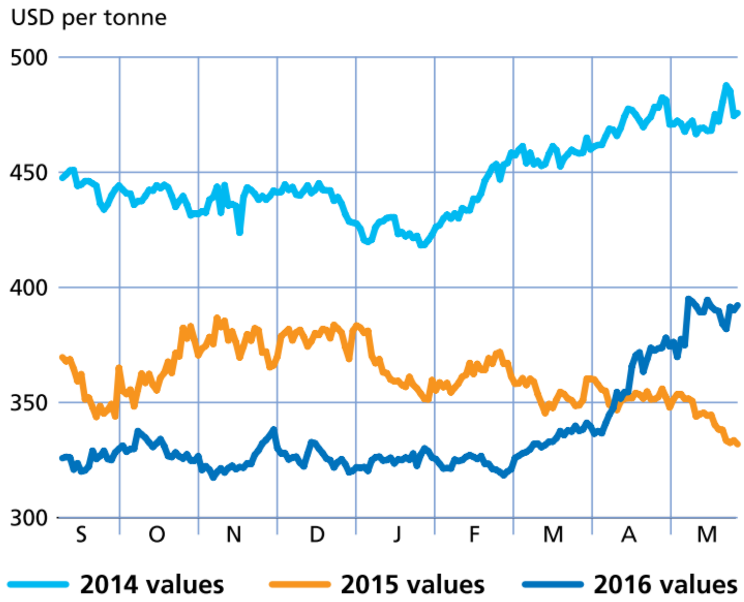
3.1.6 Pricing

While analyzing prices and pricing of European non-GMO soybeans and soybean commodities, it turned out that major information gaps exist. After contacting experts such as Federal ministries like of the Baden-Wuerttemberg State Ministry of Rural Affairs and Consumer Protection (Landesanstalt für Entwicklung der Landwirtschaft (LEL)) or the Bavarian State Research Centre for Agriculture (Bayerische Landesanstalt für Landwirtschaft (LfL)), (Thünen Institute) and the Rabobank FAR (Food & Agribusiness Research and Advisory) or Soyabrokers the unitary statement was that no general formula can be given for the pricing of European produced non-GMO soybean commodities. As also described in the paper by Tillie and Rodriguez-Cerezo (2015), actors in the supply chain (agricultural processing and wholesale) are the only possibility to receive information on European non-GMO soybean pricing. The only major processor, which had been willing to disclose prices, was ADM in Straubing.

Thus, information on what influences pricing can be given, not however, an exact breakdown of the prices. In this chapter, the available information on pricing in the soybean sector will be given.

As in any market economy, also for soybean commodities pricing takes place under the influence of demand and supply. Basically, European prices for soybean and soybean products depend on the world market prices. Hence, they are similar to the price curve of the Chicago Board of Trade (CBoT). Also European commodity buyers connect their prices to the CBoT (Burghardt, 2016; Van der Poel, 2016).

Figure 8: CBoT soybean prices



Source: FAO 2016 p.35.

Figure 8 provides an overview of CBoT prices of soybeans from 2014 to 2016 to give a sense of the price range of commercial soybeans. The graph shows for September-March 2014 an average price of 450 USD per ton. In 2016, prices are relatively low compared to the previous year with an average of 325 USD per ton. In May/April 2016, the previous downward turn in soybean prices came abruptly to an end. The line shows a steep upward trend and with it an increase in value on the previous year of about 50 USD per ton.

Reasoned by Europeans strong dependence regarding oilseed imports and the resulting products such as protein meals and vegetable oils, import duties were abolished. Hence, the supply of food, feed, as well as industrial components, is almost entirely determined by the world market (EU Commission, 2016c).

Most of the main database on agricultural prices only report conventional soybean or soybean meal commodity prices, but do not distinguish non-GM IP products. Hence, especially in regard of the price premium for European non-GMO soybean products and commodities major information gaps exist. The reason for that is that non-GMO soybean commodities are not traded at a stock exchange. Only price notations are available on that non-GMO prices are oriented (Krön, 2016).

Generally, it can be stated that the existence of a price premium for non-GM IP soybean products is explained by the following factors (Tillie and Rodrìguez, 2016):

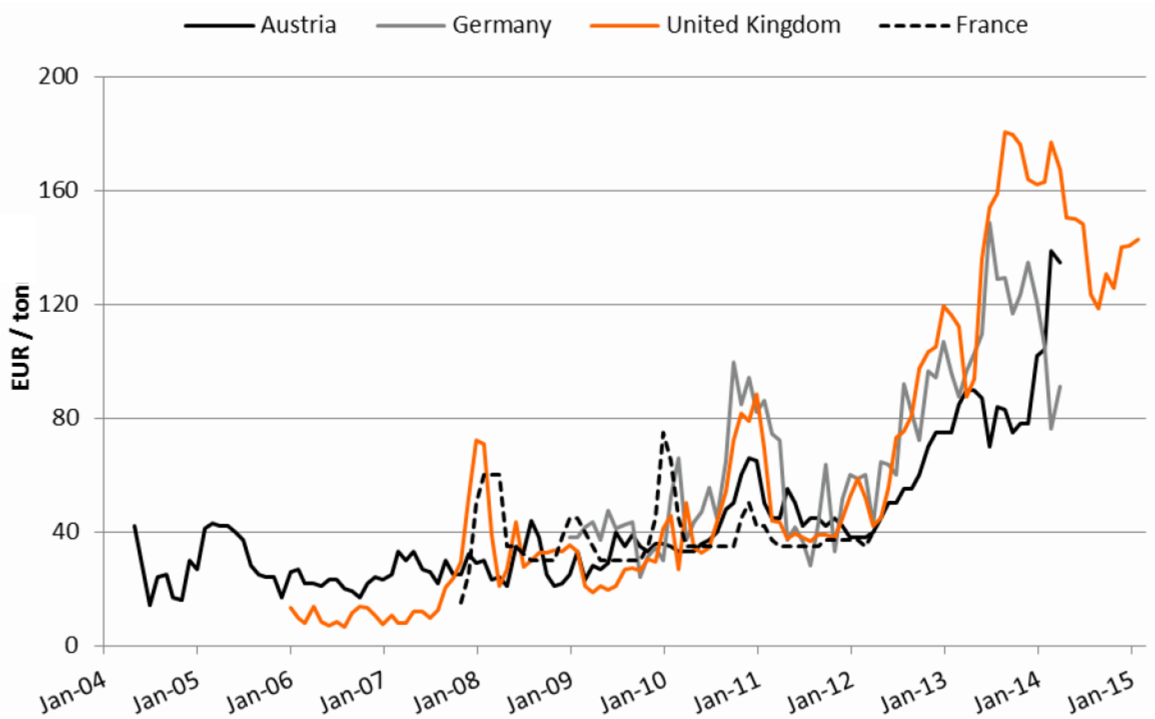
- Product segregation by producers, collection points and terminals, mills, transportation and loading in general
- Disadvantages for farmers due to profit losses for not growing GM soybeans. Thus, opportunity costs shall be compensated by higher prices for foregone benefits.
- Costs for certification and controls to preserve the identity of the non-GMO soybeans along the value chain.
- A breakdown premium levied by feedstuff producers, if commodities exceed threshold values of GMO contamination.

In addition to these components it can be assumed that the expected availability compared to the expected demand will reflect in the price premium. An increasing/decreasing premium for non-GMO soybean increases/lowers the consumer prices (Kruppa, 2016). Also the demand for the valuable soybean oil and the availability of crush capacities as well as weather/climatic extremes can influence price formation (Van der Poel, 2016).

Looking back from 2006 to 2015 it can be noted that prices of soybeans have risen drastically. The relatively high price, as assumed by the FAO, tend to remain a rather high level in the next decade after the low in 2003 (FAO, 2011). While the price for soybean meal can be explained by the increasing demand especially in Asia, rising logistics costs for the separation of products as well as the low supply as compared to the demand, were named as reasons for the currently increasing premium (Tillie and Rodríguez, 2016; Schmied 2016, Rupschus, 2016).

The premium for non-GMO soybean over GMO soybean commodities differs widely according to different factors, such as the protein content, certification level, transportation destination and country of origin. Due to the variation of protein and oil contained, a soybean commodity is always more expensive than a soybean meal, which has a higher oil content. This is why a consistent premium throughout Europe is impossible to determine. The premium for a non-GMO soybean meal of four European countries (AT, DE, UK and FR) is presented in figure 9 over the period 2009-2014. The premium for non-GMO soybean meal is usually set 15 % below the commodity price. Over the last twelve years the premium has been fluctuating between 5 to 35 % which means about 20 € and 120 € (Tillie and Rodríguez-Cerezo, 2015).

Figure 9: Price premium of non-GMO soybean meal in 4 countries (2004-2015)



Source: Tillie and Rodríquez-Cerezo, 2015 p. 32.

It is particularly noticeable that at the end of 2012 beginning 2013 the price premium increased drastically to a record high. The main reason for this development can be found in a market shortage of soybean meal due to rising segregation costs, reasoned by acreages planted with GM soybeans in Brazil. This makes it increasingly difficult as well as cost intensive to prevent from GMO contaminations.

The market responded swiftly and adapted in supply and demand. Two main movements have been observed which eased the pressure on the availability of non-GMO soybeans: firstly, some industries switched back from non-GMO soybean meal to GMO soybean meal. This was the case for the UK, DK and DE. Secondly, India has been discovered as a new and fast growing non-GMO soybean exporter. In order to bypass higher premium prices in Brazil, importers are interested in the continually improving quality of India's soybean production (IndexBox, 2015; Tillie and Rodríguez, 2015).

An example of pricing for non-GMO soybeans is shown in table 6. The price assumptions are based on data from the LTZ, the ZG Raiffeisen and the LEL. The derived soybean commodity price shall serve for orientation to estimate the soybean price for domestic non-GMO soybean commodities.

Table 6: Price* derivation of soybeans from the CBoT

Price derivation Soybeans (CBoT)	**Date: 14.07.2016**	**Exchange rate: 1.1072 US $ for 1€**		
CBoT on the stock exchange	1128.00	US ct. / bushel	374.34	€ / ton
Non GMO premium	195.90	US ct. / bushel	65.01	€ / ton
Non GMO Soybean (fob US Port)	1323.90	US ct. / bushel	439.35	€ / ton
Freight and trading costs (cif Rotterdam)	105.50	US ct. / bushel	35.01	€ / ton
Non GMO Soybean (cif Rotterdam)	1429.40	US ct. / bushel	474.36	€ / ton
Transhipment costs Rotterdam and freight paid to Southern German Fodder Plant			20.00	€ / ton
Non GMO Soybean (freight paid Southern German fodder plant)			**494.36**	€ / ton

*Based on Incoterms 2010 (without duties).

Source: Adapted from data obtained from Rupschus 2015,Schmied 2015.

Pricing Outlook:

To determine a price forecast for soybeans, Oil World and Rabobank make predictions mainly based on three global influencing factors: The demand from China, the acreage development in the US and the acreage development in South America. Another factor which affects price stability is the increasing appearance of extreme weather conditions like El Niño and El Niña (heavy rainfalls and hot/dry periods).

Increased acreages and high yield expectations in 2015 and 2016 in the US and South America lead to a well-balanced global sheet with good supplies. As a result it is assumed that demand and supply will be balanced and prices compared to the forward curve are likely to increase what should avoid declining acreages in the US 2016 (Rabobank, 2016; Market Watch, 2016).

Corresponding to that, the following table 7 will give an indication for HP, LP and non-GMO soybean meal prices expected in Germany for 2016 / 2017 (prices refer to annex XI).

Table 7: Purchase price* indication for soybean meal (HP, LP, non-GMO)

	LP – Soybean meal (44 %)		HP – Soybean meal (49 %)		Non-GMO Soybean meal
Dates	Hamburg	Straubing	Hamburg	Straubing	Straubing
07 / 16	373.00 €	396.00 €	404.00 €	429.00 €	422.00 €
08 / 16	373.00 €	395.00 €	404.00 €	428.00 €	422.00 €
09 / 16	377.00 €	399.00 €	409.00 €	432.00 €	422.00 €
10 / 16	377.00 €	400.00 €	409.00 €	433.00 €	422.00 €
11-04 / 17	375.00 €	394.00 €	407.00 €	427.00 €	422.00 €
05-10 / 17	354.00 €	374.00 €	386.00 €	407.00 €	422.00 €
*Prices are based on notations per metric ton *Prices from July 11 2016, exchange rate: 1 USD = 0.9052					

Source: Adapted from data obtained from Scheffler GmbH 2016.

The OECD is publishing price forecasts up to 2025 (see table 8). It is pointed out, that at the end of the projection period soybeans stock-to-use level will decrease. As a result, there is an uncertainty for stable prices in the future especially in case that unfavourable weather conditions will affect soybean productions (OECD FAO, 2016).

Table 8: Soybean prices for the EU-28 (2017-2025) in USD per metric ton

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025
Producer Price	351,16	315,43	381,85	416,00	407,36	424,95	443,53	459,04	487,02

Source: Adapted from data obtained from OECD FAO 2016.

Differences can be noticed between the prices on tables 7 and 8. This is because retail prices are listed in table 7 which include sanitation and processing costs, and are therefore higher than the costs in table 8, as table 8 shows purchase prices for soybean commodities on farmer level.

3.2 European soybean growing potential

This chapter illustrates the situation and actual potential of soybean growing in Europe. In order to understand the differing potentials for the growth of soybean in different regions several factors which affect the rate at which crops develop have to be considered. These are for example temperature, moisture, soil conditions and photoperiod. Soybeans require a shorter day length in order to have strong physiological growth which makes them belong to the group of short-day plants. The more the cultivation areas lie in the north, the longer the days. This implies that especially in northern growing regions a delay in maturity can be expected. Consequently there is the risk of frost days during the final days of ripening which would prevent full ripening (Podolsky, 2015).

This is a considerable fact which influences yield and has a great influence on the choice of growing areas for soybean. In the following, developments from recent years as well as potentials for the cultivation of soybeanwill be described (Palle and Licht, 2014).

In the first place, soybean is not a new crop in Europe. Italy, France and Austria have been growing soybean since decades (FAO, 2016). In these countries the production has already reached a high level and good yields are achievable. France is growing soybeans since 1779. From that time until today, the cultivation and the processing have never stopped. Italy cultivates soybean since 1760 which means, they are not only pioneers but also the most productive soybean growing country in Europe. Considerable yields can be achieved due to the cultivation of high yielding late maturing soybean varieties in contrast to most of the other European countries (cf. Shurtleff and Aoyagi, 2015).

Since the whole value chain is very mature in France and Italy these countries are self-sustaining in production and are not players on the export markets. Hence, they are highly relevant for considerations on the development of a European soybean market. In order to provide a general comparison of the infrastructures it should be mentioned, that Italy has six soybean crushing plants besides the organic oil producers (Micheloni, 2016), France even ten (fncg, 2015). In comparison the whole Danube region (after Danube Soya definitions – without Italy) has an overall number of seven up to eight crushing plants. Out of them four crushing plants are processing non-GM soybean and two plants are in the process shifting to a non-GM soybean crush.

However, in Germany ADM (Staubing) has increased the oil extraction capacities for soybean this year. Also Austria has just one oil extracting plant for soybeans (BAG, 2016). For geographical reasons Austria is currently the driving force in the European soybean market. For this purpose, the Danube Soya association was founded (Krön, 2016). Besides the already mentioned large and experienced soybean producing countries, in figure 10 also Romania, Hungry and Croatia are shown as considerable soybean producers within the European community. Also a steady increase of acreage extent is noticeable since 2012/13 as well as a fast increase of the cultivated area since 2015/16 via greening payments (USDA, 2016a). According to the Annual USDA report 2016, an increased demand for soybean commodity is noticeable through the increasing acreage in Europe.

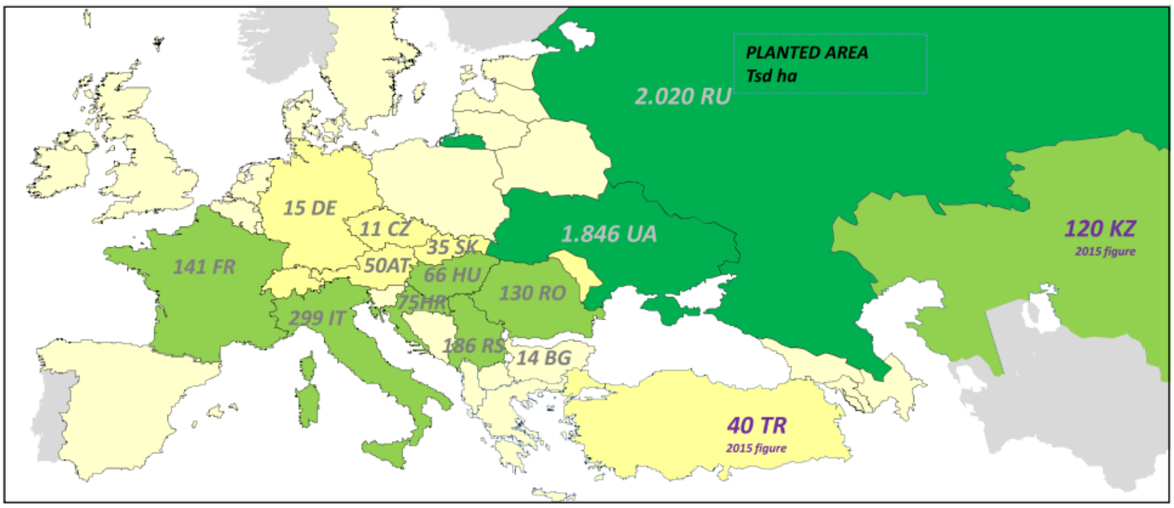
Cultivation of soybean within Europe is only possible in regions with a vegetation period of 105 to 140 days per year which equals rather early to mid-maturing varieties. Which means that the temperature sum is defined in 1500 up to 1800 degree days in relation to a value of 6°C. In general, the growing conditions of soybean resemble closely to those of corn for grain usage, both requiring warmer and moisture soils. This means that possible production areas extend a broad scope from tempered to (sub-) tropical regions. The soil temperature for germination should be at least 10-12 °C over a certain period of time (Heyland, 1996 and Hartman, 2015). This makes Romania, Bulgaria, Hungary and Croatia (EU) as well as the Republic of Moldova, Ukraine and Serbia (outside EU) countries that have a high potential for growing soybeans (Dima, 2015).

The European soybean acreages development in 2015 increased by almost 20.5 % but declined in 2016 by 3.5 %.

In 2015 Germany (17 tsd. ha) and Czech Republic (12 tsd. ha) increased by 70 % compared to the planted area in 2014. Austria (57 tsd. ha) and Slovakia (44 tsd. ha) increased about 30 %. Especially in the eastern European regions some areas have more than doubled. Hungary's (73 tsd. ha) as well Croatia's (81 tsd. ha) production for example increased by 72 %, Serbia's (240 tsd. ha) by 56 % and Romania's (122 tsd. ha) soybean production increased by 54 % (Eurostat, 2015). The Ukraine (2145 tsd. ha) was 2015 by far the largest producer in Europe but outside of the EU-28. Ukraine had an increase of about 20 % (APK-Inform, 2015).

Political support (VCS) and the availability of arable land could be a factor causing this extension in 2015 (USDA, 2016a; LfU, 2007). Thus, the shrinking demand for winterrapein the biofuels sector could be an additional essential driver for available hectares (EU Commission, 2016c).

Figure 10: Total acreages planted in Europe 2016 (in thousand hectares)



2014: 4.209,20 Tsd ha

+ 20,5 %

2015: 5.074,50 Tsd ha

- 3,5 %

2016: 4.888,92 Tsd ha

Biggest grower ***Russia***, still increasing.

France, Italy, Romania with steady increase.

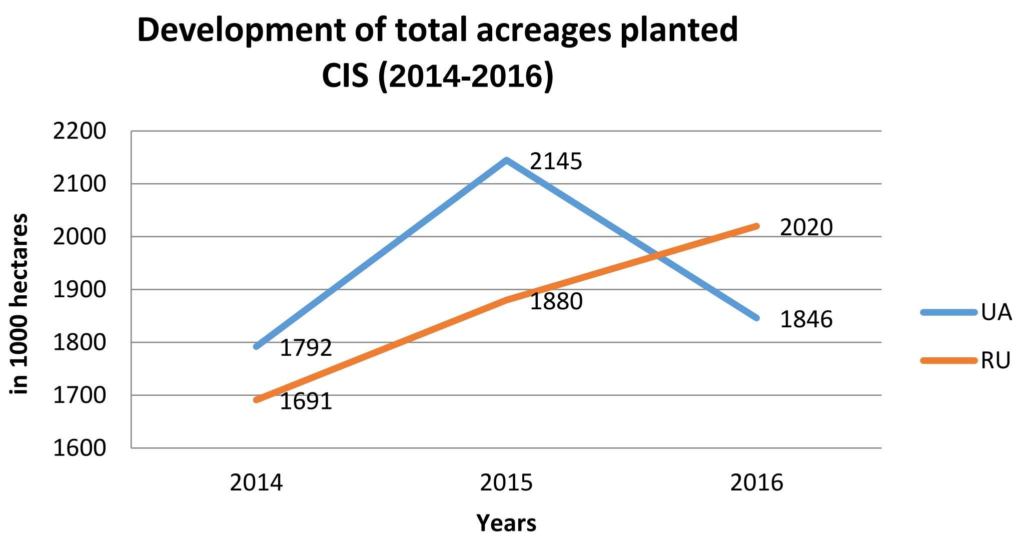
All other ***European countries*** decreased 2016.

Source: Own illustration, data obtained from Eurostat 2016, APK-Inform 2016, Gossort, 2016.

The figure is divided in three colors. The pale-yellow countries are those where soybean is grown in a smaller scale but nevertheless nameable. The light green color of the countries indicates if the country is growing soybean on a larger scale within the EU-28 and the dark green countries produce on largest scale soybeans. According to figure 10 the actual planting data in 2016, the soybean acreages are more likely to decline throughout Europe. The only countries where an increase of the acreage has been recorded is France with 141 tsd. ha (+ 39 %), Italy with approximate 300 tsd. ha (+ 12 %) and Romania with more than 130 tsd. ha (+ 7 %). In most other European countries the soybean acreage declined by about 13 % compared to the planted areas in 2015 (Eurostat, 2016).

The following figures summarize the soybean planted area from 2014 up to 2016. The area of each country is given in tsd. ha. The figures clearly illustrate the large soybean production dimensions in Ukraine and Russia. Besides France and Italy, Serbia and Romania produce soybean on nameable hectares (see figure 11). The origin numbers refer to annex XII.

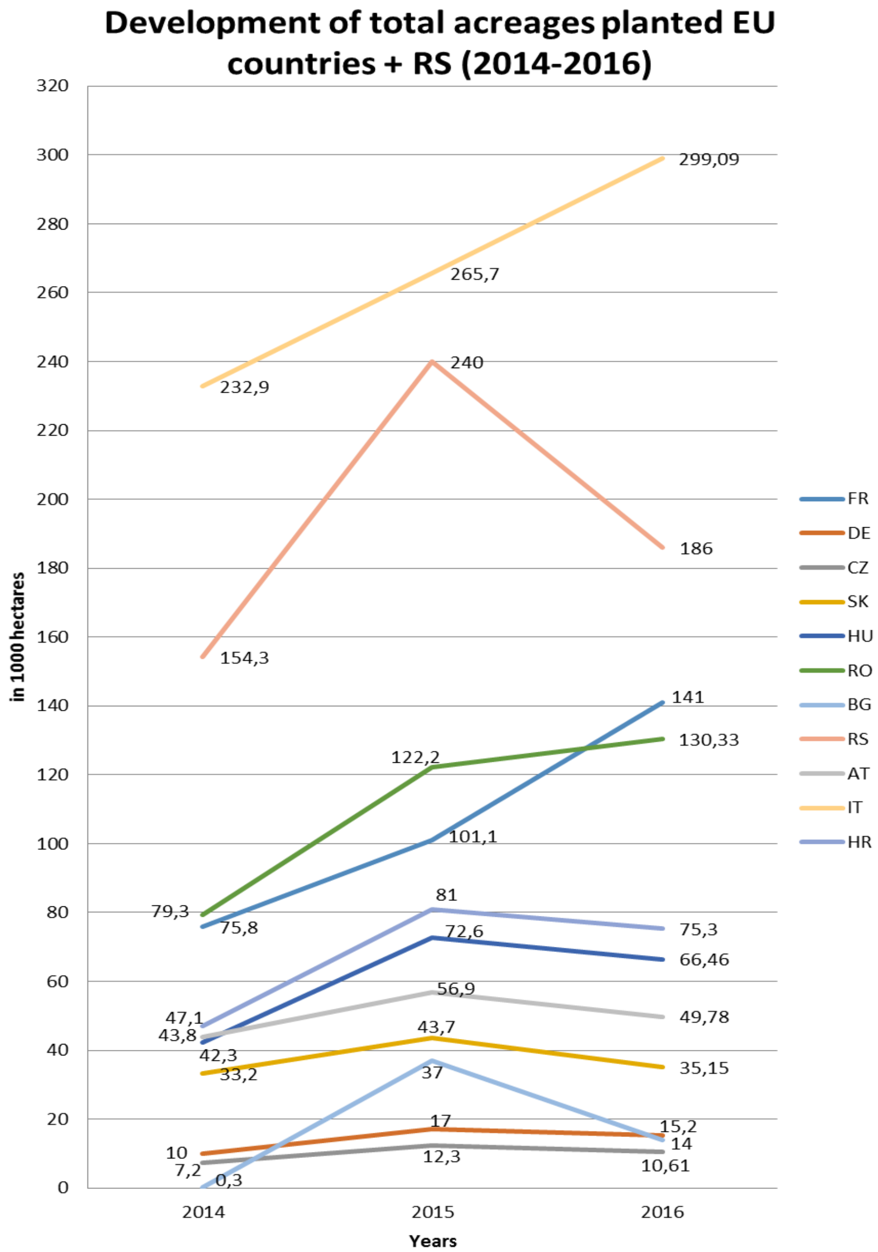
Figure 11: Total acreages planted in the CIS (2014-2016)



Source: Own illustration, data obtained from APK-Inform 2016, Gossort 2016.

The graph shows Ukraine and Russia as the strongest European producers in relation to the total planted land area. At a peak production of 2020 tsd.ha, Russia has overtaken Ukraine (1846 tsd. ha).

Figure 12: Total acreages planted in the EU + RS (2014-2016)



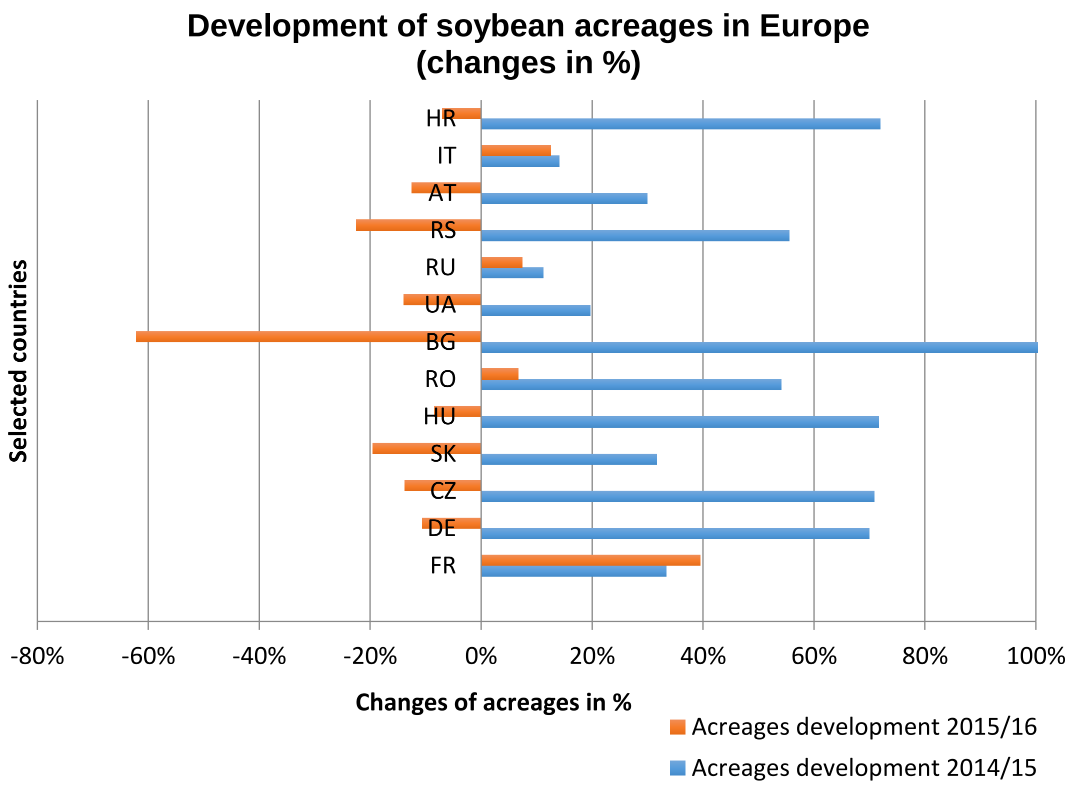
Source: Own illustration, data obtained from Eurostat 2016, Sorte 2016.

Figure 12 shows the planted acreages in EU states and Serbia. Three groups of European countries can be identified. The first group includes Italy and Serbia showing highest acreages. The second group refers to France and Romania, occupying a middle position. The rest of the EU countries is grouped in the lower-third of the graph.

Starting with the highest acreages during this period, Italy shows the strongest linear growth and reaches almost 300 tsd. ha, whereas, in Serbia soybean acreage decreased in 2016, having reached peak production in the previous year. In reference to the middle group, it can be seen that in 2016 there were more soybean acreages in France than in Romania. Both countries achieved growth in total planted area throughout the time period represented. The graph clearly shows that the planted area of most of the countries grouped in the lower-third of the graph climaxed in 2015. However, this peak has started to decrease in 2016. The reason for the peak in 2015 were linked to the greening payments and the decrease was mainly caused by disappointing harvests due to adverse weather conditions in 2015.

Soybean cultivation developments are expressed as a percentage in figure 13. This graph depicts increases from 2014 until 2015. However, most countries are characterized by a negative growth in 2016, except for the large producers: Italy, Russia, Romania and France. Overall, between 2015 and 2016 the European acreage only dropped by 3.5%.

Figure 13: Changes of soybean acreages on a percentage basis



Source: Own illustration, data obtained from Eurostat 2016, Sorte 2016, APK-Inform 2016, Gossort 2016.

Dima (2015) describes the cropping potential for soybean in Romania, Bulgaria and the Republic of Moldova with 0.8 - 1 mn ha. Hence, there is a production potential of about 2 mmt. This could represent 30 % of the yearly required demand for non-GMO soybean in the EU, correspondingly about 5 % of total EU consumption per year. However, one of the challenges with the Ukraine is that there is still a problem with an illegal use of GM soybean seed and one has to be careful with GMO contamination into the EU via importation (Birschitzky, 2016). With respect to the USDA FAS (2016d) report, within the Ukraine GMO soybeans use is estimated to be about 80 % of the overall production, despite a political ban on GMO seeds. Yet, the situation has improved in the last 2-5 years, since about 90 % seed of varieties with a GM event were grown. According to a statement from the Danube Soya report (2016b) on the Ukrainian soybean sector, since 2010 there is more pressure from the state, for large companies like agro holdings to commit to switch to non-GMO production.

Cultivation of soybean in mid-Europe is limited due to unfavorable climatic conditions (Hahn, 2015). In Germany, for example, only the southern parts of the country provide the required conditions for growing soybean. Nevertheless, the planting area for soybean is constantly growing (LfL, 2015b). Plant breeding companies which inserted or intend to insert soybean into their product range could therefore focus on the fast expanding regions in Eastern and South-Eastern Europe.

To extend the European soybean growing areas, the plant breeding research recommends very early maturing varieties (up to maturity group 000-0000). These maturity groups are important for the agriculture in order to be able to grow soybeans that mature in higher latitudes up to 51° (e.g. Thuringia in Germany), where the average temperatures are not as high as they are in typical soybean growing regions, where latitudes are usually below 48°. More about this topic will be explained in the subchapter Maturity classification.

Generally, one of the challenges that has to be faced is the gap of breeding efforts and growing expertise for soybean in Europe. There are limited numbers of early soybean varieties on the market, which are well adapted to European regions caused by a lack of breeding activities over the last 20 years (Hahn, 2015; Saatzucht Donau, 2016). Hence, breeding and growing maturity adapted varieties is an important goal in order to enhance soybean profitability in Europe through increased yield potentials. There are already projects and activities of breeders as well as the University of Hohenheim, which aim to develop early maturing maturity groups (MGs) well adapted varieties with improved characteristics. These are besides early maturing, cold resistance and an increase of protein content as primary targets (Hahn, 2015). However, if a maximum yield potential is targeted, it should be focused on common –later ripening varieties (MG I-V) planted within the adequate latitude because the short vegetation period of earlier varieties involves losses in yield (Palle and Licht, 2014).

3.2.1 Maturity classification

In high yielding and highly developed countries like North America an adequate maturity classification system is used. Different systems of maturity classification are evolved but most common is the US American System which is expressed in relative maturity (RM). There is a range of MGs from 000, 00 and 0 for northern growing regions close to Canada and for southern soybean production up to I-X in adaptation from the Northern to the Southern direction (Zhang, 2007). In total there are 13 classified MGs. Additionally, in the US classification system each classified MG is subdivided in ten numbers to designate the appropriate RM rating for a soybean variety (iGrow, 2015).

At this point the maturity classification of soybean varieties within certain latitudes is one of the important challenges within Europe. As there is no uniform maturity classification system to classify soybean varieties used in Europe, this fact complicates the expansion of soybean growing within Europe.

Neither the definitions of MGs are uniform across the EU nor is it sure, if a variety classified in a certain MG remains in the same MG in another country. Therefore, an attempt during the internship at the plant breeding company was to create a table summarizing the different systems of MGs in Europe (see annex XIII). Agricultural Ministries and Plant Variety Offices of European States which had been contacted confirmed the gap of an overall MG system in soybeans in Europe. This fact, considerably impede the European soybean market by selection and distribution of optimal adapted varieties (Hartmann, 2015; Hahn 2015). In 2014/2015 Alena Pfeiffer's master's thesis (University Hohenheim) has already focused on the same subject from an agronomic perspective.

3.2.2 Soybean acreages

In order to respond research question 4 (How much of total imports could be replaced by a European soybean production?) production capacities of Europe and the global leading soybean producers US and Brazil are investigated to define Europeans position.

As described in the previous part (European soybean growing potential), soybeans sensitivity to photoperiod and temperature represent a critical factor in increasing its further adaptation to different more northern growing zones. The relative maturity classification system serves as an assessment to account all influencing factors, which affect the maturity and the number of vegetative days to reach full maturity. Besides temperature also solar radiation, germplasm, latitude, planting date, disease resistances as well as water supply combine influencing factors.

Growing regions in the US

Figure 14 represents the US map with its subdivided maturity regions. Latitude plays an important role, because flowering of soybean occurs only when the day length is shorter than the critical photoperiod. While the beginning of flowering depends on both, day length and temperature sum, maturity is decisively dependent on temperature sum and solar radiation. Therewith a late maturing variety would not reach full maturity when planted northwards. On the other hand, an early variety planted in southern latitudes would flower too early reasoned by the shorter day length in the South. Therewith, in both cases varieties are not able to exploit full vegetative growth in order to achieve the maximum yield.

On the US map in figure 14 it is obvious that MGs begin in the northernmost with MG 00 and theoretically can be extended to MG IX in Florida. Therewith, the map only displays 11 of the existing 13 MGs. However, the most productive main region of the US is in MGs I-V. This is due to excellent surrounding growing conditions for soybeans which includes ideal sowing dates, day length, temperature sum and sufficient precipitation which offers highest yields (Fox 2016).

The top soybean producing states in the US are Illionis, Iowa, Indiana and Minnesota, followed by Nebraska, Missouri, and Ohio (USDA, 2015; Statista, 2016a).

The states with high yields are mainly between latitudes from 44°-38° within the scope of MGs II-IV. The seven states listed above had 2015 average yields of 3.5 t/ha (Miller-Gravin and Naeve, 2015).

Figure 14: Maturity groups of Soybean varieties in the US

Source: Palle and Licht 2014 p.2.

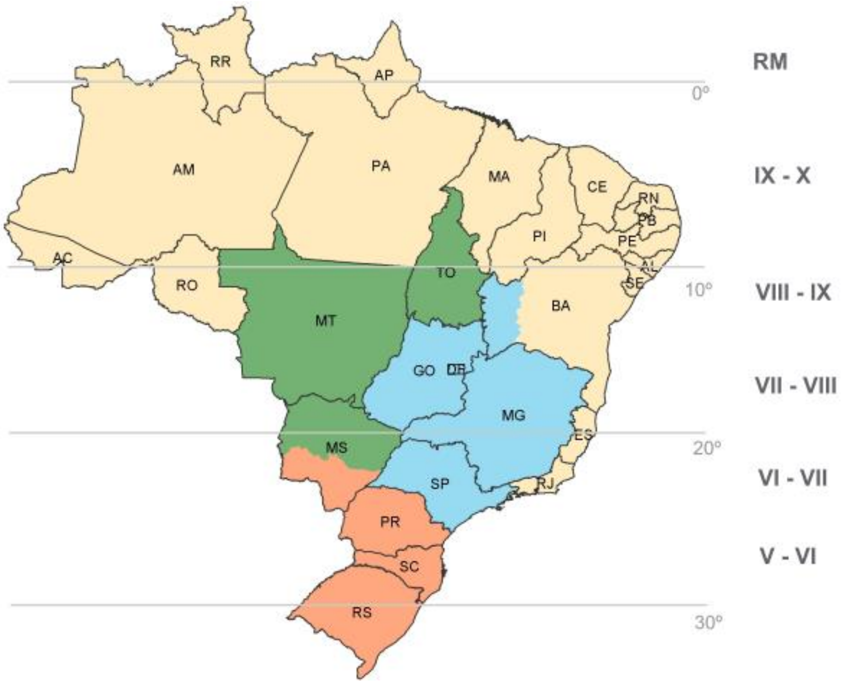
Growing regions in Brazil

The US maturity classification system also has replaced the traditional Brazilian approach (early, medium and late by region) due to the marketing activities of US American based breeding companies, as for example Monsanto (Alberini, 2009). The subdivided acreages are shown in figure 15. However, as well as for Europe until today there is no published research proving the use of the US American maturity classification system under Brazilian conditions.

The main production regions of soybeans can be divided in two regions. The south-central or Midwestern region and the south which includes Mato Grosso, Goiás, Mato Grosso do Sul, Minas Gerais, Sao Paulo, Paraná, Santa Catarina and Rio Grande do Sul. Most of the expansion occurred in Mato Grosso.

Regarding to figure 15 in Brazil overall later maturing varieties are used compared to the US. According to Paschal (Paschal et al. 2000), about 44 % of soybean are grown in the Midwestern regions (10 - 20° latitude) using late and subtropical adapted varieties with MGs from VII to IX. The southern regions are more like the major growing regions in the US. Within latitudes from 20 - 30° the map displays MGs V to VII, which account for approximately 56 % of soybean grown in Brazil (Paschal et al. 2000).

Figure 15: Maturity groups of soybean varieties in Brazil

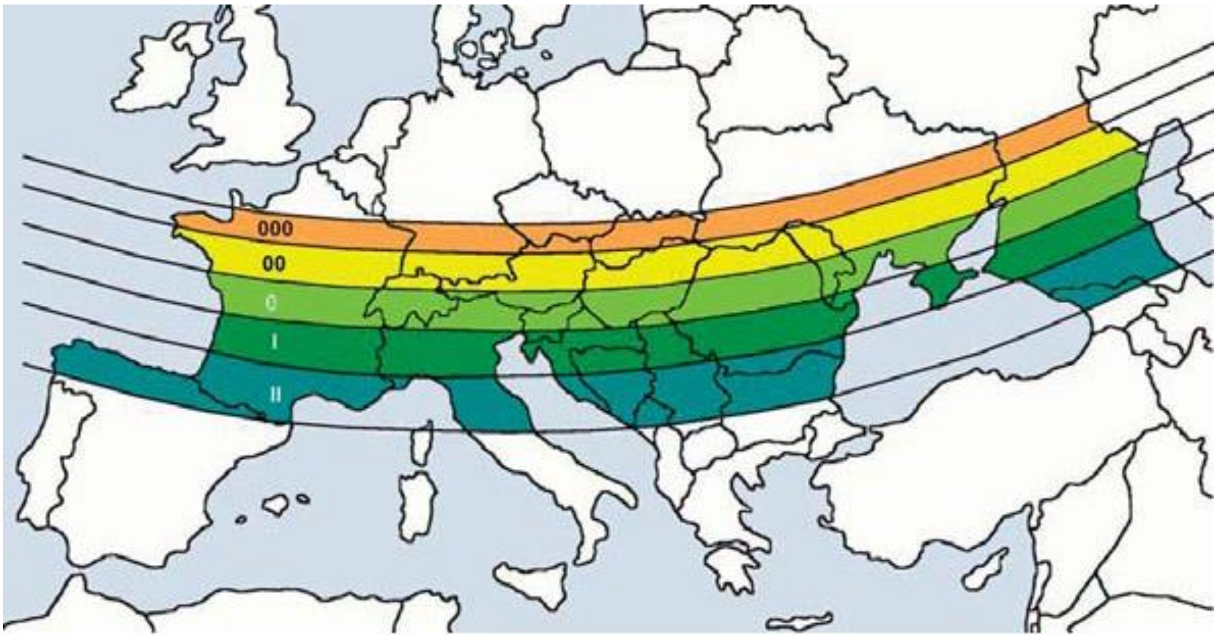


Source: Bowers, 2011 p.3.

Growing regions in Europe

As there is no uniform maturity classification system for the European Union, Miladinović et al. created a map (Figure 16), which follows the ideas of maps from the US. The distribution of soybean MGs was made on assumptions and transfers from the US American maturity classification, combined with growing experiences in Europe. The colored areas are highlighting the optimal zones for particular MGs, while the real growing area is much wider (Miladinović, 2015).

Figure 16: Maturity groups of soybean varieties in Europe



Source: Miladinović, 2011 p. 513.

Due to the intensive investigation on MGs of European countries and which standard soybean varieties are grown in countries, estimates could be made about main MGs. This knowledge about major MGs combined with data of hectares grown with soybean of each country, allowed an overall calculation assisted by own estimates to make statements of European most grown MGs.

As a result, the main cultivation area in Europe was concentrated in MGs 00-I. These MGs are grown in the European latitudes of 48°-47°. Austria for example is a typical 000/00/0 region, Hungary 00/0 and Serbia I/II.

When comparing these three growing regions - USA, Brazil and Europe, the following disadvantages for the soybean cultivation are apparent for Europe:

- Due to the rather early occurrence of low temperatures, rainfall and frosts towards harvest in wide ranges of Europe early maturing varieties are necessary (nearly 70 % are MG 000/00/0).
- The US and Brazil have an advantageous position by latitude, what provides higher temperature sums-, and shorter day-lengths. Thus, later maturing varieties can be grown.
- The planting- and harvesting period is more limited in Europe due to cold and wet weather conditions in spring and autumn.

- Precipitation in Brazil is more expectable and lasts into the growing season.
- In general, the US and Brazil have longer growing seasons, which result naturally in higher yields.

Summarized it can be stated, that crucial limits of growing soybean in Europe results from the necessity to cultivate early maturing soybean varieties.

Although, soybean genotypes have been adapted to northern areas with longer day-lengths and lower temperatures which ensures reliable higher yields. However, according to Euralis (2016) (a French plant breeding company) and Hartmann (2016), these adapted early varieties result in lower grain yield potentials as well as lower protein contents compared to late maturing varieties. From this consequence, breeding activities have to be forced in the future, as described in the last part chapter 3.2 (Hahn, 2015).

The yield level per hectare is therefore poorer in Europe than in the two compared countries US and Brazil. Therefore, the income situation for farmers in the US and Brazil should generally be higher than for European farmers. The European crop usage on arable land is considered more in detail to pursue the research question 4 about how much acreages of other crops could be replaced by soybeans.

3.2.3 Analysis of a replacement of other crops by soybean in Europe

In the EU-28 arable land is about 60 % (107,032.1 tsd. ha) of the overall utilized agricultural area (178,5411.0 tsd. ha) in 2015 (Forti and Henrard, 2016).

The most produced crop on European arable land is cereal. Common wheat, barley and corn including CCM make up the highest share with more than 86.4 % of all European cereals. 23.4 % is corn and CCM (Forti and Henrard, 2016). The most important oilseeds produced in Europe are rapeseed (69.83 %), sunflower (25.73 %) and soybean (4.5 %). The values in the brackets show the respective percentages when one presumes that these three represent 100 % of all oil crops (Statista, 2016b).

In the following table 9, selected spring crops are compared with soybeans. Soybean is a spring crop as well, hence decisive factors for or against a specific cultivation or maybe replacements will be analyzed. In reality, there are numerous of influencing factors on which decisions for a specific cultivar are based on. As the scope of this thesis is limited the focus is on selected spring crops, sunflower and corn, and chosen influencing factors.

It should be mentioned that spring barley has been neglected from this investigation, because the main growing countries of spring barley differ too much from countries where soybeans are grown. However, corn, sunflower and soybeans potentially are grown in more or less similar agricultural regions (Baruth et al., 2015). Thus, it makes sense, to provide an overview of production area, yields and prices of possibly rivaling crops (table 9).

Table 9: Production, yields and prices of competitive spring crops (Ø 2014/15)

	Area (1000 ha)	Production (mmt)	Yield (t/ha)	Commodity Prices* Oilseeds (USD/t)	Commodity Prices* Protein meals (USD/t)
Sunflower (seed)	4,229.04	9.2	2.17	506	231
Corn and CCM	9,432.44	78.03	8.27	170	--
Soybeans	730.26	1.8	2.46	362	406

*2014/15 average wholesale, 48 % protein.

Source: Data obtained from Eurostat 2016, FAO STAT 2016, USDA FAS 2016b.

As it is shown in table 9, soybeans have only small acreages and their total production (mmt) is low when compared to corn and CCM. Yields in tons per hectare for corn are a lot higher, while the crop sectors sunflower and soybean have comparable yields. It is important to mention at this point that yields in the soybean production are significantly less stable under drought conditions than for sunflower (Hartmann, 2016). Hence, soybean yields in Germany 2014 with 3.17 t/ha are comparatively high and 2015 with 2.0 t/ha are rather low modest.

With regard to pricing, soybean meal has an average of 44 USD/t more added value as soybeans commodities. For sunflower, it is the other way around. During the 2014/15 sowing Sunflower seeds achieved on average 144 USD/t higher prices than meal (FAS USDA, 2016 in annex XIV).

Table 10 shows the revenue calculation. It can be illustrated, that revenues for corn and CCM are significantly higher and therefore a high yielding soybean crop would be less competitive compared to corn when highest revenues are targeted. On the other hand, concerning revenues, soybean can compete better with sunflower in case of reasonable high soybean yields.

Table 10: Revenue calculation

		Revenue* (USD/ha)
Sunflower	506 (USD/t) * 2.17 (t/ha)	1098.02
Corn and CCM	170 (USD/t) * 8.27 (t/ha)	1405.90
Soybeans	362 (USD/t) * 2.50 (t/ha)	890.52
Soybeans (2014)	362 (USD/t) * 3.17 (t/ha)	1147.54

*Average commodity price multiplied with average yield.

Source: Own calculations data obtained from FAS USDA 2016.

Moreover, in Rotterdam Oilseed commodity prices for US commodities of sunflower (2015/16) cost 25 USD per ton more than soy beans. For this reason, the imports of sunflower instead of soybeans would be uneconomical (USDA, 2016). An exclusive examination of revenues in agribusiness is too unilateral. From cultivation recommendations and experts experience it can be emerged that local conditions cannot necessarily be compared with each other.

Water supply is an essential limiting factor in agriculture, which is decisive to achieve optimum profits and optimum yields in crop rotations. Besides the revenue situation, a second major profit influencing factor will be analyzed based on the crop water needs and the sensitivity to drought (see table 11). In general, this is a very complex analysis which includes different types of water uptake and soil moisture availability. In this case, it is a simplified isolated comparison of both factors based on data from the FAO and expert's knowledge. A detailed analysis would go beyond the scope of this thesis, as it only will be shown, why or why not acres of a certain crop could theoretically be substituted by another.

Table 11: Crop water needs and sensitivity to drought

Crop	Crop water need (mm/total growing period)	Sensitivity to drought
Sunflower	600 - 1000	low-medium
Corn	500 - 800	medium-high
Soybean	450 - 700	low-medium

Source: Adapted from data obtained from FAO n.d.

The duration of growing periods is different depending on areas and environmental factors, e.g. temperature. Thus, the table provides minimum and maximum values for crop water needs in accordance to the duration of the growing period (FAO, n.d.). As shown in the table, sunflower has the highest water requirements for total yields compared to corn and soybean. But, according to the FAO (2015) and experts, sunflower is able to withstand drought periods after flowering with a decelerated reduction of the yield potential. For each crop, water deficiencies in different growth stages result in different intensive losses. The most water sensitive period is the flowering stage. In this case, flowers could not reach full development, which leads to yield losses (FAO, 2015). Other growing stages are less sensitive to water deficiencies in respect to yield. Experts reported from experience, that sunflower has the ability to achieve satisfying yields (2 t/ha) even if precipitation were minimal since flowering. This does not mean that sunflowers in high quantities are tolerant to drought. However, they are capable of delivering high yields under drought conditions. (Schuster and Marquart, 2003; Hartmann, 2016).

Based on the FAO data, corn has lower water needs, but is more sensitive to drought. The occurrence of drought during flowering affects growth and ear formation, due to insufficient pollination. In consequence, this results in considerable losses of yield and yield potential. However, under consistent conditions of water supply corn as well as soybean show a strong correlation to high yields (Ehlers, 2013). For soybean, the table provides the same sensitivity to drought as for sunflower but water needs are lower. Despite of that, soybeans are extremely sensitive towards water deficiencies (Imgraben und Recknagel, 2016). This happens especially from the stage of flowering until pod filling which is from late July to mid-August. Within this period, water shortages cause massive flower and pod dropping and hence considerable yield losses (FAO, 2015).

In addition to those mentioned above, sowing of winter crops in autumn influences available acreages for spring planting. If the conditions are too dry in autumn, rapeseed will not be sown in winter. However, if the soil conditions are too wet, winter wheat cannot be sown. Since both winter cultivations will not be harvest before early summer (May-August), sowing of winter crops is an important factor for spring planting. (Hartmann, 2016; AMIS, 2015).

Altered crop rotation cannot be ignored as well. As soybean and sunflower belong to foliage plants, a substitution between both crops would be theoretically reasonable (Hartmann, 2015).

In order to fully and correctly refer to the exchange worthiness of the three cultivations corn, sunflower and soybean, hereinafter the spring cultivations will be discussed with the above-mentioned influencing factors. Cultivating soybean rather than corn is environmentally possible, as corn locations are equally advantageous for soybean (Imgraben und Recknagel, 2016; Hartmann 2016). With regard to revenue of corn and soybean it hasn't any economical purpose-driven substitution. Corn achieves significantly higher yields per hectare, especially when sufficient water is available. Furthermore, corn as starch plant has worldwide a more major position than oil plants (soybean), since corn ranks among the most important crops (wheat, corn, rice) of world nutrition (Wilhelm, 2012). Those could be arguments that prevent the substitution of corn by soybean. Locations, that show too dry conditions for good corn yields, are alternatively planted with sunflowers. The decisive reason therefore is that they respond much slower to water shortages. Sunflowers also respond to water shortages with yield losses, but lower than other types of cultivation and more slowly. Especially soybeans could respond to dry periods with total crop failures.

In summary, it can be said that, besides the disadvantages regarding profitability of soybeans compared to corn and sunflower, also the sensitivity of a cultivar to environmental conditions (drought, water scarcity) or crop rotation represent crucial cultivation criteria's. Hence, this chapter elucidates that a realistic assumption of the ability to substitute crops depends on a variety of factors and that such an inquest would be too complex for this work. The findings that emerge from this chapter will be taken up again in the results section and the discussion.

Outlook for European acreages development

According to the OECD (2016) forecasts, rising yields per hectares are expected for cereals and oilseeds in Eastern Europe. Especially for soybeans the strongest increases in yield are predicted. Because soybeans as a rather new crop for some areas in eastern Europe are expected to increase due to better adapted varieties and the appropriate crop management by farmers. However, in total Eastern Europe yields are not forecast to exceed global averages. For western Europe, the OECD (2016) forecasted predict a further concentration on cereals but for oilseeds the production is expected to decrease.

Based on several expert statements (Van der Poel 2016; Stoll 2016; Hartmann 2016) it can be assumed that the potential for European non-GMO soybean production which can be added towards the existing produced amount is a rise of maximum 20 % of the annually imported amount. Proceeding from a total of 33 mmt of imported soybean commodity (Ovid, 2015) which are named in chapter 3.1.1 the following model calculation can be made: At current, the named 20 % of 33 mmt soybean imports would be 6.6 mmt. Assuming an average yield in Europe of 2.7 t/ha (Ovid 2016; Oil World 2016), this results in an additional future crop area of 2.4 mn ha of soybean Today soybeans are produced on 5 mn ha in the EU + CIS, a growth in the planted surface by 48 % would hence be expected. This equals a future total of 7.4 mn ha. This development could only be based on crop substitutions as there are none or scarcely any additional acreages of arable land available in Europe.

4 European soybean market analysis from experts' view

In this chapter the results of the expert interviews will be presented. First the analysis scheme based on the categories which have been set is introduced. As explained in subsection 2.3.4 the analysis was computer assisted by Atlas.ti due to a two-cycle categorization scheme. In order to involve the readers and enable them to better understand the correlations between expert's statements, extracts from the interviews have been comprehensively summarized without affecting the meaning. For this purpose each of the interviewed experts revised their respective summaries.

4.1 Analysis of the expert interviews

As the ten interviewees were selected in a manner that allows comparing the statements in relation to another interviewee from the same market segment, the two interviewees belonging to the same market segment will be analyzed jointly. In that way, the perception of the respective branch shall be reflected.

In the first round of the computer-based analysis the interviews were analyzed paragraph by paragraph and according to the following categories:

1.) **Intentions:** From the viewpoint of the interviewees this category codes the interests and purposes of a European soybean market.
2.) **Chances:** Current favorable market conditions or developments which are observed by experts, that can influence the European non-GMO soybean market.
3.) **Forcing factors:** Factors which can, according to the experts, positively influence and promote the EU soybean market.
4.) **Barriers/ limitations:** Factors which can, according to the experts, negatively influence and hinder the EU soybean market.
5.) **Challenges:** Changes in the market that, according to the experts, need to be implemented first in order to increase the chances for the EU soybean market.

The second round of the interview analysis was done after the results of the first cycle were investigated. This cycle specifically followed the objective of the thesis to find out about the most important chances and limitations for the European soybean market. It became clear that all identified chances and limitations from the first round can be sorted towards the six topics: regionality, animal feeding, economic efficiency, policy, market and environment. Hence, in the second cycle the chances and limitations were coded using these six categories.

All interviews were analyzed in the same way according to the defined scheme. The sequence of the interviews is the same as already presented in table 1 of chapter 2.3.1 and therefore is based on the value chain. The scheme was designed to specifically address the objectives of the thesis. At first, the companies and positions of the interviewees are introduced. This is followed by summaries of the expert statements which could be sorted towards the specific categories as listed above.

As for the first category Intentions the statements of the experts are almost identical, this category is being summarized once in the beginning rather than reiterating each sector separately.

Intentions of a European soybean market from all sectors

The question about the intentions of a European soybean market was answered almost identically from all interviewees. The goal is to become more independent of imports from overseas. The explanation is that Europe is highly dependent on Brazil based on the current structures. The secure supply of proteins, which is required for the processing, is the goal. It was also emphasized that the protein gap only exists in the processing industry, not however, if the soybean was consumed directly by humans. Due to the strong focus on the processing industry for soybean, catastrophic conditions are assumed, should the protein supply terminate abruptly.

Because the developments are, according to the experts, mainly based on the greening, also the aims of the Common Agricultural Policy (CAP) are named as intentions. This means to act more sustainably and ecologically in agriculture as well as make the agricultural sector more competitive. This is seen as the reasons for funding by the experts. Furthermore, this is the reason for the formation of a new market. This means, the GMO regulations are used for creating a new market niche and establish a new market, if the demand is high enough. Hence, the Inner-European added value could be increased.

4.1.1 Research and development

The first segment of the value chain is research and development (R&D). In this segment the interviews started in December 2015. The interviewees were Mr. Miersch and Dr. Volker Hahn, both chairman of the association Sojaförderring, which was already established in 1980 as an association for soybean interested persons and institutions in Germany. Dr. Hahn is head of the working group for soybean breeding at the Landessaatzuchtanstalt (State Plant Breeding Institute) of the University of Hohenheim. Currently, there are still several ongoing projects in breeding climatically-adapted and profitable soybean varieties towards a genomics-based screening system. The decision towards soybean cultivation came in 2007 after the market for sunflower in Germany became too small. Mr. Miersch is chairman of the agricultural center for soybean cultivation and the development of the Taifun Life Food GmbH. The company is the biggest European manufacturer of organic tofu and supplies a total of 15 European countries. In their tofu production regional and organic farming plays a particularly important role.

Chances

Both interviewees believe that the trend towards regionality will prevail as this can currently be seen in several areas. Society is increasingly approaching nationalism, external fears are increasing and people believe what is grown here is better (Hahn, 2015). Mr. Miersch believes in a huge increase of regionality. The background is similar to Mr. Hahn: The desire of consumers to get back towards the manageable basics in an increasingly globalized world.

In addition, soybean has the significant advantage of a very good amino acid composition which makes most of the feeding stuff compounds dependent on soybean. Even though soybean utilization can be reduced, it is not possible to replace it entirely. If field beans and field peas also had the quality of soybeans, it would not be necessary for the 2-3 mmt of imported soybeans from Brazil annually. Furthermore, soybean provides an alternative after more and more problems with rapeseed evolved. Through low input factor costs soybean could even compete with other crops. EU soybean commodity has to compete with world market prices (CBoT), as feed stuff manufacturers would otherwise obtain their products from Brazil. In addition, after the boycott of Russia, there is a chance to bring the East closer to the West again. From a breeding perspective there will not be any problems to grow soybean in Europe. Taking corn (silage and grain usage) and winter rapeseed as forecast models also soybean could be grown widely. It is important that produces soybean, being competitive to the world market price and/or a price premium, can be charged based on its regionality. Dr. Hahn claims that this premium shall not be based on the freedom from GMO as in ten years genetic engineering could no longer be detected. Hence, the EU could therefore no longer stay GMO free like an island (Hahn, 2015).

Both consider the greening as successful, yet one cannot rely on political subsidies since they can change very quickly. From an ecological perspective crop rotations are needed, especially legumes. In contrast to other legumes soybean is the only alternative which could be profitable (Miersch and Hahn, 2015).

Both identify opportunities in contract farming, which initially offer the farmers the necessary security so as to dare cultivating soybean. Furthermore, it depends on what is demanded in the crop rotation. What is the preceding crop effect and profit contribution? Even though soybean could not compete with corn, but it could be the second best option. With barley, for example, soybean could easily keep up. Also the fact that large companies such as ADM are reconstructing in order to process proceed regional, soybean must be based on a well-observed movement in recent years. The reason for that is a company would not decide on social personal philosophy but with which practice they can earn money (Miersch, 2015).

Market forcing factors

Especially the Danube Soya association with all their members drives the movement. Without the association Danube Soya the development would certainly not be that far. Also the memberships in clubs and associations are very important in the beginning. Networking is decisive. But also the absorbing hand is a driving force, feed mills and processors which are the primary consumers and they can pay adequately. This is then followed by more cultivation. Consumers slowly follow. Nutrition and rationality are often officially addressed, which also shows for example in the trend towards animal welfare (Hahn, 2015). Also green genetical engineering can be a forcing factor. Thus, this has also been the driving force of the Taifun contract farming, as genetic modification and organic are not compatible (Miersch, 2015).

Market barriers

According to the two experts the environmental conditions and finding adapted varieties are two of the major challenges that still exist today. Our yields are not necessarily low, if so, only due to regional conditions such as day length and climate (Hahn, 2015). Especially the cold night temperatures are a critical point (Miersch, 2015). There is a lack of adapted varieties and also in the field of seed germination capacities we face difficulties. However, to purchase qualitative seed from Canada the risk of GMO contamination or GMO traces is too high (Miersch, 2015). Another barrier is the maturity classification scheme and that a Serbian 00 maturity does not correspond to a German 00. Even though Crop Heat Units (CHU) can be calculated, it is still up to the farmers and their willingness to take risks. Late varieties produce higher yields, but might also face the risk of not being able to reach full maturity. European CHUs therefore offer a first indication (Hahn, 2015). The politically motivated zero tolerance for soybean seed is one of the major problems as the limit value zero no longer exists in reality in a system with such intense exchanges (Miersch and Hahn, 2015). It is discouraging that one cannot grow anymore when the smallest GMO contaminations are detected, even though such contaminations are not toxic (Hahn, 2015).

Furthermore, the areas are too little for the major companies to enter the soybean breeding business, which would create an entirely different potential. From the side of the consumers lacking interest in the factor feed is a barrier. Eggs based on non-GMO feed are going well, but, in the pork sector people are not interested in what has been fed to the animals. Overall the purchasing behavior is still too much price-oriented. This means that soybean in the food industry, for example soy milk, might only become popular if it will be cheaper than cow’s milk. Another crucial barrier is the lack of education of farmers in the Eastern countries, where an enormous potential of arable land is available (Hahn, 2015).

Besides the dependencies also the overproduction of cereals based on a strong lobby is a barrier which hindering the development of the soybean market (Miersch and Hahn, 2015). Reasons for the global production distribution are the cereal and meat lobbyism.

Dr. Hahn: “Surely lobbyism is happening. The cereal people are intensely fighting soybean as they would like to grow and export more cereals and therefore rather import soybean. […] it certainly makes no sense to clear the rainforest in the long term view and import soybean, only to be able to produce pigs which we do not need and export them again. This is really pretty crazy in large parts” (translated from German).

Challenges

It depends on what one would like to achieve. For plant breeders large production acreages are important, which would be well to combine with the current trend of increasing animal production. However, it was the aim to achieve a change in consumer behavior including less meat consumption a significantly smaller area would be sufficient. Furthermore, the question is whether large breeders would invest into soybean breeding or not. Despite of that, there is confidence within the soybean food industry. It is expected over the next years that the consumption of soybean based food will increase (Hahn and Miersch, 2015). According to Mr. Miersch the most difficult issue at the moment is to find farmers who are willing to engage in the procedure of recognition and treatment. Knowledge transfer among farmers and agricultural consultancy in order to enable farmers to deliver soybean commodity to the grain elevator at the same place where they deliver their wheat, would ease the situation. In the long run Dr. Hahn believes that the GMO contamination will be no longer a problem because new GMO methods might no longer be detectable. Possibly the topic of GMO would therefore no longer be relevant.

4.1.2 Plant breeding industry

Saatzucht Donau and the Norddeutsche Pflanzenzucht (NPZ) Hans Georg Lembke KG were selected as interview partners to cover the value-added chain within the plant-breeding industry. Associates of the companies Saatzucht Donau, Saatbau Linz, as well as Probstdorfer Saatzucht are devoted to research and breeding of soybeans for the last 30 years starting in the 80s and 90s. At Saatzucht Donau the respective interview participants were the CEO Johann Birschitzky and the soybean breeder Bernhard Mayr. NPZ is a family business, which is specialised in breeding of oleaginous crops, grain legumes, and forage crops. At the NPZ Katrin Beyermann was interviewed, who is in charge of the international sales in particular. However, despite the fact that soybean is part of their product portfolio NPZ is not involved in cultivating soybean as a commodity. Both enterprises are involved in the European and international market.

Chances

Ecological advantages of soybean cultivation are particularly the increase of diversity within the European landscape that is mainly shaped by cereal production; furthermore, soybean accumulates nitrogen, thus there is no need for further nitrogen fertilization. According to Birschitzki this may be especially interesting for eastern European farmers, since the production of soybeans at low cost is quite appealing in times where prices for agrarian products are plummeting, as it is currently the case. Cultivation of high yielding crops, such as rape, could thus recede, because farmers dread the high effort in farming. In spite of the fact that soybean cultivation does not benefit from any farming subsidies except greening, soybean production is increasing in countries such as Austria, Germany and the Czech Republic. Saatzucht Donau sees the future outlook very optimistic and Birschitzky and Mayr believe that efforts to breed soybeans are a relatively sustainable investment.

All interview participants stated unanimously that the current increase of agrarian lands together with a continuous rise of EU soybean production are politically intended and the issue of GMOs still displays a great deal in the fodder industry. GMOs are negatively associated in the EU and refused by consumers. Hence, decision makers expect an increase in demand for GMO-free products in the long run. This trend is currently also observable when it comes to raw ingredients within the food retail chain and demand for European GMO-free soybean-products is believed to advance further. According to Birschitzky it is foreseeable that consumers will be rejecting GMOs in the coming 5-10 years, particularly in the food industry. Consequently, he expects either a division of the soybean market into two parallel markets, or a further increased establishment of an explicit GMO-free market for raw food products (Birschitzky, 2016).

Moreover, Birschitzky and Mayr see a competitive advantage of European producers due to restrictions on imports as well as a political zero tolerance in respect to seeds. However, a zero tolerance policy is almost impossible to fulfil for seed importers. Furthermore, Birschitzky is convinced that further increased consumer awareness and a food retail living up to its sustainability standards will unleash an enormous potential in the European market for marketing GMO-free soybeans that will have been produced within the EU boundaries. According to Mayr especially south-eastern areas of cultivation in Europe might become the dominant production region. In accordance, Saatzucht Donau sees its competitive advantage in exporting qualitative and certified soybean seeds. The company believes in a soaring demand for qualitatively high seeds with high germination ability on eastern European markets and in CIS countries, which could not be supplied up to that amount without EU exports. Furthermore, both enterprises emphasise advantages for farmers when it comes to the positive effects of soybeans in regards to crop rotation as well as added value for livestock farming. The interview participants draw a comparison to corn-/soybean production in the US: “For the case that relatively similar areas are being farmed with corn and soybeans – 30 mn ha in the US you can see that soybeans are competitive viable towards corn. The same is essentially possible for certain regions in the EU” (Birschitzky, 2016) (translated from German). Concerning the yield Birschitzky and Mayr have no doubt that European producers are competitive. Cultivation areas in North America might be larger; however, the production yield in Austria is stronger due to a strong mechanization. Also, European farms have more opportunely labour peaks in terms of temperature and crop rotation in comparison to North America, thus there is more time for seed preparation and sowing time. North American farmers are often confronted with delayed seeding dates due to late frost and wet conditions during spring time.

Market forcing factors

Especially the engagement from the Danube Soya association is perceived by experts a leading force regarding the development of a European soybean value chain. Birschitzky emphasises the organised B-to-B-meetings, which promote a movement within the value chain. Looking at the classic market dynamics a market is determined by supply and demand; however, when it comes to GMO-free soybeans that are produced in Europe, Birschitzky believes that the supply depends asymmetrically on the consumers’ behaviour. Political intentions are not enough to push for GMO-free soybean production in Europe (Beyermann, 2016). On the other hand Beyermann states that farmers in particular are the decision-makers, due to the fact that as producers they have to respond to the consumer’s demands. Especially the political greening-regulation has proven to be a successful driver. Soybean production was able to establish itself well despite that greening in fact promotes all kinds of legumes, e.g. beans, peas, alfalfa, lupins. This depicts that soybean production actually developed well quite independently in the past (Birschitzky, 2016). Beyermann acknowledges the beneficial effect the greening measure has had, however, based on past experiences with other grain legumes she does not believe in positive long-term effects. Those were also cultivated on small areas in Eastern Europe for a long period of time, however, also recently boosted in production only due the greening program.

Market barriers

One of the main market barriers towards competitive GMO-free soybean production from Europe is the fact that the fodder industry as quantity buyer still prefers soybeans from South America. South American producers can guarantee goods in bulk that are throughout consistent in quality, which, at the moment, European producers cannot ensure (Beyermann, 2016). Beyermann outlines the difficulty for farmers to offer consistency in production. Caused by the weather in 2015 the harvest was particularly bad and farmers currently have to overcome it by richer soybean harvests in the future. Drought as well as insufficient experience lead particularly in Hungary, Romania, and Bulgaria to extremely low yields and created mental reservations towards soybean production. Additionally, Beyermann doubts that soybean commodity imports will cease completely. On a global scale meat-based diets and eating habits will be soaring further and thus demand for soybeans as fodder will be increasing respectively. Also Saatzucht Donau confirms that European producers have not the capacity to substitute soybean-imports within the next 5 years, since designated areas with according quality are not yet available. This, however, should not be a reason to discourage a further working towards the above mentioned goals. All interview partners confirm heavy obstacles due to the zero-tolerance policy on GMO-free soybean production for the seed industry. According to Birschitzky soybean imports from Brazil are able to come close to the European threshold value of 0.1 of GMO-contamination, however, the situation with seeding material is substantially more difficult. The reason is that many soybean producers in Canada have switched to planting with genetically modified seeds. On the other hand this also means that Canadian producers have lost connection to the EU seed market. Lastly, another problem poses lacking wholesale buyers and processing plants for GMO-free soybeans in Germany (Birschitzky and Mayr, 2016).

Challenges

Only taking into consideration the areas under cultivation of soybeans the production already seems to be economically viable. However, every farmer has to decide for himself whether or not soybean production will pay off. In this regard the acceptance as well as value adding must rise, for instance through a broader application of small soybean toasters (Birschitzky, 2016). Thus, livestock farmers would have the possibility to process regionally produced soybeans for fodder purposes and reduce the acquisition of imported soybean-fodder.

Furthermore, it is important that import obstacles of soybean seeds should not have any impact on the soybean seed-breeding in Europe. It would be sensible to create coherent and uniform standards for different soybean breeds within the EU. Due to Europe's geographical and climatic diversity this poses difficulties when it comes to maturity classification, for instance. Coming up with a uniform system to distinguish different MGs is an important step forward, however, it would need more time to match different maturity classifications (Birschitzky and Mayr, 2016). All interview participants stated that particularly information flow, and marketing are still in its infancy for the European soybean production and market, and a further improvement is essential.

For Beyermann farmers play a crucial role in this regard. They have to increase their know-how on soybean production within the European area if they want to increase production yields. Additionally, Beyermann states, is it yet unclear which and how much land is essentially eligible for soybean production at what production yields. This would clarify the actual European potential of soybean production (Beyermann, 2016).

4.1.3 Acquisition and processing - feed industry

In order to represent the perspective of the feed industry, staff at the Raiffeisen feed factories in Kehl (RKW) and Josera were interviewed. RKW is suitable as its business philosophy is based on the freedom of genetic engineering and regionality. The interviewee, Mr. Bernhard Stoll, is the managing director of RKW. He is also involved in the organization: Food without genetic engineering e.V. VLOG. In contrast, Josera is a family-based company that not only produces agricultural feed, but also pet food and feeds with special additives. Purchasing manager, Mr. Andreas Marquart, confirms that Josera products are all free of genetic modification. Furthermore, he emphasizes the high quality of its products.

Chances

Both feed producers are in agreement that a regional non-GMO soybean market could have the advantage of being able to market end products better. Products need an added value to ensure their market position. For this reason RKW only purchases raw commodities that are under 0.1% GMO contaminated. According to Stoll, these products are sold for higher prices, which are achieved by adding value to the end products. Marquart also describes the completely non-GMO quality assurance of Josera. In his view, if Josera also produced GMO products it would cause customers to question the integrity of the company. Marquart sees regional products and non-GMO products as the preferred marketing strategy. He considers the independence of overseas imports to be irrelevant to large processors. Getting a higher added-value would depend on marketing. If they could pass the 10% higher costs on to end-consumers, they should be redistributed to the single segments of the agricultural value chain. It is difficult, but conceivable. Given the marketing of the products, customers pay more for them, even if the quality of the products is not superior.

Both interviewees currently see good opportunities to expand soybean acreages in Europe. Marquart predicts cultivation increases for the next three years, regardless of political support such as greening. It would make sense to value regional commodity flows instead of the globalized economy for the medium-term. Due to natural regulation of the market, according to Stoll, there is an economic limit of about 35% of regional non-GMO soybeans that can be placed in efficient market structures. In addition, there still exist enough providers and consumers for conventional, cheaper, GMO gray goods and end products. Hence, regional non-GMO soybeans will probably remain a market niche.

Soybeans are the most important regional protein component and are economically feasible, especially in the monogastric sector (Marquart, 2016). This cannot be replaced by other protein sources. Even if rape, grain legumes, and CCM are used as substitutes, soybean will be preferred in 30–50% of cases in the near future (Marquart, 2016). According to Stoll, this is an important aspect as substitution with other proteins would be difficult, e.g. through lower crude fiber content for monogastric animals. Stoll primarily focuses on the largest European soybeans consumption in the poultry sector (laying hens and broilers). This is because the simple value chain (without turnovers or different places to fatten and slaughter) can use high quality feedstuff (Stoll, 2016).

In Europe there is a high value placed on non-GMO food and seed productions (politically, and also increasingly for consumers). It would be an advantage to guarantee reliable amounts of high-quality non-GMO soybeans in the European market. The reason for this is that by controlling the soybean seeds from overseas there can be financial costs and difficulties in relation to GMO contamination. Test on a seed lot cost about 100 € per examination. This is reflected in the surcharge of 3 € per ton for analysis (Stoll, 2016). Hard-IP-commodity, which is tracked and certified throughout the whole commodity flow, also costs more than conventional products (Marquart, 2016).

The aim is to meet the existing demand for high quality and regional soybeans. Stoll states that he isn't worried about the future of the European market. The market development for more regional products, as well as the extension of European soybean acreages, indicates that situation.

Market forcing factors

Since the media and NGO's are seen as driving forces, they strongly influence public perception of agricultural activities. They are able to control public concerns in certain ways (at least, some parts of the population) (Marquart, 2016). This phenomenon is especially evident in Europe when discussing GMO and non-GMO. Marquart and Stoll agree that food retailing has a significant role in respect to the marketing of regional products. They can heavily influence consumer interests for regional non-GMO soy products (Marquart, Stoll).

Besides large-scale processors and food retailers, farmers are seen as decision-makers, according to Stoll. Agricultural policies affect the market and cultivation. Ultimately, growing and harvesting must prove to be worthwhile in the long term for farmers.

Market barriers

Stoll thinks that there is a restriction in the use of high-quality, non-GMO soybean in cattle and pig production. Usually, soybean is not used for cattle; other feeds and rape are used instead. Pig farming would suffer excessive financial pressures in order to use expensive European non-GMO soybean products (because of low prices for pork meat) (Stoll).

Furthermore, both Stoll and Marquart agree that local areas for soybean production are severely limited and would not be able to support a self-sufficient soybean market within Europe (Marquart, Stoll, 2016).

Challenges

The challenge will be to create the appropriate marketing concept for non-GMO products, since GMO and non-GMO products will always compete (also in terms of price). If prices for those of non-GMO soybean commodities would rise significantly higher, it would mean a loss of customers of perhaps more than 80 %. Not all customers want non-GMO products and thus, pay for it.

The infrastructure for distribution and rehabilitation of non-GMO soybeans should be strengthened (Marquart and Stoll, 2016). Currently, oil mills are designed exclusively for large-scale production. It would be a challenge to develop the right technology for processing smaller amounts in order to offer additional grain elevators or collection points near farmers and, therefore, to have better processing opportunities (Marquart, 2016). For Stoll the quality of soybeans produced regionally would be the most important challenge. It is of the utmost importance to compete with the quality of Brazilian soybean In this context, competitiveness should not be lost. European soybean is, however, still far from this state. For this reason, the plant breeding industry has to deal with the biggest challenges in making both the yield and the protein content competitive (Stoll 2016).

4.1.4 Acquisition and wholesale - oil mill

Archer Daniels Midland (ADM) is one of the World's largest agricultural traders and processors. By reason of the reconstruction of the rapeseed processing plant in August 2016 in Straubing/Germany, non-GMO soybean commodities from the Danube region should be processed as well. Thus, the growing demand for non-GMO soybean meal should be covered in Germany, Austria and. ADM in Straubing,is the first grain elevator or collection pointin Germany for non-GMO soybeans from the Danube region. The processing aims to provide soybean farmers from the Danube region a marketing opportunity and providing customers with regional processed goods. For the interview from the viewpoint of the processing industry, the managing director of ADM in Straubing, Mr. René Van der Poel, was willing to portray his visions.

Chances

The processing industry (ADM, Van der Poel) sees the current growth trend of European soybean production, mainly caused by the greening regulations, as a chance. Moreover, it portrays an increasing sustainability and soybean protein demand from the costumers. When observing the trend of regionality, the topics non-GMO and regionality can be described as growing. Furthermore, the rape processing in Europe stagnates which leads to available processing capacities which could also be used for soybeans after reconstruction of the respective processing plants.

The project European non-GMO soybeans has a huge potential. The development is depended on two crucial factors: first, a constant availability of good quality (protein content) of the locally produced soybeans and second, the use of reginal non-GMO soybeans has to increase (Van der Poel, 2016).

Marketing forcing factors

Van der Poel mentions the greening as an important market driver.

As part of the agricultural and food value chain, the dairy industry is mentioned as market driver as well because the demand for non-GMO fodder is currently increasing. This trend for regional non-GMO supports the non-GMO labelling. This increases the demand because the costumers are informed about the fact that animals being fed with regional non-GMO products. Therefore, the costumer who demands regional non-GMO products displays a crucial market driver. This only works if the costumer is also willing to pay a surplus for these products. However, the current small use of non-GMO soybean meal cannot compete with the prices of the imported soybean meal from Brazil.

By labelling the product with non-GMO, the costumer recognizes the added value of the product and is probably willing to pay more. This is the only way one can make money on the European non-GMO soybean market due to the added value and if there is a growing demand. Moreover, the environmental conditions can be driver or inhibitor especially after the poor harvest year 2015 which scared farmers from cultivation of soybean. Van der Poel stressed that the coming season 2016/2017 would have to be two good harvest years so that the market for regional non-GMO soybeans increases. If that is not the case, the EU soybean market will remain a very small niche.

Market barriers

One inhibitor is the bad price compared to soybean goods from overseas. “The supply for the regional non-GMO soybeans last year was too high and the use was too low. This was not good for the farmers who had poor harvests at the same time because of the drought” (Van der Poel, 2016) (translated from German). But especially in starting phase it is important for farmers that the harvests are rich to draw interest for an ongoing soybean cultivation.

Logistics are another inhibitor because this makes it especially hard in the beginning of the value chains progress, where non-GMO commodities have to be completely separated. At the moment there is only a very small number of oil mills (3 in the whole Danube region) that process the non-GMO soybeans. Furthermore, there is coexistence between GMO and non-GMO goods at the moment. This is the reason for a high rate of impurities on the non-GMO side. Moreover, it is highly complicated to separate both goods from each other. Because many agricultural commodity retailers cannot deal with this complex process, the costumers have to get their goods right from the oil mills. This would be a competition between agricultural commodity retailers because costumers would not buy their non-GMO soybean commodities from them. There would be a conflict which could result in agricultural commodity retailers talking costumers out of non-GMO soybeans. The problem of goods separation and contamination also consists in the inner European transport – especially in countries neighbouring Ukraine. There are GMO contaminations detected in commodity goods in Slovakia or Romania. The Agricultural and food value chain of non-GMO products in general is not fully defined, yet. For example, animals are allowed to be fed with GMO products but the end product, e.g. meat, can be sold as non-GMO. It is not recognizable, that animals have been fed with GMOs. The legislation has not made that clear, yet (Van der Poel, 2016).

Van der Poel estimates Europe’s soybean growing potential to about maximum 20% of annually soybean imports which could be reached (see chapter 3.2.3). He justifies this estimation with the restriction of the European crop rotation that makes a larger extension of soybean cultivation difficult. For a larger area, soybean would have to be able to compete with other crops such as corn and wheat (Van der Poel).

Challenges

It is important to consider that not every country is interested in non-GMO products. For the Netherlands and Spain for example, non-GMO products are not an option, reasoned by another definition of sustainability. Therefore, every country has a different demand according to their requirements on products. Furthermore, questions of the future like for what do we produce in Europe? Do we have the next 3-4 years bioenergy, biodiesel or bioethanol or not? are important key questions as Mr. Van der Poel has described.

To create an added value in comparison to competing GMO products (non-GMO labelling), the food retail plays an important role, who has to go along with this development towards regional non-GMO products. Logistics still have to be adapted to the use of regional non-GMO soybean commodities. There has to be a separation in different areas of the agricultural and food value chain, so there can eventually be consistent high quality non-GMO products on the market. Furthermore, investments in the soybean plant breeding industry are very important. These are necessary to bred better yielding varieties. Higher amounts of protein and early maturing varieties should be the aim for European cultivation.

4.1.5 Associations - NGO’s

To consider a less market-based side, the managers of NGO's Danube Soya and the Bioland Verband were interviewed. Mr. Dr. Christian Eichert is also spokesman of the coalition for action Gentechnikfreie Landwirtschaft in Baden-Württemberg (GMO-free Agriculture in Baden-Württemberg) which was founded in 2014. Mr. Matthias Krön founded the association Soja Österreich together with soybean producers and manufacturers mainly for the food sector. Later in 2012, this association developed into the Danube Soya association which focus is on the whole Danube region.

Chances

Both of the interviewees see a clear trend of the consumer demand for regional and non-GMO. This awareness among consumers is already widespread and still increasing. The described demand is currently recognized by the food retail and it is also implemented more and more. Especially Rewe, Lidl and Edeka are pioneers in this area. The changes in the supermarket chains cause the supplying dairy industries to change their production into non-GMO feed. Obvious trends are noticeable when it comes to the milk market, organic meat consumption and an increasing tendency to a vegan lifestyle. Eichert concludes that the consumers' need and demand for regional, non-GMO and organic products increases as well. Edeka Südwest state to bring 10 times more of the todays amount of regional organic pork and beef to the market (Eichert, 2016). Moreover, consumers' general awareness about the source of goods is rising. Three and a half years from now, nobody will buy something as organic that has been shipped around the whole globe. Because, only regional makes it organic (trend saying: only regio makes bio to eco). (Eichert, 2016).

For these reasons, Dr. Eichert almost takes the development of the promotion of protein plants via regional soybean markets for granted. The organization prepares for this by extending important parts of the infrastructure. "At the moment, we extend the sector of quality assurance and full traceability by installing an independent team in the field. Therefore, South Americans do not do markets, but rather as regional and close as possible" (Krön, 2016) (translated from German). Also Krön sees this as an opportunity which makes a development of the regional soybean market indispensable "This movement towards regional protein is important, necessary and will come" (Krön, 2016) (translated from German). Furthermore, he rates the current prices for European produced soybean commodities from the Donau region, which is comparable to the Brazilian prices, as competitive advantage. This is a particularly strong argument because flex. the transport charges from Rotterdam to Bavaria can be saved by using regional produced soybeans.

Market forcing factors

Both of the interviewees see the own initiative which means Bioland and Danube Soya as important elements to promote regional non-GMO soybean. Krön describes his program as intense. "Of course we want to promote change […] it is about how we shape this development and who wants to be there and gain from" (Krön, 2016) (translated from German). And Eichert describes the Danube Soya association as an important cooperation partner and intermediary platform which connects actors along the agricultural value chain. According to Eichert, they try to extend more eco-specific markets. "It is about saving fodder together with companies in the Danube area" (Eichert, 2016) (translated from German). In this way, gradually soybean imports from oversea could be reduced.

Another essential factor is the offer on the market of non-GMO labelled products, which is important for consumers to recognize the industry's willingness to meet the consumers' demand for regional non-GMO products. However, the food retail has to be ready for the extension of regional protein crop production and therewith regional non-GMO products which hast to be labelled as such. Therefore, food retailers play an important role as driving force for an European protein strategy (Eichert, 2016). The upstream parts of the value chain such as logistics and the processing industry are also driving forces, [...] since domestic production is also secured and jobs are created" (Eichert, 2016) (translated from German).

Market barriers

Eichert describes the current projects for regional soybeans as important but the amount would be too little to compete as a relevant source to feed livestock.

Krön also names several factors that can inhibit the market development. On one side, it is the fear of animal producers that regional soybeans which can be processed to tofu for direct consumption could be a competitor or partially substitute animal products. Another fear is the fear of animal producers that the switch to regional non-GMO fodder might raise the costs (Krön, 2016). That fear concerns the competitiveness in case they would not get paid for using the reginal non-GMO soybean commodities. The situation that small farmers have to compete with big commercial food chains also leads to fear amongst farmers. The commercial chains are already using goods which are produced with regional soybean commodities – however, as opposed to small farmers, they have already established trade brands. Thus, they have an enormous economic advantage. But if the use of regional soybeans shows positive outcomes in terms of European prices, there is still an uncertainty if others have to pay the price for non-GMO products. For instance, the export of non-GMO Pigs ears to China, if they would bear the incurred costs for his value added product.

Another problem is the GMO impurity which is still high because the agricultural companies have not accommodated their infrastructure to non-GMO, yet. Moreover, there is a concept missing according to politics and marketing to establish regional soybeans more as a domestic protein crop for which the consumers are willing to pay a surplus. At the moment, the soybean is seen as foreign and not as regional (Krön).

Challenges

Accordning to Eichert, there is a solution for the inhibition of a to small amount that can be produced at the moment and that is the direct funding for farming land via politics. „At the moment, they are not brave enough to support sustainable ecological protein securing systems“ (Eichert, 2016) (translated from German). He describes the challenge as follows: „We need a completely new political approach from the year 2020 on“ (Eichert, 2016) (translated from German). Moreover, the infrastructure for the regional soybean cultivation would have to be extended. He sees an important task in supporting mobile toast- and mixing plants, for a greater opportunity to process soybeans (Eichert).

He also sees an important challenge in research to create suitable varieties for the EU (Eichert). According to Krön, the most important challenge is an improvement of the European crop rotations to improve agriculture in general. For the finished products he demands labelling programs to bring the net product from the regional production to the consumer in a better way.

5 Results

First this chapter portray the chances and limitations of a European soybean market based on the results from the expert interviews. These are presented within a table in six categories of the second analysis cycle. The second part includes the results of the European soybean growing potential analysis. Both results will be discussed in order to respond the objectives and research question of this thesis.

The categories are based on the interview guideline. The statements that were mentioned most by experts can be found in the following table 12 and are listed according to their importance in a decreasing order. In the following section the most important results will be shown and briefly summaized.

When it comes to economic efficiency all experts agreed that growing soybean in Europe must be profitable in terms of its revenue situation. This includes its ability to compete with world market prices of non-GMO soybeans as well as its competitive quality. Even opposite corn prices should be able to compete with European soybeans so that farmers would be willing to substitute land. Until now there has been the constraint of a limited availability of appropriate varieties of soybeans, which simultaneously limits the revenue situation. That aside, the soybean market in Europe could create the opportunity for a higher added value.

The trend towards more regionality in the food sector is itself a chance for the European soybean market. It would be seen as long-term and would in addition advocate sustainable farming. A limitation on regionality persists in the available areas within Europe. The Danube Soya Association is often mentioned as a particularly encouraging example which brings interested market players in the Danube region together and sets and controls quality standards.

The zero tolerance of GMO traces of seed shared by the majority of EU members poses opportunities as well as limitations for the European soybean market. There is an opportunity to be found here in the fact that the possibilities to purchase soybean seeds from abroad are ever decreasing in the face of increasing worldwide GMO farming. This also poses a limitation for the same reason, since within Europe only adapted varieties are available. Greening has proved itself to affect soybean acreages positively, like experts stated based on the soybean acreages extension in 2015. At the same time it is often observed how there are only few political measures. Furthermore, it is said that political support represents no long-term alternative for European soybean cultivation.

Table 12: Chances and limitations of a European soybean market

Chances	**Limitations**
Economic efficiency • Value creation • Lower costs of transportation and controls • Low input costs	Economic efficiency • Lack of adapted soybean varieties • Competitiveness with non-GMO soybeans • Low yields due to a gap of knowledge • Incompetent industry (wholesale buyers, processors, logistics)
Regionality • Consumer demand • Sustainability • Danube Soya	Regionality • Limited area and acres • Diversity within Europe
Policy • Threshold value (0,0 for seeds) • Greening measurement	Policy • Threshold value (0,0 for seeds) • Expandable law, too less activities to promote EU protein supply
Market • Demand for non-GMO products • Demand for organic meat • Vegan/ vegetarian diet trend • Demand from the dairy sector	Market • Appropriate marketing program • Hesitation from food retail sector • Consumers decide price –oriented • Lack of interest from many consumers
Animal feeding • Combination of amino acids • Protein content • Economically not substitutable	Animal feeding • Limited application for pig/ cattle
Environment • Positive for crop rotation • Less nitrogen application	Environment • Day length, • Temperature and moisture

Source: Own table 2016.

There is a chance for the market with respect to consumer demand, which, through increasing consumption of non-GMO, organic, vegan or vegetarian food, has been indicated to be growing. The retail and wholesale sector, on the other hand, would describe the market as debilitating, since the introduction and the marketing of non-GMO products has not been implemented until now, and where it has, it has been too hesitant. However, the conduct of the retail sector stems from the consumer behavior of the general public, which makes price-based decisions.

The irreplaceability of soybean components in animal feed is a chance for the market as there are no economically sensible alternatives that serve as a 100% replacement.

Soybeans in crop rotation can be seen as an opportunity for the environment. Nitrogen fixation has positive effects in crop rotations the environment and incidence of diseases, which under certain circumstances can offer economical benefits, for example, by reducing input factor costs. However, in contrast, the environment itself does not offer the optimal conditions for growing soybean in Europe. The day length, temperatures and partly drought conditions put restrictions on the yield potential.

The results of the acreages analysis from chapter 3.2 are represented as follows in figure 17 and 18. These illustrations serve a visualization of the allocation of MGs for each country. The numbers of total area planted with soybeans were obtained from statistical databases and were assumed to be 100 %. These were divided into MG according to the European maturity classification map of chapter 3.2.2. Thus, the mapped maturity classification zones were used as coarse grid to estimate major MGs for single European countries. Own assumption were strengthened based on experts opinions as well as from inquiries of plant variety offices. Figure 17 outlines the acreages of soybeans per country in 2014 and 2015. Here an increase of soybean cultivation has been recorded in all countries, especially in countries that until now have not produced soybeans in larger quantities. These are, for example, Germany, the Czech Republic, Slovakia and Bulgaria which all vigorously expanded their soybean farming in 2015. It is also noticeable that an additional quantity of early varieties (000-00) were grown in these countries (apart from Bulgaria).

Figure 17: Results soybean acreages development (2014-2015)

Country	FR	DE	CZ	SK	UA	AT	HU	RO	IT	HR	RS	BG	RU
Area planted **2014** in 1000 ha	75,6	10,0	7,2	33,2	1792,0	43,8	42,3	79,3	232,9	47,1	154,3	0,3	1691,0
Area planted **2015** in 1000 ha	79,0	17,0	12,3	43,7	2145,0	56,9	72,7	122,2	265,7	81,0	240,0	37,0	1880,0
Difference in (%)	+4	+70	+71	+32	+20	+30	+72	+54	+14	+72	+56	+12233	+11
000 = Early in %	**20%**	**70%**	**100%**	**90%**	**40%**	**10%**	**5%**						**17%**
000 in 1000 ha	**15,80**	**11,90**	**12,30**	**39,30**	**858,00**	**5,69**	**3,64**	**0**	**0**	**0**	**0**	**0**	**319,60**
00 = Mid in %	**20%**	**30%**		**10%**	**30%**	**70%**	**45%**	**20%**					**17%**
00 in 1000 ha	**15,80**	**5,10**	**0**	**4,37**	**643,50**	**39,83**	**32,72**	**24,44**	**0**	**0**	**0**	**0**	**319,60**
0 = Mid- Late in %	**20%**				**20%**	**20%**	**50%**	**35%**	**20%**	**20%**	**10%**		**22%**
0 in 1000 ha	**15,80**	**0**	**0**	**0**	**429,00**	**11,38**	**36,35**	**42,77**	**53,14**	**16,20**	**24,00**	**0**	**413,60**
I = Late in %	**20%**				**10%**			**35%**	**40%**	**60%**	**40%**		**22%**
I = Late in 1000 ha	**15,08**	**0**	**0**	**0**	**214,50**	**0**	**0**	**42,77**	**106,28**	**48,60**	**96,00**	**0**	**413,60**
II = Very Late in %	**20%**							**10%**	**40%**	**20%**	**50%**	**100%**	**22%**
II in 1000 ha	**15,80**	**0**	**0**	**0**		**0**	**0**	**12,22**	**106,28**	**16,20**	**120,00**	**37,00**	**413,60**

Source: Own illustration, data obtained from Eurostat 2016. APK-Inform 2016, Sorte 2016, Gossort 2016, Hartmann 2016.

Figure 18: Results soybean acreages development (2015-2016)

Country	FR	DE	CZ	SK	UA	AT	HU	RO	IT	HR	RS	BG	RU
Area planted **2015** in 1000 ha - corrected	101,1	17,0	12,3	43,7	2145,0	56,9	72,6	122,2	265,7	81,0	240,0	37,0	1880,0
Area planted **2016** in 1000 ha	141,0	15,2	10,6	35,2	1846,0	49,8	66,5	130,3	299,1	75,3	186,0	14,0	2020,0
Difference in (%)	+39	-11	-14	-20	-14	-13	-8	+7	+13	-7	-23	-62	+7
000 = Early in %	**20%**	**70%**	**100%**	**90%**	**40%**	**10%**	**5%**						**17%**
000 in 1000 ha	**28,20**	**10,64**	**10,60**	**31,64**	**738,40**	**4,98**	**3,32**	**0**	**0**	**0**	**0**	**0**	**343,40**
00 = Mid in %	**20%**	**30%**		**10%**	**30%**	**70%**	**45%**	**20%**					**17%**
00 in 1000 ha	**28,20**	**4,56**	**0**	**3,52**	**533,80**	**34,85**	**29,91**	**26,07**	**0**	**0**	**0**	**0**	**343,40**
0 = Mid- Late in %	**20%**				**20%**	**20%**	**50%**	**35%**	**20%**	**20%**	**10%**		**22%**
0 in 1000 ha	**28,20**	**0**	**0**	**0**	**369,20**	**9,96**	**33,23**	**45,62**	**59,82**	**15,06**	**18,60**	**0**	**444,40**
I = Late in %	**20%**				**10%**			**35%**	**40%**	**60%**	**40%**		**22%**
I = Late in 1000 ha	**28,20**	**0**	**0**	**0**	**184,60**	**0**	**0**	**45,62**	**119,64**	**45,18**	**74,40**	**0**	**444,40**
II = Very Late in %	**20%**							**10%**	**40%**	**20%**	**50%**	**100%**	**22%**
II in 1000 ha	**28,20**	**0**	**0**	**0**		**0**	**0**	**13,03**	**119,64**	**15,06**	**93,00**	**14,00**	**444,40**

Source: Own illustration, data obtained from Eurostat 2016. APK-Inform 2016, Sorte 2016, Gossort 2016, Hartmann 2016.

When comparing the farming figures for 2015 with 2016 (figure 18), one notices clearly in the row Differences in % that primarily those countries sharply reduced their soybean cultivation which before 2015 had only grown little soybean acreages. France, Romania, Italy and Russia, the largest European soybean producers are the countries which increased the planted area in 2016 also.

After a strong rise in soybean acreages of more than 20% in 2015, the subsequent year shows an obvious decline. Despite the decline in soybean farming in nine countries, among them the Ukraine with 399 tsd. ha, as much as Italy's entire soybean acreage, the overall decrease is in planted land by 3.5% is relatively well compensated for by the main producing countries. (chapter 3.2). With regards to MGs, particularly the strong producing countries are shown to have substantial numbers of hectares in later MGs (I-II). These are France, Romania, Italy, Serbia and Russia. Even Croatia uses later maturing varieties, but it was left out due to having limited land possibilities growing soybean

Figure 19 shows the hectare numbers and percentages of all maturity zones in 2016. One can recognize from this graph that the areas in Europe offers regions largely for early maturing varieties. The regions of Europe that require MGs from 000-0 make up altogether 65.86% of the entire possible acreages for growing soybeans.

Figure 19: Percentage share of MGs grown in Europe

Area planted in (% and ha) of each maturity level ***2016****:*

000-	Early	**23.96 %**	**1.171 Tsd. ha**
00-	Mid Early	**20,95 %**	**1.024 Tsd. ha**
0-	Mid Late	**20,95 %**	**1.024 Tsd. ha**
I-	Late	19,27 %	942 Tsd. ha
II-	Very Late	14.88 %	727 Tsd. ha

Source: Own calculations 2016.

In chapter 3.2.1 it was worked out that the early maturing varieties (000-00) in Europa cannot keep up with the strength of yield of the later maturing varieties (I-V) of the US or Brazil. For this reason, the excellence of farming in the US and Brazil may be rated as considerably higher than in Europe.

The investigation into the revenue situation of soybeans, sunflower seeds and corn has revealed that the average soybean prices of 2014/2015 could not compete with corn prices. The sunflower commodity prices, on the other hand, could be placed in competition with soybean commodity prices. So long as a substitution of corn or sunflowers by soybeans is being considered, just looking at the revenue situation will be inconclusive. Further influences, such as water demand and reaction to drought stress, should be taken into account as limiting factors of soybeans capability of being a substitute. As a result, the option of replacing sunflower or corn fields by soybean poses an economic risk in both cases.

6 Discussion

Research question 4 How much of total soybean imports could be replaced by European soybean production? couldn't be fully answered. Multiple factors were collected during the analysis that would need to be considered in order to come to a comprehensive conclusion. Obviously there is a complex framework behind the following factors, revenue and market price situation, crop water demand and crop reaction to drought. However, one could conclude from the results of the comparison that substituting corn and sunflowers by soybeans would partly make economic sense in either case. Following the expert's statements in their interviews, corn acreages turned out to be the better substitute to be replaced by soybeans in reality compared to sunflower. In order to be economically competitive, soybean yields would need to increase considerably in order to be competitive with respect to their revenue situation compared to corn (chapter 3.3) as corn revenues per hectare are 258 to 515 USD higher than revenues in soybeans. Yet, soybean could compete with sunflower regarding revenues but not in view of a replacement on typical sunflower ground reasoned by mostly unsuitable exogenous factors for soybeans.

The similarities and differences between the interviews will be approached once again and discussed in the following.

During the interviews, the experts agreed with each other for the most part in the following categories: regionality, economic efficiency and environmental aspects. Their statements on these subjects were mostly clearly expressed. All experts reflected the macro-environment in a relatively balanced way. This means they all took the ecological, economic, political and also partly social and technical aspects into account. Nevertheless, branch-specific differences were able to be observed, as expected, particularly with respect to the GMO subject.The plant breeding industry demands viable GMO threshold values like what the ESA (European Seed Association), the European plant breeders association, has already been trying to establish for years. The argumentation behind this is that the purchase and distribution of quality seeds would be made significantly easier with legal threshold values. Besides this in our technical world there is always a threshold as 0 % in terms of purity (genetical purity) does not exist. Moreover, aiming to be GMO free causes cost for testing which increases the price for the commodity. The US American and Brazilian farming and processing industry therefore have less cost for controls and identity preservation as GMO is accepted in their administration. According to Stoll (2016) the surcharge is reflected with 3 € per ton for GMO content analysis on a seed lot. As Europe grows in present about 5 mn ha soybeans it can be assumed by an average yield of 2.7 t per ha (Ovid, 2016) that 1.85 mmt were produced. This leads to costs of round about 5.5 mn € only due to GMO content analysis in seed.

A comparison to the animal feed industry demonstrates that it is closer to reality to comply with a threshold for unavoidable GMO traces of e.g. up to 0.9 %. It appears very questionable to have thresholds in feed compounds and not in seed. Due to the coexistence of GMO and non-GMO commodities a zero threshold is simply not existent. According to the ESA, a GMO threshold for seeds of 0.4% would meet the subsequent standards of non-GMO animal feed processing. This way, the benefits offered by a GMO threshold for seed it could be taken advantage of more effectively, at least in in the plant breeding and seed producing industry as trading withseeds would be less threatened to take a risk due to minimal GMO traces.

However, the vision of the NGOs and the organic sector is to aim for more intensive political measures to promote a sustainable and GMO-free environment as well as biodiversity. This poses the decisive question of who would bear the costs for the added value in terms of testing and separation. An almost equally distribution of costs along the value chain would be most fair but in many cases this is far from reality. Because one sector might not be willing to pay surcharges for another. For example, the meat industry might not be willing to pay more for non-GMO pig fed if there are difficulties to release such surcharges on the consumer side.

From the standpoint of research however, the aspect of freedom from GMOs is being ignored since GMO technics themselves are reported to be safe. What is more important to them is to create a more balanced agricultural structure, in terms of import and export relations. The criticism for unbalanced structures is valid especially in export oriented countries with intensive livestock farming. Huge amounts of protein imports are correlated with an overproduction of meat which exceeds the regional consumption and thus will be later exported again. Focusing on more regional production systems should be aimed in the future.

The GM technology therefore still is a broad field for discussion. A discussion that entails as many different views as there are regulations within the European Community. In order to have a functioning and integrated European soybean market, the uncertainties in relation to the legal basis for GMOs in the agricultural and food industries need to be removed. Standardized GMO thresholds and homogenized control systems in the value chain would be significant steps towards making the European soybean market more manageable and cost efficient. In order to discuss the subject of green technologies in public in a grounded manner, there may need to be improved and more neutral ways for consumers to inform themselves.

With reference to the entirely positive appraisals of greening measures by experts, the point in time when the interviews were carried out (12/15-04/16) should be taken into account. Just like what the results of the acreage analysis demonstrate, the enthusiasm for the introduction of greening in 2015 was particularly great. The decline of soybean acreages in 2016 on the other hand shows that, despite the political incentive (coupled payments) with the direction to promote a European protein strategy, the revenue situation is an essential element if one or another crop is grown. The revenue situation for soybean was not profitable in many countries, especially not in a climatic difficult year like 2015 which lead to limited yield potentials. Whilst it is partly felt that the political assistance is too hesitant, it is mostly the case that a longer-term market cannot be created on political intentions. A historical comparison with other political agricultural subsidies shows similar movements. This is why in the year 2000 after the Blair House agreement (restriction for oil plants) a massive decline in sunflower farming was recorded (LfL, 2001). The same could be observed for oil flax when oil flax subsidies were reduced (Mlul, 2002).

Considering such examples, it becomes apparent that farmers base their crop planting decisions firstly on income and secondarily on soft factors like for example ecological advantages. Therewith, farmers are economists following the target of maximizing profits. The ecological advantages of soybeans in crop rotation have been acknowledged by all interviewees as beneficial and important. Nevertheless, the revenue situation remains the ultimate decision criterion for a farmer.

Overall, the results of the market and surface analysis of this study are mostly congruent with diverse market analytical forecasts. The OECD crop planting study forecasts until 2025 confirms the results of the surface analysis and the statements by the interviewed experts. Therefore, yield increases are mainly expected in Eastern Europe. However, in Western Europe the decline of oil crop production has been predicted along with a more intensive focus on cereals. The experts already stressed the decline in rapeseed. According to the analyses of this work, the future substitute crop, though, is presumably only very unlikely going to be soybean. The experts stated on average that a maximum of 20% of the todays imported soybean commodity quantities could be replaced by a European non-GMO soybean production. As a result, a growth in European soybean production of 48% would be required. This would mean a European soybean acreages expansion from today's roughly 5 mn ha up to 7.4 mn ha. As specified in chapter 3.2.3 this would go along with crop substitutions because of very limited possibilities to extend arable land in Europe and therewith crop planting decisions are economically justified. Based on leading aspects like economic profitability as well as agronomical oriented management systems farmers potentially could decide to replace corn by soybean. This assumption is plausible on the one hand reasoned by similar claims for growing conditions on the other hand an increased pressure from insect infestation as for example corn rootworm (Diabrotica vigrifera), the soybean could be an alternative (sanitation) crop for specific regions.

This development would be conceivable, provided that also the eastern states (the Ukraine, etc.) convert to a reliable non-GMO soybean production. This includes the application of same regulations for non-GMO seed as well as the same testing and separation procedures for commodities.

Analyzed trends on the consumers markets towards more non-GMO labelling as well as the growing demand for regional, vegan and organic products shows that this market niche has the potential to grow. Along with the experts' statements, consumer studies and studies by the BMEL (2014) and Kearney (2014) confirm the development of this trend. If also the demands for corresponding marketing strategies of non-GMO soybean products were put into place in the retail and wholesale sector, like what the experts are asking for, then one could definitely start to think about a mid to long-term increasing market potential for soybean in Europe. The regional soybean production is however restricted as described. Therefore, the market potential of regional non-GMO products would presumably remain the way it is as far as none of the specified arguments like an improvement of non-GMO commodity separation or non-GMO promoting marketing strategies will be implemented.

If one were to go a bit further in the GMO debate, one could say that the current TTIP negotiations are causing mistrust among consumers. The rejection of gene technology could force a non-GMO label. Essentially, it would though be more sensible to remain faithful to the European regulations and to label as long as GMOs and traces of GMO are contained in products. The aim should be to simplify the European GMO regulations for the benefit of non-GMO producers, and not the other way around.

Finally, a few comments on the method used in this thesis.

The interviews with experts and the specific choice of various stakeholders have proved to be worthwhile. In this way, a wide data basis from different perspectives could be collected. However, in order to have focused the analysis even more on Europe, further representatives from across Europe would have also made interesting interview partners. For a subsequent thesis it could be recommended to choose further interviewees from more diverse countries. In particular, it could be interesting to involve countries which accept GMOs legally in order to achieve a comparative appraisal of GMO and non-GMO production systems.

7 Conclusion

Overseas imports of soybeans from Brazil, the US and Argentina to Europe are increasing every year. Simultaneously, GMO farming in these countries is being expanded ever further. European farming of protein crops especially soybeans is being pushed by organizations and protein initiatives for economical and ecological reasons. In 2015 soybean acreages expanded drastically due to the additional Greening political measures which came into force. Therefore it is worth asking about the potential of a European non-GMO soybean market.

The aim of this thesis was to work out the principal chances and limitations of a European soybean market under the current agricultural political conditions. Moreover, it should be discussed how many of the imported soybean commodities, of which more than 85% are from overseas, could be replaced by soybeans planted in Europe.

In order to get to the bottom of the interests in this market from the perspective of the market actors, ten interviews were carried out. The result made it clear. European soybeans cannot yet compete with the overseas soybeans in terms of quantity (homogenous commodity lot sizes), price and even quality (mainly protein content). That's why European non-GMO soybeans are not yet of high importance on the most important consumer market, which is the feed market, as large processors favor homogeneous lots and a reliably supply of commodities as to avoid volatile qualities in production.

The greatest constraint comes from the limited availability of arable land in Europe as well as from a lack of early maturing soybeans that are well adapted to the European growing conditions. The restricted availability of arable land lead to a competitive situation with other cash crops such as corn, but according to the results of this thesis, soybean growing's result in lower revenues and are therefore economical less competitive than corn. Thus, output (income) optimizing farmers under today's conditions decide not to replace corn by soybeans.

Furthermore, a limited practice experience in less experienced relatively new soybean growing regions slow down the development of a competitive European soybean market. Moreover, an insufficiently established non-GMO soybean industry hinder the market development due to difficulties of coexisting GMO and non-GMO commodities.

Separated product flows in non-GMO processing plants, wholesale and collection points, are segments within the value chain which need to be further promoted for this market development. The zero tolerance regarding GMO traces in seed has been analyzed as a market barrier especially in the plant breeding industry. Thus, the thesis argued to establish a feasible GMO threshold value for seed as is already legal for food and feed.This is mentioned as a political constraint primarily, as well as too little effort towards specifically promoting a regional protein strategy, if more independence from overseas imports will be achieved.

On the other hand, chances for the European soybean market are expected, as long as added value can be generated through special marketing programs, particularly trademarks. This means marketing products at higher prices according to regionality and non-GMO labelling. Therewith, a distribution of additional costs for testing and separation along the value chain could be achieved. Especially the Danube Soya Association is being described as a driving force. They mobilize market agents along the value-added chain, help to create uniform standards, test and monitors soybean commodities to be non-GMO and are finally labeled as such. In this way the non-GMO separation needs to be extended by European regulation to simplify the process to reach a European non-GMO soybean market.

The consumers demand for local or organic products is constantly increasing. Consequently, non-GMO soybean components are being asked for in animal feed. A significant market opportunity for soybeans is that they are not really replaceable (in terms of quality) by any other protein crop without needing to reduce the economic efficiency of animal production. Therefore, the potential for demand is there principally. The analysis of the application of non-GMO feed shows that this is only of importance in smaller amounts in a few countries within Europe. Significant animal producing countries such as the Netherlands and Spain have no interest in non-GMO products.

Thus, the intentions behind the European non-GMO soybean market, such as more independence from overseas imports, are likewise limited to specific regions of Europe. The European soybean production possibilities are economical and geographical limited and would not be able to do much more than satisfy certain consumer niches who are willing to pay the added value for non-GMO products.

According to the acreage analysis, soybeans would need to compete with corn for acreages on reasoned by their very similar requirements on growing conditions. From an economic point of view, the soybean under the current conditions in Europe is nonetheless still far off this capability to compete in most regions, which can be attributed to the continental conditions of Europe. Only in a few countries such as Italy, France, Romania, Serbia where high yield performance been recorded even without political measures such as greening they could still increase their yields.

Similar prognoses can be extracted from the OECD forecasts, so that the prediction for 2025 appears realistic. In these it is expected that Western Europe still will concentrate on cereals production. Eastern Europe however, might partly manage large increases in soybean yields. Even the experts rate the potential of Eastern Europe the highest. Overall, the estimates by experts were about further 20 % of the annual imported soybean which can be replaced by a European soybean production. Expressed in hectares this equals additionally 2.4 mn ha to the present 5 mn ha which are grown in Europe including CIS which would be thoroughly conceivable. However, being autonomous from imports is out of the question under the current conditions of the European agrarian economy.

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Burghardt, B. (2016): Telephone contact, market analyst plant production of Agrarmarkt Informations GmbH.Bonn, Germany. 14.07.2016.

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Fox, S. (2015): Informal interview, soybean breeder of Global Soy Genetics, LLC. Bóly, Hungary. 31.08.-04.09.2015.

Hahn, V. (2015): Interview, scientific direction of Landessaatzuchtanstalt (State Breeding Institite). Freiburg, Germany. 17.12.2015.

Hartmann, J. (2016): Business development mamanger of Norddeutsche Pflanzenzucht Hans Georg Lembke KG. Hohenlieth Holtsee, Germany.

Krön, M. (2016): Interview, general manager of Danube Soya Association. Vienna, Austria. 29.01.2016.

Marquart, A. (2016): Interview, purchasing manager of Josera Erbacher Service GmbH & Co. KG. Kleinheubach, Germany. 24.02.2016.

Mayr,B. (2016): Interview, soybean breeder of Saatzucht Donau GesmbH & Co. KG. Reichsberg am Inn, Austria. 25.01.2016.

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Recknagel, J. (2016): Telephone contact, (ITADA), Landwirtschaftliches Technologiezentrum Augustenberg (Agricultural Centre of Technology). Augustenberg, Germany. 26.02.2016, 20.06.2016, 02.09.2016.

Rupschus, C. (2016): Telephone contact, specialist for protein plants of Landwirtschaftliches Technologiezentrum Augustenberg (Agricultura Centre of Technology). Augustenberg, Germany. 28.08.2016.

Schmied, W. (2016): Telephone contact, agricultural economist of Landesanstalt für Entwicklung der Landwirtschaft und der ländlichen Räume (State Ministry of Rural Affairs and Consumer Protection). Schwäbisch Gmünd, Germany. 21.07.2017, 22.07.2016.

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Van der Poel, R. (2016): Interview, general manager of ADM Straubing GmbH. Straubing, Germany. 05.04.2016.

Annex

Annex I. List of personal contacts

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Annex II. List of contacted persons via telephone/ e-mail

ADM - Archer Daniels Midland Company

Telephone conversation/ E-Mail contact with Van der Poel, R., Managing Director, on July 11 2016. Wolfgang.geltinger@adm.com

Telephone conversation/ E-Mail contact with Geltinger, W., Trade, on July 29 2016. Wolfgang.geltinger@adm.com

AMI - Agrarmarket Informations-Gesellschaft

Telephone conversation with Burghardt, B, Market Expert Plant Production, on July 20 2016.

Telephone conversation with Schenk, W., Market Expert/ Market Analyst Plant Production on July 14 2016.

Danube Soya

Telephone conversation with Mr. Krön, General Manager, on February 02 2016. Krön@donausoja.org

E-Mail contact with Bittner, U., Association Manager, Vienna, Director, Communication/PR, on January 19 2016. bittner@donausoja.org

E-Mail contact with Rittler, L. Innovation and Research Manager, (many times January to July). agro@donausoja.org

E-Mail contact with Kalentic, M., Regional Director Novi Sad, Serbia, on January 18 2016. kalentic@donausoja.org

E-Mail contact with Dima, D., Regional Director Bucharest, Romania, on June 5 2016. dima@donausoaj.org

E-Mail contact with Ilienko, I., Representative Ukraine, on January 19 2016 and June 7/13 2016. ukraine@donausoaj.org

E-Mail contact with Micheloni, C. Representative Italy, on August 30 2016. c.micheloni@aiab.it

Geflügelhof Heitlinger GmbH - Lighthouse project

Telephone conversation with Heitlinger G., Manager, on June 22 2016. Chicken@t-online.de

Johann Heinrich von Thünen Institute – Federal Research Institute for Rural Areas, Forestry and Fisheries

Telephone conversation with Dr. Günter Peter, Institute for Market Analysis, on 5 August 2016. ma@ti.bund.de

LEL - Landesanstalt für Entwicklung der Landwirtschaft und der ländlichen Räume Schwäbisch Gmünd

Telephone conversation and E-Mail contact with Schmied, W., Expert for Markets for Plant Products, on July 21/22 2016. werner.schmied@lelbwl.de

E-Mail contact with Henning, K., Expert for the German Pig Market, on July 21 2016. katharina.henning@ lel.bwl.de

LTZ - Landwirtschaftliches Technologiezentrum, Augustenberg

Telephone conversation and E-Mail contact with Recknagel, J. on February 26 2016/ June 20 2016/ September 02 2016. Jürgen.recknagel@ltz.bwl.de

Telephone conversation and E-Mail contact with Rupschus, C. and Dr. Raupp, J. on August 28 2016. Christian.rupschus@ltz.bwl.de, Joachim.Raupp@ltz.bwl.de

Rabobank-Food & Agribusiness Research and Advisory (FAR)

Telephone and E-Mail contact with Vogel, S., Head of Agri Commodity Markets research, Global sector strategist grains and oilseeds on July 5 2016. Stefan.vogel@rabobank.com

E-Mail contact with Mera, C., Senior Commodities Analyst, on July 21 2016. Carlos.mera@rabobank.com

Scheffler GmbH

E-Mail contact with Schöll, H. Dipl. Agricultural Engineer, on July 17 2016. Zentrale@SchefflerGmbH.de

SB, Soyabrokers Germany GmbH

E-Mail contact with Stege M. on July 29 2016. markus@soyabrokers.com

VLOG - Verband Lebensmittel ohne Gentechnik e.V.

E-Mail contact with Jehle, T., Head of Administrative Office, on September 7 2016. t.jehle@ohnegentechnik.org

Annex III. Questionnaire – Taifun – Life Food, State Plant Breeding Institute

Freiburg, 17.12.2015

Companies: 1. Taifun – Life Food

2. Department for seed cultivation University of Hohenheim

Interviewees: 1. Mr. Miersch

2. Mr. Dr. Hahn

(Translated from German)

General and introductory questions

1. What were the reasons for getting involved with soy cultivation and soy grocery production?
   - Development of the demand (what yould be the main reasons for this?)
   - Access in the field of genetic engineering, environmental aspects, strengthening of the own region, independence?

2. What is your attitude towards green genetic engineering?
   - What is this attitude based on?
   - Where do you see the most important tasks for reaching GM technology freedom?

3. A very important issue in regard to soy sales from the Donau region is the consumer demands for regionally produced food. According to the DLG 45 % of consumers rate regionality as highly important and 61 % do not believe that this is merely a temporary trend. Would you consider the in public interest regional soy or soy products from the Danube region as short-term, medium-term or rather long-term? Why?

4. What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Danube Region?

   (1) political
   (2) economical
   (3) ecological
   (4) European/regional

Seeding material/ Seed cultivation

5. What were and are the greatest challenges in seed cultivation and purchasing of seeding material? What went especially well?
   - Quality testing for non-GMO
   - Which ones went well, which solutions were found?

6. Where did you experience success/ problems within the processes of registration of varieties and testing of varieties? What could be optimized? Which solutions were found?

7. Were there other successes or problems in your soy cultivation career?

8. What are you basing the license assignment and license elicitation on?

9. There are different maturity groups known (13 groups between 0000-X). Which maturity groups as well as maturity classification do you use?

   - Do you know CHU (Crop Heat Units) also for the EU area?
   - In your opinion, what would be the most plausible maturity group 106lassification in Europe?

10. Are there other techniques/categorizations/methods which you got to know about during workshops, travel activities, discussions with other market pasticipants and which could be useful for farmers and seed producers?
    - E.g. in the area of work simplification, variety selection, gentle preparation, agronomic measures such as early detection and prevention of diseases

11. Have you experienced GMO pollution in the value chain? What solution approaches do you apply to this problem (e.g. monitoring systems)?
    - At what point in the value chain do you install controlling check-points?
    - Who is responsible for the inspections?

1. Who are the main soy market supporters and drivers in the Danube region/Europe?
   Who is opposing and supporting the soy market in the Danube region?
   - breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail

Pricing

12. How are prices for raw materials/producer prices set?
    (In Germany or other EU countries to which export might take place?)

    (LEL Schwäbisch Gmünd criticizes missing producer prices)

    - What is your pricing based on?
    - Do you know European quotations on pricing of soy as raw material?

2. To which extend do main producing countries (Brazil, Argentinia, USA and Canada) influence sales and price setting in Europe and the Donau region?
    - e.g. stockpiling → selling for highest possible prices
    - crop shortfall through droughts (e.g. Brazil)

Questions on agricultural policies

13. In which associations and organisations are you involved in?
    - National Soy Network (Bundesweites Sojanetzwerk)
    - VLOG
    - Further? Are any further memberships planned?

14. Which assistance measures in form of policies do you believe to be the most important?
    - Greening
    - Eiweißprämie (Premium for non-GMO products)
    - Consumer support (Surveillance)
    - Marketing support (Labels)
    - Research support

15. From which organizations, associations, initiatives, clients or other customers do you experience most support and demand? – Or also resistance/difficult demands?
    In which form? Financial, cooperative?

16. In welchen der aktuellen politischen Fördermaßnahmen sind bereits eindeutige Erfolge zu verzeichnen, wo bleiben diese noch aus?
    (GAP-Reform, Greening, Eiweißinitativen, Prämie für GVO-Freiheit)

    Sind Ihnen noch weitere bekannt? Welche?

    - Where would you have suggestions for improvement?
    - How could the GAP reform support the future European protein and soy supply?
    - Do you know about respective **agricultural policy forecast models**?

17. What are the paramount political targets of the strategy on proteins in your opinion?
    How do you evaluate the subsidies in their amount?

Markets

18. Which existing barriers hinder/support the European soy production significantly?
    Where are those barriers barely perceptible or even possible to circumvent?
    - legal framework conditions
    - political and lobby barriers (grain club, meat lobby)
    - Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
    - Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, **consumers)**
    - Market barriers (transparency of market prices, price competition, **lacking structure** (processing, transport)
    - Environmental (climate, biological, agricultural land)

3. What would be the **most important** change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?
   What long-term conditions are necessary to sustainably expand soy production in the Donau region?
   - Breeding/seeding material
   - Cultivation/production
   - Registry/storage
   - Quality assessment/upgrading
   - Processing
   - Trade
   - Customer/final consumer

19. Do you have further knowledge on plans to expand the European soy market?
    - e.g. expansion of processing facilities (such as oil mill Straubing)

Food market

20. To what extend is the human consumption of soy developing in the European market?
    Is the market development happening rather slowly? Are there any differences among the countries?
    e.g. for tofu, tofu products (burgers, sausages, cold cuts), soymilk?
    - Soybean oil

- Soya lecithin (E 322) in food, feed, cosmetics, biocides, insecticides
- Is the demand growing or rather constant? What is the percentage growth?

21. Where is your soy processed? What happens with the extracted oil? Which role does the oil play as “byproduct“ of the protein plant in Europe and the Danub region?

Agricultural area

22. How do you see the competition (e.g. area, added value, contribution margin) towards other varieties? Will soya be able to establish in the near future? Or are presently growing acreages just an agricultural policy phenomenon caused by greening, non-GMO subsidies etc.?

23. Could soy substitute another crop? (For example, other protein plants or legume plants such as rape and broad bean?) If so, on what grounds?

24. What crucial role has soybean as a protein supplying crop in animal feeding?

-Qualitative
-Quantitative

GMO

25. If Europe alone, not practically deals with genetic engineering, could not it be that the EU as regards the breeding / technical progress eventually fall by the wayside?

26. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be in regard to European soy production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

27. Based on which indicators would you predict the market development for soy?
    - Will the market for soy continue to grow as it did between 2014 and 2015?

In which areas do you still have questions?

Annex IV. Questinnnaire – Saatzucht Donau / NPZ (Plant breeding)

Reichsberg, 25.01.2016

Companies: 1. Saatzucht Donau

2. Norddeutsche Pflanzenzucht Hans Georg Lembke KG

Hohenlieth, 18.02.2016

Interviewees: 1. Mr. Birschitzky and Mr. Mayr

2. Mrs. Beyermann

(Translated from German)

General and introductory questions

1. What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Danube Region?
   -political
   -economical
   -ecological
   -European/regional

2. „Saatzucht Donau“ had already taken several steps to a breeding program.
   Regarding to market environment, what where the main difficulties in these steps?
   Which of these steps still exist today and which of them are no longer a problem?

3. What is the opinion of Saatzucht Donau concerning the topic of „green genetic engineering“?
   What are the internal challenges facing the company to avoid genetic pollution?
   Which are the different problems for your cooperation countries RO, SK, UA?
   What are the main tasks in order to comply with the non-GMO status?

4. A very important issue in regard to soy sales from the Donau region is the consumer demands for regionally produced food. According to the DLG 45 % of consumers rate regionality as highly important and 61 % do not believe that this is merely a temporary trend. Would you consider the in public interest regional soy or soy products from the Danube region as short-term, medium-term or rather long-term? Why?
   Seeding material/ Seed cultivation
5. What were and are the greatest challenges in seed cultivation and purchasing of seed material? What went especially well?

   - From where do you obtain it?
   - Quality testing for non-GMO?

6. Where did you experience success/ problems within the processes of registration of varieties and testing of varieties?
   -What could be optimized?
   - Which solutions were found?

7. Were there other successes or problems in your soy cultivation career?

   What are you basing the license assignment and license elicitation on?

8. There are different maturity groups known (13 groups between 0000-X).
   Which maturity groups as well as maturity classification do you use?
   - Do you know CHU (Crop Heat Units) also for the EU area?
   - In your opinion, what would be the most plausible maturity group classification in Europe?

9. Which area when standardized would simplify or support substantially of soy production or development of soy market?

   - for instance, determination of maturity groups)
   - How does SZ Probstdorf categorize maturity groups?

10. Are there other techniques/categorizations/methods which you got to know about during workshops, travel activities, discussions with other market pasticipants and which could be useful for farmers and seed producers? E.g. in the area of work simplification, variety selection, gentle preparation, agronomic measures such as early detection and prevention of diseases

11. Have you experienced GMO pollution in the value chain? What solution approaches do you apply to this problem (e.g. monitoring systems)?
    -At what point in the value chain do you install controlling check-points?

-Who is responsible for the inspections?

12. Who are the main soy market supporters and drivers in the Danube region/Europe?

    -Who is opposing and supporting the soy market in the Danube region?

    - breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail...

Pricing

13. Where are price differences between suppliers, how can you explain that?

    What define the prices for seed subsequently? (In Germany or other countries is exported)

    - What is your pricing based on?

14. To which extend do main producing countries (Brazil, Argentinia, USA and Canada) influence sales and price setting in Europe and the Donau region?
    - e.g. stockpiling --> selling for highest possible prices
    - crop shortfall through droughts (e.g. Brazil)

Questions on agricultural policies

15. In which associations and organisations are you involved in?
    - National Soy Network (Bundesweites Sojanetzwerk)
    - Danube Soya Association (NGO)
    - VLOG

16. Which assistance measures in form of policies do you believe to be the most important?
    - Greening
    - Eiweißprämie (Premium for non-GMO products)
    - Consumer support (Surveillance)
    - Marketing support (Labels)
    - Research support
    - associations, alliances

17. What are the paramount political targets of the strategy on proteins in your opinion?

18. Do you think the soy market in the EU can continue its market position beyond the phasing out of subventions in 2018? If yes, why? How do you rate the extend of the subventions?

Other countries

19. What are the explicit challenges for Romania in order to guarantee genetically unmodified agricultural production and consumption? (e.g. increased surveillance and costs?)

20. How would you describe the mentioned 'big process of change' in Ukraine? What is changing? (In relation to non-GMO production, political framework or structural change)
    - If so, how can this be defined, where are these changes?
    - What do you think are the reasons for these?
    - How do you prevent illegal GMO contaminations in Ukraine?
    - What is approximately the size of this share?

Markets

21. Which existing barriers hinder/support the European soy production significantly? Where are those barriers barely perceptible or even possible to circumvent?
    - legal framework conditions
    - political and lobby barriers (grain club, meat lobby)
    - Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
    - Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, consumers)
    - Market barriers (transparency of market prices, price competition, lacking structure (processing, transport)
    - Environmental (climate, biological, agricultural land)
22. What would be the most important change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?

23. What long-term conditions are necessary to sustainably expand soy production in the Donau region?
    - Breeding/seeding material
    - Cultivation/production
    - Registry/storage
    - Quality assessment/upgrading
    - Processing

- Trade
- Customer/final consumer

24. Do you have further knowledge on plans to expand the European soy market?
    - e.g. expansion of processing facilities (such as oil mill Straubing)

25. What is your position in regard to the statement that soy imports are indispensable in order to retain meat processing businesses – thus value addition and workplaces – in Germany

    (Statement by the Grain Club: For the supply of domestic protein demand: Next to quantity the qualitative fodder requirements are to be secured to competitive prices. The delay in the EU-approval procedure for GM-varieties and the subsequent zero-tolerance promotes an unbearable legal uncertainty for stakeholders. The current demands for an extension of freedom from GMOs across the whole meat-processing sector (including poultry production) is unrealistic)

Agricultural plain

26. Global competitiveness is to be enhanced through improved varieties over most important crop types (corn, wheat, rape, barley).
    - How do you see the competition (e.g. area, added value, contribution margin) towards other varieties ? (in percent)
    - How long do you assess will it take until then?
    - In which countries this goal could be achieved earlier?

27. Or are presently growing acreages just an agricultural policy phenomenon caused by greening, non-GMO subsidies etc.

GVO

28. Over time it has become increasingly difficult to obtain soy beans free from genetic modification. With genetically unmodified soy beans as a niche product, do you believe that Europa has a chance to become one of the only few selfsustaining regions worldwide? Probably also use its competitive advantage to be able to offer and export this niche product on the world market?

29. Do you think that Europe could have one disadvantage in the long term due to the prohibition of genetic engineering?

    If so, which? In which areas?

Would it be conceivable, that European breed and technology get left behind due to the prohibition of genetic engineering?

30. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be regarding to European soy production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

31. Based on which indicators would you predict the market development for soy? Will the market for soy continue to grow as it did between 2014 and 2015?

32. In which areas do you still have question?

Annex V. Questionnaire – Josera (Feed industry)

Kleinheubach, 24.02.2016

Company: Josera

Interviewee: Mr. Marquart

(Translated from German)

General and introductory questions

1. Josera is a versatile company with different business divisions. For a start could you briefly introduce the different business areas?

2. Does the company follow a soy strategy?
   - If yes, which strategy?
   - What are the goals oft he strategy?

3. On the first page of your website is to be read that Josera does not use genetically modified incredients as well as wheat and soy additives.
   - For which feed does that apply?
   - Why do you renounce soy? Would you also renounce regional, GMO free soy?

4. Josera strongly emphasizes quality, regionality as well as sustainability of their raw materials and feedstuff. This is guaranteed by inspection systems and certification schemes. Do you also use other quality labels (regional, GMO free) to communicate your position as producer of quality feedstuff towards the consumers (farmer/consumer)?
   If yes, which ones and in how far do they give you advantages?
   If not, why not? Why certificates and not trademarks?
   Are there any reasons against a membership within the Danube Soya Initiative?

Regionality

5. A very important issue for Josera is regionality. According to the DLG 45 % of consumers rate regionality as highly important and 61 % do not believe in a long-term megatrend.
   - Why do you believe that this trend is considered to continuing in the long run?
   - What do you think of the current developments in regional soybean cultivation?
   - Do you think Europe will be accepted as “regional” by the consumers?

- How do you and the company Josera define “regionality”?
- Do you consider the labels “organic” and “GMO free” as complementary?
- If Europe were to be able to support itself solely with regional soy production and distribution, do you believe that producers will sooner or later also resort to GMO soy due to difficulties in detectability?

6. The RKW-Kehl became interested in regional soy in the Rhine plain already in the 1980s. When did the interest for regional soy or a soy-strategy arise in Josera?

7. What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Donau Region?
   (5) political
   (6) economical
   (7) ecological
   (8) European/regional

8. Have you experienced GMO traces in the value chain? Which solutions are being applied for such problems (e.g. control mechanisms, traceability)?
   a. At which part do inspections take place?
   b. -> costs, efforts
   c. Who carries out inspections?

9. Who are the main soy market supporters and drivers in the Donau region/Europe?
   Who is opposing and supporting the soy market in the Donau region?
   (Grower, breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail...)

   (According to the Association against genetic modification (Verband ohne Gentechnik (VLOG)), ABRANGE and the ProTerra foundation there is pressure from the side of the food retail industry, the fast food industry and environmental associations)

   Who are your purchasers and suppliers? Which of them are the major and most important ones?

Pricing

10. How are the prices for soy components and soy feed supplements set in Josera?

a. How much is the premium for GMO free products?
b. Are there additional financial subsidies? If yes, wherefrom?

11. Does Josera work with contract farmers? If yes, how are the producer prices set?
(in Germany and other EU countries to which export takes place?)
(LEL-Schwäbisch Gmünd criticises lacking binding producer prices)

12. How do these surcharges reflect in final products as well as in subsequent animal products (e.g. meat, eggs, milk)?
(Price setting concept)

13. Which consumer and buyer are generally willing to pay additional surcharge for 'regional' and 'non-GMO' fodder/products? (classification in categories according to company size and type of animal husbandry)
Do you believe that in the long run the majority (also major corporations) can be convinced to purchase European soy? If yes, for which price? If no, what are the reasons?

14. To which extend do main producing countries (Brazil, Argentinia, USA and Canada) influence sales and price setting in Europe and the Donau region?
a. e.g. stockpiling → selling for highest possible prices
b. crop shortfall through droughts (e.g. Brazil)

Questions on agricultural policies

15. Are there any associations or organisations that Josera is a member of which supports mutual interests? Such as
- Friend´s association
- Danube Soya Association
- VLOG (Association against genetic modification)
- National soya network

  If not, why not?
  If yes, which? Are there further memberships being planned? What ist he motivation for a membership?

16. Which assistance measures in form of policies do you believe to be the most important? From where do you experience most support and the highest achievements?
a. Greening
b. Eiweißprämie (Premium for non-GMO products)
c. Consumer support (Surveillance)
d. Marketing support (Labels)

e. Research support
f. Associations, Organisation

17. Do you know about any other support measures? Which ones?
    a. In your opinion, where do you see margin for improvements?
    b. In the future, how could the GAP-reform further support the European protein-/soy supply
    c. Are there any further forecasting models on agriculture policies you could name in this regard?

18. What are the paramount political targets of the strategy on proteins in your opinion?

19. Do you think the soy market in the EU can continue its market position beyond the phasing out of subventions in 2018 (as compared to the 1980s)? If yes, why? How do you rate the extend of the subventions?

Markets

20. Which existing barriers hinder/support the European soy production significantly?
    Where are those barriers barely perceptible or even possible to circumvent?
    - legal framework conditions
    - political and lobby barriers (grain club, meat lobby)
    - Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
    - Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, **consumers)**
    - Market barriers (transparency of market prices, price competition, **lacking structure** (processing, transport)
    - Environmental (climate, biological, agricultural land)

21. What would be the **most important** change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?
    What long-term conditions are necessary to sustainably expand soy production in the Donau region?
    - Breeding/seeding material
    - Cultivation/production
    - Registry/storage → Which central registry points do you know?
    - Quality assessment/upgrading
    - Processing
    - Trade
    - Customer/final consumer

- Which segment bears the highest investment costs to guarantee genetically unmodified agricultural production?

22. Do you have further knowledge on plans to expand the European soy market?
    - e.g. expansion of processing facilities (such as oil mill Straubing)
    - Further feed manufacturer that may intend to obtain European soy

Feeding

23. Which crucial role does soy play as protein supplier in livestock farming with its valuable amino acid composition in the refinement?
    - Qualitative
    - Quantitative

      How would you guarantee a valuable amino acid composition without soy?

24. Does rapeseed meal or other protein suppliers represent a reasonable alternative to soy in livestock farming?
    What do you think about the following statement:

    According tot he Grain Club new application potential has been shown after extensive feeding tests in cattle, pig and poultry, this supposedly lead to increased acceptance for rapeseed meal in livestock farming over the last years.

25. What do you think about the statement that soy import is inevitable if the net value added and the job situation regarding animal processing shall stay constant in the country?

    (Statement of the Grain Club about covering the national protein demand: Beside quantity also the quality for meeting feeding requirements need to be secured at competitive prices. The delay in the EU approval procedure for genetically modified varieties and the associated zero tolerance represent a strong legal uncertainty for actors. Current demands for designation of non-GMO usage in the entire meat production also beyond poultry is unrealistic.)

GMO

26. What do you think is the most important argument for genetically unmodified products (e.g. political framework conditions, consumer acceptance, environmental impact...)?
    - Do you think this attitude may change at some point?

- Why, or why not?

What are the rules for genetically inmodified products especially in feed production? What are the internal rules regulating non-GMO?

27. Apart from consumer concerns, where do you see the biggest controversies regarding genetically modified crops within the fodder industry/the food sector?
    - How and in what way did consumer concerns become noticeable?
    - Are there any verified impacts on the animals itself as well as product quality? (Sources?)
    - Please elaborate your doubts on the touted benefits of GMOs and treatment with broad-spectrum chemical herbicides.

28. Over time it has become increasingly difficult to obtain soy beans free from genetic modification. With genetically unmodified soy beans as a niche product, do you believe that Europa has a chance to become one of the only few self-sustaining regions worldwide? Probably also use its competitive advantage to be able to offer and export this niche product on the world market?

29. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be in regard to European soy production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

30. Based on which indicators would you predict the market development for soy?

31. In which areas do you still have questions?

Annex VI. Questionnaire – RKW (Feedstuff industry)

Kehl, 20.01.2015

Company: Raiffeisen Kraftfutterwerke

Interviewee: Mr. Stoll

(Translated from German)

General and introductory questions

1. Which measures are taken by RKW to communicate your position as producer of quality feedstuff (regional, GMO free) towards the consumers (farmer/consumer)?

2. How and when did the membership in the Danube Soya Initiative begin? What are the greatest advantages that you experienced due to this membership?

3. As member of the Danube Soya Initiative in 2014 you obtained the first 500 t of soy from Hungary.
   - By how many percent could the share of regional soy be raised?
   - Have other countries joined?
   - In your oppinion, which countries have the greatest potential for soy cultivation?

Regionality

4. A very important issue in the sale of soy from the Danube region is the request for regionality. According to the DLG 45 % of consumers rate regionality as highly important and 61 % do not believe in a temporary phenomenon.
   - Why do you believe that this trend is considered to continuing in the long run?
   - In your opinion, what are the striking indicators for the tendencies of current developments (RKW presentation)?
   - Are further studies (apart from the DLG study) known? Where does the convincement come from?
   - Is Europe being accepted as “regional” by the consumers?
   - Do you consider the labels “organic” and “GMO free” as complementary?

- If Europe were to be able to support itself solely with regional soy production and distribution, do you believe that producers will sooner or later also resort to GMO soy due to difficulties in detectability?

5. The RKW-Kehl became interested in regional soy in the Rhine plain already in the 1980s. What do you think are the reasons that this former EU project and the connected soy production were cancelled?

   Why is this different today?

6. What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Donau Region?
   (9) political
   (10) economical
   (11) ecological
   (12) European/regional

7. Have you experienced GMO traces in the value chain? Which solutions are being applied for such problems (e.g. control mechanisms, traceability)?
   a. At which part do inspections take place?
   b. - costs, efforts
   c. Who carries out inspections?

8. Who are the main soy market supporters and drivers in the Donau region/Europe?
   Who is opposing and supporting the soy market in the Donau region?
   (Grower, breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail...)

   (According to the Association against genetic modification (Verband ohne Gentechnik (VLOG)), ABRANGE and the ProTerra foundation there is pressure from the side of the food retail industry, the fast food industry and environmental associations)

   Who are your purchasers and suppliers? Which of them are the major and most important ones?

Pricing

9. In which area are the current commodity prices for European soy and for Brazilian GMO free soy?
    - What is the European listing for pricing soy as commodity?
    - How much is the premium for GMO free products from Brazil?
    - Are there additional financial subsidies? If yes, where from?
    - Are European prices competitive with Brazilian prices? Do you see a long-term competitiveness?

10. Does RKW work with contract farmers? If yes, how are the producer prices set?
    (in Germany and other EU countries to which export takes place?)
    (LEL-Schwäbisch Gmünd criticises lacking binding producer prices)

11. How do these surcharges reflect in final products as well as in subsequent animal products (e.g. meat, eggs, milk)?
    (Price setting concept)

12. Which consumer and buyer are generally willing to pay additional surcharge for 'regional' and 'non-GMO' fodder/products? (classification in categories according to company size and type of animal husbandry)
    Do you believe that in the long run the majority (also major corporations) can be convinced to purchase European soy? If yes, for which price? If no, what are the reasons?

13. To which extend do main producing countries (Brazil, Argentinia, USA and Canada) influence sales and price setting in Europe and the Donau region?
    a. e.g. stockpiling → selling for highest possible prices
    b. crop shortfall through droughts (e.g. Brazil)

Questions on agricultural policies

14. In which associations or organisations (Danube Soya) do you have memberships?
    - National soya network
    - Danube Soya Association
    - VLOG

    Are there further memberships being planned? What ist he motivation for a membership?

15. Which assistance measures in form of policies do you believe to be the most important? From where do you experience most support and the highest achievements?
    a. Greening
    b. Eiweißprämie (Premium for non-GMO products)
    c. Consumer support (Surveillance)
    d. Marketing support (Labels)
    e. Research support
    f. Associations, Organisation

16. Do you know about any other support measures? Which ones?
    a. In your opinion, where do you see margin for improvements?
    b. In the future, how could the GAP-reform further support the European protein-/soy supply
    c. Are there any further forecasting models on agriculture policies you could name in this regard?

17. What are the paramount political targets of the strategy on proteins in your opinion?

18. Do you think the soy market in the EU can continue its market position beyond the phasing out of subventions in 2018 (as compared to the 1980s)? If yes, why? How do you rate the extend of the subventions?

Markets

19. Which existing barriers hinder/support the European soy production significantly?
    Where are those barriers barely perceptible or even possible to circumvent?
    - legal framework conditions
    - political and lobby barriers (grain club, meat lobby)
    - Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
    - Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, **consumers)**
    - Market barriers (transparency of market prices, price competition, **lacking structure** (processing, transport)
    - Environmental (climate, biological, agricultural land)

20. What would be the **most important** change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?

What long-term conditions are necessary to sustainably expand soy production in the Donau region?

- Breeding/seeding material
- Cultivation/production
- Registry/storage → Which central registry points do you know?
- Quality assessment/upgrading
- Processing
- Trade
- Customer/final consumer

- Which segment bears the highest investment costs to guarantee genetically unmodified agricultural production?

21. Do you have further knowledge on plans to expand the European soy market?
    - e.g. expansion of processing facilities (such as oil mill Straubing)
    - Further feed manufacturer that may intend to obtain European soy

Feeding

22. Which crucial role does soy play as protein supplier in livestock farming with its valuable amino acid composition in the refinement?
    - Qualitative
    - Quantitative

23. Does rapeseed meal or other protein suppliers represent a reasonable alternative to soy in livestock farming?
    What do you think about the following statement:

    According to the Grain Club new application potential has been shown after extensive feeding tests in cattle, pig and poultry, this supposedly lead to increased acceptance for rapeseed meal in livestock farming over the last years.

24. What do you think about the statement that soy import is inevitable if the net value added and the job situation regarding animal processing shall stay constant in the country?

    (Statement of the Grain Club about covering the national protein demand: Beside quantity also the quality for meeting feeding requirements need to be secured at competitive prices. The delay in the EU approval procedure for genetically modified varieties and the associated zero tolerance represent a strong legal uncertainty for actors. Current demands for designation of non-GMO usage in the entire meat production also beyond poultry is unrealistic.)

GMO

25. RKW produces without genetic modification (<0,1%) on a matter of principle. What do you think is the most important argument for genetically unmodified products (e.g. political framework conditions, consumer acceptance, environmental impact...)?
    - Do you think this attitude may change at some point?
    - Why, or why not?

    What are the rules for GMO products especially in feed production? What are the internal rules regulating non-GMO?

26. Apart from consumer concerns, where do you see the biggest controversies regarding genetically modified crops within the fodder industry/the food sector?
    - How and in what way did consumer concerns become noticeable?
    - Are there any verified impacts on the animals itself as well as product quality? (Sources?)
    - Please elaborate your doubts on the touted benefits of GMOs and treatment with broad-spectrum chemical herbicides.

27. Over time it has become increasingly difficult to obtain soy beans free from genetic modification. With genetically unmodified soy beans as a niche product, do you believe that Europe has a chance to become one of the only few self-sustaining regions worldwide? Probably also use its competitive advantage to be able to offer and export this niche product on the world market?

28. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be in regard to European soy production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

1. Based on which indicators would you predict the market development for soy?
2. In which areas do you still have questions?

Annex VII. Questionnaire – ADM (Oil Mill)

Straubing, 5.04.2016

Organisation: ADM, Straubing

Interviewee: Mr. Van der Poel

(Translated from German)

General and introductory questions

1. From the middle of the year ADM will enter in soy production.

   Why did a Bavarian location for rapeseed currently invest in soy processing?

2. Regarding to your quote in „Agrarzeitung“: „ (…) thanks to the additional processing line, it would be easier to respond flexibly to market requirements “.

   Could you specify these requirements?

   Which of them have priority? And which are very difficult to meet?

3. As one of the first major investors, do you believe in a long term soy trend, and, where appropriate, in a trend for soy from Danube?

   When considering as a whole the processing line soy is not a new type of crop. Would you go so far as to say that current European markets developments have long been overdue?

4. How many tones should be processed by the plant?

Regionality

5. A very important issue in regard to soy sales from the Donau region is the consumer demands for regionally produced food. According to the DLG 45 % of consumers rate regionality as highly important and 61 % do not believe that this is merely a temporary trend.

   - Why do you believe that this trend is considered to continuing in the long run?

     - What are the most pivotal indicators and drivers for this development?
     - Have there been conducted any other studies apart from the DLG study? Where is the belief for trending regionality based on?
     - Do consumers see Europe as ‘regional’?

- Do you see the labels ‘Organic’ and ‘GMO Free’ as complementary?
- If Europe were to be able to support itself solely with regional soy production and distribution, do you believe that producers will sooner or later also resort to GMO soy due to difficulties in detectability?

6. Regional soy production in the Rhine-plain was initially introduced in the 1980s’ as a EU project.

   Why did the project, thus the regional soy production, become abandoned?

7. What has changed/What is different today? What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Donau Region?

   (1) political
   (2) economical
   (3) ecological
   (4) European/regional
8. Can you name examples of GMO pollution in the value chain? What solution approaches do you apply to this problem (e.g. monitoring systems, traceability)? At what point in the value chain do you install controlling check-points?

   Identity from field to shipment – Expense and effort? Who is responsible for the inspections?

9. Who are the main soy market supporters and drivers in the Donau region/Europe? Who is opposing and supporting the soy market in the Donau region? (Grower, breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail)

   (According to the Association against genetic modification (Verband ohne Gentechnik (VLOG)), ABRANGE and the ProTerra Stiftung, the poultry industry in Germany and Europe has decided against GMO fodder due to pressure from the side of the food retail industry, fast food industry and environmental associations)

Pricing

10. What is the current price for raw soy for European and also Brazilian GMO free soy?

    Which European quotations of prices for raw soy are presently existing?

    How high is the current surcharge for raw non-GMO soy from Brazil? Are there any other financial subventions? If yes, which ones and from where?

Can European soy prices compete with Brazilian prices? How is the competition between European and Brazilian prices in the long term?

11. In Germany most soy production is based on contract cultivation. What are the cultivation circumstances at the DSA?

    How are the producer prices determined?

    From which countries do you know the producer prices.

    To what amount they are?

12. How do these surcharges reflect in non-GMO soy products from ADM? (Price setting concept)

13. Which consumer and buyer are generally willing to pay additional surcharge for 'regional' and 'non-GMO' fodder/products? (classification in categories according to company size and type of animal husbandry)

    Do you believe that in the long run the majority (also major corporations) can be convinced to purchase European soy? If yes, for which price? If no, what are the reasons?

14. To which extend do main producing countries (Brazil, Argentina, USA and Canada) influence sales and price setting in Europe and the Donau region?

    e.g. stockpiling -> selling for highest possible prices

    crop shortfall through droughts (e.g. Brazil)

Questions on agricultural policies

15. What are the most prominent advantages for companies that are members of DSA? In addition to Donau Soja Association is there any other association or federation you have a membership with?

16. Which assistance measures in form of policies do you believe to be the most important? From where do you experience most support and the highest achievements?

    - Greening
    - Eiweißprämie (Premium for non-GMO products)
    - Consumer support (Surveillance)
    - Marketing support (Labels)
    - Research support
    - Associations, Organisation

17. Do you know about any other support measures? Europe-wide or country-specific? Which ones?

    - In your opinion, where do you see margin for improvements?
    - In the future, how could the GAP-reform further support the European protein-/soy supply
    - Are there any further forecasting models on agriculture policies you could name in this regard?

18. What are the paramount political targets of the strategy on proteins in your opinion?

19. Do you think the soy market in the EU can continue its market position beyond the phasing out of subventions in 2018? If yes, why? How do you rate the extend of the subventions?

Other countries

20. Concerning **Serbia** you mentioned that it is the only country that is self-sufficient in regard to soy-supply and moreover has a fully integrated agriculture system without GMOs. However, through WTO pressure and a potential accession to the EU this would need to change.

    Which developments be expected in the Serbian market economy – could Serbia benefit more from soy export than from its domestic use. On the other hand, would Serbia perhaps also increase animal husbandry in order to export meat?

21. What are the explicit challenges for Romania in order to guarantee genetically unmodified agricultural production and consumption? (e.g. increased surveillance and costs?)

22. In Danube from where do you receive with reliably large quantities of soy with reliably?

    According to that, could you provide a percentage distribution?

23. What do you think, which country within the Danube region is able to produce most efficiently while meeting quality standards (homogeneity of delivery, freedom from GMOs, level of protein)?

Markets

24. Which existing barriers hinder/support the European soy production significantly? Where are those barriers barely perceptible or even possible to circumvent?

legal framework conditions
political and lobby barriers (grain club, meat lobby)
Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, consumers)
Market barriers (transparency of market prices, price competition, lacking structure (processing, transport)
Environmental (climate, biological, agricultural land)

25. What would be the most important change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?

    What long-term conditions are necessary to sustainably expand soy production in the Donau region?
    - Breeding/seeding material
    - Cultivation/production
    - Registry/storage, which central registry points do you know?
    - Quality assessment/upgrading
    - Processing
    - Trade
    - Customer/final consumer

    Which segment bears the highest investment costs to guarantee genetically unmodified agricultural production?

26. Do you have further knowledge on plans to expand the European soy market?

    e.g. expansion of additional processing sites that compete with non-GMO production?
    Further feed manufacturer that may intend to obtain European soy

27. With respect to oil mill locations in Europe:

    Where are the processing facilities? Why are they precisely at this location?
    Who competes with whom?
    Which market do they operate?

28. Which export markets compete with the European oil mills concerning oil and grist?

Where do processed products come from and where do they arrive in Europe? Where do goods go to from there?

Feeding

29. What is your position with regard to the statement that soy imports are indispensable to retain meat processing businesses thus value addition and workplaces in Germany?

    (Statement by the Grain Club: For the supply of domestic protein demand: Next to quantity the qualitative fodder requirements are to be secured to competitive prices. The delay in the EU-approval procedure for GM-varieties and the subsequent zero-tolerance promotes an unbearable legal uncertainty for stakeholders. The current demands for an extension of freedom from GMOs across the whole meat-processing sector (including poultry production) is unrealistic)

30. Donau Soy (DSA) is a brand for soy beans from the Donau region that are genetically unmodified. What do you think is the most important argument for genetically unmodified products (e.g. political framework conditions, consumer acceptance, environmental impact...)?

    Do you think this attitude may change at some point?
    Why, or why not?

31. Do you have certain internal rules regulating genetically unmodified products for ADM?

    In which area costs are the highest iIn order to complete guarantee of the GMO-free status?

32. What is your position on genetically modified crops? Why should Europe not adopt genetic modification for fodder and food crops? What is your opinion based on?

33. Over time it has become increasingly difficult to obtain soy beans free from genetic modification. With genetically unmodified soy beans as a niche product, do you believe that Europa has a chance to become one of the only few self-sustaining regions worldwide? Probably also use its competitive advantage to be able to offer and export this niche product on the world market?

34. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be regarding European soybean production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

35. Based on which indicators would you predict the market development for soy?

36. In which areas, do you still have questions?

Annex VIII. Questionnaire - Danube Soya Association

Besigheim, 29.01.2016

Organisation: Danube Soya Association (NGO)

Interviewee: Mr. Krön

(Translated from German)

General and introductory questions

1. In your opinion, what was the motivation and the primary reasons for the founding of the Donau Soya Association (DSA) in 2012?
    - Who were the decision makers and promoter or donors?
    - Who were the initial members, the strongest proponents as well as opponents in regard to the NGO's foundation?
2. What are the most prominent advantages for companies that are members of DSA? What arguments do you believe have convinced other companies to join the DSA?
3. Do you have the feeling that particular members are outstanding in enriching the portfolio of the association in regard to their activities or position? Do you aim to attract prominent or international corporations as well as certain lobby groups to join the DSA? If yes, could you name some?

Regionality

4. A very important issue regarding soybean sales from the Donau region is the consumer demands for regionally produced food. According to the DLG 45 % of consumers rate regionality as highly important and 61 % do not believe that this is merely a temporary trend.
    - Why do you believe that this trend is considered to continuing in the long run?
    - What are the most pivotal indicators and drivers for this development?
    - Have there been conducted any other studies apart from the DLG study? Where is the belief for trending regionality based on?
    - Do consumers see Europe as 'regional'?
    - Do you see the labels 'Organic' and 'GMO Free' as complementary?
    - If Europe were to be able to support itself solely with regional soy production and distribution, do you believe that producers will sooner or later also resort to GMO soy due to difficulties in detectability?

5. Regional soy production in the Rhine-plain was initially introduced in the 1980s' as a EU project. Why did the project, thus the regional soy production, become abandoned?
   - What has changed/What is different today?

6. What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Donau Region?
   (13) political
   (14) economical
   (15) ecological
   (16) European/regional
7. Can you name examples of GMO pollution in the value chain? What solution approaches do you apply to this problem (e.g. monitoring systems, traceability)?
   - At what point in the value chain do you install controlling check-points?
     - Identity from field to shipment – Expense and effort?
   - Who is responsible for the inspections?

8. Who are the main soy market supporters and drivers in the Donau region/Europe?
   Who is opposing and supporting the soy market in the Donau region?
   (Grower, breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail...)

   (According to the Association against genetic modification (Verband ohne Gentechnik (VLOG)), ABRANGE and the ProTerra Stiftung, the poultry industry in Germany and Europe has decided against GMO fodder due to pressure from the side of the food retail industry, fast food industry and environmental associations)

Pricing

9. What is the current price for raw soy for European and also Brazilian GMO free soy?
   - Which European quotations of prices for raw soy are presently existing?
   - How high is the current surcharge for raw non-GMO soy from Brazil? Are there any other financial subventions? If yes, which ones and from where?

- Can European soy prices compete with Brazilian prices? How is the competition between European and Brazilian prices in the long term?

10. In Germany most soy production is based on contract cultivation.
    What are the cultivation circumstances at the DSA?

    How are the producer prices determined?

    (in regard to trade within Germany and export into other EU countries)

    (LEL-Schwäbisch Gmünd criticises lacking binding producer prices)

11. How do these surcharges reflect in final products as well as in subsequent animal products (e.g. meat, eggs, milk)?
    (Price setting concept)

12. Which consumer and buyer are generally willing to pay additional surcharge for 'regional' and 'non-GMO' fodder/products? (classification in categories according to company size and type of animal husbandry)
    Do you believe that in the long run the majority (also major corporations) can be convinced to purchase European soy? If yes, for which price? If no, what are the reasons?

13. To which extend do main producing countries (Brazil, Argentina, USA and Canada) influence sales and price setting in Europe and the Donau region?
    - e.g. stockpiling → selling for highest possible prices
    - crop shortfall through droughts (e.g. Brazil)
    -

Questions on agricultural policies

14. In which associations and organisations is the DSA involved in?
    - National Soy Network (Bundesweites Sojanetzwerk)
    - VLOG
    - Further? Are any further memberships planned? What is the motivation for a membership?

15. Which assistance measures in form of policies do you believe to be the most important? From where do you experience most support and the highest achievements?
    - Greening
    - Eiweißprämie (Premium for non-GMO products)
    - Consumer support (Surveillance)

- Marketing support (Labels)
- Research support
- Associations, Organisation

16. Do you know about any other support measures? Europe-wide or country-specific? Which ones?
    - In your opinion, where do you see margin for improvements?
    - In the future, how could the GAP-reform further support the European protein-/soy supply
    - Are there any further forecasting models on agriculture policies you could name in this regard?

17. What are the paramount political targets of the strategy on proteins in your opinon?

18. Do you think the soy market in the EU can continue its market position beyond the phasing out of subventions in 2018? If yes, why? How do you rate the extend of the subventions?

Other countries

19. Concerning **Serbia** you mentioned that it is the only country that is self-sufficient in regard to soy-supply and moreover has a fully integrated agriculture system without GMOs. However, through WTO pressure and a potential accession to the EU this would need to change.
    - Which developments be expected in the Serbian market economy – could Serbia benefit more from soy export than from its domestic use. On the other hand, would Serbia perhaps also increase animal husbandry in order to export meat?

20. What are the explicit challenges for **Romania** in order to guarantee genetically unmodified agricultural production and consumption? (e.g. increased surveillance and costs?)

21. How would you describe the mentioned ‘big process of change’ in **Ukraine**? What is changing?
    What is the primary subject to the process of change?
    What are the drivers for this?

How do members of DSA try to counteract potential GMO contamination from Ukrainian partners? What are the challenges to produce, load and store non-GMO products in Ukraine?

Markets

22. Which existing barriers hinder/support the European soy production significantly?
    Where are those barriers barely perceptible or even possible to circumvent?
    - legal framework conditions
    - political and lobby barriers (grain club, meat lobby)
    - Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
    - Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, **consumers)**
    - Market barriers (transparency of market prices, price competition, **lacking structure** (processing, transport)
    - Environmental (climate, biological, agricultural land)

23. What would be the **most important** change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?
    What long-term conditions are necessary to sustainably expand soy production in the Donau region?
    - Breeding/seeding material
    - Cultivation/production
    - Registry/storage → Which central registry points do you know?
    - Quality assessment/upgrading
    - Processing
    - Trade
    - Customer/final consumer

- Which segment bears the highest investment costs to guarantee genetically unmodified agricultural production?

24. Do you have further knowledge on plans to expand the European soy market?
    - e.g. expansion of processing facilities (such as oil mill Straubing)
    - Further feed manufacturer that may intend to obtain European soy

Feeding

25. What is your position in regard to the statement that soy imports are indispensable in order to retain meat processing businesses – thus value addition and workplaces – in Germany

    (Statement by the Grain Club: For the supply of domestic protein demand: Next to quantity the qualitative fodder requirements are to be secured to competitive prices. The delay in the EU-approval procedure for GM-varieties and the subsequent zero-tolerance promotes an unbearable legal uncertainty for stakeholders. The current demands for an extension of freedom from GMOs across the whole meat-processing sector (including poultry production) is unrealistic)

GMOs

26. Donau Soy (DSA) is a brand for soy beans from the Donau region that are genetically unmodified. What do you think is the most important argument for genetically unmodified products (e.g. political framework conditions, consumer acceptance, environmental impact...)?
    - Do you think this attitude may change at some point?
    - Why, or why not?

    Do you have certain internal rules regulating genetically unmodified products for DSA members?

    If yes, are those rules varying depending on the varying members within the value chain? If yes, how?

27. Apart from consumer concerns, where do you see the biggest controversies regarding genetically modified crops within the fodder industry/the food sector?
    - How and in what way did consumer concerns become noticeable?
    - Are there any verified impacts on the animals itself as well as product quality? (Sources?)
    - Please elaborate your doubts on the touted benefits of GMOs and treatment with broad-spectrum chemical herbicides.
28. What is your position on genetically modified crops? Why should Europe not adopt genetic modification for fodder and food crops? What is your opinion based on?

29. Over time it has become increasingly difficult to obtain soy beans free from genetic modification. With genetically unmodified soy beans as a niche product, do you believe that Europa has a chance to become one of the only few self-sustaining regions worldwide? Probably also use its competitive advantage to be able to offer and export this niche product on the world market?

30. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be in regard to European soy production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

31. Based on which indicators would you predict the market development for soy?
32. In which areas do you still have questions?

Annex IX. Questionnaire – Bioland

Esslingen, 11.04.2016

Organization: Bioland (NGO)

Interviewee: Mr. Dr. Eichert

(Translated from German)

General and introductory questions

1. In your opinion, what was the motivation and the primary reasons for the founding of the GM-free agriculture alliance in the province of Baden Württemberg?

   - Who were the decision makers and promoter or donors for the association?

   - How strongly discussed is the topic of the European soy production?

   - How is the association involved to a GM-free cultivation of soy in Europe? (Workshop)

2. What are the most prominent advantages for companies that are members of DSA?
   How high do you access the interest of organic producers in Donau Soy (soy beans from the Donau region) in general?
   (As usually there is an attempt to source animal feed from Germany)

3. In the dairy market the „not genetically engineered "label has been established very well, i. e. it has attracted attention among consumers and sales increased.

   How do you see the market position for a „not genetically engineered "label on meat products? Or rather the interests of consumers in „not genetically engineered „feeding?

Regionality

4. A very important issue in regard to soy sales from the Donau region is the consumer demands for regionally produced food. According to the DLG 45 %

of consumers rate regionality as highly important and 61 % do not believe that this is merely a temporary trend.

- Why do you believe that this trend is considered to continuing in the long run?
- What are the most pivotal indicators and drivers for this development?
- Do consumers see Europe as ‘regional’?
- Do you see the labels ‘Organic’ and ‘GMO Free’ as complementary?
- If Europe were to be able to support itself solely with regional soy production and distribution, do you believe that producers will sooner or later also resort to GMO soy due to difficulties in detectability?

5. Regional soy production in the Rhine-plain was initially introduced in the 1980s’ as a EU project. Why did the project, thus the regional soy production, become abandoned?
   What has changed/ What is different today?

6. What main advantages and disadvantages can you name that the EU is facing due to soy production in the European Region and particularly in the Donau Region?
   (1) political
   (2) economical
   (3) ecological
   (4) European/regional

7. Can you name examples of GMO pollution in the value chain? What solution approaches do you apply to this problem (e.g. monitoring systems, traceability)?
   At what point in the value chain do you install controlling check-points?
   Identity from field to shipment – Expense and effort?
   Who is responsible for the inspections?

8. Who are the main soy market supporters and drivers in the Donau region/Europe?
   Who is opposing and supporting the soy market in the Donau region?
   (Grower, breeder, consumer, oil mills, fodder producer, farmers, governmental decision makers, retail...)

   (According to the Association against genetic modification (Verband ohne Gentechnik (VLOG)), ABRANGE and the ProTerra Stiftung, the poultry industry in Germany and Europe has decided against GMO fodder due to pressure from the side of the food retail industry, fast food industry and environmental associations)

Pricing

9. What is the current price for raw soy for European and Brazilian GMO free soy?
   How high are the price differences between organic soy and genetically modified-free soy? (Could they ever be in a competition?

   How far can be the distance of a Bioland when obtain animal feed there regionally?

Questions on agricultural policies

10. Which assistance measures in form of policies do you believe to be the most important? From where do you experience most support and the highest achievements?
    - Greening
    - Eiweißprämie (Premium for non-GMO products)
    - Consumer support (Surveillance)
    - Marketing support (Labels)
    - Research support
    - Associations, Organisation

11. Do you know about any other support measures? Europe-wide or country-specific? Which ones?
    -In your opinion, where do you see margin for improvements?
    -In the future, how could the GAP-reform further support the European protein- or soy supply?

12. Do you think the soy market in the EU can continue its market position beyond the phasing out of subventions in 2018? If yes, why? How do you rate the extend of the subventions?

Markets

13. Which existing barriers hinder/support the European soy production significantly?
    Where are those barriers barely perceptible or even possible to circumvent?

    - legal framework conditions
    - political and lobby barriers (grain club, meat lobby)
    - Technical (harvest, transport, storage, detection of genetic engineering, separation of goods)
    - Knowledge transfer (communication/information exchange between agricultural enterprises, processors, retailers, **consumers)**

- Market barriers (transparency of market prices, price competition, **lacking structure** (processing, transport)
- Environmental (climate, biological, agricultural land)

14. What would be the **most important** change within the various segments of the value chain to support a further and sustainable expansion of soy production in the Donau region/Europe?
    What long-term conditions are necessary to sustainably expand soy production in the Donau region?

    - Breeding/seeding material
    - Cultivation/production
    - Registry/storage Which central registry points do you know?
    - Quality assessment/upgrading
    - Processing
    - Trade
    - Customer/final consume

    Which segment bears the highest investment costs to guarantee genetically unmodified agricultural production?

15. Do you have further knowledge on plans to expand the European soy market?
    - e.g. expansion of processing facilities (such as oil mill Straubing)
    - Further feed manufacturer that may intend to obtain European soy

Feeding

16. What is your position in regard to the statement that soy imports are indispensable in order to retain meat processing businesses – thus value addition and workplaces – in Germany?

    (Statement by the Grain Club: For the supply of domestic protein demand: Next to quantity the qualitative fodder requirements are to be secured to competitive prices. The delay in the EU-approval procedure for GM-varieties and the subsequent zero-tolerance promotes an unbearable legal uncertainty for stakeholders. The current demands for an extension of freedom from GMOs across the whole meat-processing sector (including poultry production) is unrealistic)

GMO

17. Do you have certain internal rules regulating genetically unmodified products for Bioland?

18. Apart from consumer concerns, where do you see the biggest controversies regarding genetically modified crops within the fodder industry/the food sector?
- How and in what way did consumer concerns become noticeable?
-Are there any verified impacts on the animals itself as well as product quality? (Sources?)
- Please elaborate your doubts on the touted benefits of GMOs and treatment with broad-spectrum chemical herbicides.

19. What is your position on genetically modified crops? Why should Europe not adopt genetic modification for fodder and food crops? What is your opinion based on?

20. Over time it has become increasingly difficult to obtain soy beans free from genetic modification. With genetically unmodified soy beans as a niche product, do you believe that Europe has a chance to become a self-sustaining region? Probably also use its competitive advantage to be able to offer and export this niche product on the world market?

21. Do you see the current transparency on directives and regulations for genetic engineering threatened through TTIP? What do you believe the impact of TTIP might be in regard to European soy production?

Overview/ Questions at the end of the interview/ Ad-hoc questions

22. Based on which indicators would you predict the market development for soy?
23. In which areas do you still have questions?

Annex X. Implementation of the ‘green-payment’ in Member States

Table 1.13: Implementation of the ‘green payment’ in Member States

	Green payment			Permanent grassland		EFA		
	Equivalent practices	Flat or individual payment	Regional application	Designation of permanent grassland in sensitive areas	Territorial application	Area to be considered EFA	Regional or collective implementation	Derogation for MMSS with more than 50% of their land covered by forest
Austria	Yes, Equivalent practices exist in the framework of the agro-environmental program: Participation in the measure "Environmentally sound and biodiversity-promoting types of management (UBB)" substitutes the requirements regarding Ecological Focus Areas (EFA) and crop diversification (equivalent practice: "Creation of biodiversity protection sites on arable land")	Individual payment until 2018	No	Yes	National	1) Land lying fallow; 2) Landscape features in accordance with the rules on cross compliance; 3) Areas with short rotation coppice; 4) Areas with catch crops, or green cover established by the planting and germination of seeds; 5) Areas with nitrogen-fixing crops	No	Not relevant
Belgium (Flanders)	No	Individual payment	No	No	Regional	1) land lying fallow; 2) landscape features: hedges or wooded strips; trees in group and field copses; field margins; ponds; ditches; 3) buffer strips; 4) hectares of agro-forestry; 5) areas with short rotation coppice; 6) areas with catch crops or green cover; 7) areas with nitrogen-fixing crops	Collective implementation	Not relevant
Belgium (Wallonia)	No	Individual payment	No	No	Regional	1) land lying fallow; 2) landscape features: hedges or wooded strips; isolated trees; trees in line; trees in group and field copses; field margins; ponds; ditches; 3) buffer strips; 4) hectares of agro-forestry; 5) areas with short rotation coppice; 6) areas with catch crops or green cover; 7) areas with nitrogen-fixing crops	No	Not relevant

Croatia	No	Individual payment	No	N/A	National	1) land lying fallow; 2) landscape features: hedges or wooded strips; isolated trees; trees in line; trees in group; ponds; ditches; traditional stone walls; 3) buffer strips, including buffer strips covered by permanent grassland; 4) strips of eligible hectares along forest edges; 5) areas with short rotation coppice with no use of mineral fertiliser and/or plant protection products; 6) areas with catch crops or green cover; 7) areas with nitrogen-fixing crops	No	Not relevant
Cyprus	No	Flat payment	N/A	No	National	1) land lying fallow; 2) landscape features, yet, entering into force as of 2016, including the following: a. isolated trees; b. field margins; 3) buffer strips; 4) hectares of agro-forestry; 5) afforested areas; 6) areas with nitrogen-fixing crops	No	Not relevant
Finland	No	Flat payment	Yes	Yes	National	1) land lying fallow; 2) other landscape features in accordance with the rules on cross compliance; 3) Areas with short rotation coppice; 4) Areas with nitrogen-fixing crops	No	Yes
France	Yes Equivalent practices exist in the framework of national certification established by the Ministère del'Agriculture, de l'Agroalimentaire et de la Forêt: green cover replaces the requirement on diversification only for specialized producers of maize	Individual payment (Mainland France) Flat payment (Corsica)	No	No	Regional	1) land laying fallow; 2) terraces; 3) landscape features (except landscape features under GAEC or SMR); 4) buffer strips; 5) hectares of agro-forestry; 6) strips of eligible hectares along forest edges, with or without agricultural production; 7) areas with short rotation coppice; 8) afforested areas; 9) areas with catch crops or green cover; 10) areas with nitrogen-fixing crops	No	Not relevant

Greece	No	Individual payment	Regional	No	National	1) land lying fallow; 2) landscape features: trees in line; trees in groups and field copses; ditches; 3) buffer strips; 4) areas with nitrogen-fixing crops	No	Not relevant
Hungary	No	Flat payment	Not relevant	Yes	National	1) Land lying fallow; 2) Terraces; 3) Landscape features (from 2017): Hedges or wooded strips, Trees in line, Field margins, Ditches and other landscape features under GAEC or SMR: Isolated trees, Trees in group and field copses, Ponds, Kurgans, draw wells; 4) Buffer strips; 5) Hectares of agro-forestry; 6) Strips of eligible hectares along forest edges; 7) Areas with short rotation coppice; 8) Afforested areas; 9) Areas with catch crops or green cover; 10) Areas with nitrogen-fixing crops	No	Not relevant
Italy	Yes, Equivalent practices exist in the framework of the agro-environmental programme: included are those listed in Annex IX, as from 2016	Individual payment	National	Yes	National	All the elements included in the corresponding article (46.2) of the regulation (UE) n. 1307/2013 are to be considered Ecological Focus Area, with the exception of areas with catch crops, or green cover (letter i)	No	Not relevant
Lithuania	No	Flat payment	Not relevant	Yes	National	From 2015 EFA elements will consist only of land laying fallow and nitrogen fixing crops; from 2018 Landscape features will be counted as EFA	No	Not relevant
Luxembourg	No	Flat payment	N/A	Yes	National	1) land lying fallow; 2) landscape features: Hedges or wooded strips; Isolated trees; Trees in line; Trees in group and field copses; Field margins; Ponds; 3) buffer strips; 4) hectares of agro-forestry; 5) strips of eligible hectares along forest edges; 6) areas with short rotation coppice; 7) afforested areas; 8) areas with catch crops or green cover; 9) areas with nitrogen-fixing crops	No	Not relevant

Slovakia	No	Flat payment	No	Yes	National	1) Land lying fallow; 2) Terraces; 3) Landscape features: Detached tree; Strips of eligible hectares along forest edges; Group of trees / thickets field; Margins; Ponds; Ditches; Traditional stone walls; 4) Buffer strips; 5) Areas with catch crops, or green cover; 6) Areas with nitrogen-fixing crops	No	Not relevant
Slovenia	No	Individual payment	No	Yes	National; holdings level if located in the areas of Natura 2000	1) Land lying fallow; 2) Areas with nitrogen-fixing crops; 3) Areas with catch crops, or green cover	No	No
Spain	No	Individual payment	No	Yes	National	1) Fallow land; 2) agro-forestry; 3) Afforested areas; 4) Nitro-fixed crops	No	Not relevant
Netherlands	Yes, 3 national certification schemes	Individual payment (until 2018)	No	No	National	1) landscape features: field margins; 2) areas with short rotation coppice; 3) areas with catch crops or green cover; 4) areas with nitrogen-fixing crops	Regional and collective implementation	Not relevant
United Kingdom (England)	No	Flat payment	No	No	National	1) Land lying fallow (buffer strips); 2) catch and cover crops used to manage soil fertility and quality; 3) Nitrogen Fixing Crops and hedgerows	No	Not relevant
United Kingdom (Northern Ireland)	No	Over time the value of the greening payment per hectare will move towards a flat rate payment at the same pace as the movement of the Basic Payment.	No	Yes	Regional	1) Land lying fallow; 2) Landscape features required to be retained under cross compliance (will include hedges, ditches and stone walls); 3) Areas of agro-forestry; 4) Areas with short rotation coppice with no use of mineral fertiliser and/or plant protection products; 5) Afforested areas which were used to claim SFP in 2008; 6) Areas with nitrogen fixing crops	No	Not relevant
United Kingdom (Scotland)	No, Possible review in 2016 to introduce equivalent practices for crop diversification.	Flat payment	Yes	Yes	National	1) Fallow land; 2) Buffer strips; 3) Field margins; 4) Catch crops and green cover; 5) Nitrogen fixing crops	No	Not relevant

United Kingdom (Wales)	No	Individual payment (until 2018)	No	Yes	National	1) Land lying fallow; 2 Hedges and traditional stone walls; 3) Short rotation coppice; 4) Afforested areas used to claim SFP in 2008; 5) Nitrogen fixing crops	No	Not relevant
Ireland	Yes, equivalent measure under an agri-environment scheme	Individual payment	National	No	National	1) Land lying fallow; 2) Hedges/wooded strips; 3) Trees in a group and field copses; 4) Ditches; 5) SPS eligible forestry which were afforested under afforestation aid scheme since 2009; 6) areas with short rotation coppice; 7) areas with N-fixing crop; 8) areas under catch crops / green cover	No	Not relevant
Latvia	No	Flat payment	National	Yes	National	1) Land lying fallow; 2) Landscape features: protected large trees, tree avenues and large stones; trees growing in a group, and clusters of trees and bushes; edges of the field; ponds; 3) Buffer strips; 4) Areas with catch crops, or green cover; 5) Areas with nitrogen-fixing crops. In 2016, additional inclusion of strips along forest edges, and ditches is planned	No	Yes
Estonia	No	Flat payment	National	Yes	National	1) Landscape features; 2) Land lying fallow: 3) Areas with short rotation coppice; 4) Areas with nitrogen-fixing crops	No	Yes
Romania	No	Flat payment	No	N/A	N/A	1) terraces; 2) landscape features; 3) buffer strips; 4) areas with short rotation coppice; 5) afforested areas; 6) areas with green cover; 7) areas with nitrogen-fixing crops	No	Not relevant
Sweden	No	Individual payment (until 2019)	No	No	National	1) Land lying fallow ; 2 Landscape features; 3) field margins ; 4) Area with short rotation coppice; 5) Area with catch crops or green cover; 6) Area with NFC	No	Yes

Denmark	No	Individual payment (until 2018)	No	Yes	National	1) Land lying fallow; 2) Landscape features: Ponds and other landscape feature under GAEC or SMR; 3) Buffer strips; 4) Areas with short rotation coppice; 5) Areas with catch crops or green cover	No	Not relevant
Bulgaria	No	Flat payment	No	No	National	1) land lying fallow; 2) terraces; 3) landscape features: hedges or wooded strips, isolated trees, trees in line, trees in groups and field copses, field margins, ponds, ditches; 4) buffer strips; 5) strips of eligible hectares along forest edges; 6) Strips without production; 7) areas with short rotation coppice; 8) Areas with catch crops or green cover; 9) Areas with nitrogen-fixing crops	No	Not relevant
Germany	No	Flat payment	No	Yes	Regional	1) Land lying fallow; 2) Terraces; 3) Landscape features; 4) Buffer strips; 6) Hectares of agro-forestry that receive, or have received, support under Pillar II; 7) Strips of eligible hectares along forest edges; 8) Areas with short rotation coppice; 9) Afforested areas; 10) Areas with catch crops, or green cover established by the planting and germination of seeds	No	Not relevant
Czech Republic	Yes, Equivalent practices exist in the framework of the agro-environmental programme (from 2016)	Flat payment		Yes	National	1) Land lying fallow; 2) Landscape features; 3) Buffer strips; 4) Short rotation coppice; 5) Afforested areas; 6) Catch crops; 7) Nitrogen-fixing crops	No	Not relevant
Malta	No	Flat payment	National	No	National	1) land lying fallow; 2) landscape features: isolated trees; trees in line; 3) trees in group and field copses; Field margins; Other landscape features under GAEC or SMR; 4) Areas with nitrogen-fixing crops	No	Not relevant

Poland	Yes, Equivalent practices exist in the framework of the agro-environmental scheme: crop diversification	Flat payment		No	National	1) Fallow land; 2) Landscape features (all, excl. stone walls and other landscape features under GAEC or SMR); 3) Buffer strips; 5) Strips of eligible ha along forest edges 6) Short rotation coppice; 7) Afforested areas; 8) Catch crops/green cover; 9) Nitrogen-fixing crops	Collective implementation	Not relevant
Portugal	No	Individual payment	No	No	National	1) land lying fallow; 2) landscape features: Other landscape features under GAEC or SMR; 3) Hectares of agro-forestry; 4) Afforested areas; 5) Areas with nitrogen-fixing crops; 6) Areas with nitrogen-fixing crop	No	Not relevant

Source: Own elaborations based on information collected by Member States, European Commission 2015a, COPA-COGECA 2015.

Source: European Parliament 2015.

Annex XI. Price notations from H.-J. Scheffler GmbH

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		Kauber Pegel:	**2,63 m**	**1 EUR =**	**1,1047 $**	**(1,1071 $)**
Datum:	**11. Juli 2016**	**KWZ Mz**	**per t € 0,00**	**1 USD =**	**0,9052 €**	**(0,9033 €)**

Unsere heutigen freibleibenden Euro Notierungen per t, lose, frei Fuhre, Basis 25 t, Normalwasser

LP Sojaschrot 44/7							
	Soya **Mainz/Wiesb.**	ADM **Hamburg**	Umschlag **Rbg/Kelheim**	Umschlag **Heilbronn**	Umschlag **Straub./DEG**	Umschlag **Bülstringen**	46 % Prot. Pell. **Heilbronn**
Termine	**11.07.2016**	**11.07.2016**	**11.07.2016**	**a.A.**	**11.07.2016**	**11.07.2016**	**loko**
07/16	380,00	373,00	390,00	389,00	396,00	379,00	418,00
08/16	380,00	373,00	390,00	388,00	395,00	381,00	420,00
09/16	386,00	377,00	399,00	396,00	399,00	386,00	424,00
10/16	385,00	377,00	400,00	397,00	400,00	386,00	424,00
11-04/17	380,00	375,00	394,00	391,00	394,00	384,00	419,00
05-10/17	359,00	354,00	374,00	371,00	374,00	363,00	388,00

HP Sojaschrot 49 %							
	Soya **Mainz/Wiesb.**	ADM **Hamburg**	Umschlag **Rgb/Kelheim**	Umschlag **Heilbronn**	Umschlag **Straubing**	**HP** **Bülstringen**	**48 % PROFAT/P.** **Bülstringen**
Termine	**11.07.2016**	**11.07.2016**	**11.07.2016**	**a.A.**	**11.07.2016**	**11.07.2016**	**11.07.2016**
07/16	413,00	404,00	423,00	423,00	429,00	412,00	408,00
08/16	413,00	404,00	423,00	422,00	428,00	414,00	409,00
09/16	419,00	409,00	433,00	430,00	432,00	418,00	415,00
10/16	419,00	409,00	433,00	431,00	433,00	418,00	415,00
11-04/17	413,00	407,00	427,00	425,00	427,00	416,00	412,00
05-10/17	394,00	386,00	408,00	405,00	407,00	395,00	383,00

Rapsschrot Basis 12,5 % Feuchte							
	Bunge **Mannheim**	Cargill **Mainz/Schier.**	Thyw/Sels **Neuss/Spyck**	ADM **Straubing**	Dreyfus **Wittenberg**	Ölwerk **Magdeb./Riesa**	Bunge **Bruck/Leitha**
Termine	**11.07.2016**	**11.07.2016**	**a.A.**	**a.A.**	**a.A.**	**a.A.**	**ppt.**
07/16	208,00	206,00	206,00	202,00	202,00	**2H07** 202,00	200,00
08-10/16	209,00	a.A.	207,00	208,00	203,00	203,00	202,00
11-01/17	220,00	a.A.	217,00	219,00	214,00	214,00	215,00
02-04/17	222,00	a.A.	219,00	224,00	216,00	216,00	217,00
05-07/17	224,00	a.A.	219,00	226,00	218,00	217,00	a.A.
					0,00		

fr. Luzernegrünmehlpellets		**EU-Sojaschrot NON-GMO**		**Sonnenschrot 28 % Prot.**		**Sonnenschrot 35,5 % ProFat**	
Termin	ab Werk 16 %	Termin	Straubing	Termin	Neuss/Riesa	Termin	Bruck/Leitha
07-10/16	172,00	07/16	422,00	07/16	a.A.	08/16	a.A.
11-04/17	a.A.	07-10/16	422,00	10-12/16	180,00	10-12/16	209,00

Leinschrot		**Leinexpeller**		**Protigrain**		**Roquette Beinheim**	
Termin	Thywissen	Termin	Thywissen	Termin	Zeitz	**Milurex BE**	**Corex 200**
07/16	300,00	07/16	305,00	07/16	a.A.	08-09/16 a.A.	08-09/16 a.A.
				09-10/16	182,00	10-12/16 a.A.	10-12/16 a.A.

Melasseschnitzelpellets							
	Rain u. Ochs.	Plattling	Offstein	Offenau	Warburg PS	Kl.Wanzleben	Niedersachsen
07/15	a.A.	a.A.	a.A.	a.A.	a.A.	a.A.	a.A.
Kamp. 2016	n.n.	n.n.	n.n.	n.n.	n.n.	140,00	135,00

Source: Scheffler GmbH 2016.

Annex XII. Total area planted (2014, 2015, 2016) – Europe (+UA, RU)

Country	FR	DE	CZ	SK	HU
Area planted **2014** in 1000 ha	75,8	10	7,2	33,2	42,3
Area planted **2015** in 1000 ha	101,1	11	12,3	43,7	72,6
Percentage difference (%)	33,4%	10,0%	70,8%	31,6%	71,6%
Area planted **2015** in 1000 ha	101,1	17	12,3	43,7	72,6
Area Planted **2016** in 1000 ha	141	15,2	10,61	35,15	66,46
Percentage difference (%)	39,5%	-10,6%	-13,7%	-19,6%	-8,5%

Country	RS	AT	IT	HR
Area planted **2014** in 1000 ha	154,3	43,8	232,9	47,1
Area planted **2015** in 1000 ha	240	56,9	265,7	81
Percentage difference (%)	55,5%	29,9%	14,1%	72,0%
Area planted **2015** in 1000 ha	240	56,9	265,7	81
Area Planted **2016** in 1000 ha	186	49,78	299,09	75,3
Percentage difference (%)	-22,5%	-12,5%	12,6%	-7,0%

Country	RO	BG	UA	RU
Area planted **2014** in 1000 ha	79,3	0,3	1792	1691
Area planted **2015** in 1000 ha	122,2	37	2145	1880
Percentage difference (%)	54,1%	12233,3%	19,7%	11,2%
Area planted **2015** in 1000 ha	122,2	37	2145	1880
Area Planted **2016** in 1000 ha	130,33	14	1846	2020
Percentage difference (%)	6,7%	-62,2%	-13,9%	7,4%

Source: Own tables adapted from Eurostat, APK-Inform, Gossort, Sorte 2014-2016.

AT	**Austria**	**HU**	**Hungary**
BG	**Bulgaria**	**IT**	**Italy**
CZ	**Czech Republic**	**RO**	**Romania**
DE	**Germany**	**RS**	**Serbia**
FR	**France**	**RU**	**Russia**
HR	**Croatia**		

Source: laendercode.net 2015.

Annex XIII. Soybean Maturity Group Classification systems (Part 1)

Maturity Groups after:	**Maturity Groups in the USA**	**Comparison in days vs. 00 maturity group**	**Comparison vs. FAO of corn usage**	**Temp. Sum Basis 6°C**	**Crop Heat Units (CHU)**	**US Realtive Mat. Days (RM)**	**Latitude**	**Comparable to North American Region**	**Comparable to European Region**
09.09.2016	USA								
Extremely early	000.0	12 days earlier	FAO 210 - 230		2075 CHU				
Standard:									
Very early	000.5	8 days earlier	FAO 240 - 250	1.450°	2200CHU				Russia (Moscow) 55.8 Ukraine (Kiev) 50.6
Standard:		GALLEC							
Very early to early	00.0	4 days earlier			2325 CHU	105 Days	Greater than 50 latitiude	North of Winnepeg, Manitoba	
Standard:									
Early	00.5	0 days to full maturity	FAO 260 - 300	1.600°	2425 CHU	110 Days	from 50 to 49 latitude	South of Winnipeg, Manitoba	Slovakia (Bratislava) 48.1 Austria (Vienna) 48.2
Standard:		MAPLE ARROW							
Early to medium	0.0	4 days later			2550 CHU	115 Days	from 49 to 48 latitude	Northern North Dakota and Minnesota, Canadian Border	
Standard:		MN0095		1.800°					
Medium	0.5	7 days later	FAO > 300		2675 CHU	120 Days	from 48 to 47 latitude	Central NorthDakota, North Central Minnesota	Hungary (Pecs) 46. Russia (Krasnodar) 45.5
Standard:		SHEYENNE (0.7)							
Medium to late	1.0	10 days later			2800 CHU	125 Days	from 47 to 46 latitude	Southern North Dakota, South Central Minnesota, Northern South Dakota	
Standard:		Surge							
Late	1.5	18 days later	FAO > 350		2925 CHU	130 Days	from 46 to 45 latitude	Central South Dakota, Southern Minnesota	Russia (Krasnodar) 45. Serbia (Belgrade) 44.8
Standard:		IA1022 (1.8)							
Late to very late	2.0				3050 CHU	135 Days	from 45 to 44 latitude	Iowa, North Illionis South Michigan	
Standard:		IA2102							
Very late	2.5				3175 CHU	140 Days	from ≈ 44. up to ≈ 42. latitude	Central Iowa, Central Illinois	
Standard:									

Soybean Maturity classification- Federal plant varieties offices (Part 2)

Maturity Groups after:	C.T.P.S	Bundessortenamt	AGES	ÚKZÚZ	UKSUP	Nébih
Country:	FR	DE	AT	CZ	SK	HU
Extremely early			0000-1			
Check Varieties:						
Very early	000	1 sehr früh (very early)	000-2 000-3 000-4	1		
Check Varieties:	AWOLO1 (-2d)* MERLIN (-2d) RGT SHOUNA SIRELIA SULTANA ES COMANDOR (can.)		SULTANA (000-3) TOURMALINE (000-4) [ABELINA (000-2] [ALEXA (000-2] [SULTANA (000-3] [REGINA (000-3]	BOHEMIANS		
Very early to early		2 sehr früh bis früh (very early to early)		2		
Check Varieties:						
Early	00	3 früh (early)	00-5 00-6 00-7	3	00	I
Check Varieties:	ES MENTOR SOLENA SOPRANA RGT SVELA (can.)	TIGUAN		BRUNENSIS LAURENTINA	ES MENTOR CARDIFF	BRÓKA LONDON
Early to medium		4 früh bis mittel (early to medium)	00-(8)	4		
Check Varieties:		AMAROK, [MERLIN]				
Medium	0	5 mittel (medium)	00-(8) 0-(9)	5		II
Check Varieties:	ES GLADIATOR RGT SPEEDA	[SULTANA] [PRIMUS]		NAYA		BROSTYÁN ALÌZ BÓLY 44
Medium to late		6 mittel bis spät (medium to late)	00-7	6		
Check Varieties:						
Late	I	7 spät (late)	00-(8)	7		III
Check Varieties:	ISIDOR SHERPA STEARA ES PALLADOR (can.)					IKA BÓBITA PANNÓNIA KINCSE
Late to very late		8 spät bis sehr spät (late to very late)	0-(8)	8		
Check Varieties:						
Very late	II	9 sehr spät (very late)	0-9	9		IV
Check Varieties:	ECUDOR SANTANA					

* (-2d) = two days earlier than other 000 varieties
(can.) = Candidate for the next years VCU

Soybean Maturity classification- Federal plant varieties offices (Part 3)

Maturity Groups after:	SORTE	ISTIS	ИАСАС	COBORU	SORTTEST	UIESR – УИЭСР	GOSCOMSORT – ГОСКОМСОРТ	GOSSORT
Country:	RS	RO	BG	PL	BY	UA	KZ	RU
Extremely early	< 100 days							1
Check Varieties:						ANNUSHKA (fm) very early	BARA very early	
Very early	< 100 days very early (000)		000 < 90 days					2
Check Varieties:	GRACIA							AMAROK GALLEC
Very early to early								3
Check Varieties:						CHEREMOSH (fm) HOROL early	ARLETTA early	LANCEOLATE
Early	101 - 115 days very early (00)		00 90-100 days	126 days to be ready for harvesting				4
Check Varieties:	MERKUR			AUGUSTA				BELGOROTSKAYA 48 CAMEP 2 ALBA DON 9 SIBIRER
Early to medium				127 days to be ready for harvesting				5
Check Varieties:				ALDANA	SWAPO			ANNUSHKA SELECTA 201 DREAM GRAMPUS SIIN NIIK 315
Medium	116 - 125 days early (0)		0 100-110 days	132 days to be ready for harvesting				6
Check Varieties:	GALINA			ABELINA	PRIPYAT		GANSAYA medium	
Medium to late				136 days to be ready for harvesting				7
Check Varieties:				MAVKA				
Late	126 -135 days medium early (1)		I 110-120 days	137 days to be ready for harvesting				8
Check Varieties:	SAVA		ISIDOR, AVIGEYA	MADLEN	YASELDA		DANAYA late	
Late to very late	136 - 145 days medium late (2)			138 days to be ready for harvesting				9
Check Varieties:	SAVA (136 days)			ALLIGARTOR				
Very late	over 145 days very late (3)		II 120 - 130					10
Check Varieties:	Senka (145 days)							

Source: Own table 2015.

Annex XIV. USDA: Oilseed Prices

Table 29: Oilseed Prices
U.S. Dollars per Metric Ton

Year Beg Oct 1	Soybean U.S. 1/	Soybean U.S. 2/	Soybean Brz 3/	Soybean Arg 4/	Soybean Rott 5/	Peanut U.S. 6/	Peanut Rott 7/	Sunseed U.S. 8/	Sunseed Rott 9/	Rapeseed Hamb 10/	Copra Rott 11/
Oct - Sep Average											
04/05-13/14	377	387	411	409	452	502	1396	450	487	473	676
2004/05	217	214	232	228	277	402	915	316	313	262	431
2005/06	205	202	228	227	261	383	857	261	291	292	387
2006/07	254	264	279	279	335	394	1,128	343	401	375	537
2007/08	414	452	472	469	550	458	1,688	532	745	644	867
2008/09	368	365	403	392	421	517	1,204	461	364	393	487
2009/10	354	357	390	395	429	467	1,209	342	452	419	613
2010/11	454	482	508	511	549	508	1,792	591	661	647	1188
2011/12	488	505	549	533	562	729	2,480	632	593	616	829
2012/13	530	537	538	543	592	635	1,391	546	580	579	570
2013/14	482	487	514	517	542	524	1,300	480	466	505	854
2014/15											
Oct	366	343	403	424	425	463	1,342	503	419	412	769
Nov	375	373	417	457	449	472	1,370	437	443	418	795
Dec	378	377	414	459	443	463	1,360	432	464	428	813
Jan	378	365	397	447	423	496	1,350	425	438	415	764
Feb	364	361	385	442	407	492	1,350	454	438	405	794
Mar	362	356	377	402	403	496	1,300	489	433	399	721
Apr	356	353	376	368	395	487	1,300	511	426	404	714
May	353	350	374	362	389	496	1,290	582	406	427	748
Jun	352	353	373	364	397	481	1,280	564	420	451	748
Jul	366	371	394	376	405	507	1,280	582	432	419	735
Aug	357	348	378	362	381	483	1,150	531	430	411	689
Sep	333	317	371	353	368	443	1,150	556	431	413	699
Average	362	356	388	401	407	482	1,294	506	432	417	749
2015/16											
Oct	324	320	364	358	376	412	1,150	410	464	426	736
Nov	319	316	331	349	368	392	1,175	406	478	406	716
Dec	322	321	330	350	372	392	1,200	428	473	413	759
Jan	320	320	333	340	367	425	1,175	441	465	397	763
Feb	313	317	332	327	369	434	1,150	452	464	395	813
Mar	315	322	342	332	375	423	1,150	472	436	394	990
* Apr	N/A	345	375	360	393	N/A	1,163	N/A	427	421	1045
May											
Jun											
Jul											
Aug											
Sep											
Average	319	323	344	345	374	413	1,166	435	458	407	832

1/ U.S. Farm Price; USDA. 2/ U.S. NO.1 Yellow Cash Central Illinois; AMS.
3/ Brazil Paranagua, FOB; IGC 4/ Argentina Up River, FOB; IGC
5/ Rotterdam CIF; US origin; Oil World. 6/ US Farm Price, Inshell, USDA.
7/ Rotterdam CIF; US Runners 40/50%, Shelled Basis, Oilworld. 8/ US Farm Price; USDA
9/ Rotterdam/Amsterdam CIF; EU; Oil World 10/Hamburg CIF; Europe "00"; Oil World.
11/ Phil/Indo CIF NW Europe; Oil World
* Preliminary   Sept/Oct/Nov Shipment   5/10/2016 11:35:28 AM

Source: USDA FAS 2016b.

Annex XV. Statutory declaration

I, Berschneider, Jana

Born on 05 December 1989

Matriculation Number 488567

hereby declare on my honour that the attached Master Thesis has been independently prepared, solely with the support of the listed literature references, and that no information has been presented that has not been officially acknowledged.

Supervisors	Prof. Dr. Harald Grethe
	Prof. Dr. Manoj Potaphon
Thesis topic	Chances and Limitations of European Soybean Production: Market Potential Analysis
Semester	Winter semester 2016

Study programme Sustainable Agriculture and Integrated Watershed Management

I declare, here within, that I have transferred the final digital text document (in the format doc, docx, odt, pdf, or rtf) to my mentoring supervisor and that the content and wording is entirely my own work. I am aware that the digital version of my document can/or will be checked for plagiarism with the help of an analyses software programme.

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