

Risk assessment in the conversion from conventional to organic production: case studies of the potato and tomato farming in the Netherlands and in Italy

Master thesis in

Business Economics

Management, Economics and Consumer Studies

Author: Federico Concaro

Registration Number: 941222161100

Supervisor: Xudong Rao PhD

(Business Economics Group, Wageningen University)

Thesis code: BEC-80433

Wageningen University 2017-2018

Table of contents

Abstract.....	4
Acknowledgements.....	5
1. Introduction.....	6
1.1. Background.....	6
1.2. Research problem and methodology.....	9
1.3. Research objective and research questions.....	12
2. Literature review.....	12
2.1 Moving towards an organic production.....	12
2.2 Risk in Agriculture.....	16
2.3 The Netherlands and Italy.....	18
3. Methodology.....	21
3.1 Theoretical framework.....	21
3.2 Research methodology.....	23
4. Analysis of interviews.....	26
4.1 Production risk.....	26
4.1.1 Dutch potato growers.....	26
4.1.2 Italian potato growers.....	28
4.1.3 Dutch tomato growers.....	29
4.1.4 Italian tomato growers.....	30
4.1.5 Summary.....	31
4.2 Market risk.....	32
4.2.1 Dutch potato growers.....	32
4.2.2 Italian potato growers.....	33
4.2.3 Dutch tomato growers.....	33
4.2.4 Italian tomato growers.....	34
4.2.5 Summary.....	35

4.3 Institutional risk.....	36
4.3.1 Dutch potato growers.....	36
4.3.2 Italian potato growers	36
4.3.3 Dutch tomato growers.....	37
4.3.4 Italian tomato growers	38
4.3.5 Summary	38
4.4 Personal risk	39
4.4.1 Dutch potato growers.....	39
4.4.2 Italian potato farmers	39
4.4.3 Dutch tomato farmers	40
4.4.4 Italian tomato farmers	40
4.4.5 Summary	41
5. Discussion and limitations.....	42
6. Conclusions	44
7. References	47
Appendix.....	51

Abstract

Over the last decades, European organic production has gained consensus and popularity among consumers, changing from a niche to a well-established market. All the same, only a small fraction of European Utilised Agricultural Area (*UAA*) is cultivated with an organic production strategy. Apparently, farmers still perceive the change from a conventional towards an organic production strategy as risky and uncertain. The current study aims to better define the major risks that Dutch and Italian farmers consider during the transition period. The report will focus on two specific crops, namely potatoes and tomatoes. Ultimately, the purpose of the research is to better define the risks involved for such crops in the analysed countries. As a matter of fact, the current literature is very broad and general, but hardly analyses single crop in selected Nations.

Key words: risk assessment strategy, organic production, Netherlands, Italy, potatoes, tomatoes.

Acknowledgements

I would like to acknowledge all relevant people who made this research possible. To begin with professor Xudong Rao who followed me thoroughly over the entire thesis, offering me valuable suggestions and ideas. Then the agronomist Dave Bekker from Nautilus Organic, whose help was pivotal in order to engage Dutch tomato producers in the research. Next to Nautilus Organic I would like to thank SATA, who provided me with different contacts throughout the entire Italian country and made available the interviews within the summer time. Last but not least, I want to acknowledge every single farmer and stakeholder who took part in this research: thank you for your availability, time and insights!

1. Introduction

1.1. Background

European organic production has continuously increased over time. In 2015 the total area under organic production was approximately 11.1 million hectares¹ (ha). The increase in size has been escorted by a remarkable market growth: the market value of organic products has doubled from €11.1 billion in 2005, to €24 billion in 2014². Within this market, fruits and vegetables are considered as blockbuster products, accounting for one fifth of many national markets². In general, they have higher market share than the overall organic products market share (Weibel, Daniel, Tamm, Willer, & Schwartau, 2013). Despite the significant market value, vegetable sector accounts for a minor section of the organic area: 145 639 *ha* in 2015³, representing 1,3% of the total organic area.

Nevertheless, as stated before, the horticulture sector as a whole, is of relevant importance for European agriculture, determining 13,6% of the overall agricultural production. Regarding hectares, in 2014 vegetable crops were grown over an area of 4,150,407 *ha*⁴, 2,4% of the European utilized agricultural area (UAA). In terms of economic value, Netherlands and Italy are two of the most representative countries, accounting for 35% of vegetable output in 2015⁵. As it is possible to detect from the previous data only a small percentage (3,5%) of the European horticulture production is organic.

This report will focus on two of the main horticulture countries in Europe: Netherlands and Italy. There is a substantial difference in organic production between the two countries. As a matter of fact, in 2015 the total area under organic production in the Netherlands amounted to 50 435 *ha* (2,6% of the total UAA)⁶ compared to 1 492 579 *ha* of the Italian peninsula⁷ (11,6% of the total UAA). As it is possible to detect, Italy allocates much more *ha* of fertile land than Netherlands to the production of organic crops. In addition, compared to the data of 2010, Dutch organic share has decreased by 4% (from 46 233 *ha* to 44 402 *ha*), whereas

¹ http://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics

²

³ http://ec.europa.eu/agriculture/sites/agriculture/files/markets-and-prices/more-reports/pdf/organic-2013_en.pdf

⁴ <http://www.fao.org/faostat/en/#data/QC>

⁵ http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_production_-_crops#Vegetables

⁶ <http://www.louisbolck.org/downloads/2338.pdf>

⁷ http://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics

Italian one has soared by 34% (from 1 113 742 *ha* to 1 492 579 *ha*)⁶. Mind that the percentages are being calculated upon the UAA of the European agricultural census of 2010.

Nevertheless, as for the horticulture division, there is an opposite situation: 84 582 *ha* of fresh vegetables, of which 6 185 *ha* organic, in the Netherlands and 509 624 *ha* in Italy⁸, of which 22 859 *ha* organic⁹. Within the sector, the organic share of fresh vegetables accounts for 7,31% in the former country and 4,49% in the latter. Percentages are being computed based on 2014 data from the FAO database¹⁰. Data is summarized in *Table 1*. For the sake of consistency, each data refers to the area fully converted to organic farming, without taking into consideration the portion under conversion.

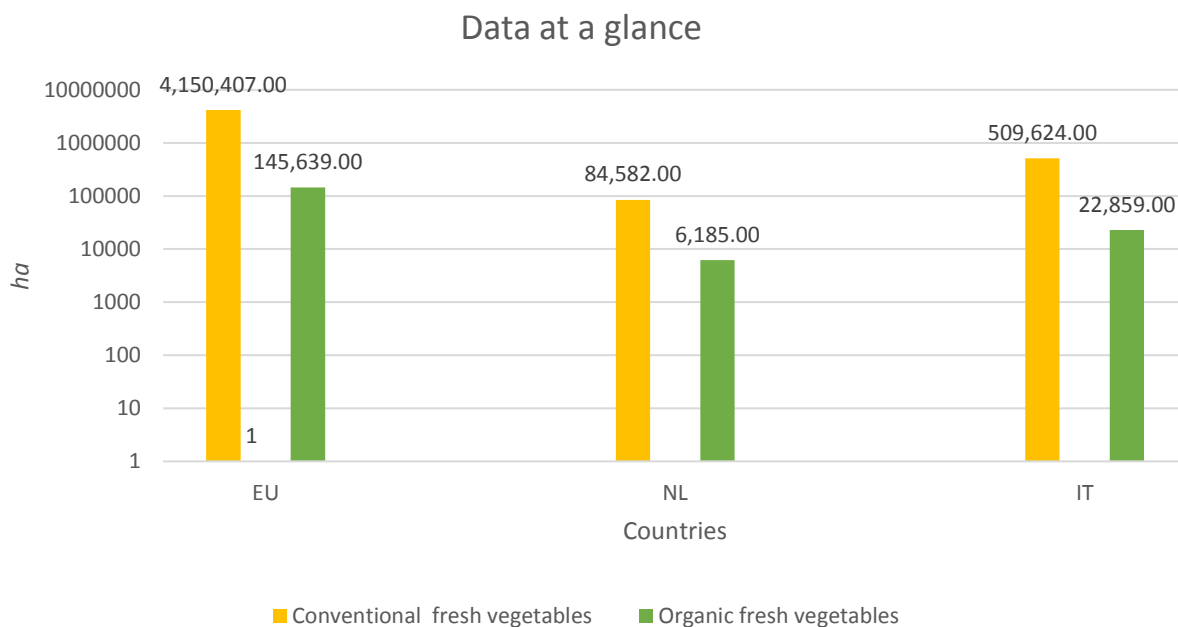


Table 1: amount of conventional and organic fresh vegetables ha in Europe, the Netherlands and Italy (<http://www.fao.org/faostat/en/#data/QC>; <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>)

As it possible to depict from the above description, Italy has a bigger share of organic horticulture in absolute value, but the Netherlands has a higher portion of organic vegetables in terms of national production. Moreover, the vegetables portfolio of the two countries is significantly different, mainly due to the surrounding landscape and weather conditions. The overall aim of the study is to define the main sources of risk in the transition from conventional to organic farming of two important crops for the mentioned countries, namely

⁸ <http://www.fao.org/faostat/en/#data/QC>

⁹ <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>

¹⁰ <http://www.fao.org/faostat/en/#data/QC>

potatoes (*Solanum tuberosum* L.) and fresh tomatoes (*Solanum lycopersicum* L.).

The first one is an “open field” vegetable and represents the most widespread horticulture species in the Netherlands, accounting on its own for 155 000 ha of the total UAA. On the other hand, in Italy the harvested area was 52,349 ha in 2014¹⁰. In terms of organic area there are around 1,300 ha of organic potatoes in the Netherlands (2008)¹¹ and 693 ha in Italy (2016)¹².

The latter crop takes up a considerable portion of land in Italy, amounting to 26 000 ha, of which 50% of the overall yield is cultivated under greenhouses, for an utter production of approximately 1 130 000 tons¹³. Even though the harvested area in the Netherlands is significantly lower, only 1 760 ha, all of them under greenhouses, the production is almost the same, namely 900 000 tons^{http://www.freshplaza.com/article/156722/900-million-kg-Dutch-tomatoes-in-2016}. In 2009, the organic share of greenhouses tomatoes in the Netherlands was 85 ha¹⁴. Data is summarized in Table 2

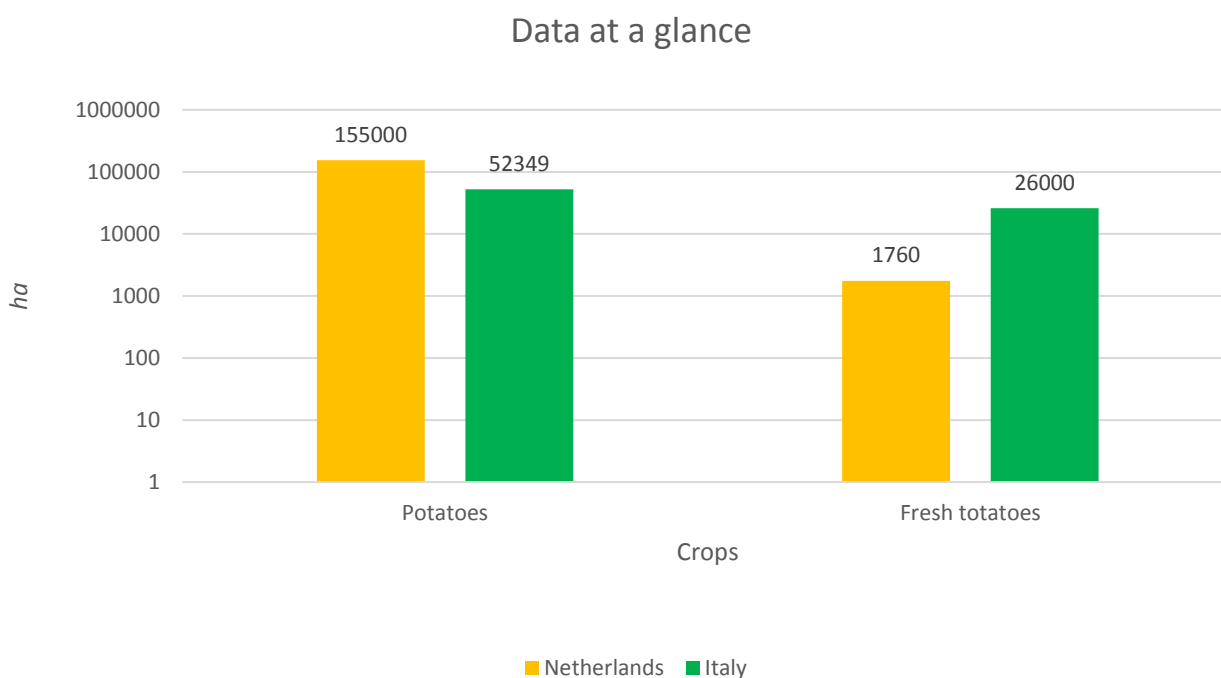


Table 2: ha of potatoes and fresh tomatoes in the two countries (<http://www.fao.org/faostat/en/#data/QC>)

¹¹ Ministry of Agriculture, Nature and Food Quality. 2007. Policy Document on Organic Agriculture 2008 – 2011, Organic connections, perspectives for growth. Ministry of Agriculture, Nature and Food Quality, The Hague, December 2007

¹² Sinab: bio in cifre 2016

¹³ <http://www.italiafruit.net/DettaglioNews/33775/la-categoria-del-mese/focus-pomodoro-da-industria-e-da-mensa-produzioni-import-export-consumi-prezzi>

¹⁴ Research on organic agriculture in the Netherlands

1.2. Research problem and methodology

Despite the great market value of organic production, the organic horticulture *UAA* in the analysed countries can still be implemented. As a matter of fact, there is a severe gap between the conventional and organic horticulture share. In general, farmers are still doubtful and reluctant about the transition from a conventional production to an organic one (Hanson et al.,2017). However, the environmental community urges to introduce agricultural techniques that eventually promote a worldwide sustainable development. Such development is made up of three elements, namely economic, natural and social sustainability. Organic farming is an essential component of such a change. However, farmers that shifted towards an organic farming take on more risks than conventional growers (Serra & Zilberman, 2008).

Especially within the agricultural sector, risk is an inherent and key element. Risk can be defined as the simple following equation (Kaplan & Garrick, 1981):

$$\text{Risk} = \text{uncertainty} + \text{damage}$$

For the purpose of this research, it is important To better define the difference between hazard and risk. The former is identified as “a source of danger”, while the latter as the “possibility of loss or injury” and the “degree of probability of such loss” (Kaplan et al, 1981). The hazard is therefore a source, while risk implies the probability of that specific source to become a loss or create other forms of damage. If the probability is null then risk does not end up in a negative outcome, but might be perceived as a source of benefit and/or profit. Nowadays, there are many risks that farmers need to take on in their working activities. Clearly, the personal inclination towards risk is subjective and differs from person to person. In such a way, farmers do not deal with risks equally: there are some producers who are more inclined and others that are more risk averse. The multiple types of risks involved in agriculture can be summarized, as cited within the book “Coping with Risk in Agriculture” (J. Hardaker et al, 2015), in four different categories:

1. **production risks:** due to weather and crop performance uncertainty;
2. **price or market risks:** erratic demand and unstable currency exchange rates;
3. **institutional risks:** shifts within national and international laws can affect, positively or negatively, farm performance. It can be further split into two sub-categories:

political risk, unfavourable changes of the current regulations, and *sovereign risk*, determined by foreign governments actions;

4. **human or personal risks**: unexpected events (such as illness, business divorce, death) that affect people who run the farm and their perception towards risk.

The following study has the aim to analyse the most pivotal sources of risks within the change from conventional to organic farming. The analysis tries to be as representative as possible for two main reasons:

1. evaluate two countries, one Northern Europe and the other Southern Europe, both of remarkable relevance within the horticulture sector;
2. compare two different crops under distinct ways of production, namely open field and greenhouse production strategy.

According to these dissimilarities farmers may be more in favour or more reluctant to face the four categories of risk mentioned above. Based on their attitude and risk preferences, they might either undertake an organic production strategy or keep running their businesses in a conventional way.

To determine and assess the underlying factors within the switch from conventional to organic farming, it will be used a “bottom-up” approach. To wit, starting with a broad analysis of the multiple risks involved in such a conversion and then focusing on particular cases to provide concrete and applied examples (P. Sabatier, 1986). In practice, the research will be carried through three main steps: first of all, it will be performed an integrative literature review to evaluate the state of the art of the European conventional and organic production strategy, with a particular focus on the horticulture sector. Then, the focus will switch to a more specific analysis by evaluating the current results in the Netherlands and in Italy, mainly through online databases such as Eurostat and Faostat, partly mentioned within the *Introduction* chapter. Eventually, through the introduction of case studies, it will be possible to plot local trends and determine the major risks involved in the conversion for Dutch and Italian farmers.

The case study is the unit of analysis, or multiple units of analysis (respectively *single* and *multiple* case studies), where the phenomenon of interest can be studied (D.A. de Vaus, 2001). There are different types of case studies, such as exploratory, descriptive and explanatory. The thesis will be based on descriptive qualitatively oriented case studies, which allows to describe in depth and thoroughly each farmers’ beliefs, decisions and choices related to the conversion (Zainal, 2007). Moreover, they are valuable to highlight

the variety of linkages and connections among the socio-economic and biophysical aspects of organic farming (Watson et al., 2007). In total, there will be twenty-two case studies, three per each crop in the Netherlands and eight per each crop in Italy. Such an imbalance is mainly due to the lack of availability of Dutch farmers within the time frame of the thesis. Even though this methodology engages fewer farmers than other case studies approach, such as normative case studies based on quantitative questionnaires, it provides the researcher with an overall exhaustive and insightful picture of the decision-making factors that farmers take into account for the conversion (Darnhofer et al., 2005).

In the Netherlands, organic tomatoes farmers have been selected through the help of the cooperative *Nautilus Organic* (<https://www.nautilusorganic.nl/>), which has identified available and suitable growers for the purpose of the thesis. With respect to potatoes farmers, they have been selected through personal contacts (mainly thanks to peer students and researchers within the University) due to lack of time, interest and availability of National potatoes companies and/or cooperatives, such as Aviko and Agrico.

In Italy, both tomatoes and potatoes farmers have been chosen with the help of SATA (<http://www.satasrl.it/>), an Italian consultancy company within the Agri-business sector. Producers have been selected in three different regions: Emilia-Romagna and Veneto, in the north of the country, and Sicily, located in the south. These areas are highly significant and representative, since they respectively represent the highest percentage of potato and tomato growers in Italy.¹⁵

In light of the fact that the cases were selected at once, the specific technique is called *parallel* case studies. As previously stated, the interviews will be mainly based on open questions (qualitative data), with a couple of closed questions which helped to rank the different sources of risk and focus on the major ones within the interview.

Once ended the interviews it was possible to draw a comparative analysis based on similarities and dissimilarities of the answers and eventually plotting the specific trend per crop and per country based on farmers' experience and ideas.

¹⁵ http://dati.istat.it/index.aspx?DataSetCode=DCSP_COLTIVAZ

1.3. Research objective and research questions

The objective of the present study is to investigate the transition from conventional horticulture production to an organic one by assessing the main risks for Dutch and Italian farmers involved in such a change.

Based on the stated objective, the general research question comes as follows:

“Do Dutch and Italian farmers take different risks into account in moving from a conventional to an organic production?”

Since the study analyses two different countries, it is appropriate to split the general research question into two sub-questions, namely:

1. What are the main factors that Dutch farmers take into consideration in changing from a conventional to an organic production?
2. What are the main factors that Italian farmers take into consideration in changing from a conventional to an organic production?

2. Literature review

2.1 Moving towards an organic production

Over the last decades society's interest about health, environment and food's quality has significantly increased. Many studies have stated that the majority of people regards organic products as more environmental friendly and more ethical than conventional ones (Woese et al., 1997). In addition, organic farming increases the organoleptic quality of its fruits, by keeping unchanged the sanitary quality of the final products (Sacco et al., 2015). Such general interest has played and keeps playing an important role in encouraging farmers to switch from conventional towards an organic production strategy. As a matter of fact, in 2014 more than 43.7 million hectares of agricultural land worldwide were cultivated with an organic production strategy and the number of organic hectares keeps raising over time.¹⁶ The belief that organic agriculture differ from all other production strategies is supported by

¹⁶ <http://orgprints.org/29790/13/willer-lernoud-2016-global-data-biofach.pdf>

the International Federation of Organic Agriculture Movements (IFOAM). This association has highlighted four underlying factors that represent the cornerstones for the development of organic agriculture. These principles are listed as follows: the principle of health; the ecological principle; the principle of fairness and the principle of care (IFOAM 2005). It appears evident that these principles are not solely linked with production but include societal and environmental principles. This is due to the fact that the development of organic farming was carried not only by agriculturalists and biologists but even by consumer groups. (Watson et al., 2007).

Next to such non-economic aspects, mainly related to environment and health sustainability, even economic factors represent a key element for the conversion. In fact, profit is pivotal to allow farmers to run their own business and survive in the long term. (Acs et al., 2007). Organic price premiums and European subsidies have been identified as useful tools to make organic farming economic sustainable and support growers within the conversion period of the first three years (Serra & Zilberman, 2008). Moreover, different studies have highlighted how organic production strategy may be a better and more effective technique, compared to traditional farming, to foster the socio-economic and environmental sustainability. (Aleixandre, et al., 2015)

The main reasons that encourage farmers to move towards the change can be listed and summarized in four bullet points (Lee, 2005):

1. concerns about their relative's health;
2. concerns about farming and agricultural land (i.e. desertification, soil degradation, animal welfare);
3. lifestyle choice (ideological, philosophical, religious and ethical);
4. financial and profit reasoning.

Early adopters were mainly driven by the first three bullet points, which can be defined as *non-economic* factors. Nowadays, farmers decide to convert mainly for economic factors. This radical change lies in the fact that at its origin organic products market was essentially supply driven, while more recently it has become consumers dependent. Such high demand, supported by scandals in conventional agricultural who has decreased its own reliability, have urged farmers to switch towards an organic farming (Watson et al., 2007)

As a matter of fact, it is worth mentioning the importance of consumers in the change from conventional towards organic products. A literature review from *Hemmerling et al.* has analysed in depth the reasons that encouraged and stimulated consumers to change food

consumption. It focused on the concept of the *consumer-oriented* mix (4Cs), which embedded (Hemmerling et al., 2015):

1. consumer value and benefits: mainly analysed through product characteristics, packaging and labelling;
2. costs to the consumer: based on price perception and willingness to pay (WTP);
3. communication and information needs: interactive communication and marketing strategy to gain consumers' interest and trust;
4. convenience and distribution: description of availability of organic products and store choice behaviour.

Although the thesis does not consider consumers' perspective, it was appropriate stating the main trends that drive consumers' behaviour and eventually the *UAA* of organic produce in Europe.

Legally speaking, products can be labelled organic as long as they comply with Council Regulation (EC) 834/2007 and its supplementary (Grazyna, 2015). Such decree established the rules of production and the indications of conformity that all organic products must comply with.

Therefore, it is clear that the switch from conventional towards an organic production strategy is justified by ethical and sustainable reasons as much as the aim of getting higher profits (Burton et al., 1999).

Next to societal approval and support, over the last 20 years organic farming got assistance and subsidies by national and European agriculture policies. The support of European policy makers represented a milestone for the expansion and development of organic research, techniques and market (Watson et al., 2007). Nevertheless, as stated in the introduction chapter, the economic support among EU countries is erratic. This is the main reason of the heterogeneity of the sector in Europe. Next to public subsidies there are other factors which hamper the spread and growth of organic farming. These can be summarised as follows:

1. market demand: unstable over EU countries, generally higher in the Northern rather than in the Southern nations;
2. unstable economic environment under which conversion takes place;
3. lack of institutional support for organic farming;
4. lack of technical support for organic farming.

In terms of subsidies from European Union, farmers get supported both from Common Agriculture Policy (CAP) and Rural Development Plans (RDP) for key activities of the farm, such as modernization, advisory statements and investments in processing and marketing. (Weibel et al., 2013).

When it comes to production, yield's reductions are common for organic farming. The decrease in yields range between 20 to 40% for arable crops compared to conventional farming systems in the short term.(Seufert, Ramankutty, & Foley, 2012). This is the result of a ban on the use of chemical fertilizers, herbicides and pesticides, depending merely on natural and biological products to counteract adversities. Besides, the definition of organic farming implies a minimal use of external inputs, relying on natural elements and compounds already present within the soil. This is the key to keep and increase an overall ecological harmony. Organic growers may use input products only, and only if, they are considered natural by law. It means that no chemical processes have been used to make such compounds.

As for organic vegetables (subject matter of the research), fewer vegetables crops over time on the same plot of land, due to rotation with other products as cereals and legumes, reduce farmer's revenues. Consequently, organic vegetables highly rely on the premium price to make up for the overall reduction in yields (Klonsky, 2012). However, organic farming techniques, above all the ongoing and massive spread of farmyard green manure and compost, determine a rise in soil organic matter (SOM) in the long term (> 5 years). Such increment reduces the gap with conventional productions, close to 20%, and make the organic farming less dependent on external inputs, which eventually mean less costs and higher profits for the farmer. Aforementioned benefits are escorted by ecosystems services, as a higher level of biodiversity and better air and water quality. (Darnhofer, et al., 2010). Another paramount element regards the biological activity: microbial biomass activity take time to adapt to the new farming strategy. Such adaption is fundamental for nutrients' mineralization within the soil, particularly for Nitrogen (N). Usually, many years are required in order to mineralize the nitrogen provided by the manure and by organic fertilizers. The lack of available nitrogen is depicted by many researchers as the principle reason for lower yields in the short term. To counteract such negative effect and shorten the time of reduced yields it is necessary to implement organic farming techniques such as rotation and crop residue inputs. Furthermore, the speed of nitrogen mineralization and the quantity of SOM are determined by environmental factors, independent of organic practices and techniques.

Such elements vary from farm to farm and might be summarized as: soil texture, rainfall and land slope (Sacco et al., 2015).

As depicted above, organic agriculture shows many benefits for the quality of soil and the surrounding environment, however there is one major pitfall about this production strategy. Nowadays the population growth rate keeps rising and by 2050 we will need to feed 9 billion people, consequently crop yields need to keep up with such increase. (Filip & Dragnea, 2017). Many recent studies based on meta-analyses (De Ponti et al., 2012) pointed out that it is not feasible and not sustainable, in terms of feeding the current population, to replace conventional farming with organic farming. The only solution would be to get organic yields as productive as conventional ones, in order to feed everyone by 2050 (Aleixandre et al., 2015).

Eventually, many studies have been carried out to analyse the key topics that encourage farmers to switch towards an organic production strategy (Darnhofer et al., 2005). Nonetheless, the majority of existing studies has mostly focused on general trends without pointing out specific crops in specific countries. Moreover, the results of different studies are not always coherent and might be perceived as contradictory with each other, particularly among different countries (Darnhofer et al., 2005; Serra & Ziberman., 2008). This research aims to explore the underlying reasons for the conversion of two specific crops in the Netherlands and in Italy. By analysing one open field crop and one greenhouse crop and by using the same set of questions within each interview, the results aim to be the least biased as possible.

2.2 Risk in Agriculture

Agriculture is surely one of the industry that depends the most on risk. Over time, farmers have complied with many risks and adopted their strategy of production based on such elements. As highlighted within the introduction chapter, farmers essentially face four different categories of risk: production risks, price or market risks, institutional risks and personal or human risks. (Hardaker J. Brian et al., 2015). Farmers cannot entirely avoid risk. All the same, by carrying out proper risk analyses they can minimize risks and get an overall better outcome (economic and environmental). Such decision-making process needs a clear and proper analysis of each hazard that might play a role in the final decision, identifying the

major related benefits and drawbacks.

An intrinsic point of risk perception is its subjectivity: risk is relative to the observer and changes from person to person. In order to point out such characteristic many studies have coined the structure “perceived risk”. Qualitative speaking risk refers to what you do, what you know and what you do not know. Regarding the quantitative approach Kaplan & Garrick have defined risk as our endeavour to forecast the future based on our previous actions. As a consequence, we can structure the risk analysis in three different questions (Kaplan & Garrick, 1981):

1. What can happen? What can go right? What can go wrong
2. What are the chances that a specific event will happen?
3. If it does happen, what are the most likely consequences?

Even though risks have been identified as pivotal elements for crop production, risk analyses and risk management strategy are not widespread among producers. This mainly relies on the difficulty of implementing risk analysis compared to more traditional forms of analysis. Most of time it needs powerful and modern computer software, reason why not many farmers have the economic means and knowledge skills to handle this tool. However, the development of new technology and the spread of big data in agriculture will enable farmers to get access to a larger set of risk management tools and software. These will be critical and fundamental to counteract the future agricultural challenges and risks.

Current and previous studies have distinguished risk’s perception for conventional and organic growers. In general, organic price premiums and higher subsidies from CAP have encouraged the conversion. In fact, European Union has developed political acts and measures to foster the expansion and development of organic farming (Läpple, 2010). Such strategy is supported in the Rural Development Programme 2014-2020. With this programme, policy makers have highlighted how critical and crucial it is to move towards an organic production strategy. Specifically, it is pointed out, how farms that carry out two different production strategies, both conventional and organic, face difficulties to manage and control the entire production process. The entire conversion of the farm *UAA* is the first and essential step to get an organic production certificate. This issue is indicated in the following quote: “The risk of non-compliance with the organic production rules is considered higher in agricultural holdings which include units not managed under organic production rules. Therefore, after an appropriate conversion period, all agricultural holdings in the Union

which aim to become organic should be entirely managed in compliance with the requirements applicable to organic production.” (Grazyna, 2015)

Eventually, as described by many authors, the increase in revenues of organic farming is escorted by a higher production risk, linked with the ban of the use of chemical products in organic farming. It is said that profit is the reward for bearing risk: in simple words no risk, no gain. This might be considered as the basis of an entrepreneurial mind. As confirmed by Serra & Zilberman, organic farmers are more risk inclined rather than their conventional peers, which eventually determine higher profits. (Serra & Zilberman, 2008)

2.3 The Netherlands and Italy

As previously highlighted, both the countries are significantly important for European agriculture production. Especially within the horticulture sector, Netherlands and Italy are two of the most representative countries, accounting for 35% of vegetable output in 2015 in terms of economic value¹⁷.

As for the Netherlands, there are many studies in the literature referring to the conversion from a conventional to an organic farming system. They are comprehensive, ranging from non-economic to economic aspects of the conversion. With respect to sustainability and landscape quality, Hendriks et al. have developed an exhaustive framework to take into consideration all major aspects involved in these two important factors. They have framed the landscape highlighting four different types of coherence:

1. Vertical coherence: relationship between abiotic (soil, air, water) and biotic factors (flora and fauna). It is made up of three different scale levels: region, farm and crop.
2. Horizontal coherence: relationship among landscape components, such as visual, spatial and ecological. There are three diverse scale levels: farm region, farm surroundings and farmyard fields.
3. Seasonal coherence: coherence between landscape appearance and current season.
4. Historical coherence: connection between landscape appearance and human activities in the past and nowadays.

¹⁷ http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_production_-_crops#Vegetables

The results of the study have confirmed that organic horticultural farms have better landscape quality than conventional farms.(Hendriks et al., 2000)

When it comes to profit, organic farmers perform better than conventional ones, mainly due to lower input costs and high selling prices. Despite the satisfying economic results, in 2011 the vast majority of farmers in the Netherlands (96% of arable farms in 2011) were still conventional growers (LEI 2012). In general, Dutch farmers consider production and price risks, which together add up to the income risk, as the main barriers for the conversion. The first one stems from uncertainty linked with yields quantity and quality. The latter accounted mainly in the past, because of an organic niche market. Lately it decreased, due to a significant expansion of the sector. (Berentsen, et al., 2012)

One of the greatest bottleneck for Dutch farmers as well as other European farmers, since they all comply to the same laws (EU Council Regulation (EC) No. 2092/1991 and on EU Council Regulation (EC) No. 1804/1999) is represented by the transition period. It lasts two years and farmers face lower yields, as a consequence of the implementation of organic techniques and ban on chemical inputs. All the same, they sell their products at conventional prices. Moreover, the farmer needs to get familiar with these practices (Oude Lansink & Jensma, 2003). This “learning effect” causes an extra reduction in income. Overall, such starting hindrance might hamper and discourage many farmers to move towards an organic farming system. Local growers can counteract such negative trend either by a stepwise conversion, implementing organic farming gradually within the farm, or by sowing commercial and profitable crops (above all sugar beets and potatoes) to gain higher profits from the converting area. (Acs, Berentsen, & Huirne, 2007) However, the latter strategy may have negative results on subsequent land fertility and organic crops. Therefore, it is advisable for local farmers asking for technical help to guide them through such technique. Furthermore, model calculations (Acs et al., 2007) depicted that additional constraints, like extra depreciation costs and higher manpower costs within the organic production strategy, will further reduce farmers’ income. Dutch government, aware of the societal, environmental and economic benefits of organic farming, keeps supporting farmers to change production strategy. Its main tools are represented by financial incentives (taxation and subsidies), marketing researches and global market extension (Berentsen et al., 2012).

When it comes to Italian production, literature has mainly focused on environmental and sustainable impacts, disregarding economic impacts on local growers. There are multiple studies (Pacini et al., 2003; Sacco et al., 2015; Fusaro et al., 2016) that emphasized the

positive impacts of organic farming in terms of environmental sustainability. Pacini et al, highlighted as the organic farming system (OFS) is strictly interconnected with three features of sustainability:

1. it improves the efficiency of miscellaneous environmental performance indicators;
2. it rests on pedo-climatic factors, both at regional and *in loco* scale;
3. it tends to increase the resilience of a specific agricultural area.

Apart from sustainability impacts, there is a severe gap within the international literature about marketing research and economic feasibility of organic agriculture in Italy. This gap was partly filled by *Bertazzoli et al.*, which developed a paper about the competitiveness of organic horticultural farms that have developed a short food supply chain (SFSC). Such strategy can be applied both by single farmers or cooperatives and destined towards both a business to consumer (b2c) and business to business (b2b) market. The study results pointed out that most of the farmers interviewed were not satisfied with their yearly turnover. This is mainly due to direct selling in-farm without any supporting network. On the contrary, farmers who have implemented the networking and cooperative direct selling approach were able to accomplish better economic results. The difference was mainly explained and justified by farms geographical location. (Bertazzoli et al., 2010).

Although the research represented a step further for the existing literature, it is clearly not enough. The Italian organic industry needs further economic analyses and studies.

In the first instance, the current thesis aims to fill the existing gaps of current literature, for the Netherlands and particularly for Italy. Establishing personal contacts with different farmers will allow the researcher to listen to many opinions, insights and thoughts regarding the organic farming system. Moreover, the research has the aim to be more specific than most of articles concerning organic agriculture as a whole. It will pick only two crops, representative of two diverse production strategy (open field and greenhouse), and analyse the main risks and opportunities that local growers face for such change. Institutional issues, production techniques, market opportunities, economic feasibility and inclination towards risk will be analysed for each specific crop within the selected country. By doing so, it will be possible to assess the findings of current literature, confirming or denying them, and to add useful insights for further researches.

3. Methodology

3.1 Theoretical framework

The theoretical framework represents a crucial tool to explain the findings and assumptions of existing literature. In addition, these theories represent the basis for the implementation of the theoretical framework itself, which eventually will improve and implement the understanding to fill existing literature gaps.

As stated in the introduction section, the aim of the current research is to investigate the major risks that Dutch and Italian farmers take into account while moving towards an organic production strategy. The focus lies on two different crops, potatoes and greenhouse tomatoes, cultivated with two different strategies. Diverse production strategies imply different risk assessment strategies. Depending on the crop and on the country as well, farmers are likely to point out various major risks and different strategies to counteract them.

First of all, it is worth listing the main agricultural risks that growers take into consideration. These hazards have been highlighted by European and international studies over time. As pointed out by *Just R.*, there are miscellaneous problems that farmers faced over the past forty years. The list included in total eleven topics, listed as follows: land and technology allocation and diversification; risk-reducing inputs; crop insurance and revenue insurance; forward selling and use of futures markets; expectations formation and information management; contracting and vertical integration; grain storage and other mechanisms for income stabilization; diversification using off-farm income opportunities; technology adoption; variability of asset prices and timing of asset purchases; financial management and debt structuring (Just, 2003)

This set of risks was further summarized by *Hardaker et al.* As a matter of fact, they came up with four different risk areas that included the more significant agricultural risks. As stated within the introduction chapter, the four areas are: *production risks, market or price risks, institutional risks and human or personal risks* (see Figure 1). Within the rightmost column are listed some of the major hazards per each risk category. This further distinction has been developed by many international studies and provides a more detailed and insightful framework about the broad concept of coping with risks in agriculture (Acs et al., 2007; Hanson et al., 2017).

Such sources of risks are faced by every type of farmers, regardless of the production strategy implemented. However, organic farmers take on higher risks during the transition period, which in total usually lasts three years, according to the European law. Those risks vary from production towards market risks and need a proper management strategy. The perception of risks might change between conventional growers, farmers who want to swap conventional with organic production strategy, namely in conversion farmers, and organic producers (Just 2002; Hanson et al., 2017).

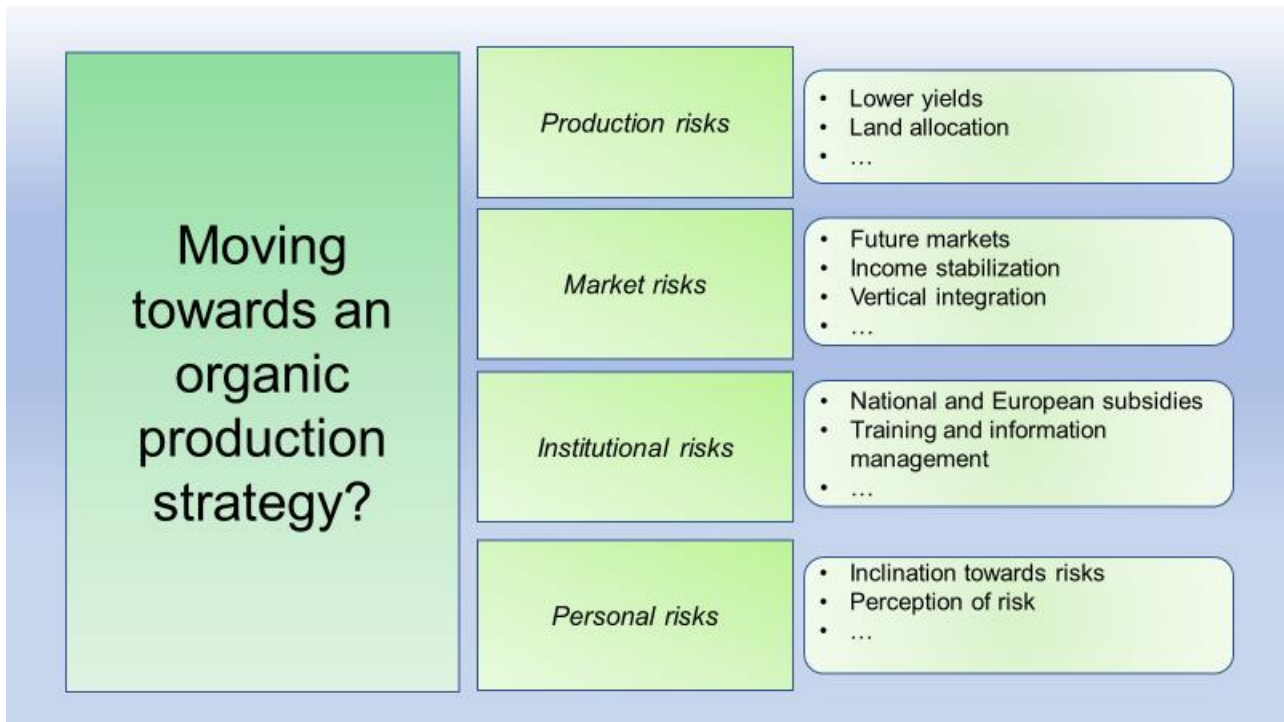


Figure 1 Chart of theoretical framework

The theoretical framework allowed to design the interview questions which were submitted to Dutch and Italian farmers. The questions of the interview can be found in *Appendix A*. It is meant to identify and distinguish which risks farmers consider more meaningful and harmful for the transition towards an organic strategy. It does not add any source of risks, since they have been already studied and analysed by many international papers, but it focuses on specific crops for two valuable European horticultural countries. As a matter of fact, it is pivotal to categorize the sources of risks that farmers take on to better understand local shortcomings and find appropriate solutions. As for the last source of risk, namely *Personal risks*, the interview focused more on the farmers' perception of risks rather than investigating the health and human risks connected with agricultural activities. Some questions focused on the strategy implemented by farmers to counteract and minimize risks under organic production.

The findings of the research will point out the most significant differences and similarities between the two countries' risk assessment strategy. Moreover, it will partly fill the literature gap for economic feasibility and marketing development of Italian organic farmers.

3.2 Research methodology

The current research relies on qualitative data, gathered through interviews with local farmers. In the past, different studies have examined the factors involved in the conversion from conventional towards organic production. However, most of the papers used a normative approach, based upon statistical notions and statistical tools, by means of surveys and questionnaires (Darnhofer et al., 2005; Burton et al., 1999). The advantage of the normative methodology is the large number of participants included in the study, in order to attain representativeness in the sample and rigor in the results. Therefore, data can be analysed statistically and trends can be drawn.

Nonetheless, the mentioned approach has a significant drawback: it may fail to offer a comprehensive and exhaustive picture of the relationship of various risks, factors and barriers involved in the conversion.(Darnhofer et al., 2005)

In contrast, qualitatively oriented interviews can further analyse data and define a trustworthy understanding of the current state of art regarding the conversion decision. In practice, this technique enables researchers to gain extra ideas and insights from farmers, through face-to-face interviews, in order to help better explain the results of normative surveys. As a matter of fact, in-person interviews have been exploited by many authors to compare risks in conventional and organic production (Fairweather, 1999; Darnhofer et al., 2005). Even though this approach usually implies a smaller sample size (usually less than 80 farmers), it elaborates a complete frame of the decision-making process for each farmer. Clearly, farmers' behaviour and choices will highly depend on the type of crop that they are growing and on their geographical location (Lund et al., 2002; Darnhofer et al., 2005). Since this study is essentially exploratory and descriptive, the selected methodology well fits the aim of the research. It will be possible to draw comparisons between farmers and countries, thanks to the in-depth level of analysis of personal interviews.

As stated in the Introduction chapter, the case studies will be in total twenty-two: six in the Netherlands and sixteen in Italy. The higher number of Italian farmers is justified mainly by two reasons:

1. larger area of organic production in Italian horticulture rather than in the Dutch one;
2. easier access to personal contacts with Italian producers, which made it more feasible to arrange and schedule interviews throughout the summer period and stick to the agreed deadlines.

The case studies were selected in different geographical areas both for the Netherlands and Italy. The farmers were selected with the cooperation of *Nautilus Organic* and *SATA*, which both have contacts with local growers. In *Figure 2* it is possible to take a look at the geographical location of the farmers interviewed. In the Netherlands they are spread throughout the entire country from the Region of *Zeeland* (leftmost point) towards Venlo (easternmost point, next to the German border). In comparison in Italy there is a concentration over three regions, from North to South: *Veneto*, *Emilia-Romagna* and *Sicily*. As pointed out before, such density is due to the large numbers of potatoes and tomatoes organic growers located in the mentioned regions.

As for Dutch potato farmers, it was not possible, due to lack of time and availability of local growers, to interview three organic producers. Only one out of three was already organic, one grower is in conversion and the last one is still conventional. With respect to Dutch organic tomato growers, *Nautilus Organic*, an organic cooperative, gathers almost one-third of organic tomatoes growers, namely 30 *ha* out of 85¹⁸ *ha*. The three interviewed farmers covered an overall surface of 20 *ha*, namely almost one fourth out of the total organic production in the country. Therefore, they are meant to be considered highly representative for the national organic production.

Regarding the Italian production, interviews were carried out mainly in Sicily and in the North-East of the country (Emilia-Romagna and Veneto regions), due to the high share of organic potatoes and tomatoes¹⁹ in such regions. All farmers, in terms of hectares, were above the national UAA (utilized agricultural area), which is approximately 10 *ha*, both for potatoes and tomatoes²⁰. For the sake of consistency with Dutch potato growers, five out of eight Italian potatoes growers were organic and the remaining three were still conventional.

¹⁸ Research on organic agriculture in the Netherlands

¹⁹ Sinab: bio in cifre 2016

²⁰ http://dati.istat.it/Index.aspx?DataSetCode=DCSP_COLTIVAZ

However, two of them had some *ha* in conversion, managed with an organic production strategy. All interviewed Italian greenhouse tomato growers, in total eight farmers, were organic.

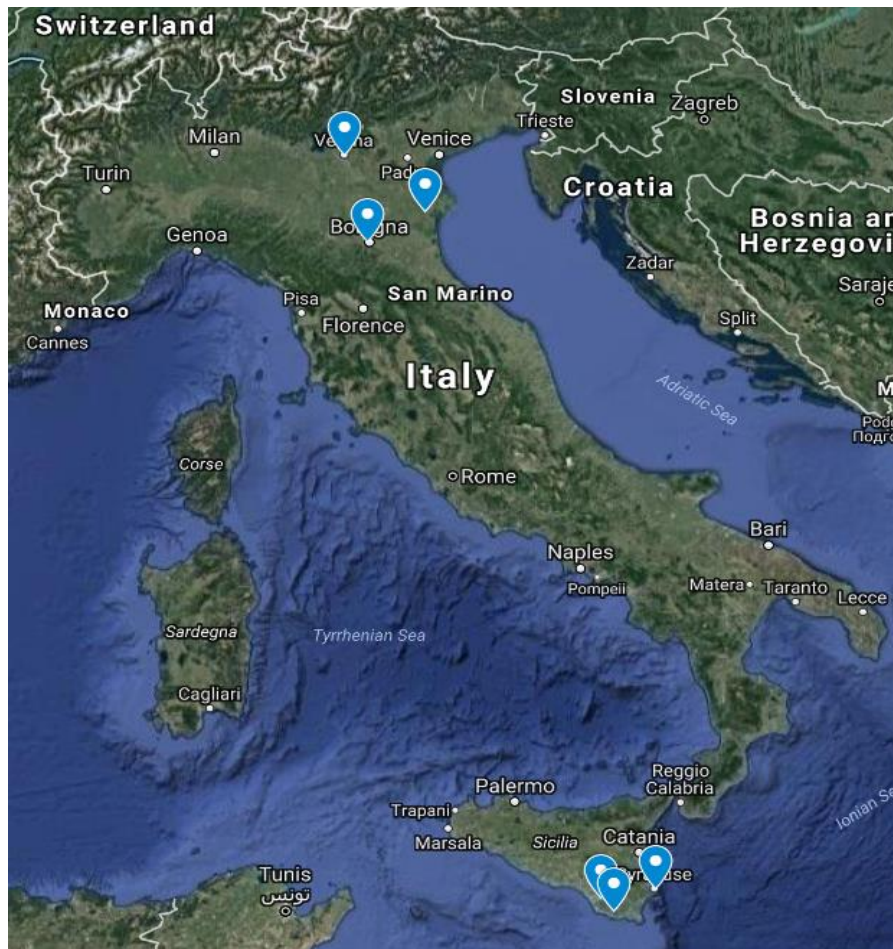


Figure 2 Maps of local growers in Italy and in the Netherlands

4. Analysis of interviews

This chapter aims to analyse the answers of the twenty-two case studies carried out in Italy and in the Netherlands. The structure of the chapter will be divided into four sections, which correspond to the major sources of risks outlined in the theoretical framework: *production*, *market*, *institutional* and *personal* risks. Within each source of risk, it will be performed a two-way comparison:

1. comparison between the two crops;
2. comparison between the two countries.

This layout allows to relate the type of crops and the countries involved within the study. Eventually it will be possible to highlight similarities and dissimilarities based either on the crops or on the nations analysed.

The answers provided by local growers, which can be given upon request, will be examined, focusing on the most frequent and repeated concerns per each source of risk. Consequently, the research will point out the major analogies and differences per crop and per country, based on the interviews. All detailed answers were recorded and can be provided upon request.

4.1 Production risk

4.1.1 Dutch potato growers

Currently, all three interviewed growers manage a larger Utilised Agricultural Area (UAA) than the average one in the Netherlands, which amounts to 26 *ha*²¹. As mentioned above the three farmers carry out different production strategies: one is organic, one is in conversion and the last one is still conventional.

The first major difference refers to the size of potatoes cultivated per year in each farm. The

²¹http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Table1_Farm_Structure_key_indicators_Netherlands_2000_2010.PNG

conventional grower allocates on average 50 out of 210 *ha* of his farm to potatoes, compared to 30 *ha* out of 150 for the converting grower and only 10 out of 150 *ha* for the organic grower. It is appropriate to point out that the national average number of hectares per potato growers is 18 *ha*²². This first difference denotes how the crop rotation, namely changing successive crops on the same plot of land to prevent depletion of soil nutrients and appearance of diseases, is a fundamental technique for organic growers. Moreover it positively affects the mineralization of fundamental element such as Nitrogen (N), Phosphorus (P) and Potassium (K), releasing them within the soil solution. (Bražinskienė & Gaivelytė, 2016; Sacco et al., 2015).

In terms of production, the conventional strategy, as confirmed by the two growers, determines a yield of approximately 50 tons per *ha*. The organic grower instead dealt with a decrease of 25%, which means roughly 35 tons per *ha*. This data is fully supported by existing literature (Ponisio et al., 2015; Seufert et al., 2012; De Ponti et al., 2012) The growers who have not implemented an organic strategy yet, feared a greater reduction in yields (i.e. 40%) and pointed it out as the highest risk for conversion. They have explained that yields are likely to significantly decrease mainly due to the ban on chemical compounds, paramount to counteract diseases, weeds and insects.

Based on the literature and on the experience of the organic grower they are partly right. However, the reduction in yields is not as big as they think, but it can be reduced to 20-25% if specific agronomic techniques are implemented. Therefore, there is a substantial difference between the objective risk and subjective risk regarding yield reduction. Such techniques imply: large crops rotation (at least 5 crops before the same product is sowed again), presence of *Leguminosae* within the crop rotation, scouting and monitoring activities, timely mechanical actions, use of colour and sex pheromone traps and improvement of physical techniques such as solarisation and flame weeding (techniques based on high temperature to control the development of weeds). Such tools, which are not particularly expensive, will contain the yields reduction. Moreover, they are pivotal in order to deliver high quality product to the final consumer, who is concerned not only about the healthiness of organic produce but even about its physical appearance. Such limited tolerance denoted by consumers should be taken into account during the production process. (Yue et al., 2008)

What emerges from the interviews is that both organic and non-organic farmers claim that

²² <https://www.nak.nl/organisatie/nak-services/>

the conversion requires a severe change in terms of production techniques and precise timing of actions during crop protection. All farmers stated that it is difficult to get in contact with knowledgeable people from the sector who can guide them through such a change. They have mainly got support either from local growers who converted earlier or from some local consultancy companies and international firms, such as *Delphy* and *Koppert*. There is not any technical support provided by public institutions such as governmental organizations and universities. This existing gap needs to be filled in the upcoming years in order to provide farmers with enough training and encourage them to change towards an organic production strategy.

4.1.2 Italian potato growers

In Italy, the total sample consists of 8 potato growers, of which five already converted to organic, two in conversion and one still conventional. The farmers were spread throughout the entire country, as it possible to depict in *Figure 2*, from *Veneto*, in the north-east of Italy, to Sicily. Contacts were provided by the consultancy company SATA.

Regarding the production risk, same as for Dutch farmers, Italian growers mainly fear the reduction in production, as result of the change of strategy. Organic producers experienced a decrease of 25% on average, whereas the conventional and in transition farmers believe that the contraction of yield might reach the level of 40% compared to the conventional one. As it possible to depict from the mentioned data, the numbers resemble closely between the countries. The current average production for organic growers is roughly 35 tons per *ha* compared to the 50 tons of the conventional growing (same level of Dutch farmers). The techniques implemented by Italian organic farmers can be summarised as follows: long crop rotation, use of traps, scouting, timely treatment and increased labour force to counteract the weeds development. It is evident that the two countries do not differ neither for the agronomic techniques nor tools.

With respect to the change of production strategy, Italian farmers, both organic and conventional ones, search for reliable and knowledgeable experts in order to guide them through such major change. Based on the interviewed farmers, they mainly relied on local consultants, cooperatives and, from time to time, even on international companies. There is not any technical support from the local government, which would be appreciated especially

by small growers who cannot afford the expenses of outsourcing training from consultancy companies.

4.1.3 Dutch tomato growers

The interviewed organic tomato farmers were in total three. They are located throughout the entire country: from *Brielle* towards *Venlo*, and one in *Utrecht*. The contacts were provided by the cooperative *Nautilus Organic*, the main organic cooperative in the Netherlands. The growers manage different area of tomatoes, respectively: 5 *ha*, 15 *ha* and 3 *ha* on average per year. The average *UAA* in the country is around 6 *ha* per farmer²³.

Two producers changed production strategy in the last decade of the twentieth century, one of them started his business as organic grower in the middle of the eighties. They are very committed and passionate about the organic principles and production strategy. The yield per *m*² is on average between 40 and 45 kg, depending on the seasonal weather condition. This amount is roughly 30% less than the conventional production strategy, which amounts to 60-70 kg per *m*².²³ Since the conversion, all farmers have transplanted all their crops into the soil, in accordance with European law. In conventional production instead, the tomatoes are being cultivated out of soil, most of the time with hydroponic systems. As for crop rotation, farmers usually interchange tomatoes with three different vegetables, namely: cucumbers, peppers and aubergines, all of them grown in greenhouses.

With respect to the techniques implemented, farmers have highlighted how critical it was to restart growing into the soil. Next to the change of ground layer, even fertilization played a pivotal role in order to keep yields satisfactory. As confirmed by the literature (Murmu et al., 2017) nutrient management is paramount. The fertilization should be as timely and variegate as possible, by adding different natural compounds to the soil and allow the plant to grow in the best growing environment. Moreover, mechanization and crop rotation represented a critical change from the previous strategy too. As a matter of fact, organic farmers, after the change, are not anymore specialized in one specific crop, but need to adjust their techniques and machines to cope with different cultivars within the farm. The growing environment is always overseen through the use of specific traps and soil and leaf samples, which allows the monitoring of the quality and the health of the plant.

²³ <http://www.freshplaza.com/article/156722/900-million-kg-Dutch-tomatoes-in-2016>

Overall, production risk, to wit mainly lower yields, was perceived as the most significant source of risk during the conversion. Abandoning the common agricultural practices for something new was surely critical, especially with low technical support from external companies and above all institutions. Indeed, as stated by all three farmers, it was difficult to get in contact with some knowledgeable people of the sector, due to the lack of expertise. They mainly faced the problem by asking some older farmers, who converted before, and local consultancy companies (i.e. Hortinova and Vortus) for advice or, occasionally, solving the new issues themselves: “learning by doing” strategy. Nowadays, due to the expansion of the organic sector, it is easier to receive technical support and training to better take on the challenges of conversion.

4.1.4 Italian tomato growers

The interviewed Italian tomato producers, eight in total, are mainly located in Sicily. Only a couple of them grow in the north of the country. Their contacts were provided by the consultancy company SATA.

The size of the area destined to tomato production varies significantly from farmer to farmer: it ranges from 5 *ha* to 150 *ha*. Unfortunately, as confirmed by many stakeholders of the sector, from producers to organic trade companies (among others *BRIO* spa) it is quite difficult to know the exact number of organic greenhouses in Italy and from that it is hard to deduce the average UAA of Italian growers.

In terms of production, the average yield per *m*² amounts to 10 kg, which means 40 to 50% less than the average 20 kg per *m*² of conventional agriculture. In order to minimize the reduction in yields growers have implemented techniques that are not very common in conventional agriculture, such as green manure, a growing crop that is ploughed under to enrich the soil, crop rotation with *Leguminosae*, timely and frequent treatments, scouting, introduction of useful insects-bacteria and heat treatment, mainly solarisation. Moreover, since they converted towards an organic production strategy, they have increased the labour use on the farm, especially to counteract the development and the spread of weeds, which needs to be removed by hand. They all have underscored how paramount it is, as organic farmers, to prevent the diffusion of diseases rather than cure them. Therefore, they keep the growing environment as fit as possible for the species under greenhouses, so that to keep high yields and quality throughout the entire season.

The production risk was perceived, within the conversion period, as the most detrimental by many farmers. This was due to the severe change in production strategy and to the lack of technical support from the government and from local companies. Almost every farmer faced the change on their own, by means of personal expertise and experience. Only some of them could afford the consultancy of specialized companies, mainly from Germany.

4.1.5 Summary

When it comes to production risk, Dutch and Italian farmers have quite similar opinions and attitudes. They both fear, during the conversion time, the significant reduction in yields and almost ever tend to overestimate it based on the lack of technical support. However, once converted they experienced a lower decrease in yield than expected, particularly after some years since the change in production strategy. It is clear that, neither in the Netherlands nor in Italy the government provides growers with the proper level of training. This might be implemented in the upcoming future to make farmers more conscious and aware of the real level of production and agronomic tools available within organic agriculture.

Potatoes and tomatoes perform differently in the two countries. The former presents roughly the same yield and does not require a severe change from the conventional towards the organic strategy. The latter instead highlights a critical difference between the two nations. With respect to the yields, Dutch growers show four times the Italian production. This contrast is mainly due to the innovative and modern greenhouses available in the Netherlands compare to the outdated ones in Italy. In terms of agrarian practices, tomatoes require more radical changes compared to potatoes. Especially in the Netherlands, where growers need to transplant the crop into the soil, compared to the traditional hydroponic system. Next to such modification, both in Italy and in the Netherlands farmers need to perform a long crop rotation and spread manure yearly, in order to prevent the appearance of pests and keep high yields over time. These techniques are hardly used within the conventional production.

Therefore, it can be stated that organic greenhouse tomatoes demand more critical changes than organic potatoes, compared to the conventional strategy. It is riskier and it demands high technical skills from the farmers.

4.2 Market risk

4.2.1 Dutch potato growers

Premium price of organic produce represents the main reason to switch production strategy for each interviewed farmer. The organic grower, who moved towards organic production strategy in 2005, engaged this path to differentiate himself from other producers and to enter a niche market, which eventually led to higher profit. Even the other two farmers depict the higher prices per organic produce as the main reason for a potential change, more significant than the environmental sustainability impact of organic agriculture. As a matter of fact, farmers' beliefs about organic market share is confirmed by the existing literature. Since the end of last century the organic sector has experienced a surge in popularity and consequently in consumer demand (Hemmerling et al., 2015; Denver et al., 2012; O'doherty et al., 2011).

Based on farmers' experience and expectations, the premium price of organic potatoes is on average 25-30% higher than the conventional selling price. In practice, 100 kg of conventional potatoes are being sold on average at 20-30 € (price might fluctuate depending on the competition and on the season), whereas the price of the organic ones settles at 35-40€. With respect to the clients, all interviewed farmers trade their potatoes within the Netherlands. The conventional and in-conversion ones sell their produce mainly to Dutch potatoes industry, setting annual contracts based on the yield. On the other hand, the organic producer works primarily with national retailers and regional organic shops. He does not establish contracts, but sets agreement with his buyers based on the current production and the expected demand. Actually, it is difficult to forecast organic production, due to the weather and pest risk, and it is uncommon, found on the experience of the interviewed organic grower, to sign contracts based on crop yield. Such uncertainty of production, and consequently lack of contracts, is the main reason, within the market risk section, that prevents the interviewed conventional farmers from changing production strategy. Moreover, none of them is member of local cooperatives and they sell potatoes independently.

4.2.2 Italian potato growers

With respect to Italian potato growers, the premium price and new market possibilities are perceived differently by organic and conventional farmers. The former group stated that entering a niche market and gain extra revenues was not as paramount as the positive environmental impact during the conversion. Biodiversity, sustainability and the ban on chemical compounds played a major role than the possibilities of getting higher profit once converted. In comparison, the three conventional farmers pointed out that the premium price and the differentiation from other producers represent the main reasons and opportunities for a change towards organic production, more significant and important than environmental issues.

The prices of organic potatoes are roughly 25% higher than conventional ones, with an average of 18-25 € per 100 kg of production for the conventional ones and 30-35 € per 100 kg of organic potatoes. Most of the farmers interviewed, are members of cooperatives, regardless of the production strategy. They sign up contracts based on price and allocate the entire production to the cooperative itself. Only three interviewed farmers trade directly with foreign supermarkets, mainly in Germany. This difference is primarily justified by the larger *UAA* of the farm, which leads to higher yields and consequently more bargaining power on the market. The contracts with foreign customers are based on annual production, and they need to be set and prepared in advance of the sowing date, usually during the winter time.

4.2.3 Dutch tomato growers

All three growers converted more than twenty years ago. They stated that the main reason of urging them to change production strategy was the beneficial impact on the environment, rather than extra profit. Impact on local biodiversity, quality of soil, sustainability and quality of surrounding air, were ranked as pivotal to encourage them to swap approach. Therefore, their choice was highly supported by their passion and aim for a more sustainable production strategy, with only natural compounds allowed.

The interviewed farmers are member of the cooperative Nautilus Organic, to which they supply their entire production. The cooperative sells the produce mainly on national market,

to supermarkets and wholesales. The remainder is sold mainly to the German market, with a residual part of products shipped to United Kingdom. They establish annual contracts based on production. They can overcome the production risk thanks to the cooperative itself. In case one farmer, due to diseases or adverse weather, is not able to provide his customer with the agreed volume of products, other producers can back up and supply the missing part of produce. The cooperative system enabled farmers to meet their customer needs and establish long-term relationships. Eventually, such system minimizes the market risk of organic growers

4.2.4 Italian tomato growers

Interviewed farmers had incongruent opinions about the role of premium price within the conversion. Half of them claimed that the main reason that encouraged them to change production strategy was indeed the possibility of gaining extra profit. The remaining four pointed out the sustainability theme and the positive environmental impact as the key element for the conversion. It is interesting to underscore how all the former group of farmers converted later than the latter group. Farmers who converted relatively more recently, namely 15 years ago, assigned more importance to the premium price rather than the positive and sustainable impact on the environment. On the other hand, long-running organic farmers, who converted more than 20 years ago, attribute primary importance to the sustainable impact of organic production. Moreover, they claim that tomatoes quality, with respect to the level of flavonoids, played a pivotal role during the conversion too. They argued that the level of flavonoids, consequently to the agronomic practices of organic production, would have increased over time. It has been confirmed that quantity of flavonoids increase over time in organic production rather than conventional one, primarily due to the higher level of soil organic matter and different quality of N (nitrogen) fertilization in organic production (Mitchell et al., 2007).

All interviewed farmers sell organic tomatoes abroad, mainly towards northern European countries, such as Germany and Scandinavia. The majority of them trades directly with foreign supermarkets. Only a couple of farmers, due to the small UAA, to wit less than 10 *ha*, are members of cooperatives and supply the entire of their production to the cooperative itself. Growers who ship their produce directly abroad sign up yearly contracts based on the

production. On average, they have established long-term relationships (longer than 10 years) with their customers.

4.2.5 Summary

With respect to market risk potatoes and tomato growers perform similarly in Italy and in the Netherlands. Recent organic producers assign major importance to premium price, to encourage farmers to swap strategy, rather than long-running organic farmers. In both countries, farmers did not perceive it as a relevant risk, during the conversion, the market instability and lack of demand in the long term, namely after 10 years since the change. The prices for organic produce are higher in both countries, with on average 30% extra price for biological produce: 30€ conventional potatoes and 40 € organic potatoes per 100kg of products and 0,80-0,90€ per kg of conventional tomatoes compared with 1,30€ per kg of organic tomatoes. Moreover, the majority of producers confirmed that, in general, organic price is more stable over time than conventional one, which fluctuates with several peaks, both positive (higher price) and negative (lower price).

The main difference between the two countries is the distribution channels. For potatoes, due to large UAA, farmers tend to sell their products directly, without joining cooperatives or using intermediaries. On the other hand, tomato growers significantly differ within the two countries. In the Netherlands, all interviewed organic tomato growers are member of one cooperative (Nautilus Organic) which takes all produce and sell it to different clients. Instead in Italy, farmers do not gather together but sell independently their products mainly to foreign customers. By doing so, in comparison with Dutch growers, they lose bargaining power on the market and depend on the competition of other countries, where local producers join cooperatives. This feature plays an important role especially for growers with smaller UAA, who cannot compete on their own and need to cooperate with local farmers to survive on the market. In both countries and for both crops, farmers did not perceive the fluctuation of organic produce selling price in the long run, namely ten years time frame, as a significant risk. Last but not least, Italian producers mainly export their produce to Northern European countries, above all Scandinavian countries and Germany. On the other hand, Dutch farmers mainly trade their products within the national market. Such difference is justified by the bigger share of organic market in Northern European countries compared to the Southern European ones (Ruiz De Maya et al., 2011).

4.3 Institutional risk

4.3.1 Dutch potato growers

Interviewed growers did not perceive institutional-policy risk as a major risk within the conversion. Both organic and conventional were satisfied with the European subsidies for organic potatoes, stating that they can receive a fair compensation to cover extra expenses following the change. They did not fear a change in European organic laws and regulations within the upcoming future. Moreover, they were satisfied with the current laws of organic production, which prevented any frauds or scandals within the local market. They were pleased with the role of national policy makers to protect their production from price fluctuation and unfair competition with foreign countries. Nonetheless, especially the two conventional growers, pointed out the lack of technical support, as previously stated, from governmental institutions. This absence of training within the conversion period is perceived as a critical risk by farmers, who would like to have a third part opinion in addition to consultancy companies and long-running organic growers. The trust in the national government combined with new activities of training and demonstration sessions would facilitate the change of production and eventually increase the number of organic potatoes growers.

4.3.2 Italian potato growers

For Italian producers, the institutional risk plays a critical role, both for farmers who are considering the change of production strategy and for those who have already switched towards organic production. Overall, they are satisfied with the economic support provided by the Common Agricultural Policy (CAP) and by the Rural Development Plans (RDP). Nevertheless, they are discouraged by national and European policy for two main reasons:

1. there is not technical support provided by national institutions. Conventional farmers, who cannot afford private consultancy companies or do not trust neighbouring growers, do not have any reliable alternatives. All conventional farmers interviewed

would appreciate a major support by the Italian government for production support and training;

2. lack of transparency within national laws and scepticism about organic world. Within this topic, it is appropriate to distinguish conventional from organic growers. The former group is very sceptic not only for the quality of organic produce but also about the transparency and fairness in organic production. The latter complains about the absence of strict controls on organic growers, essential to guarantee the quality of the organic industry and reveal potential frauds or scandals.

Apparently, listening to farmers' voices, a better, timely and strict intervention by the Italian government is necessary, not to discredit organic world and to improve its economic value and reputation among potato producers and in the industry as a whole.

4.3.3 Dutch tomato growers

The three Dutch organic growers did not perceive the institutional risk during the change towards an organic production as a major risk. They were aware of the current policy, legislation and subsidies and they did not fear a severe change in regulation within the upcoming future. Nevertheless, they did not receive enough production support and advice neither from local institutions nor from the European Union. They have stated that nowadays, due to the higher competition within the organic sector, such help would be needed in order to support and encourage more farmers to swap production strategy. Moreover, they have claimed that current economic subsidies are not sufficient due to high expenses per *ha* of infrastructures and agronomic costs (i.e. seeds, fertilizers, ground layer). Approximately, there is almost one million euros investment per hectare and organic farmers need to cope with reduction in yield compared with conventional growers, particularly for the first three years. It would have been more desirable, based on their experience, to increase the subsidy destined to organic growers, compared to conventional ones. By doing so, the government would provide more economic support, which is of pivotal importance primarily within the conversion period of three years. Within this period, farmers are not allowed to sell products labelled as organic yet, but they have to face the increased expenses following the change of strategy.

4.3.4 Italian tomato growers

With respect to Italian tomatoes farmers, institutional risk did not play a major role during the conversion period. The legislation and controls for greenhouses tomatoes have been transparent and coherent over time, with no significant complains from organic or conventional greenhouses tomato growers. The subsidies from local government are slightly higher than the ones granted for open field crops (such as potatoes). Nevertheless, due to the outdated infrastructure and greenhouses of many Italian farmers, compared with the northern European countries, the economic support supplied by the government is perceived as satisfactory among growers. Nonetheless, especially for large farmers who converted recently (less than ten years ago), the subsidies play an important role to finance new greenhouses and long-term investments as well as the purchase of new plots of lands. Farmers claimed that the farm could not receive organic subsidies if they rented plots of conventional land from other growers. First, they need to convert the conventional *ha* in organic *ha*, and this procedure takes three years. Then they get apply for subsidies for the entire size of the farm. As long as the farmer hectares within his farm that are not managed under an organic production strategy, he cannot receive economic support neither from the national government nor from the European Union. This bureaucratic hindrance prevents many organic farmers from renting new plots of land or extending their farm's size. Eventually, it would be possible to issue new laws that facilitate the access to organic agriculture subsidies.

4.3.5 Summary

In both countries farmers do not receive production and technical support, which is critical within the conversion, due to the lack of expertise. Potatoes farmers are satisfied with the overall economic support provided by the national government, whereas tomato growers, all Dutch and farmers and part some Italian ones, do not receive a sufficient amount of subsidies to cover the greenhouses expenses. Overall, institutional risk did not play a major role for the conversion in the past, but the increasing competition and the scepticism towards the organic industry, particularly in Italy, make it critical for farmers who are currently converting or considering the conversion.

4.4 Personal risk

4.4.1 Dutch potato growers

The interviewed farmers perceive risk differently according to the production strategy implemented. The organic grower, who converted in 2005, is more inclined towards risk than the two conventional farmers who are still producing in a conventional way. All three farmers are running the business on their own and bear the agricultural risks entirely on their shoulders. The main difference among the producers was the importance of sustainability and environmental aspects. As for the organic grower, such issues were fundamental for a better agriculture and therefore he decided to swap production strategy in spite of problems and higher risks. On the contrary, conventional producers were more risk averse and did not perceive that the opportunities of organic production outweighed its risks and hazards. As for counteracting production risks within their farm, none of the farmers decided to sign up for insurances. They reckoned that the yearly fee was too high and preferred to face risks implementing a preventive strategy, by developing proper agronomic techniques. As for weather risks, mostly from hailing, they decided to take on the risks rather than purchasing expensive insurances.

4.4.2 Italian potato farmers

Italian potato producers run the business on their own, without collaboration with any partners. Conventional growers were sceptical about the organic industry, especially for the lack of control and rules from the national government. They did not want to take on the higher production risks and institutional risks involved in such a change. On the other hand, organic producers were more risk inclined and stated that organic production represented an opportunity rather than a threat. In this latter group, it is possible to point out two main reasons for the change:

1. farmers who converted before the beginning of the century, swapped production strategy mainly for ethical and environmental purposes;

2. farmers who converted after the beginning of the century were mainly attracted by the premium price of organic produce and eventually by higher profits.

None of the producers, regardless of the production strategy, decided to purchase insurances for their crops. Some of them tried in the past, but in the end the fee was too high and therefore they dropped such a tool. In order to counteract risks they have implemented a preventive strategy, creating the best growing environment for their plants.

4.4.3 Dutch tomato farmers

The three tomatoes producers converted more than twenty years ago. They were all risk inclined, encouraged by their beliefs of a more sustainable agriculture. Moreover, they all run the business on their own, with no other partners or shareholders.

Regardless of the lack of knowledge and support from local institutions they decided to change production strategy. They abandoned the hydroponic system and started growing crops into the soil. Their desire of implementing biodiversity, reducing the chemical inputs in agriculture and maintaining the soil fertility over time, outweighed the hazards of reduced yields and uncertain market (since the organic industry was still a niche market when they converted to organic farming).

They decided not to pursue any insurance policy, due to its high cost. On the other hand, they have claimed that with a proper preventive strategy, made up of scouting of insects and weeds, leaf and soil samples and add of manure, they are able to keep high yields throughout the entire year, regardless of weather conditions.

4.4.4 Italian tomato farmers

Since many interviewed organic growers converted before the beginning of the century, the personal inclination towards risk was not perceived as a major source of risk during the conversion. In fact, they were positively challenged by this new adventure, regardless of the hazards that it implied. Their passion towards a more sustainable production and more resilient environment played a major role in the change, outweighing the disadvantages of lower production and lack of support from local institutions. More recently, the farmers

decided to convert to organic farming particularly for new market opportunities. Indeed, producers who turned to organic production less than 15 years ago, were encouraged mostly by the premium price of organic produce, rather than the organic positive impact on the surrounding environment. Therefore, their personal perception of risk soared, since the market price could fluctuate significantly over time and reduce farm's profitability in the long run.

None of the interviewed farmers purchased insurances to protect their greenhouses from extreme weather events, such as hail or hurricanes.

4.4.5 Summary

In both countries and for both crops, long-running organic farmers were positively challenged by higher risks during the conversion. They were urged by the belief and idea of making agriculture more sustainable and wanted to ban the use of chemical compound from their farm. They considered the organic production as a pivotal tool to do so, regardless of all the linked risks and hazards. Whereas, for recent organic farmers, who pointed out the premium price as the major reason for the change, the personal inclination towards risk represented a paramount source of risk for the swap of production strategy, due to all the uncertainties interweaved with the yield and the market share of organic produce in the long term. The different mindset of recent and long-running organic growers justifies the diverse inclinations towards risk.

In order to counteract and reduce risks, farmers decided to implement a preventive strategy. They grow the crop in the best growing environment to reduce the presence of diseases and attacks by insects. Based on the organic principles, such strategy is much more effective than the intervention after the appearance of the disease, since it would be difficult to limit its damages to the crops. None of the interviewed farmers established insurances to protect their yields from extreme weather events. Within the greenhouse production, it is not possible to insure the crop, but only the infrastructure, which is unlikely to get destroyed by climate events, particularly in these two nations. On the other hand, potatoes growers need to face the high risk of hail, which every year jeopardises their production. However, they decided not to sign an insurance because of the high costs. They have claimed that with lower costs they would have protected their crops by means of insurance, so that reducing the lack of profit consequent to an extreme weather event.

5. Discussion and limitations

Based on the existing literature and listening to farmers' opinions it is possible to draw overall comments about stakeholders' activity within the organic industry.

To begin with, it is appropriate to point out the lack of technical support from local institutions and government in both countries. Although the literature confirmed the help provided by local institutions, farmers have refuted it (Hanson et al., 2017; Serra & Zilberman, 2008). They mainly relied on consultancy companies during the conversion period, because of a lack of alternatives within the institutional world. The creation of specific institutional departments working entirely on the organic industry, and above all on the organic conversion period, would provide farmers with a valid and reliable alternative to the current ones available on the market. This is especially valuable for small farmers who are not members of cooperatives and cannot afford the expenses of private companies. Universities themselves could supply extra training to local farmers, by organizing informative events and field trials where they show the most innovative organic farming techniques. Such assistance would meet the current needs of conventional farmers who do not have the proper expertise or skills to face the change of production strategy on their own.

With respect to technical support, Italian government, according to potato farmers' experience, should improve the quality controls and inspection on organic growers. The scepticism and mistrust surrounding the organic world is widespread among Italian producers. Food scandals and lack of credibility represent two of the major issues for the low rate of conversion within the potato industry. In fact, Italian policy makers should implement the quality controls and intensify the inspections in order to guarantee a clear and transparent production. Another important insight refers to Dutch greenhouse horticulture. As stated by the interviewed tomato growers, for two years now it has become more difficult to apply and get subsidies from Dutch government. This is due to a different set of laws, stricter than in the past. Growers confirmed that they did not receive any subsidies in the previous two seasons and that such system is not economically sustainable in the long run. Investments per *ha* have reached peaks of more than one million euros and farmers cannot bear such effort solely on their shoulders. Therefore, it is necessary a quick and appropriate change of agricultural policy. Investments for the refurbishment of current greenhouses or the creation of new infrastructures should be adequately supported and encouraged by the government too.

Eventually, a substantial difference between the two countries lies on the presence of cooperatives. In the Netherlands, it is much more widespread the culture of association and cooperation among farmers, which ultimately allows farmers to reduce the market risk and increase farmers' profit. Such advantage is particularly appreciated by organic farmers, whose yields are more erratic than those of conventional growers. Gathering the majority of organic greenhouse producers within the same cooperative, in this specific case Nautilus Organic, has permitted to establish a long-term relationship with different customers and reduce the market-price risk. On the contrary, in Italy is hard to find a national cooperative which gathers the majority of organic greenhouse producers. In fact, there are many regional cooperatives, which usually are competitors rather than partners on the market. By doing so farmers lose the competitive advantage with national and foreign producers and bargaining power with their customers. This is the major difference between the Dutch and Italian vegetable sectors, and it stems from a different agricultural policy and culture. Such divergence was not mentioned within the existing literature, essentially because of the scarcity of papers focusing on the economic performance of Italian organic farming.

With respect to methods used, the research focused primarily on qualitative data, analysing each interview independently and highlighting the major differences and similarities per country and crop. Within the questionnaire, there are two quantitative questions, asking the interviewee to rank the risks faced during the conversion period. By doing so, the farmer got an overall picture of the problems and risks under investigation and could emphasise the most significant hazards based on his personal experience. The face-to-face interview allowed the researcher to establish personal contact with local producers and look closely at the risk assessment strategy that organic farmers have implemented over time

Such research comes together with some limitations and shortcomings. There are essentially three major drawbacks encountered during the writing of the thesis. They are listed as follows:

- limited number of international papers and studies, particularly for the Italian economic sector. To support some figures and statements the researcher used grey literature too. The specificity of the topic made it hard to find proper references and peer-reviewed articles.
- Interviewed Dutch potato farmers were in total three and only one out of them was organic. Therefore, the thesis is not representative of the Dutch organic potato industry. For sake of consistency, even interviewed Italian potato farmers were partly

organic and partly conventional, so that it was possible to compare the findings of the interviews. However, it would have been more exhaustive and appropriate to interview more Dutch organic potato growers in order to gain more credibility and trustworthiness with the results of the research. Unfortunately, due to the shortage of contacts with local growers and lack of availability from potato industry (i.e. Agrico and Aviko potato) it was not possible to interview more than three farmers. For future researches, it will be better and wiser to contact farmers ahead of time, maybe even before the research proposal, in order to have enough data to derive the final results.

- Most of data used within the research was not updated to the current year. Based on international databases, EUROSTAT and FAOSTAT, it was possible to retrieve data only until 2014 or, in some cases, 2015. In both countries, there was not official data for the share of greenhouses tomato hectares. This is mainly due to the rotation of crops under greenhouses within the same season, therefore it is difficult to keep track and monitor the precise number of hectares per crop. Within the research, in a few circumstances, some grey literature was used to support figures.

6. Conclusions

After the interviews and the analysis of data, it is possible to answer the main research question of the current thesis:

“Do Dutch and Italian farmers take different risks into account in moving from a conventional to an organic production?”

All growers, for both crops, stated that production risk, mainly linked with reduction in yields, is the major risk within the conversion from conventional toward organic production. Therefore, regardless of the country and the crop, growers perceive the ban on use of chemical compounds and the consequent decrease in yields as the most significant and crucial source of risk. Moreover, it emerges from the interviews that organic farmers are willing to face such problem and undertake the conversion. However, it is possible to differentiate two different mindsets, applicable to both countries:

1. farmers who converted before the beginning of the century were willing to take on the production risk because the positive and sustainable environmental impact of organic agriculture compared to the conventional strategy;
2. farmers who converted after the beginning of the century were willing to face the decrease in yields because of the premium price of organic produce compared with conventional products.

Even the existing literature underscored how crucial the production risk is for the conversion to organic production. However, it was not mentioned the different perception of such risk between long-running organic farmers and growers who converted more recently. Based on the interviews this mindset applies to both countries, regardless of the type of production. Italian growers, particularly organic and conventional potato growers, highlighted institutional risk as crucial within the conversion. Compared to Dutch farmers, who highly rely on and trust national policy and legislation, Italian producers are much more sceptical about the role of national government. They showed concerns towards the possible scandals within the organic industry, due to lack of several strict controls both on organic and in-conversion farmers. Such mistrust prevents many conventional farmers from changing strategy and represented a critical hindrance for the organic ones back in the conversion period. Within the existing literature, the institutional is not recorded as a pivotal source of risk, however based on interviewed Italian potato farmers it represents a critical point. Within the greenhouse production, quality and compliance controls are stricter and more frequent, therefore farmers of both countries were completely satisfied with the current legislation and did not perceive food scandals as a concrete and major risk. In both countries local producers claimed that there was not enough technical support from local institutions or government. This lack of training was highlighted by organic farmers as a major drawback during the conversion and by conventional or in-conversion growers as one crucial negative factor.

With respect to the market risk, in both countries farmers were not concerned about a possible severe change in price within the upcoming future. They confirmed, as stated in the literature, how the premium price represented a paramount opportunity for the change of production strategy. In Italy, the shortcoming of structured cooperatives is perceived as a major risk particularly by small farmers, who do not have much bargaining power against their customers and suppliers. This lack of cooperation is thought to be even more detrimental within an organic strategy, where yields are more erratic depending on the seasonal weather. On the contrary, in the Netherlands farmers tend to aggregate in local

cooperatives (i.e. Nautilus Organic) to overcome the yield and price uncertainty, by signing longer contracts with their customers.

In the end, in both countries emerged that organic growers have a different risk perception than conventional or in-conversion farmers. They are more risk inclined and willing to take on new challenges. Their strong beliefs and passion towards a more sustainable farming strategy and the possibility of increasing their profit outweighed the risks involved in the change of production. On the other hand, conventional and in-conversion farmers are more conservative and risk averse. They believe that the hazards of organic production exceed its opportunities.

To sum up, farmers assign varying importance to different sources of risk based on the country of residence and type of crop. However, the research has pointed out how the passion and ideals of a sustainable agriculture are shared among all organic farmers, regardless of the nation and the crop. The hope is that current findings might be valuable and useful for further research within the risk assessment strategy in organic agriculture.

7. References

- Acs, S., Berentsen, P. B., de Wolf, M., Huirne, R. B., Berentsen, P., & Huirne, R. (2007). Biological Agriculture & Horticulture An International Journal for Sustainable Production Systems Comparison of Conventional and Organic Arable Farming Systems in the Netherlands by Means of Bio-Economic Modelling Comparison of Conventional and Organi. *Biological Agriculture and Horticulture*, *24*, 341–361.
- Acs, S., Berentsen, P. B. M., & Huirne, R. B. M. (2007). Conversion to organic arable farming in The Netherlands: A dynamic linear programming analysis. *Agricultural Systems*, *94*(2), 405–415.
- Aleixandre, J. L., Aleixandre-Tudò, J. L., Bolanos-Pizarro, M., & Aleixandre-Benavent, R. (2015). Mapping the scientific research in organic farming: a bibliometric review. *Scientometrics*, *105*(1), 295–309.
- Berentsen, P., Kovacs, K., & van Asseldonk, M. (2012). Comparing risk in conventional and organic dairy farming in the Netherlands: An empirical analysis. *Journal of Dairy Science*, *95*, 3803–3811.
- Bertazzoli A, Ruggeri A, & Samoggia A. (2010). 18th EAAE Seminar: short supply chain, analysis of the competitiveness of organic horticultural farmers at Italian regional level.
- Bražinskienė, V., & Gaivelytė, K. (2016). Chapter 11 - Organic Potatoes. *Proceedings of the Royal Society*, *282*(1799).
- Burton, M., Rigby, D., & Young, T. (1999). Analysis of the Determinants of Adoption of Organic Horticultural Techniques in the UK. *Journal of Agricultural Economics*, *50*(1), 47–63.
- Darnhofer, I., Lindenthal, T., Bartel-Kratochvil, R., & Zollitsch, W. (2010). Conventionalisation of organic farming practices: from structural criteria towards an assessment based on organic principles. A review. *Agron. Sustain. Dev*, *30*, 67–81.
- Darnhofer, I., Schneeberger, W., & Freyer, B. (2005). Converting or not converting to organic farming in Austria: Farmer types and their rationale. *Agriculture and Human Values*, *22*(1), 39–52.
- De Ponti, T., Rijk, B., & Van Ittersum, M. K. (2012). The crop yield gap between organic and

conventional agriculture. *Agricultural Systems*, 108, 1–9.

Denver, S., Christensen, T., Jensen, J. D., & Jensen, K. O. (2012). The Stability and Instability of Organic Expenditures in Denmark, Great Britain, and Italy. *Journal of International Food & Agribusiness Marketing*, 24(1), 47–65.

Fairweather, J. R. (1999). Understanding how farmers choose between organic and conventional production: Results from New Zealand and policy implications. *Agriculture and Human Values*, 16, 51–63.

Filip, L., & Dragnea, B. (2017). The food rush. A security risk and a cause for international intervention. *Journal of Defense Resources Management*, 8(1), 157–164.

Fusaro, S., Gavinelli, F., Sommaggio, D., & Paoletti, M. G. (2016). Higher efficiency in organic than in conventional management of biological control in horticultural crops in north-eastern Italy. *Biological Control*, 97, 89–101.

Grazyna, N. (2015). Farms combining organic and conventional production methods at the background of organic farms. *Institute of Agricultural and Food Economics*, 3344, 128–146.

Hanson, J., Dismukes, R., Chambers, W., Greene, C., & Kremen, A. (2017). Risk and risk management in organic agriculture: Views of organic farmers. *Renewable Agriculture and Food Systems*, 19(4), 218–227.

Hardaker J. Brian, Lien Gudbrand, Anderson R. Jock and Huirne B.M. Ruud (2015). *Coping with Risk in Agriculture*.

Hemmerling, S., Hamm, U., & Spiller, A. (2015). Consumption behaviour regarding organic food from a marketing perspective—a literature review. *Organic Agriculture*, 5(4), 277–313.

Hendriks, K., Stobbelaar, D. J., & Van Mansvelt, J. D. (2000). The appearance of agriculture An assessment of the quality of landscape of both organic and conventional horticultural farms in West Friesland. *Agriculture, Ecosystems and Environment*, 77(1), 157–175.

Just, R. E. (2003). Risk research in agricultural economics: opportunities and challenges for the next twenty-five years. *Agricultural Systems*, 75(2–3), 123–159.

Kaplan, S., & Garrick, B. J. (1981). On The Quantitative Definition of Risk. *Risk Analysis*, 1(1), 11–27.

- Klonsky, K. (2012). Comparison of Production Costs and Resource Use for Organic and Conventional Production Systems. *American Journal of Agricultural Economics*, 94(2), 314–321.
- Läpple, D. (2010). Adoption and Abandonment of Organic Farming: An Empirical Investigation of the Irish Drystock Sector. *Journal of Agricultural Economics*, 61(3), 697–714.
- Lee, H. (2005). International Journal of Agricultural Sustainability Methodologies for the Comparison of Organic and Conventional Farming Systems Methodologies for the Comparison of Organic and Conventional Farming Systems. *International Journal of Agricultural Sustainability*, 3(2), 122–129.
- Lund, V., Hemlin, S., & Lockeretz, W. (2002). Organic livestock production as viewed by Swedish farmers and organic initiators. *Agriculture and Human Values*, 19, 255–268. f
- Mitchell, A. E., Hong, Y.-J., Koh, E., Barrett, D. M., Bryant, D. E., Denison, R. F., & Kaffka, S. (2007). Ten-Year Comparison of the Influence of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes. *Journal of Agricultural and Food Chemistry*, 55, 6154–6159.
- Murmu, K., Chandra Ghosh, B., & Kumar Swain, D. (2017). Yield and quality of tomato grown under organic and conventional nutrient management Yield and quality of tomato grown under organic and conventional nutrient management. *Archives of Agronomy and Soil Science*, 59(10).
- O 'doherty Jensen, & K, Denver, S., & Zanolli, R. (2011). Actual and potential development of consumer demand on the organic food market in Europe. *NJAS - Wageningen Journal of Life Sciences*, 58, 79–84.
- Oude Lansink, A., & Jensma, K. (2003). Analysing profits and economic behaviour of organic and conventional Dutch Arable Farms. *Agricultural Economics Review*, 4(2), 19–31.
- Pacini, C., Wossink, A., Giesen, G., Vazzana, C., & Huirne, R. (2003). Evaluation of sustainability of organic, integrated and conventional farming systems: a farm and field-scale analysis. *Agriculture, Ecosystems and Environment*, 95, 273–288.
- Ponisio, L. C., M 'gonigle, L. K., Mace, K. C., Palomino, J., De Valpine, P., & Kremen, C.

- (2015). Diversification practices reduce organic to conventional yield gap. *Proceedings of the Royal Society*, 282(1799).
- Ruiz De Maya, S., López-López, I., & Munuera, J. L. (2011). Organic food consumption in Europe: International segmentation based on value system differences. *Ecological Economics*, 70(1), 1767–1775.
- Sacco, D., Moretti, B., Monaco, S., & Grignani, C. (2015). Six-year transition from conventional to organic farming: effects on crop production and soil quality. *European Journal of Agronomy*, 69(1), 10–20.
- Serra, T., & Zilberman, D. (2008). Differential uncertainties and risk attitudes between conventional and organic producers: the case of Spanish arable crop farmers. *Agricultural Economics*, 39(2), 219–229.
- Seufert, V., Ramankutty, N., & Foley, J. A. (2012). Comparing the yields of organic and conventional agriculture. *Nature*, 485(7397), 229.
- Watson, C. A., Walker, R. L., & Stockdale, E. A. (2007). Research in organic production systems – past, present and future. *Journal of Agricultural Science*, 146(1), 1–19.
- Weibel, F. P., Daniel, C., Tamm, L., Willer, H., & Schwartau, H. (2013). Development of organic fruit in Europe. *Acta Horticulturae*, 1001, 19–34.
- Woese, K., Lange, D., Boess, C., & Bögl, K. W. (1997). A comparison of organically and conventionally grown foods-results of a review of the relevant literature. *Journal of the Science of Food and Agriculture*, 74(3), 281–293.
- Yue, C., Grebitus, C., Bruhn, M., & Jensen. (2008). Potato Marketing – Factors Affecting Organic and Conventional Potato Consumption Patterns. *Conference Paper*.
- Zainal, Z. (2007). Case study as a research method. *Jurnal Kemanusiaan Bil*, 9.

Appendix

Interviews' questions

1. What is the size of your farm?
2. How many crops do you grow? Are there only vegetables? Greenhouse and open field crops?
3. Is your production strategy entirely organic or do you keep producing some conventional crops?
4. When did you decide to switch from a traditional production system towards an organic one?
5. Why did you switch to an organic production strategy? What were the main threats and opportunities that you faced in such a change?
6. On a scale from 1 to 10, which factors urged you to move towards an organic production?
 - Premium Price:
 - Sustainability:
 - Ethics:
 - Differentiation from other producers, namely competitive advantage:
7. On a scale from 1 to 10, which major risks did you take on during the conversion towards an organic production?
 - Production risk (i.e. lower yields, no chemical compounds allowed)
 - Market risk in the middle-long term
 - Lack of support from local government
 - Lack of support from European Union
 - Personal inclination towards risks

8. Did you deal with a decrease in yields? If yes, does the premium price of organic products make up for it?
9. Have you monitored an increase in the land fertility after your change? If yes how?
10. Have you monitored an increase in the level of biodiversity after your change? If yes, how
11. What are the main changes required for an open field and a greenhouse crop? Which techniques have you implemented and which ones have you dropped?
12. Moving towards a biological system implies a severe change in the production strategy. In such a shift, did you lack the proper expertise? If yes, how could you overcome the difficulties faced? (i.e. agronomists, consultancy companies, universities and so on)
13. Does your government provide you with training, support and/or production subsidies in order to facilitate the new production strategy?
14. To whom do you supply your products? Do you export or do you sell your products locally?
15. Do you establish contracts based on annual production? If yes, do you perceive it as an extra risk for moving towards an organic production, since the yields are usually more erratic.
16. Since you became an organic producer, how has your perception towards risk changed? Have you implemented any type of risk management tool? (I.e. insurances)
17. How do you identify risks for your farm and how do you counteract them?