

Maria Cipollaro,  
Veronica Alampi  
Sottini, Sara Fabbrizzi

## The role of the raw materials in the development of a Tuscan craft beer chain

Department of Agricultural, Food and Forestry System, University of Florence

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Over the past two decades, the craft beer sector has developed significantly both in Europe and Italy. Through a SWOT analysis, the research highlights the main critical points of the Tuscan craft beer chain, in particular the use of local raw materials, which are mainly linked to the cereal malting process currently carried out by large non-regional plants.

The research also shows that the high quality and the strong product differentiation are the main strength of the sector, since they meet the preferences of a niche of consumers attracted by products characterized by a strong bond with the territory. The major risks concern the introduction of “craft” lines by multinationals and the entry of new craft breweries, which are not in line with the microbreweries’ quality standards.

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### 1. Introduction

Today, the Italian craft brewing sector is a relatively small economic niche dominated by about a thousand small breweries (including microbreweries, beerfirms and brewpubs) (Ravelli and Pedrini, 2015; Amoriello, 2016). In 2015, the average craft beer production was approximately 740 hectolitres, reaching a total of 390,000 hectolitres (equal to 2.1% of the total national supply) (As-sobirra, 2016). In the period 2013-2015, the sector showed a rapid growth of 143% (Amoriello, 2016).

The strong concentration in the Italian beer market by multinational companies does not seem to have hindered the entry of new small craft breweries. These craft beer companies implemented differentiation and product focusing strategies (Donadini and Porretta, 2017; Garavaglia, 2009; Fastigi and Cavanaugh, 2017) able to meet the favour of Italian consumers attentive to high-quality products characterized by different flavours and aromas (Aquilani *et al.*, 2015; Donadini and Porretta, 2017).

Tuscany is the fourth region in terms of number of microbreweries behind Lombardy, Veneto, and Piedmont. It is followed by Emilia Romagna and Lazio (Microbirrifici.org, 2018).

In 2015, the Tuscan craft sector consisted of a hundred companies<sup>1</sup> (Menghini, 2016). The presence of beer farms on the regional territory was relevant as it is still today (21 cases, 23% of the total), though the national legislation recognized beer as an agricultural related production only in 2010, with the Ministerial Decree no. 212 of 5<sup>th</sup> August 2010.

In 2015, the production of Tuscan beer fluctuated between 20 and 25 thousand hectolitres. The average production per craft company (Menghini, 2016) was comprised between 100 and 500 hectolitres, below the national average (Assobirra, 2016). Only 16% of the total number of companies produced more than 500 hectolitres.

This study is part of a wider research project on “The craft beer chain in Tuscany” and its purpose is to identify those factors that can be a source of success or may represent critical issues for the development of a cereal-beer chain in Tuscany. The analysis is carried out through a qualitative survey on 13 breweries selected as case studies.

The international scientific literature on beer production is highly specialized. Through laboratory techniques, several authors examined the chemical and physical characteristics of those raw materials that might affect beer quality (Li *et al.*, 2008; Nielsen and Munck, 2003). Other researches focused on the optimization of the production process and its environmental impact (Grassi *et al.*, 2014; Koroneos *et al.*, 2005).

Several economic studies analysed the structure of the market, the competitiveness among beer companies (Day, Lewin and Li, 1995; Horvath, Schivardi and Woywode, 2001) and the phenomenon of the proliferation of microbreweries (Carroll and Swaminathan, 2000; Murray and O’Neill, 2012).

At national level, only a few studies carried out analysis on the beer sector. Among them, we can cite some researches on the raw materials (Gianinetti *et al.*, 2005; Mongelli *et al.*, 2015) and on the final product (Giovenzana, Beghi and Guidetti, 2014; Mignani *et al.*, 2013). Moreover, Donadini *et al.* (2016) and Aquilani *et al.* (2015) carried out analysis on consumer preferences for craft beers, Garavaglia (2009, 2015) and Fanelli and Felice (2014) focused on the Italian beer market, and Esposti *et al.* (2017) analysed the entry/exit dynamics of the Italian craft breweries to identify those factors that encourage entry in the sector and determine their survival in the market.

As for the craft beer sector, the development of a production chain represents a real opportunity both for the primary sector and for the beer sector in general (Fastigi *et al.*, 2015). The creation of a cereal-beer chain offers the farms the opportunity to expand the production systems, converting them

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<sup>1</sup> Including microbreweries, beerfirms and brewpubs.

into agricultural breweries, and it represents an engine for the development of more sustainable local production models. This evidence explains the interest shown by the academics in the subject (Menghini, 2016; Fastigi *et al.*, 2015), but also by the researches, which analyze the critical aspects and the opportunities related to the creation of both a cereal-beer supply chain (Menghini *et al.*, 2016; Amoriello, 2016; Carbone, 2016) and a hop supply chain (Carbone *et al.*, 2017) in different Italian regions (e.g. Tuscany, Lazio, Marche).

In the current state of knowledge, there is a lack of researches focusing on producers, on the weight that producers attribute to the characteristics of the raw materials at the time of the purchase or on the degree of interest towards the purchase of national or regional raw materials. Lastly, the paper meets specific needs at public level, especially since the introduction of a number of regulations to support the craft beer sector. In particular, law 154/2016 and Ministerial Decree 212/2010 introduced specific typologies of support to stimulate local production of raw materials to be used in the process.

## 2. Methodology

The characteristics of the companies operating in the Tuscan craft beer sector were analysed through a qualitative survey, as well as the degree of interest in the purchase of regional malt and local raw materials and their willingness to bear any higher purchase costs. Meetings with experts in the sector allowed us to select 13 craft companies that were representative in terms of volume of production, years of activity on the market, use of regional and/or local raw materials. In addition, two agricultural breweries were selected: a farm, which used mainly its agricultural products in the brewing process, and with its own production plant and a craft brewery, which rented land for the production of barley and hop on an experimental level.

The survey was carried out using a questionnaire drawn from the relevant literature on the subject (Bastian *et al.*, 1998; Berni *et al.*, 2004; Palmer and Kaminski, 2013; Fastigi *et al.*, 2015; Food Processing Center, 2001; Hieronymus, 2012). The questionnaire comprised 64 questions and it was divided into 3 areas of investigation:

- 1) Company structure
- 2) Raw materials
- 3) Production cost

The questionnaire was structured with open and closed-ended, dichotomous, multiple and Likert scales questions. Quantitative data concerning the purchase of raw materials were collected with closed-ended questions and were analysed using descriptive statistics.

Multiple and Likert scales questions were used to determine the intrinsic and extrinsic properties of the raw materials to which the producers attribute the greatest importance at the time of purchase. The open answers allowed us to make an in-depth analysis of the opportunities and of the critical aspects related to the development of a cereal-beer chain.

Two researchers encoded the data, autonomously. Then, on the different categories, was tested the inter-coder reliability (Ross *et al.*, 2004), which gave an agreement index higher than 0.8.

Lastly, an interpretation of the results was provided, according to the SWOT analysis model.

### 3. Results

On average, companies have been on the market for 6 years (with a range between 2 and 14 years), with a single plant. They have 2 employees on average, with a maximum of 6 and a minimum of 1, often it corresponds to the number of the company members.

The owner is a male, in 12 cases out of 13 aged between 32 and 52 years old; he is highly qualified, with a high school diploma in 69% of cases (and a postgraduate degree in 15% of the cases) and he claims to have attended specific training courses on beer production in 62% of cases as well.

In 2015, the breweries surveyed produced a total of 10,290 hectolitres, representing between 41% to 52% of the estimated value of the total production of craft beer in Tuscany (Menghini, 2016). The average annual production of beer is 700 hectolitres, for a total turnover that exceeds 300,000 euros. The target market for the craft beer production is polarized: 40% is intended for the local market and 38% for the national market. A small part of total production is destined to the foreign market (around 8%), but half of the companies declare to export their products.

Due to the importance in the potential activation of local supply chains, the survey is focused on the analysis of malt and hop. In addition, an in-depth analysis of the specialties was carried, in view of the role in characterizing the beer and their ability, to create a link between the product and the territory.

Non-malted cereals are used in small quantities and they are predominantly regional or national.

On average, the breweries buy 14,5 tons of malt per year. 84% of the volume of malt purchased is imported, while 11% is domestic. Respondents said they preferred imported malt because it has higher qualitative characteristics than domestic malt. The item "regional/local malt" has been omitted in Table 1, because companies declared that there is currently no market for malt

**Tab. 1.** Average purchasing volumes of malt by cereal.

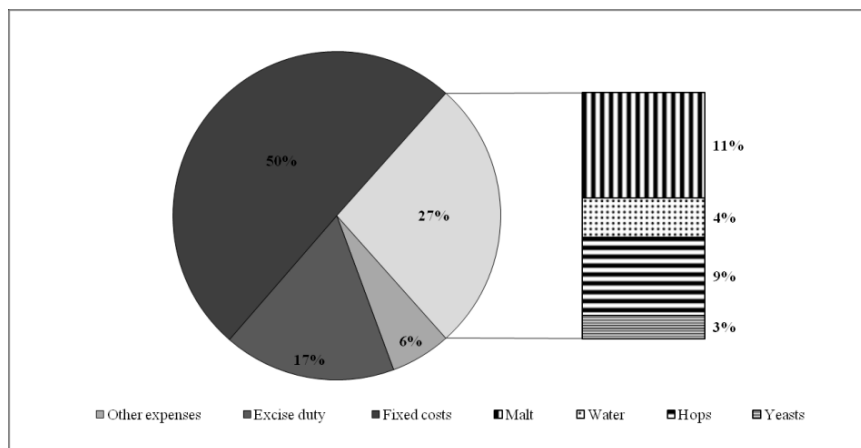
Malt	Malt from Farm-produced grains (Kg)	National origin (kg)	Imported (Kg)	Total volumes (Kg)
Emmer wheat		200		200
Wheat	2,000		280	2,280
Millet			10	10
Barley	8,300	20,550	156,210	185,060
Rye			1,000	1,000
Total	10,300	20,750	157,500	188,550
Percentage Distribution	5%	11%	84%	100%

Source: our elaboration.

in Tuscany. However, the two agricultural brewers use self-produced cereals which are malted by third parties.

On average, companies incur a cost of 2.34 € to produce one litre of beer. Raw materials represent 27% of the total cost (Fig. 1). Among the raw materials, the higher incidence on the costs is due to the purchase of malt (43%), followed by hops (32%) and yeasts (9%).

The purchase price for a kilogram of malt ranges between 0.51 and 1.51 €, with an average price of 0.91 €/kg. In Menghini (2016), the results show that

**Fig. 1.** Incidence (%) of the different costs in the production of 1 litre of beer.

Source: our elaboration.

the cost of the malting processing an experimental micro malt house varies between 1.25 and 1.8 €/kg. This value is considerably higher than buying a standard product on the market, but it can be competitive if the malting process is carried out to obtain special malts.

Eleven breweries out of 13 state that they are willing to bear up to 25% higher costs (about 1.18 €/kg) for a malt produced at national/regional level, compared to the average purchase cost of one kilogram of imported malt with the same qualitative characteristics. Two companies claim to be willing to bear up to 40% higher costs (1.41 €/kg) for a national/regional product. Only 2 breweries are not willing to bear higher costs for national/regional malt. According to them, the cost of transport should have less impact on the final price in the case of regional/national malt, so there would be no justification for a higher price.

On average, the breweries surveyed buy about 440 kg of hops per year. Aromatic hops accounts for about 77% of the total volume. Bitter varieties, on the contrary, are purchased in small quantities (about 23% of the total volume) as they are used in significantly lower quantity in their recipes (Tab. 2).

The hops are 100% imported (from Europe, America and New Zealand). This has an evident effect on prices, which are extremely variable: on average, one kilogram of bitter hops costs 24.5 €, while one kilogram of aromatic hops costs 27.5 €. The average cost ranges between 12 and 50 €/kg for specific high value varieties. All companies state that they are willing to pay a higher price up to 25% (33 €/kg) on average for national/regional hops and three of them even up to 40% (37 €/kg).

Specialties are mainly of national or regional origin. However, breweries face some critical problems in their supply, especially in terms of time and

**Tab. 2.** Average purchasing volumes of hop by categories.

Pellets	Total volumes (Kg)	Average (Kg)	%
Bittering hops	1,077.50	82.88	21.19
Aroma hops	4,007.50	308.27	78.81
Total	5,085.00	391.15	
Dried cones	Total volumes (Kg)	Average (Kg)	%
Bittering hops	264	20.31	41.25
Aroma hops	376	28.92	58.75
Total	640	49.23	

Source: our elaboration.

availability. On the contrary, the quality of the specialties and logistics are rated positively, while the market prices for their purchase vary greatly, depending on the raw material used (organic or quality-certified). However, the quality/price ratio is always considered favourable.

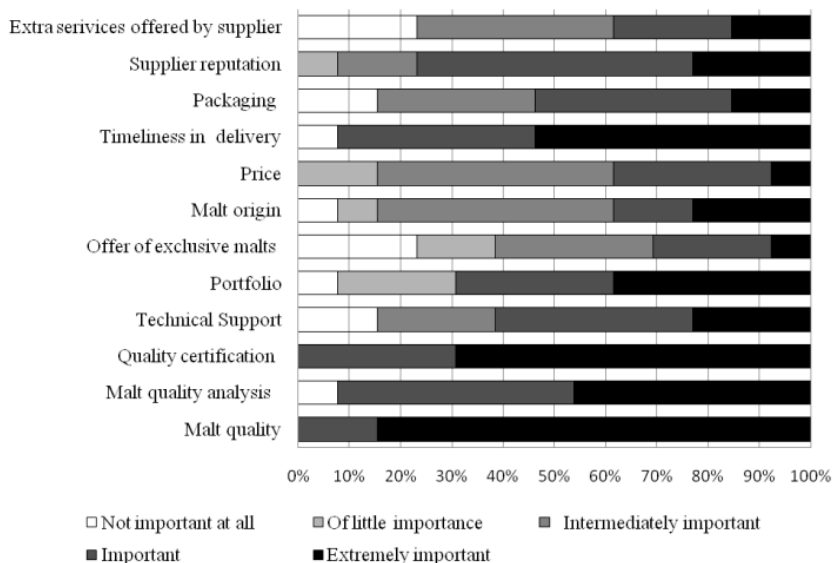
All companies rely on national distributors to purchase their raw materials, with the exception of two agricultural breweries, which produce their own brewing, and one company, which buys online.

Figures 2 and 3 show the respondents' opinion on a number of factors that influence their choice of supplier when purchasing malt and hops, respectively. The results are similar. In both cases, the quality of the raw material is a priority. In fact the value attributed to product quality, chemical product analysis and quality certification range from important to extremely important for almost all the microbreweries.

The origin of the malt is considered to be of intermediate importance by most breweries, while the score given to the range of malt offered by the supplier is polarized. Although most breweries consider this element important or extremely important, some of them do not give importance to it.

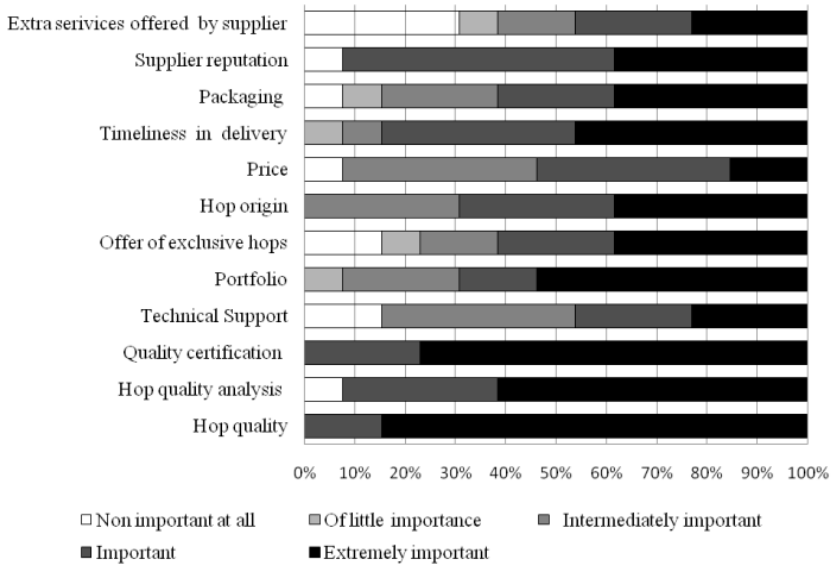
As for hops, the origin, the selection available and the possibility of benefitting from an exclusive range of hops (although the opinions expressed on

Fig. 2. Factors affecting the purchase of malt.



Source: our elaboration.

Fig. 3. Factors affecting the purchase of hop.



Source: our elaboration.

the latter are more variable) are considered to be of intermediate importance or extremely important.

### 4. Swot Analysis

Local raw materials can increase the typicality of the product, differentiating it from the competitors, and they represent an important element for the development of microbreweries. The importance of the origin of the raw materials is also underlined by a consumer study carried out as part of the project (Menghini, 2016). The study shows that almost half of the 655 respondents believe that the use of local malt has a very positive impact on the quality of craft beer. These results are in line with the literature, which stresses that the consumer is willing to rediscover the authenticity of local raw materials. In fact they establish a link with the specific elements of the territory (Schnell and Reese, 2003) and they confer uniqueness to the product (Favalli *et al.*, 2013). Brewers state that product differentiation and improving company visibility are strongly encouraged through the networking with other local companies.

The use of local raw materials is not perceived as a way of reducing production costs. In addition, some critical aspects are linked to the availability



Fig. 4. SWOT matrix.

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Product Innovation</li> <li>• Use of local raw materials</li> <li>• Product quality</li> <li>• Product differentiation</li> <li>• Craft productive process - limited production</li> <li>• Consumer loyalty</li> <li>• Peculiar and easily recognizable image of the packaging (label and bottle)</li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• High production costs (and sales prices)</li> <li>• Qualitative characteristics of raw materials and timing in their supply</li> <li>• Product availability and perishability</li> <li>• Lack of an industrial regional malt house</li> <li>• Lack of support from the public bodies</li> <li>• Integration difficulties</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Expanding market (for the increase of consumption and for the growing consumption opportunities)</li> <li>• Product innovation</li> <li>• Differentiation of the product thanks to the use of typical Italian products</li> <li>• Improvement linked with the development of a short-production chain</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Increasing number of competitors in the craft beer sector</li> <li>• Significantly higher price compared to industrial and also "craft" industrial beers</li> <li>• Strong market concentration</li> <li>• "Deceptive" marketing of multinational companies</li> <li>• Damage to the craft beer because of poor quality craft products in the market</li> <li>• Non educated consumer</li> </ul>

Source: our elaboration.

of raw material on the market that meet the minimum quality standards required by the breweries, in particular malt and hops.

All companies surveyed state that the main obstacle to the creation of a regional cereal-beer chain is related to the difficulties associated with the management of the malting process. In Tuscany there is not an industrial malt house, even if there are some experimental micro malt houses. Unfortunately, their efficiency is greatly reduced by their small size of production, which does not allow the achievement of economies of scale. Moreover, the quality of the raw material processed is variable and it does not guarantee the achievement of a homogeneous and standardized qualitative level of malt. The efficiency of a micro malt house is guaranteed only if the cost of the process does not exceed 1000 euros per ton of malt produced, a value difficult to reach by the single companies investigated (since their volumes of beer production are lower). Therefore, it is possible to affirm that a minimum level of efficiency can be achieved by a micro malt house only if it offers third-party services.

It should be noted that brewers have expressed discordant opinions on the possible creation of a regional or local brand. The main risks associated with the introduction of products strongly linked to the territory or deriving from a short-production-chain are related to the strong competition both on the regional/national market and on the foreign market. Moreover, the situation is even more difficult as large industries, leveraging at very competitive prices,

are adopting specific marketing strategies to promote their “craft” beer and their regional product lines, which attract uneducated consumers.

## 5. Conclusions

At the national level, the studies filling a gap in economic studies on the production of craft beer. Although this is an exploratory analysis, the results can be a useful tool for public bodies to take effective and efficient actions to support the sector at different levels of governance. Public authorities also play a strategic role in the dissemination of product knowledge. In fact they make the product more recognisable through the promotion of actions related to the territory and the local economy (organization and promotion of fairs and events), and through the support of the creation of a network among the stakeholders of the sector. This network could support the exchange of information and the creation of cooperation relationships (Amoriello, 2016; Carbone, 2016).

In addition, the public sector can support the production of local malt grains, given the interest of beer masters in creating a product strongly linked to the territory. At the regional level, the weak link in the supply chain is the malting process. The economic convenience of breweries to have a micro malt house is linked to the achievement of a profit. Today the profit can only be guaranteed if the final product is characterized by superior quality characteristics, mainly related to the territory. Only in this way the consumer is willing to pay a higher price, able to cover the higher costs of a process of self-produced malt. The building of a malt house managed by a producers’ organization at a regional level could represent, as indicated by all the interviewees, a possible solution for the achievement of a cereal-beer chain in Tuscany. Examples of such malt houses are available in other regions of Italy. An example is in Marche, the first region in which a consortium of farmers has set up a malt house together.

This study represents a first investigation into the potential development of a very dynamic and rapidly expanding sector. Moreover, it can encourage the creation of networks among producers in the chain, consumers and local authorities; in this sense, it represents a starting point for further quantitative and qualitative surveys.

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