



SMILE MICROBREWERS LEARNING NETWORK

Independent Brewing in the EU



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FOREWORD

Most micro brewers begin as hobbyists, and so develop technical skills in brewing first. Many do not necessarily have the knowledge of regulations around food safety, health and environmental issues, or the business training to confidently and sustainably brew commercially. The SMILE project is developing a new, accredited, apprenticeship type training programme which address the needs of this sector. The provision of this training programme will simulate innovation and entrepreneurship by offering incumbents and new entrants, exposure to new techniques, culture and ideas from across the EU, as well as providing the necessary business training and compliance training to build a business around a product.

The SMILE training programme will be open source, accessible and free to anyone. A fully accredited version will be available to anyone who wishes to peruse the formal SMILE Qualification.

The SMILE project is represented by 6 partner countries including, Ireland, Czech Republic, United Kingdom, Spain, Italy and Belgium. The companies directly involved are:

Ireland – Mullingar Employment Action Group (MEAG)

MEAG's focus is to support enterprise, entrepreneurship and job creation. MEAG is a strongly networked organisation domestically and in Europe. Through their activities over 30 years MEAG supports an extensive range of highly innovative start-ups bringing new ideas, employment and European best practice to the region.

United Kingdom – Inn Training Ltd

Inn Training is a SME delivering training across the East of England. Inn Training deliver a large range of courses and apprenticeships covering Hospitality, Customer Service, Management and Team Leading.

Italy – Associazione Artistica Culturale – 'A Rocca'

Associazione Artistica Culturale "A Rocca", located in the Northern part of Sicily is a very active organisation. A Rocca organise training course for teachers, trainers and adult from all over Europe, including training in Food and Wine and one in agriculture management.

Czech Republic – GLAFKA s.r.o

GLAFKA s.r.o is a Czech based educational and consulting institution located in Prague focusing on knowledge and innovation transfer in a field of lifelong learning and further education: labour market and entrepreneurship: teaching and training methods and technologies.

Spain – Dramblys: Social Creativity Lab

Dramblys, located in Spain, combine sociological imagination and inquiry with social creativity and design to approach, explore and innovate solutions and contributions to sustainable development issues.

Belgium – The European Brewing Convention (EBC)

Based in Brussels, The Brewers of Europe and its technical and scientific arm, the European Brewery Convention, brings together national brewers associations from 29 European countries and provides a voice to represent the united interests of Europe's 8490 breweries. The Brewers of Europe promotes the positive role played by beer and the brewing sector in Europe and advocates the creation of the right conditions to allow brewers to continue to freely, cost effectively and responsibly brew and market beer across Europe.



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INTRODUCTION

Beer is at present the most consumed alcoholic beverage in the world, and is the most popular drink after water and tea. When consumed responsibly, as is done by the vast majority, it is a refreshing enjoyable beverage that brings people together and delivers pleasure to the lives of many people.

How beer was discovered / invented is a pre-historic mystery going back to a time long before humans wrote down their experiences. Fruits often naturally ferment through the actions of wild yeast, and the resultant alcoholic mixtures are often sought out and enjoyed by animals. Pre-agricultural humans in various areas, from the Neolithic period on, surely similarly sought out such fermenting fruits and probably even collected wild fruits in the hopes that they would have an interesting physical effect (that is, be intoxicating) if left in the open air. The problem in conceiving beer as having similar origins is that, unlike fruits which already contain the requisite sugars and water and only need yeast contact for fermentation, cereal's insoluble starches and sugars (that is polymers) must be converted into soluble starches and sugars, mainly maltose but also dextrose (that is monomers), through the actions of enzymes. Without this process of conversion one would have a product with an extremely low alcohol content due to the small amount of fermentable sugar found in unprocessed cereal. The main way of processing cereal for beer is malting it, whereby the enzyme diastase, along with other enzymes formed from germinated cereal are used. For complete conversion, the added step of mashing, that is the heating (but not boiling) of the malt in water for a period of time, is essential.

There is evidence that the Mesopotamians (Middle East) produced a beer very similar to the Belgian 'Lambic' about 5000 years ago, while the first evidence of fermented beverages appears from China. Shards of pottery, collected from a Neolithic village known as Jiahu in Northern China's Henan province and analysed with modern techniques revealed traces of alcoholic liquid dated between 9000 and 7000 years ago. The liquids were the result of a mixed fermented beverage of wild grapes, hawthorn, rice, and honey. (McGovern et al, 'Fermented Beverages') The origins of beer in Europe has been traced back to ancient Egypt. It is understood that the ancient Egyptians taught the Greeks and Romans how to ferment wheat and yeast and thus produce the first type of beer. (Although evidence suggests beer being discovered independently by the Celts and other races of Western Europe). The Greeks and Romans however favoured wine over the consumption of beer and for a long time beer was considered a second class drink.

Climate too, determined how and what was drunk before the advent of planes, trains and automobiles, when local food and local drink wasn't just a fashion. Where grapes were not as abundant wine would have to be made from other fruits or even from cereals. A fairly moderate climate and soils that are particularly favourable for the growing of cereals, coupled with countless sources of underground water, makes the so called 'European Beer Belt' an ideal region for beer production. The Beer Belt comprises areas where beer has been the alcoholic beverage of choice since times immemorial: Ireland and the UK, the Low Countries, Denmark, Germany, Austria, Slovenia, Bosnia and Albania; most of the Czech Republic, Slovakia, Croatia, Serbia and Romania; and significant, western parts of Poland.

The fact that these mineral water sources all have their own distinctive character and taste has led to the development of an enormous range of different beers throughout Europe. For instance, Dublin has very hard water and this is particularly good for making stout, like Guinness. Pilsen in the Czech Republic has very soft water, ideal for making pale lager, universally known on the Continent as Pils. The waters of England's Burton on Trent are rich in gypsum, making them ideal for the brewing of pale ale. In addition, some regions are particularly rich in airborne wild yeasts and these have been used from earliest times to create wild beers, the character of which arises not so much from the ingredients, but from the environment of the brewery (winemakers call this 'terroir'). This is particularly important for the traditional beer styles of Belgium, but also used by brewers the world over to create beers in style and character unique to their place.

By the end of the Middle Ages beer had become one of the most common European drinks and it was consumed daily by every social class in the northern and eastern parts of Europe where grape cultivation was difficult or impossible. The perception of beer as inferior to wine changed dramatically with the fall of the Roman Empire. In medieval times the brewing process of beer was progressed by the ancient Celts and Monks who added different flavours or ingredients to vary the taste of the beer as it grew from strength to strength. It is widely believed that the commercial beers that are brewed today in the modern age hail from medieval Europe. The coming of Christianity saw a tremendous increase in the brewing of beer, largely because monks played such an important role in its production. People often had a very dubious water supply, and there was a constant risk of illness. In this case it was not safe to drink the water so beer was drunk instead and in very large quantities. Monks lived pretty frugal lives, particularly during fasting periods, but fortunately for them, consuming liquids did not break their fast. Beer, being boiled, hence sterilised, also provided a source of nutrients. One rule was that monks should provide travellers with something to eat and drink. As a result, during the Middle Ages, monasteries everywhere became stopping off places for travellers who shared the monks' often meagre food and particularly their robust and sustaining beers. In western Flanders a glass of beer is still referred to as 'gloazen stutjes'... translated as 'a sandwich in a glass'. The practice evolved and the monks eventually began to sell the beer in what were rather like medieval pubs.

The basic way to make beer is to boil malted barley with water and let it ferment. Sometimes natural yeasts found floating in the air did the vital work but generally yeast was deliberately to help things along. The resulting mix was usually flavoured with mixtures of various herbs. One of the problems of early brewing was that beer didn't keep well; it soon spoiled, so couldn't be transported over long distance or even travel from town to town. This could be overcome to a certain degree by increasing the alcohol content, but that was expensive. In the 9th Century it was discovered that beer could be flavoured with hops, but it was difficult to get the recipe right and it took until the 13th Century to fully perfect the process. Once the Germans discovered that hopped beer lasted longer they introduced standard barrel sizes and started the export trade in beer. These technological leaps meant beer was no longer a small scale cottage industry. Up to 10 skilled and specialist artisans were needed to run a German brewery. By the 14th Century this type of operation had spread through Holland and on to Flanders.

In the nineteenth century, technological discoveries and improvements such as the introduction of refrigeration and the development of pasteurisation techniques dramatically changed beer brewing. By controlling the brewing process, the environment, the type of fermentation, and the type of yeast culture, brewers were able to obtain a 'standardised' product, something that could not be achieved previously, thereby providing enhanced opportunities for mass production and consumption as well as large scale packaging and distribution. Between the first and second world wars, beer production and consumption were affected significantly. The war effort resulted in a great shortage in supply for brewers, who had to cope with rising prices of grains combined with a general scarcity of raw materials. Governments issued laws to limit the distribution and consumption of alcoholic drinks, pushing larger brewers to diversify into alternative products such as soft drinks, and smaller producers out of business. These developments led the industry down a path where much modern beer production is now dominated by a handful of multinational companies.

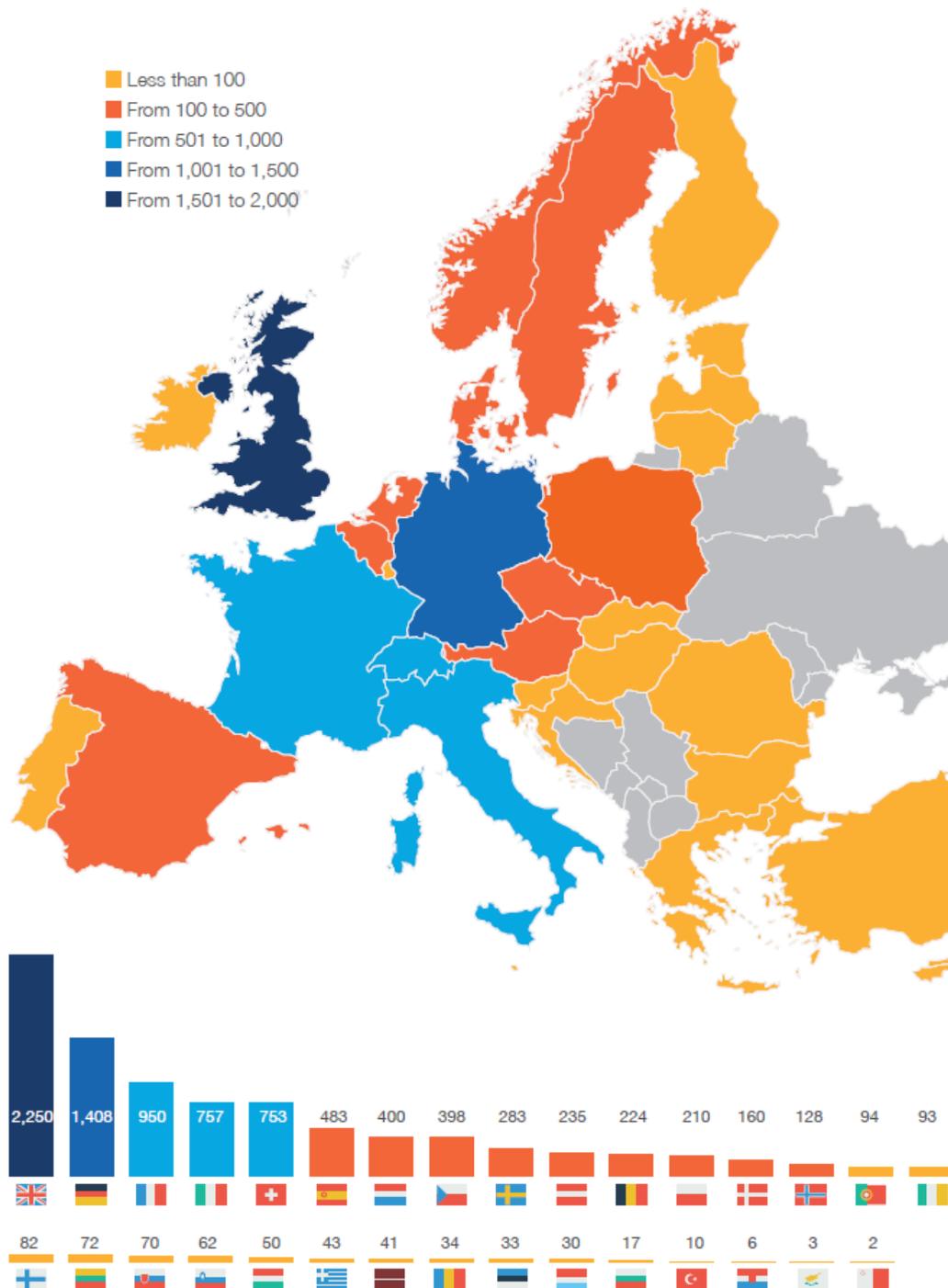
The effects of concentration in the market started to be most significant during the 1970s and 1980s. A number of global conglomerates originated as a result of a series of large acquisitions and mergers. However, most recent times have seen a rise in the number of micro and craft breweries almost everywhere in the world. Trends in Europe show many thousands of smaller producers emerging. Set-up costs are fairly low and the heavy concentration processes in the brewing industry has left space for new entrants and created condition for niche markets. Policies in support of small entrepreneurs, such as rate reliefs and financial grants made available by local governments; and an increased level of sophistication in consumers' tastes (more inclined to try qualitatively different products) have all added to growth.

Having smaller fixed costs and therefore being less reliant on economies of scale, micro-brewers have been more adept at responding to changing consumer tastes. In addition, because they supply a more discerning market, the craft brewers can afford to be more adventurous in the styles of beer they produce and this has increased their competitiveness even though they are selling at premium prices. The growth of micro-brewers is testament to growing entrepreneurship in this industry.

OVERVIEW OF BREWING IN EUROPE

The European Union as a whole is the second largest beer producer in the world, The EU now counts around 8,500 active breweries, with an estimated twenty new breweries starting up each week. In 2016 annual beer production moved above the 40 billion litre mark for the first time since the economic crisis. With 2.3 million jobs created by beer in Europe we can see the impact Beer has on growth and prosperity in Europe.

NUMBER OF ACTIVE BREWERIES - 2016



Source: Brewers of Europe, Published Statistics 2017.

Diversity amongst beer products is increasing over time as the industry innovates, producing a wider range of products. At the same time, consumers are reducing the volume of beer they are drinking but have an increasing preference for specialty beers. The value of that diversity to consumers is therefore likely to be rising as well. An increase in the consumption of specialty of beers was noted across Europe by brewers and national associations in the latest survey. It was also noted that consumers are typically willing to pay higher prices for those beers, with the overall market shifting towards lower volumes but more valuable products.

This diversity is also reflected in the rising numbers of micro-breweries. There are substantial increases particularly in the Czech Republic, France, Portugal, Slovenia, Spain, Sweden and Switzerland. There was also a large increase in Italy and the United Kingdom.

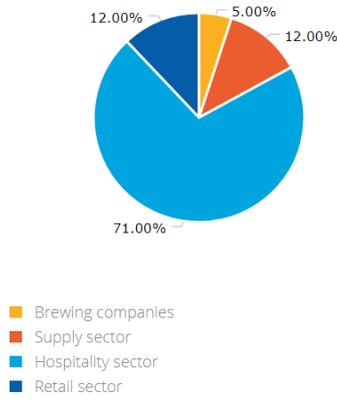
The European beer sector makes a significant contribution to a number of economic outcomes of interest to policymakers particularly:

- Value added: economic growth can be understood as an increase in value added across the economy (the difference between inputs consumed and output produced in each industry). Value added contributions to the EU strategy for economic growth, Europe 2020 (hence reinforcing the objectives of increasing employment and government revenues)
- Employment: many people work in the beer supply chain, and this contributes to Europe 2020 targets of achieving 75% of 20-64 year olds being employed
- Government revenues: there are taxes on the beer itself, excise duties and VAT, but also taxes on the factors of production in the supply chain. Government revenues are especially important as EU Member states have committed to medium term limits on borrowing under the stability and Growth Pact, (and as part of a wide range of priorities for public spending)

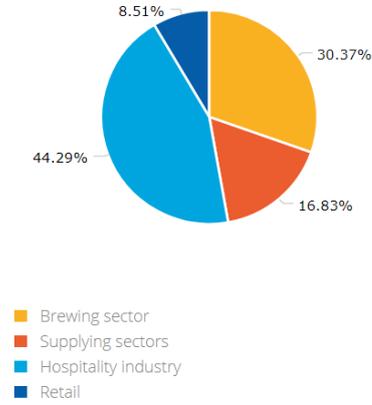
Key Statistics for the Industry in Europe:

- 8490 Breweries
- 400,168,000 Production (HL)
- 85,622,000 Exports (HL)
- 2,300,000 jobs

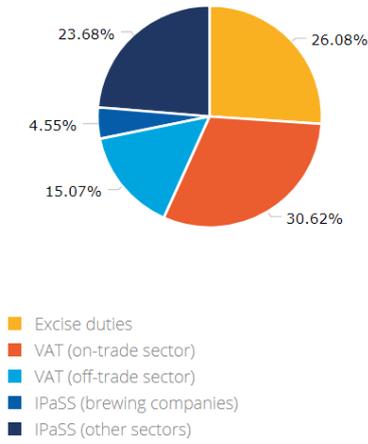
Employment generated by Beer: 2,300,000 jobs



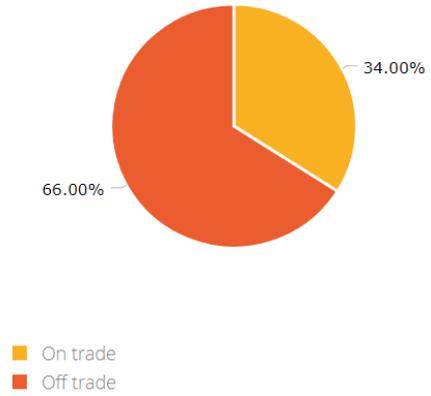
Value-added generated by Beer (€51 billion)



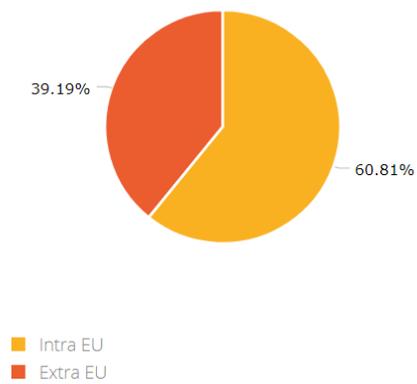
Tax revenues generated by Beer (€42 billion)



On-trade (34%) / Off-trade (66%) split in Beer sales (hectolitres)



Exports of Beer: 77 million hectolitres



Source: Brewers of Europe

INDEPENDENT BREWING IN IRELAND

Ireland has a rich tradition of brewing, and home to one of the most famous brands in the world, Guinness. However only 10 years ago you could count the number of Irish brewers on one hand, now risen to over 100 in the Republic of Ireland. The trend of micro-breweries in Ireland has risen significantly in the last three to five years. According to reports conducted by Feeney (2015) this trend has grown sharply with an estimated 63 micro-breweries in Ireland in that year. This figure has further risen in 2016 to approximately 90 micro-breweries in Ireland and currently over 100. The overall yield of production companies for craft beer was in the region of 134,000 hectolitres in 2015. The corresponding figure for 2017 was 7680000 hectolitres, 3104000 of that being exported.

According to reports carried out in the micro brewing sector, the level of employment from this industry stands at 1400, this includes full time, part time and seasonal employment.

In relation to distribution and aspects of production, there are approximately 26 production companies with at least 5 frequent product lines. In general micro-breweries have a range of distribution channels available to them. In the region of 50% of revenue is derived directly from pubs, restaurants and hotels. A further analysis of this figure equates to 16% of revenue which comes from brewery owned pubs, restaurants and hotels. Another relevant detail in relation to this topic is that 29% of revenue for production companies is gained from direct sales to off licenses and a further 22% of revenue is garnered from the utilization of a wholesaler or distributor.

According to Alan Kelly TD who is the spokesman for Health, Jobs, Enterprise and Innovation in 2016, he initiated legislation to remove a barrier to growth for craft beer brewing and micro-breweries in Ireland. The bill was directed at micro-breweries and distilleries being able to sell their produce to tourists and visitors on the premises of the business. Mr Kelly further stated that quite a number of those businesses in Ireland provide guided tours of their premises to visitors and there are a significant number of requests made by the visitors to sample the craft beer at the end of the tour. This in turn would increase the marketability of the product and entice further sales from craft beer enthusiasts. This piece of legislation that was introduced in 2016 will enhance the craft beer industry and help to create further growth and job prospects in this ever evolving industry.

TRAINING OFFERING IN IRELAND

The majority of breweries in Ireland are micro-breweries and there is a growing need for training services to be provided to them. The gap is currently being filled by 2 institutes, University College Cork (Dept. of Food and Nutritional Sciences) as well as the BSc (Hons.) course founded in 2016 with the assistance of the ICBT (Heriot Watt University, Edinburgh) at the Carlow Institute of Technology.

Bachelor of Science Brewing and Distilling - Carlow I.T.

The course offering qualifications at NFQ level 8 (Honours) focuses on the aspect of Brewing and Distilling. Brewing is primarily achieved by fermenting the sugars in grain to alcohol with yeast and is followed by adding hops for flavour. Distilling is primarily focused on the

production of spirits such as Whiskey and Brandy and the process is carried out using a fermentation and purification method. The industry of Brewing and Distilling has grown significantly in Ireland in recent years.

In order for brewing and distilling to be successful, scientific and engineering principles must be applied to the process. The four year course in Carlow I.T. the first of its kind in Ireland, allows the students to gain the necessary skills and competencies required to fully understand and implement the methods and procedures involved in working in the brewing and distilling industry. The course also features modules such as product development and marketing alongside regulatory affairs which prepares successful graduates to work in these growing industries. The programme offers an industry work placement in year 3 and a research project in year 4.

Course Objectives

Graduates will qualify upon successful completion of the course with the skills and knowledge of an expert in distilling and brewing. This qualification will allow the graduate to gain employment in a number of areas such as production, laboratory and technical work, and also quality assurance or product development in small or large scale breweries and distilleries. The option for graduates to start their own company is also possible, and the skills gained on the course can be utilised internationally so this gives the graduate a lot of scope to gain employment in the industry.

On successful completion of the Bachelors Honours degree in brewing and distilling from Carlow I.T., there are routes into further advanced study in the field. These options are open to graduates to progress into MSc and PhD programmes based in Carlow I.T. or other third level colleges or research centres.

Course Content

- Fundamental Biology
- Chemistry
- Physics
- Laboratory Science
- Quantitative methods
- Current Concepts in Science
- Biochemistry
- Microbiology
- Quantitative Methods
- Quality Control

The Beer Academy of Ireland City and Guilds Level 1 - Porterhouse Brewing Company

Delivered in partnership with the Beer Academy U.K. and the Institute of Brewing and Distilling in London, the aim of the course is to allow students to avail of a quality educational environment that encompasses the energetic and exciting industry of beer. The Porterhouse operates 3 different courses related to the beer industry which include.

- The how to judge beer course
- The beer foundation course
- The advanced course

Course Objectives

The 'How to judge beer' course is aimed at providing students with the skills and expertise to successfully sample and judge the quality and design of beer and to prepare the student for a role as a refined beer judge in competitions involving beer.

The 'Beer foundation' course prepares the student to learn about how beer is produced and how the ingredients determine the flavour of the beer. It also gives the student the ability to match beer with certain foods for specially selected menus. This award is an internationally recognized certificate and is awarded under the City and Guilds accreditation at level 1 of the national framework of qualifications from the U.K. This award will strengthen the student's knowledge about beer and allow the student to engage with consumers in the beer sector on a global scale.

The 'Advanced course' sharpens the student's level of understanding of beer, different varieties and pairing with food. Through undertaking this course the student will gain a vast amount of knowledge and expertise in the industry of beer and prepare them for a career in the beer sector.

Course content

How to judge beer course:

- The appropriate use of beer terminology and a refined understanding of beer
- Ability to decipher a variety of beer flavour details
- The capability to assimilate key varieties of beer
- Acquire the knowledge to distinguish between beers of a similar style

Beer foundation course:

- The fundamental aspects of beer and their role within the process of brewing
- An indebt analysis of beer styles
- How to sample beer
- Pairing beer with food

Advanced course:

- To accentuate the students' knowledge of beer
- The varieties of ingredients and the methods and process of brewing beer
- To distinguish between the different designs and flavours of beer with an emphasis on foreign beer styles

Various Technical Brewing Programmes - Hibernian Brewing School

The Hibernian Brewing School provides a range of various technical brewing programmes which are designed to satisfy the brewing enthusiast. Their beer appreciation programmes are specifically constructed for beer enthusiasts who may be seeking to advance into a career in

the brewing profession as craft beer brewers or home brewers. The brewing programmes offered by Hibernian are recognized on an international scale and are designed especially for those beer enthusiasts who require a recognized professional brewing award. The school offers tutoring by renowned experts in the area of brewing and with the help of their guidance and tutoring alongside the online lessons and E-books that are also offered by the school, this brewing course is a very enticing and innovative learning initiative in the area of professional brewing.

Course Objectives

There are four main courses to choose from through the school and they are completed on a step ladder process.

- The starting point is the 'beer appreciation award' which offers an introduction into the world of beer sampling and dissemination of different beer styles.
- The next point on the step ladder is the 'beer appreciation certificate', this is an advancement on the previous course and offers a more detailed insight into the area of beer appreciation.
- The next learning step after the 'beer appreciation course' is the associate brewer programme. This course offers an informative and professional outlook for enthusiastic aspiring craft brewers. Through the study of the material available through this part of the learning process, the student is prepared to initiate a path into a career as an associate brewer.
- The last and probably most significant of the learning process is the 'master brewer apprenticeship'. This course aims to enhance the knowledge gained from the associate brewer course and transform the student's knowledge into that of a master brewer.

Cereal and Brewing Science - University College Cork

The aim of the course is to allow students to learn about the aspects of chemistry, microbiology and technology of cereals in relation to a vast amount of beverages produced from cereals.

Outcomes for successful completion:

- The student should be able to define the quality aspects of varieties of barley that are required to manufacture adequate quality malt
- The student should have the ability to apply the fundamental principles of the malting to the process of design malting while acknowledging the requirement of specific raw materials
- The student should be able to demonstrate the necessary skills and knowledge involved in the process of brewing to effectively work in the brewing industry
- The student should be able to categorise the relevant types of wheat required for the development of different types of cereal products
- The student should possess the knowledge to understand a vast range of cereal processing techniques to gain a career in the food industry

- The student should understand the creation process of specific cereal based products such as part baked products, gluten free products and frozen breads in order to advance the creation of new products for the food industry

Course Content

A range of ingredients related to the production of beverages, through the use of cereals, such as beer are covered throughout the delivery of the course. A detailed analysis of raw materials, equipment related to the production process and legislation corresponding to the regulation of the industry will be covered during the course timeframe.

Certificate in Brewing & Distilling Operations - Taste 4 Success Skillnet Cork Institute of Technology

The modules on the programme are closely aligned with the Institute of Brewing and Distilling (IBD) syllabi for the Diploma in Brewing and Diploma in Distilling examinations. IBD diploma examinations are recognised as a world standard in Brewing and Distilling. It is expected that students on the programme would also take the IBD examinations. Partners in programme design include representatives of the Irish Branch of the Institute of Brewing and Distilling, accredited tutors of the Institute of Brewing and Distilling, representatives of Taste 4 Success Skillnet and senior engineers and technologist from local industry.

Course Objectives

This programme provides candidates with the scientific and engineering background required to work in craft and traditional breweries & distilleries. Candidates who complete all five modules will be awarded a CIT Certificates in Brewing & Distilling. Candidates may choose to take any number of modules on a stand-alone basis and will receive individual certification for each module completed. All modules are at Level 7 on the National Framework of Qualifications (NFQ). Lectures may be supplemented by industry-relevant laboratory practical's, guest lectures and visits to breweries, distilleries and malting's.

Course Content

- Yeast and Beer Brewing
- Raw Materials & Wort Brewing & Distilling
- Spirit Production Distilling Module
- Fluids & Heat Brewing & Distilling
- Distillation Plant Design Brewing & Distilling

INDEPENDENT BREWING IN BRITAIN

With England, Scotland and Wales becoming more and more industrialised in the 19th century it was the area in the West Midlands that rose to brewing prominence as there was a happy coincidence of finding good and plentiful water for being in the vicinity of coal mining and clay based industries at Burton upon Trent. Britain has returned to its rightful role as a global 'brewing powerhouse' after some years in decline, and a surge during the recent years has seen breweries opening up at a rate of 3 every week. This trend is reflected right across the country with all regions sharing the success of the British beer boom. There are now over 2250 breweries in the UK, employing 4300 people and producing 43,734,000 hectolitres of beer in 2017. 5,965,000 hectolitres of that for export. The production and sale of beer creates jobs in agriculture, brewing, pubs and the wider supply chain, in total the sector supports almost 324,582 jobs.

Research by the Accountancy group UHY Hacker Young, that drinkers in the UK were willing to pay premium prices for a luxury product, they said "craft beer is leading the way in the surging popularity of artisan products and has pushed aside other brands in high street bars", "This increasing popularity has transformed many micro-breweries into highly profitable businesses for entrepreneurs looking for a niche position in the food and drinks market. As a result of their success, micro-breweries across the UK have also become attractive acquisition targets for larger breweries".

Micro-breweries are doing well and numbers are up by around 8%, according to SIBA (Society of Independent Brewers) in their 2017 annual report they documented figures drawn from a survey of some 497 respondents. Some of the findings in the SIBA annual survey is detailed below

- According to the SIBA 2017 annual survey of member's beer production continued to increase in 2016, registering at 13.7% increase in the period of 2013-2016, (compared to 5.7% in 2011-2012 and 8.5% in 2012-13.)
- Nearly half of respondents brew less than 1,000hl
- 37% of members are now selling some craft beer in keg, up from 27% in 2015
- Cask production now at 74% of total production
- Majority of respondents brew more than 10% of production as bottled or canned beer
- Most brewers produce between 4 and 6 regular brands
- One in 3 forecast over 10% growth in annual turnover in 2017
- 1 in 6 expect a decline in annual turnover in 2017
- 55% of production is supplied to free trade pubs, with 13% going to controlled pubs. 65% of beer is sold within 40 miles of the brewery
- 23.5% of respondent brewers now export their beers, 60.7% of brewers are interested

Some points of interest in regards to revenue where also outlined in the SIBA report which are highlighted below.

- 35% of respondents achieved an annual turnover between £50K-£250K in 2016
- 22% invested more than £50K in 2016, and 10% investing more than £100K

- Bulk of investments were in expanding beer production, modernising equipment and to enlarge current premises
- Duty savings and small breweries relief continue to be mainly used for more capacity and new equipment
- Training remains very important to members – 77% intend to invest in staff
- Almost 1 out of 6 breweries plan to double their current levels of production, sales and turnover by 2018
- 71% of brewers expect to recruit at least 1 new employee in the next 12 months
- Estimated 980 new jobs to be created by members next year
- On average 5.5 full time and 1.9 part time staff are employed by members
- 1 in 5 employees among surveyed breweries are female
- Strong impact on local employment – over a third live in the same town or village

TRAINING OFFERING IN BRITAIN

These days studying brewing can be pursued at the University of Nottingham and Heriot Watt University in Edinburgh through the ICBD, (the International Centre for Brewing & Distilling), or via a pupillage at Molson-Coors or Heineken. Brewing training by the Institute of Brewing & Distilling (IBD) is being looked after by the Institute's training arm, the arm "Beer Academy". The IBD also provides students of brewing some long-distance learning programmes with an internationally respected qualification in the form of a) The Foundation Certificate (basic), b) The Diploma in Brewing (Intermediate) and c) The Master Brewer Programme (advanced). Some other training worth mentioning within the private sector are Campden BRI in Nutfield, Surrey (the former Brewing Research Institute) and Brewlab in Sunderland.

Institute of Brewing and Distilling

The Institute of Brewing and Distilling (IBD) is the world's leading professional body for people working in brewing and distilling. As an international professional and educational body the IBD promotes "The advancement of the education and professional development in the science and technology of brewing, distilling and related industries." Dating back to 1886 the IBD now boasts over 5,000 members and is the largest global professional body for brewers and distillers, and the only one with a worldwide footprint. Global membership is administered on a geographical basis with sections around the world. Members are grouped into regional sections, four of which are in the United Kingdom: Great Northern, Southern, Midlands and Scottish. There are an additional four international sections: Africa, Asia Pacific, Irish and International. Membership classes include Student, Standard, Retired and Fellowship levels. The IBD offers a range of examinations and qualifications in brewing, distilling, malting and packaging, ranging from the Fundamentals of Brewing and Packaging and of Distilling for nontechnical personnel, through General Certificates in Brewing, Distilling, Malting or Packaging, to Diplomas in Brewing, Distilling or Packaging. The ultimate accolade is the Master Brewer or Distiller qualification, which assesses levels of both competence and knowledge in the technical management of the production process. This course is delivered by industry experts.

distilling: cereal science and technology, yeast science, microbiology, biochemistry, process technology, business strategies, management food safety, practical and project skills (maling, brewing and distilling), quality control and quality assurance, flavours assessment and analytical chemistry.,

- Develop a sound understanding and knowledge of policy, legislation, ethical, health and safety issues of concern as they relate to the design, manufacture, marketing and sale of alcoholic drinks and for the raw materials, processing aids, by products and wastes of the industry.
- Develop specialist knowledge of the malting, brewing fermentation, processing, distillation, maturation, packaging and distribution process stages in the production of alcoholic drinks
- Develop knowledge and understanding of the methods and research skills for investigating new and existing problem areas in malting, brewing and distilling, so that the ability is acquired to conduct independent research and solve problems.
- Develop knowledge and understanding of the business environment pertaining to malting, brewing and distillery companies including the main areas of strategic planning, operations management, organisational structure, human resources management, marketing, finance, intellectual property and due diligence.
- Critically analyse and evaluate subject materials and concepts.

INDEPENDENT BREWING IN ITALY

Italy has taken enormous strides towards a differentiation in its beer market, currently the number of breweries stand at 757 showcasing a wealth of distinctive styles and bearing testimony to creative experimentation.

ASSOBIRRA protects the interests of the industry and the product in the awareness of the criticalities associated with unmanageable consumption of beer as alcoholic beverages. ASSOBIRRA carries out institutional, promotional and technological development brewing activities for the brewing industry. The association's institutional tasks are mainly related to the representation of associated companies in both Italy and abroad regarding legislative, legal and trade aspects. According to ASSOBIRRA Italian beer brings wealth to the country. In 2015, faced with the first signs of recovery recorded within the internal market (caused by a climate that was particularly favourable to demand), the Italian beer industry managed to intercept a part of the beer consumption increase, which by the end of the year had reached 18.7 million hectolitres. Focus was kept on exports and reached a historical record, almost 2.3 million hectolitres. This combination of both of these factors has meant an increase in production, which for the first time has surpassed the 14 million hectolitres mark.

Key stats for the industry in 2017 are:

- 757 Breweries sustaining 5350 Jobs
- Production 14515000 hectolitres
- Export 2581000 hectolitres
- Employment generated by Beer: 146,264 jobs

It isn't all good news for the Italian beer industry, for the third year in a row the job sector has remained stationary. The internal consumption, despite being over 30 litre per person per year has not reached the values recorded in 2007 (the last year before the crisis) and more importantly it remains in last place amongst countries within the European Union. A worrying trend within the market is that imports are 3 times higher exports. In 2015 the imports reached a new record of 7 million hectolitres. The persistence of these critical factors are mainly due to the excessive fiscal pressure that beer is under in Italy. This pressure moves consumption towards low cost products which attracts imports from other countries that are more competitive to their own. Due to the decreased competitiveness and increase in tax burden, the Italian beer is losing domestic market share.

It should be mentioned at this point there is a continued recovery in the sector, especially in employment terms, (direct and indirect jobs). This is largely due to the persistence of the new Italian micro-breweries, as they are the most noteworthy innovation that has occurred over the past decade, the number of these businesses had quintupled between 2008 and 2015, going from 113 to 525 units, and now standing at 757 independent commercial brewing businesses. In spite of the difficulties Italian beer has shown that it can compete successfully within the market. With this in mind ASSOBIRRA asks on behalf of all its beer producers, that the industry be allowed to thrive to make the most of all available opportunities. In other words, reducing the abnormal fiscal pressure that penalizes Italian beer would not only mean helping an

important sector of the agri-food industry, but it would also mean helping the country finally reboot with the passion of which it is capable.

Italy is in a difficult situation due to fiscal pressure but throughout this pressure the brewing industry has continued to produce wealth, employment and entrepreneurship within the country. It has been an exemplary partner for the fundamental sectors within the industry (agriculture, packaging, logistics, hospitality industry, distribution) and contributed substantially to the states income. On January 1st 2015, the last of a series of increases on excise tax regarding beer, decided upon by the government in September 2013, was put into effect. This decision resulted in a total increase of 30% in taxes over a period of only 15 months, which in turn places Italy at the top of the continental European charts. For example in Germany and Spain, excise taxes on beer are respectively a quarter and a third of that of Italy. All of this happens whilst beer represents, in Italy and abroad, an important figure within the agricultural and food industry, as well as a source of wealth economically and in terms of employment. One that should be defended, not penalized.

TRAINING OFFERING IN ITALY

Key to the Italian brewing industry on terms of training is the Centro di Eccellenza per la Ricerca sulla birra – CERB. Brewing is dealt with in a practical way, balanced with the theory. Sensory education covering all aspects of beer evaluation and tasting are additional features of these courses. Interestingly The CERB receives funding from major brewers and some teaching is geared towards students finding employment, not just in the craft beer segment. The University of Udine has a different approach to its training and has developed a training programme to appeal mainly to small brewers. Italian brewers have benefited greatly from globalisation and they are most mobile when it comes to arranging collaboration brews or submitting their products for international awards, it is not unrealistic to expect a proliferation of institutions offering brewing training to a wide variety of brewers and Brewhouse sizes.

The Italian Brewing Research Centre CERB

CERB: The Italian Brewing Research Centre is the first independent research institute on beer in Italy. CERB was established in 2003, as a result of a bilateral agreement between the University of Perugia and ASSOBIRRA (The Italian Brewers Association), to reach common goals in the various activities of the beer sector. All of the pilot plants and equipment were financed by the Ministry of Agriculture and the Ministry of the University and Research, due to this special interest in the creation of this centre for research on brewing science.

Research activity in brewing science started in Perugia before 2003, specifically in 1998, when the Food Science Department of the University of Perugia was involved in a project (financed by the Italian Ministry of Science and Technology) in the nutritional and technological aspects of fermented beverages, especially beer. The project was developed with ASSOBIRRA. The results demonstrated the remarkable scientific qualification in the sector, and the high reliability of reaching the fixed goals provided the necessity for the realization of the first and only public Brewing Centre in Italy.

The working group of the centre consists of food technologists, agronomists, chemists, engineers and technical staff. CERB wants to be a “meeting place” for research in the field of

production, development and quality certification of beer to safeguard the consumers and the product. As stated in the Quality Policy of the CERB, according to the ISO 9001: 2008 regulation on the “Quality System Management”, the centre has been identified for research, training and analysis of the main processes in the production of beer. These processes include:

- Research and testing of raw materials from the agro-food sector with the attention to the brewing of raw materials and beer
- Research activities related to the brewing process and the quality assessment of beer, nutrition, health and sensory and commodity
- Implementation of analytical methods (chemical and biological) for the evaluation of raw materials, semi-finished products of the beer industry
- Consultancy activities for brewing industries and laboratories
- Training activities for university students, micro-breweries and the brewing industry
- Dissemination for scientific results

The centre has fully equipped chemistry laboratories that are able to offer the full range of EBC analyses, the centre also has developed a research program for students, the Master in Brewing Technologies.

Master Degree in Brewing

The University Master’s Degree in Brewing Technologies takes place in the course of an academic year for a total of 1500 hours for 60 credits by providing training the student in the following topics:

- Legislation, Quality and Safety
- Malting Technology
- Brewing Technology
- Analysis of Ingredients and Products
- Beer Tasting

In addition, it is planned to carry out an internship at the headquarters of CERB or at one of the companies affiliated with CERB and belonging to the brewing industry. The classes will be taught by university professors and experts, Italian and International, in the field of malt and beer. The Masters_[MW1] course is also open to the holders of an equivalent qualification obtained abroad. The Master is open to the holders of a Bachelor’s degree or 1st level Master.

Training related to brewing – Beer tasting expert

The course aims to train experts in beer tasting. The participants, through theoretical lessons in the classroom, will be informed initially about all major processes and production technologies. Below, through an in-depth tasting course, participants will be provided with the main tools to understand and recognize the qualitative characteristics of the product and the organoleptic peculiarities that can be developed during the process of brewing and preserving beer.

Lessons take place in 3 days

Training content

- | | |
|-------|--|
| Day 1 | <ul style="list-style-type: none">• Introduction to the course• Brewery technology• Tasting of 3 lager beers |
| Day 2 | <ul style="list-style-type: none">• The styles of beer• Tasting of 8 beers |
| Day 3 | <ul style="list-style-type: none">• Geography of beer• Tasting of 3 beers |

Beer Filling

Packaging is the final operation in beer production. This operation must be appropriately managed to prevent the emergence or reduction of any hygienic-sanitary and quality problems in finished beer. The aim of the course is to train industry operators on how to handle and manage an effective and modern beer brewing process. It also aims to train people involved in the management of the health risks associated with the packaging of the beer.

Training content

- | | |
|------------------------------|---|
| 1 day of course
(8 hours) | <ul style="list-style-type: none">- Introduction to brewing beer- Theoretical notions on the packaging of beer bottling- Theoretical theories on beer packaging, infusion- Practical proof of isobaric beer bottling |
|------------------------------|---|

INDEPENDENT BREWING IN SPAIN

Due to increasing efforts of the Cerveceros Espana over the past 2 decades, beer consumption in Spain is higher than in any other Mediterranean Country. Spanish brewers have worked exceedingly hard at producing consistent and clean flavours. Recently in Spain a new concept has emerged, known as micro-brewery and brewpubs with traditional methods of elaboration. This concept has also impacted Spanish beer sector and little by little micro-breweries are increasing and so we find an increasing number of alternative beers in the Spanish market.

Spain ranks fourth in beer production in the European Union, and in 2017 there were a total of 36,461,000 hectolitres produced, by 483 breweries, employing 5900 people. Between 2011 and 2013 beer production suffered a continuous drop in the production as result of the decline in the consumption during this period, after 2013 we can see a growing trend increasing the production. In 2013 to 2015 the beer consumption continued to grow steadily. Even though Spain ranks 4th in beer production, the country is in the 27th position when we refer about beer consumption at EU level. In 2015, beer consumption per capita was 47.8 litres, far away from Czech Republic, Germany, Austria, Poland or Lithuania, which are in the first positions of European ranking. This dropped to 46Litres per capita per year in 2017.

The Spanish micro-breweries growth rate means the sector is gaining more relevance in the beer global market, which is under the control of the big beer industrial companies (95% of the total market). The success of the craft beer in Spain can be attributed to different factors, which include the variety of beer types, the low cost of starting the business and the marketing used by the craft brewers to commercialise new brands and attractive packaging.

In Spain there is no official definition of a micro-brewery or craft brewery. This lack of clear definition and also a lack of data can make it somewhat difficult to describe the current state of the sector. In 2010 the number of 'micro-breweries' in Spain was 46, but their market share was only 1% of the total. This has increased to 483 by 2017, even though their market share continues to be less than 1% of the total production. This is due to the increasing production of the industrial breweries and excessive fragmentation of the micro-breweries. As far as the production of the micro-breweries in Spain is concerned, it is important to highlight that it has increased more than 1,000% between 2010 and 2015. In 2010 the total production of micro-breweries was 17.9 thousand hectolitres, in 2015 the 409 micro-breweries in Spain produced 182 thousand hectolitres.

Micro-breweries in Spain have a low production rates, according to data in 2015 about 70% of the micro-breweries produced between 1.000 and 5.000 litres of beer per year. Only 17% of the total micro-breweries produced between 30.000 and 41.000 litres of beer per year.

There are currently 2 main issues limiting the Spanish micro-brewery industry, low beer production and a lack of specific commercialisation channels of micro-breweries. According to the existing data the micro-brewery market is characterised by a limited geographical coverage, Spain is the main market of the micro-breweries although about 4 or 5 micro-breweries export their beer to markets such as: USA, France, Italy, Denmark and Sweden. So, we can consider that the internationalisation of the micro-brewery production is exceptional. However, 71.1% of the breweries show their intention to promote an

internationalisation process in short term. Only, 5.3% of the total don't have any internationalisation objectives.

TRAINING OFFERING IN SPAIN

In terms of training, Spanish brewers have traditionally followed in house training courses within their companies, often rounded off with the relevant top-level qualification from the Escuela Superior de Cervexa y Malta or further afield at the VLB in Berlin of the Scandinavian School of Brewing in Copenhagen. Together with the changes related to the beer production process as a result of the growth in number of micro-breweries and emerging business opportunities, we can find a wide training offer in beer production, which covers from formal and certified training to non-formal training through e- learning tools.

Beer production – Certificate of professionalism

In 2005, the Spanish government approved the Beer production certificate of professionalism through the Royal Decree 1087/2005, developed by the Order PRE/2047/2015. The Certificate regulates a qualification of the level 2, included in the National Catalogue of Qualifications in the professional family of "Food Industries". The competences and skills developed through this professional profile are intended to work in active malt and beer processing and bottling industries. These are generally large and medium sized beer breweries. The technician works in a team with other people of the same category or lower and depends on an intermediate command, in small companies you can have operators under your responsibility and depend directly on the production manager. It depends its activity in the functional areas of barley and or malt production, wort and beer. The production operations cover the field of malt and beer production.

Productive sectors related

Malt and beer production industries. Craft Breweries. Bottling industries.

Competences and training associated

General competences: Control and process of raw and auxiliary materials, implementing the malting process and implementing operations which are necessary for obtaining malt, wort and beer.

Competence units

- Control and prepare the raw materials and implement the malting process.
- Implement the process to produce the beer wort according to the established procedures.
- Manage the beer fermentation, maturing, filtration and elaboration process.
- Control of the preparation and packaging process (transversal)

Other Training

To obtain the professional certificate, a total of 310 hours are mandatory. The training activity structure comprises of the following modules and training units.

Modules	Training Units (subjects)	Hours
Malt production	<ol style="list-style-type: none">1. Barley2. Malt3. Malt house4. Cleaning of facilities and equipment	50
Beer wort production	<ol style="list-style-type: none">1. Milling, other liquid and solid components, dosing and water in beer production2. Brewing process3. Beer wort filtering and boiling4. Beer wort lautering and cooling5. Regulation of health in beer production6. Regulations of safety in beer production	60
Beer fermentation maturing and elaboration	<ol style="list-style-type: none">1. Yeasts: strains for industrial application2. Biological pollutants: wort and beer3. Wort fermentation. Maturation process and beer storage4. Filtering and beer preparation5. Beer6. Environmental security and protection measures	60
Beverages preparation and packaging	<ol style="list-style-type: none">1. Beverages preparation for packaging2. Packaging and labelling characteristics3. Packaging operations4. Health and safety in the packaging process5. Quality self-control in packaging process	60
Work internship		50

Master Degree in Brewery Science and Technology - University of Alcalá de Henares

Promoted by the High School of Beer and Malt and delivered by the University of Alcalá de Henares, this certificate is addressed to persons with a degree (in sciences and engineering), interested in the promotion of their professional career, while improving their knowledge in brewery science and technologies as well as obtaining a practical specialization in beer production. The master programme was launched in 1996. Total face-to-face training includes 480 hours, of which 230 hours correspond to theoretical classes, 156 hours to practical classes (includes manufacturing and packaging practices, final projects and internship at the laboratory) and 94 hours of seminars and industrial visits. The Masters is delivered by professors of the University of Alcalá de Henares, professional brewer's and recognized experts and consultants.

Course objectives

The programme is aimed to provide the necessary scientific and technological knowledge for the postgraduate professional training of those technicians who wish to develop their professional career in the brewing, malting and related industries. The programme is also intended to develop new areas of research with possibilities of professional application.

Course content

The course is structured in 10 modules

Modules	Subjects	Credits
Brewing industry	<ol style="list-style-type: none">1. Beer along the history2. Brewing industry in Spain3. Food legislation4. Food security5. Health and safety	3,5
Transformation theory	<ol style="list-style-type: none">1. Basics on biochemistry2. Transformation in malting process3. Transformation in brewing process	6,0
Malting technology	<ol style="list-style-type: none">1. Malting technology and machines	3,0
Brewing technology	<ol style="list-style-type: none">1. Brewing technology and machines2. Manufacturing practices	10,0
Packaging technology	<ol style="list-style-type: none">1. Packaging technology and machines2. Packaging practices	6,0
Microbiology	<ol style="list-style-type: none">1. General microbiology2. Brewing microbiology	6,5
Quality	<ol style="list-style-type: none">1. Raw materials control2. Market quality3. Total quality4. Sensorial management	9,5
General services	<ol style="list-style-type: none">1. Fluid mechanic2. Cold3. Hot4. Electricity5. Compressed air and liquid6. Automatization and control7. Water	5,0

Project management	<ol style="list-style-type: none"> 1. Feasibility study 2. Production management 3. Maintenance management 4. Environmental management 	3,0
Final project	<ol style="list-style-type: none"> 1. Final master research project 	7,5

Entrepreneurship in Micro-brewery

This course is intended to provide participants with the basic knowledge to create a micro-brewery. Organised and delivered by *Instituto de la Cerveza Artesana (I.C.A.)*, this training activity is addressed to all entrepreneurs who want to start producing (with commercial objective) craft beer and want to learn all the aspects to take into account before launching their own business. This one day course aims to clear all the doubts in relation to the machinery and the legal aspects and formalities needed to open a micro-brewery. To date, more than 500 entrepreneurs have participated in over 50 course deliveries. In fact, some of the participants in the past editions developed successful entrepreneurship projects in the area micro-breweries.

Course objectives

The course has an objective to provide basic information about how to create a micro-brewery and more in detail:

- Legal requirements of the business
- Beer production process
- Micro- brewery management (feasibility study, marketing and financing)

Course content

- Legal issues to start and economic activity
- Professional beer production
- Facilities to set up a micro-brewery or a brewpub
- Quality factors to avoid beer contamination (and steps to follow in case of contamination)
- Beer production and storage (including the legislation that regulate these)
- Special tax system of craft beer
- Financing and accounting
- Branding and marketing (focusing on the protection of the brand in the Internet)
- Feasibility plans, expenses and return on investment
- Tools to assist in the design and follow up of craft beer recipes
- Business approaches and their particularities (micro-breweries/ brewpubs/ symbiosis with a catering business)

INDEPENDENT BREWING IN CZECH REPUBLIC

Brewing has a deep rooted and cherished tradition in the Czech Republic, and belongs to the main pillars of the local food industry. Its products – beer, malt and the core ingredient hops – are important export items. The beer and malt industries also considerably contribute to employment, giving jobs to 65,000 people. More than 95% of ingredients used for brewing are produced locally. In 2017, 398 Czech breweries, employing 6100 people, produced almost 20,475,000 hectolitres of beer. There are 6 large brewing companies (operating 19 breweries), 30 independent breweries and many mini breweries (this amount is increasing), along with these there are also several research and training breweries.

The average consumption per capita was 143 litres, which is the same number in 2015 and 2016. The difference between the amount of beer consumed in pubs and the amount of beer sold in supermarkets increased. In 2016, for the first time in the last 10 years, the local market saw a rise in sale of tap beer. Consumption of lagers also rose slightly in year to year comparison. In foreign countries, Czech beer continues to be popular. 4,362,000 hectolitres of beer were exported to over 50 countries in 2017 (interestingly, this is down slightly on 2016 exports). The largest importers were Slovakia, Germany and Poland within the EU, and the USA, Korea and Russia outside the EU. Import of beer increased, too. Despite that, the Czech Republic is still the smallest beer importer in the European Union.

In 2016 Czech malt houses produced 544 thousand tons of malt, out of which 267 thousand tons were exported to 52 countries. The main export markets were Poland, Germany, Hungary and the United Kingdom. 3.818 tons of certified hops were exported in 2016, primarily to Germany, China, Japan and Russia.

A trend towards dissatisfaction with the quality of production of large multinational breweries can be interpreted as evidence of changing consumer's tastes. Today people like trying craft beers and specialties produced by mini breweries, strengthening the demand for good quality products. In the Czech Republic, a mini brewery is considered any brewery with annual production of less than 10 thousand hectolitres. At present there are more than 350 mini breweries, covering approximately 2% of the overall consumption. An estimated 50 new mini breweries are founded every year, either by beer lovers or by those who find it a great investment opportunity. Experts estimate that by 2020, 800 to 1000 mini breweries will have been established in the Czech Republic.

TRAINING OFFERING IN CZECH REPUBLIC

It stands to reason that Czechs would provide ample opportunities for brewers to be trained. Unfortunately, this is not exactly the case and may be a legacy of decades of socialist planning. The most renowned of places to study brewing is at the Institute of Chemical Technology in Prague. It has a department dedicated to brewing and fermentation sciences. Various bachelor and master study programmes are offered and short courses are geared towards those more interested in rounding off their vocational training. There are multiple ways in the Czech Republic to get training in brewing and malting. Professional training is provided by certain secondary schools and universities. There are also re-training courses for unemployed people. Below are some examples of official study programmes, as well as courses and workshops that are not part of the formal education system.

Specialized secondary education with vocational certificate – programme malting and brewing.

Length and form of study: 3 years, full time.

Level of education: Secondary vocational. Termination and Certification: Final exam

The programme provides training for the following tasks:

- Storing and treating ingredients used for brewing
- Making malt
- Mastering all production processes of brewing
- Preparing fermentation cultures
- Controlling ingredients and final products, laboratory – testing
- Bottling expediting beer
- Operating and servicing brewing machines and technical equipment
- Sterilizing brewery premises and equipment
- Keeping appropriate documentation

Graduates will find jobs in the malting and brewing industries, in beer related consumer services, in specialized laboratories or in technical and economic departments of breweries.

Complete specialised secondary education with vocational certification and maturita-exam (follow up course) – programme Food Technology

Length and form of study: 2 years, full time

Certification: maturita – exam Certificate

The programme provides training for the following tasks:

- Management of technologies in the food-production process
- Assessment of basic economic parameters and their use in trading and logistics = planning of production phases
- Management of various production branches
- Respecting technical procedures and hygiene rules, exercising quality controls
- Supervising the production process in terms of food safety, conducting laboratory and sensory tests of quality of ingredients, intermediate products and final products, proposing ideas for improvement
- Operating technical equipment in food production
- Keeping appropriate documentation
- Respecting technological norms
- Respecting safety and hygiene norms

The programme allows its students to choose an area of specialisation. Graduates can work as technologists and experts in food processing companies. They can also continue their study at University in one of those areas, food-processing, chemistry, ecology and agriculture.

Post-secondary technical education – programme Food Technology and Biotechnology.

Length of Study: 3 years, Full time

This programme is intended for secondary school graduates who wish to get more training in food-processing technologies and related areas.

The objective of the programme is to provide:

- Overview of production processes in all food processing branches
- Skills and best practice for treating and processing ingredients
- Knowledge to handle secondary products
- Overview of ecological aspects of production
- Information on new nutrition trends

The subject matter is studied in relation to business administration, law, social and communication skills, language skills, management, marketing, human resources. In the 3rd year of study, students choose their specialisation. The study programme is created in a modular form and applies the ECTS credit system. Graduates are very practice-oriented and actively apply their knowledge in their everyday work lives. They find jobs in food production or in trade departments.

Bachelor Study Programme: Food Technology, Faculty of Food and Biochemical Technology, University of chemistry and Technology in Prague (VSCHT)

Length of study: 3 years

Form of study: Daily or combined attendance

Graduates get comprehensive knowledge and skills and can find employment in various areas. An essential part of this study programme is laboratory sessions. Throughout these, students acquire knowledge necessary to manage and control food production, and are able to assess and monitor quality of ingredients, intermediate products and final products. Students participate in a number of projects throughout their study, and write a final thesis at the end. On these, they are asked to collaborate with food-processing companies. They are also made aware of how processes can be modernised and can apply this knowledge later on when in the workforce. Graduates will find employment in food production, food research, food control and food trading. Many of them go on with their study to obtain a Master's Degree.

Master Study Programme Food Technology, Faculty of Food and Biochemical technology, University of Chemistry and Technology in Prague (VSCHT)

Length of study: 2 years

Form of study: Daily or combines attendance

The programme combines knowledge and skills from Science, engineering, model-making and management of biotechnological processes. This programme builds on knowledge of

processes and happenings that occur in living organisms, and seeks their practical utilization in technological processes. Special emphasis is put on laboratory projects and students independent work. Employment possibilities: Graduates can opt for a career of a scientist, or they will find jobs in food processing companies.

Re – training Courses “Brewing and Malting” (Research Institute of Brewing and Malting)

The course lasts 6 months and consists of 121 hours of theoretical training and 180 hours of practical training. Trainees who complete it successfully get a certificate of aptitude and can run sole proprietorship in brewing and malting, as well as a certificate confirming they can conduct sensory analyses of beer.

A successful trainee:

- Has basic theoretical knowledge about the history and technology of malt and beer production
- Can follow an outlined production process
- Can assess technology conditions and parameters of malt and beer production
- Can monitor, record and evaluate technical parameters and report on production processes and results
- Knows basic calculations pertaining to production
- Is familiar with terminology of malting and brewing
- Knows ingredients, packaging and additives used in malting and brewing
- Can grow and multiply fermenting cultures
- Can operate basic malting and brewing equipment and machines
- Can make malt, wort and beer
- Can clean, disinfect, maintain, adjust and make basic repairs of technical equipment
- Can make basic microbiological and analytical tests as part of operational control
- Can collect samples, make their sensory check and determine their quality
- Understands results of tests and adjusts the production process accordingly, if necessary
- Knows how to store, treat, process pack and transport ingredients
- Knows how to store, pack, mark and expedite final products
- Knows basic legislation applicable to malting and brewing

Applications must meet the following criteria in order to be admitted to the re training course:

- Completed secondary-level education with a matura-exam certificate
- Valid health certificate authorizing its holder to work in the food processing industry
- A least 18 years of age

The practical part of the training involves technological seminars and laboratory training. Trainees will be walked through all the phases of the brewing process in a training brewery. They will collect samples for analysis and get familiar with finalizing and bottling beer. The samples will be analysed in an analytical and microbiological laboratory. Trainees will know the basic analytical and microbiological methods to control quality of ingredients (malt, water

and hops), intermediary products, side products and final products (malt and beer). Trainees will be divided in groups of 2-3 and will be led by technological experts supervised by an instructor.

INDEPENDENT BREWING IN BELGIUM

Belgium has a brewing sector marked by rich traditions, separated by different local preferences but united in their affinity for good strong beers. Of all the beer producing nations it is undoubtedly Belgium that consistently produces so many different beer styles with so many different fermentation techniques and such a wide range of alcohol by volume.

As Belgians revel in hundreds of mainly small breweries catering for anything but mainstream tastes, it is clear the definition of “craft brewing/craft beer” is perhaps least fit for purpose in Belgium. Being a small country has also led to brewers being well organised and represented by the Belgian Brewers Federation which recommends that all their members attain a sufficiently high standard of technical competence.

Key statistics for the industry in Belgium (2017) are as follows;

- Breweries: 224
- Jobs: 4700
- Production: 20,616,000 hectolitres per annum
- Export: 14,085,000 hectolitres per annum
- Consumption: 68 litres per capita per annum
- Total employment generated by the industry: 49,251

TRAINING OFFERING IN BELGIUM

It is with the rich beer heritage in mind that Belgium has a wider range of training available. The brewing training in Belgium is mainly academic in nature. The KUL has a great history of brewing with many eminent scientists making their mark on brewing. The KUL has positioned itself as the prime provider of top level brewing science in Belgium. The Institut Meurice at the Haute Ecole Lucia de Brouckere in Western Brussels is a brewing school with the aim of producing brewers rather than brewing scientists. The Belgian Brewers Federation recommends that all their members attain a sufficiently high standard of technical competence.

The Leuven Institute for Beer Research (LIBR)

The Leuven Institute for Beer Research (LIBR) is embedded in the University of Leuven and unites specialised KU Leuven laboratories with a proven track record of expertise in beer and beverage research and development in one unique research centre. LIBR facilitates the transfer of innovative technologies in the domain of beer and beverage products that result from multidisciplinary research to a practical and /or industrial application.

LIBR offer a 4 week international MSc level course on Malting and brewing technology. The objective of this course is to provide a theory basis and to update your knowledge of malting and brewing technology, provide you with up to date information about the state of the important processing steps and improve your skills in designing and trouble-shooting the malting and brewing processes. The course (in English) covers the whole field of malting and brewing and includes several practical sessions (including brewing your own beer in our 5 hl. pilot brewery). As a student you will:

- Get a clear view on the total malting and brewing process
- Learn the most important properties (biological/ physiological/ (bio) chemical/ technological) of barley malt, water, hops and yeast as raw materials in brewing and will be capable of evaluating their quality
- Understand the technological questions in respect of steeping, germination and kilning, respectively, and the modern industrial practice of malting
- Gain insight in the relation between the malting process and the final malt quality
- Know the main properties of the different malt types and other raw materials (adjuncts) used in beer preparation
- Gain theoretical and practical insight in the whole brewing process (milling of malt, mashing, wort filtration, wort boiling, wort clarification, wort cooling)
- Gain theoretical and practical insight in the biochemistry of fermentation, yeast propagation, fermentation technology, lagering, beer clarification, stabilisation, and packaging
- Understand the connection between the malting and brewing process and malting/brewing in relation to the final beer quality
- Gain insight in conceptual engineering in malting, brewing, and fermentation, aiming at enhanced flavour quality/stability and total cost reduction in combination with clean label technology
- Learn to evaluate analytically the raw materials used in beer preparation (malt, hops, yeast)
- Gain practical experience in pilot brewing and will be capable of evaluating the different steps of the brewing process: wort production (including determination of Brewhouse yield), yeast propagation, fermentation, lagering, beer clarification, beer filling, bottle re-fermentation)
- Be able to perform basic sensory assessment (recognition of flavours and off-flavours and evaluation of fresh vs. aged beers)

Advanced Master in Brewing Engineering

This program allows candidates who already have training in areas such as biochemistry, microbiology and various aspects of engineering to train specifically for the brewing sector and thus acquire a high professional qualification level. This program can only be pursued after obtaining a first master's degree, endorsing graduate studies, valued for at least 300 credits. It may provide access to doctoral training.

Course Objectives

This programme aims to provide training and preparation for professional practice in the brewing industry. It includes theoretical and practical training as well as an internship. Schematic description of program components

1. Theoretical training will detail the biochemistry, chemistry and microbiology of processes used in malting and brewing. It will also cover the practical and technological aspects related to these two industries as well as the organoleptic aspects. It will extend the student's knowledge to related fields such as chemistry and microbiology of foodstuffs.
2. Stage-mémoire :The objective of this work is to introduce students to the brewing industry in a concrete context. It will allow the student to become familiar with the activity of a team

working on a specific problem related to the manufacture of malt or beer. It allows them to use the theoretical knowledge acquired within the framework of a scientific research approach (capacity to analyse the context of the problem in all its dimensions, to understand the methodology adopted, to analyse the results of the team). In addition, it allows to become better acquainted with the different analytical techniques (GC-MS, HPLC, etc.) applied to the malting breweries.

CONCLUSIONS

This study has showed that the training and development sector for brewers has been considerably invigorated by the advent of the craft and micro brewers, as traditional segmentation into vocational vs. academic education is not necessarily valid in some cases. Some caveats need to be borne in mind:

- Only in the first part of the 20th century did brewing teaching become more formalised. The centres of good brewing were Munich, Berlin, Prague, Copenhagen, London and Edinburgh. Often, promising brewing talent was sent to those places of higher learning to consolidate their knowledge base. Equally important to getting a qualification, however, was the chance for networking and landing respected positions in the European Sector.
- Defining “craft” verses “non-craft” beer is tricky and very much in the realm of which philosophy is being adhered to. The US-based Brewers Association (BA) has attempted to classify craft brewers as A) Independent, B) Producing less than 6 million HL P.a. volume output, C) Being “Innovative”, and D) with no major flaws and is one of the reasons why The Brewers of Europe, in consultation with the national brewing trade associations, have consistently rejected calls for a definition of beer (and, by interference, craft-beer).
- Brewing training should be based on national and EU accepted training standards and be applicable to both small and large brewers, as scientific concepts and technological principles in brewing are universal.
- As many training services institutions are in fact small companies conducting their teaching in the vernacular, the often do not show up on English based search terms. This is particularly the case in France, Italy and Central Eastern Europe. This also explains why no information on brewing training is known to EBC in countries such as Romania, Greece and others.
- The ESCO classification of occupations, skills/competencies and qualifications is a must to ensure lateral applicability and transversal comparability of the SMILE training standards and programmes.
- The EBC brewing Science Group is composed of brewing scientists from both breweries as well as academic institutions. It is valuable resource to communicate and get extra input regarding SMILE, as members are aware of this project.

In the next section we provide the first proposal for the SMILE Qualification, ‘**SMILE Certificate in Brewing Entrepreneurship**’. This proposal was developed after a period of primary research, in consultation with the industry, and with commercial and homebrewers in the Partner countries and beyond. In conclusion of our research, this is the training that the people in the industry want.