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Introduction, Definitions and Legislation

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1.1 Introduction

Consumers have always wanted to know where their food came from and what it consisted of. In recent days, especially in more economically developed countries (MEDC), consumers have demanded to know without any doubt the origin and content of the food and whether it is safe to eat; in certain cases, consumers are willing to pay more for specific quality attributes (Aprile et al. 2012). Apart from being assured of the quality of the product they purchase, there is also strong interest in adulteration and fraud which, as well as financially damaging, can represent significant health hazards.

The proper description of food (and beverages) and its ingredients is enforced by labeling legislation which aims to reassure the consumer by giving them all the available information needed by issuing guidelines on the proper description of food. In order to enforce this legislation, state inspection bodies use various scientific methods to certify that the food products available in the market fully comply with label description.

Authenticity means the quality of being authentic or genuineness (www.dictionary.com). This word originates from the Greek word authentikós which means original, primary, at first hand, equivalent to authént (ēs) one who does things himself (aut- aut- + -hentēs doer). Similar definitions identify authentication with genuineness and truthfulness of origins, attributions, commitments, sincerity, and intentions; if something is authentic, it is not a copy or forgery.

The concept of authentic, defined by something original, true, undoubted, etc. applied to food, certifies that these products are of a certain origin in concordance with standards and force rules and with the inscriptions of the presentation label (Pascu 2013). Authenticity is of great concern for producers, manufacturers, traders, consumers, and state inspection bodies.

Food authentication is the process by which a food is verified as complying with its label description. Labeling and compositional regulations, which may differ from country to country, have a fundamental place in determining which scientific tests are appropriate for a particular issue (Dennis 1998). This is a brief definition of the principle of “food authentication”, but food authentication includes or may include many different attributes that give each food product its unique character.
1.2 Definitions

1.2.1 Food Origin

This may refer to the place or region in which the food or its ingredients were produced. It also refers to the botanical species and/or raw material used. In the case of meat products, this includes the wild or farmed species. A tool for covering these prerequisites is traceability. Traceability in most developed countries is a legal obligation of the production and marketing, but is also a major part of quality management schemes and standards (i.e., HACCP, ISO 22000:2005, FSSC 22000, EurepGAP, BRC, etc.). “Traceability” means that the path that led the product and its ingredients from its initial origin to the point that it became available to the final (or the intermediate) consumer(s) is known. All the information of the pathway that the product and its ingredients followed is recorded to the final point of sales. However, any systems involved in defining traceability are only as strong as their weakest link. In the EU, the main tool which enforces traceability is Regulation 178/2002 which came into force in 2005, although since 1993 the legislation (Directive 93/43) had made mandatory the existence of an active hazard analysis and critical control point (HACCP) plan in most enterprises that handled food, and traceability is *sine qua non* in any such scheme.

1.2.2 Label

The description of any food product is presented on its label. Although the main role of the label is to give the purchaser all the description details of the product needed to make an informed choice, it is often connected with legal aspects concerning the protection of the specific brand of the company that handles the product such as: brand protection (from counterfeit/fraud, misbranding); trademark; trade dress; trade secret; and liability of the production or marketing company(ies). Other data that the label may provide are nutritional properties, date of production (or year of harvest), date of manufacture, expiration date, and the type of technology used to produce or process the food. When a company addresses its products to a specific target group of consumers, specific labeling often combined with certain certifications and logos can be used. Examples of this practice include: related religion practices (i.e., kosher for Jews, musbooh and halal for Muslims, no beef for Hindu); groups of people with special dietary needs or health concerns (i.e., diabetics, high cholesterol, infants, children, lactose intolerant, vegan, vegetarian, gluten free, potential allergens); and lifestyle choices (organic, biodynamic agricultural products, low carbon footprint, fair trade, sugar free, low calorie content, low fat content).

1.2.3 Adulteration and Fraud

Fraud of foods or food ingredients is usually defined as a deliberate alteration of the product in order to increase profit. The UK’s Food Standards Agency (FSA) describes two main types of fraud: (1) the sale of food which is unfit and potentially harmful; and (2) the deliberate misdescription of food (FSA 2015). Although the misdescription of the product results in financial loss for the consumer, in most cases it rarely intends to harm (Brereton 2013; Braden 2014). Nevertheless, it can reduce consumer confidence and raise obstacles in authentic products sales. In 2009 the US Food and Drug


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The Food and Drug Administration (FDA) adopted the following working definition of fraud or economically motivated adulteration (EMA) (Braden 2014):

fraudulent, intentional substitution or addition of a substance in a product for the purpose of increasing the apparent value of the product or reducing the cost of its production, i.e., for economic gain. EMA includes dilution of products with increased quantities of an already-present substance (e.g., increasing inactive ingredients of a drug with a resulting reduction in strength of the finished product, or watering down of juice) to the extent that such dilution poses a known or possible health risk to consumers, as well as the addition or substitution of substances in order to mask dilution.

Adulteration is generally described as the addition of inferior ingredients. Adulteration is not a new practice; it has been carried out since antiquity and probably since the beginning of trade. Pliny the Elder (AD 23–79) describes the ways in which traders used to adulterate wine, pepper, and balsam, all commodities of high added value and price (Rackham 1960). Such practices continued throughout the Middle Ages and until the present days. In 1820, German chemist Fredrick Accum (1769–1838) published his book “A Treatise on Adulterations of Food and Culinary Poisons” in which he described methods of adulteration and analytical techniques to detect them, focusing on valuable commodities of his era such as tea, coffee, bread, beer, and pepper. He also emphasized the quality of the water used for food and drug production (Accum, 1820), a key element even in the quality and safety schemes of the present day. His book was a best seller and was reprinted in Germany and USA; some consider it as milestone in the history of adulteration (Wilson 2008; Shears 2010).

Tähkäpää et al. (2015) describe food frauds/adulterations cases published in the EU Rapid Alert System for Food and Feed (RASFF) as well as the notifications of recalls published by the Finnish Food Safety Authority (Evira) during the period 2008–2012. Most cases (92%) originated outside EU, although the suggested reason for this is that the RASFF system “is tailored especially to report non-EU cases of frauds or adulterations.” Another reason for this conclusion is that many EU regulations regarding the organization of the common market lay provisions of sampling checks of products on the internal market; on the other hand, checks for imported products from third countries are obligatory for almost all products with some exceptions (e.g., if a third country has requested European Commission approval and received certification; such approval is published in the C series of the Official Journal of the European Union).

1.3 Geographical Indications

When we are discussing the origin of food, one of the main issues is the link between origin and the particular geographical area where specific goods (and services) are originated. This link is covered by the generic terms “geographical indications (GI)” or “indications of geographical origin (IGO),” depending on the international and regional law. Such a link could give food added value reflected in its price.

According to the WTO (article 22.1 of the Trade-Related Aspects of Intellectual Property Rights, TRIPS Agreement 1994), geographical indications are: “indications...
which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin” (WTO 1994).

Similar definitions are found in other treaties. There are four global international treaties which provide regulation of GIs, namely the Paris Convention (1883), the Madrid Agreement (1891), the Lisbon Agreement (1958), and the TRIPS (1994), but none of these treaties may be considered as a treaty providing for uniform protection of GIs (Blakeney 2014; Mantrov 2014).

Keblová (2014) describes three general categories of GIs protection: (1) the trademarks system, followed by 56 countries including the USA, Australia, Canada, and Japan; (2) the “suis generis” system, followed by 111 countries including the EU; and (3) through legal regulation of unfair competition or other nonspecific legislation (Keblová 2014).

1.3.1 PDO, PGI, and TSG

In order to protect foods that were produced in certain member states or regions, in the early 1990s the European Economic Community (EEC; since 1993 European Union, EU) created a specific legal framework by introducing the terms “protected designation of origin” (PDO) and “protected geographical indication” (PGI), enacted with Council Regulation (EEC) No. 2081/92 and Council Regulation 2082/92. This was the first legal protection of geographical indications and designations of origin for agricultural products and foodstuffs linked to a territory or a particular production method, and an attempt to provide a set of rules for harmonization of European food production (with the exception of wines and spirits). For example, in France the terms “appellations d’origine” (AO) existed since 1919 and “appellations d’origine contrôlée” (AOC) since 1935 (Marie-Vivien et al. 2015).

In 2006, following the third reform of the Common Agricultural Policy (CAP) of 2003 which was aimed at quality as well as quantity (Swinnen 2010), the EU replaced Council Regulation (EEC) No. 2081/92 by Council Regulation (EC) No. 510/2006. This also remedied disputes USA and Australia had raised to the World Trade Organization (WTO) against the previous regulations in 1999 (Carcea and Melini 2013, p. 6), and led to the 2005 decision of the WTO Dispute Settlement Body (WTO 2005). At the beginning of 2013, Regulation (EC) No. 510/2006 was repelled by Regulation (EU) No. 1151/2012, the main legislation act that governs GIs in EU.

According to Regulation (EU) No. 1151/2012 (under Article 5 paragraph 1), a “designation of origin”:

- a) originating in a specific place, region or, in exceptional cases, a country;
- b) whose quality or characteristics are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors; and
- c) the production steps of which all take place in the defined geographical area.

where “geographical indication” (under Article 5 paragraph 2)

- a) originating in a specific place, region or country;
b) whose given quality, reputation or other characteristic is essentially attributable to its geographical origin; and

c) at least one of the production steps of which take place in the defined geographical area.

Both definitions describe how the production of a food is linked to a specific geographical area which can vary from a small island to a whole country. The difference between a PDO and PGI is that in the former all production steps take place in the designated area; for the latter at least one stage in the chain production must take place in the designated area to qualify a food product as PGI. The same regulation under Article 18 defines the criteria that a specific product or foodstuff must meet in order to be eligible to be registered as “traditional speciality guaranteed” (TSG), a term introduced by Council Regulation No. 509/2006. In all cases (PDO, PGI, and TSG), a product must first be registered in order to take advantage of the protection of the aforementioned legislation.

In the EU, PDOs, PGIs, TGIs, and organic products are labeled with special signs which are not trademarks and are strictly defined by relative legislation enforced by inspection bodies of the member states. Figure 1.1 depicts different versions of the EU official logos for the existing categories of geographical indications.

To date, in the EU there are 618 PDOs, 702 PGIs, and 54 TSGs registered products; 46 PDOs, 72 PGIs, and 6 TSGs are currently pending approval as presented at DOOR, the official database for registration of food products of the European Commission, initially enacted with Council Regulation (EEC) No. 2081/92 and Council Regulation 2082/92. These products number 1411 in total. As the above numbers show and Tosato (2013) concludes, the TSG scheme has experienced limited success so far due to structural flaws in the legislation and has not yet reached full potential (Keblová 2014).

Figure 1.2 shows the number of products registered according to Regulation (EU) No. 1151/2012 per country. As can be seen, most applications concern countries of the Mediterranean basin. One reason for this could be that countries such as Italy, France, Spain, Greece, and Portugal already had existing GI legislation schemes, mainly based on the AOC concept influenced by local traditions and autochthones species for many years before the first adoption of PDOs and PGIs in 1992 by EU. For example, even in 1990 the volume of AOC cheese production was more than 10% of total cheese production.
production in France and 49% in Italy (Bertozzi and Panari 1993). In Figure 1.3 the registered products are presented as categorized by the official classes of Regulation (EU) No. 1151/2012.

Regulation (EU) No. 1151/2012 also introduced the concept of “optional quality terms” suggesting two new categories: “mountain product” and “product of island farming.” As stated, “Operating quality schemes for producers which reward them for their efforts to produce a diverse range of quality products can benefit the rural economy.” It is suggested that “The optional quality term ‘mountain product’ ... will add value to the product on the market.” Although only a general description is given for the term “product of island farming,” the “mountain product” under article 31 (paragraph 1) is defined as follows:

The term ‘mountain product’ is established as an optional quality term. This term shall only be used to describe products intended for human consumption listed in Annex I to the Treaty in respect of which: (a) both the raw materials and the feedstuffs for farm animals come essentially from mountain areas; (b) in the case of processed products, the processing also takes place in mountain areas.

1.3.2 Wines

The wine sector is a special case. It is often connect with tradition and, as an alcoholic beverage, has always been of special interest of taxation. A pre-existing geographical designation system in the EEC was the legislation regarding Quality Wines Produced in Specified Regions (quality wines p.s.r. or QWPSR) which were established with Regulations (EEC) No. 816/70 and No. 817/70 of the council which specified down “additional provisions for the common organisation of the market in wine” and “special provisions relating to quality wines produced in specified regions,” respectively.

In 2008, the EU acknowledged that existing legislation had not “proved effective in steering the wine sector towards a competitive and sustainable development”. In order to achieve the required objectives – “increasing the competitiveness of the Community’s wine producers; strengthening the reputation of Community quality wine as the best in
Figure 1.3 Registered agricultural products and foodstuffs per category from DOOR (EC 2016).
the world; recovering old markets and winning new ones in the Community and worldwide; creating a wine regime that operates through clear, simple and effective rules that balance supply and demand; creating a wine regime that preserves the best traditions of Community wine production, reinforcing the social fabric of many rural areas, and ensuring that all production respects the environment” – the EU issued Council Regulation (EC) 479/2008 of 29 April 2008 on the common organization of the market in wine. Following the framework of regulation 510/2006, the terms PDO and PGI were introduced within the wine sector. Under Article 34 of Regulation 479/2008:

“designation of origin” means the name of a region, a specific place or, in exceptional cases, a country used to describe a wine that complies with the following requirements:

i) its quality and characteristic are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors;

ii) the grapes from which it is produced come exclusively from this geographical area;

iii) its production takes place in this geographical area;

iv) it is obtained from vine varieties belonging to Vitis vinifera”

and

“geographical indication” means an indication referring to a region, a specific place or, in exceptional cases, a country, used to describe a product referred to in Article 33(1) which complies with the following requirements:

i) it possesses a specific quality, reputation or other characteristics attributable to that geographical origin;

ii) at least 85% of the grapes used for its production come exclusively from this geographical area;

iii) its production takes place in this geographical area;

iv) it is obtained from vine varieties belonging to Vitis vinifera or a cross between the Vitis vinifera species and other species of the genus Vitis.

This approach continued by including wines (except specific products, e.g., spirit drinks, aromatized wines, or grapevine products) in the provisions set out by Regulation (EC) No. 1151/2012, the main legislation framework regarding GIs in the EU. Council Regulation (EC) 479/2008 of 29 April 2008 and Council Regulation (EC) No. 491/2009 of 25 May 2009, accompanied by 10 implementing regulations, are the basic regulations of the wine sector in the EU.

A special case of GI, especially concerning wine, is “terroir”. This French word relates the origin of a wine to a specific area, sometimes to a single farm consisting of a few acres. According to Barham (2003) “The French AOC system is guided by the concept of ‘terroir’; which has been interpreted in many ways through time. In 2010 The International Organisation of Vine and Wine (Organisation Internationale de la Vigne et du Vin or OIV) issued Resolution 333/2010 giving “terroir” the following definition (OIV 2010):

Vitivinicultural “terroir” is a concept which refers to an area in which collective knowledge of the interactions between the identifiable physical and biological
environment and applied vitivinicultural practices develops, providing distinctive characteristics for the products originating from this area. “Terroir” includes specific soil, topography, climate, landscape characteristics and biodiversity features.

Presently, the number of registered wines with geographical identifications in the EU is 2883 (E-Bacchus: database of GIs for wines in EU and third countries, in accordance with Regulation (EU) No. 1308/2013; EC 2013) and are categorized in Figure 1.4. It is interesting to note that only two non-EU wines are registered as PDOs, forming a distinct category (one from Napa Valley, USA and one from Vale dos Vinhedos, Brazil).

1.4 Organics

The Research Institute of Organic Agriculture (FiBL) and International Federation of Organic Movements (IFOAM) estimate that the size of the global organic market increased to US$ 72 billion in 2013, an estimation based on data provided by 170 countries (FiBL & IFOAM 2015). A total of 90% of these sales were made in Northern America and Europe, the leading markets in the organic sector. The European market share is worth €24.3 billion, the EU share €22.3 billion, and the North America market is almost €27 billion (since the data are collected from many countries and different currencies, FiBL and IFOAM survey uses the average exchange rate of 2013: 1 Euro = 1.3281 US dollars, according to the Central European Bank). Figure 1.5 shows the largest markets in terms of retail sales shares.

According to the Organic Trade Association (OTA, https://www.ota.com/) of the USA, in 2014 the sales of organic products in the USA exceed $39 billion with $35.9 billion worth of organic food representing almost 5% of total US food sales.

The organic production in the EU is mainly regulated by Council Regulation (EC) No. 834/2007 of 28 June 2007, which repealed its predecessor Council Regulation

In the USA, agricultural products labeled as organics have to be certified under the scheme of USDA’s National Organic Program (NOP). NOP is authorized under the Organic Foods Production Act (OCFPA) of 1990, as part of the 1990 Farm Bill (Winter and Davis 2006; Braden 2014). National Organic Program Standards were announced in 2000 and became effective on 21 October 2002. All products marketed as organic must contain at least 95% organically produced ingredients; the source of the other 5% must be included on the national List of Approved Substances (Winter and Davis 2006). Figure 1.7 depicts the organic seal of USDA that agricultural products may use when production and handling meets all the requirements of the USDA organic regulations. In most cases, in order to use the seal in Figure 1.7 or relative claims of organic production, the producer, handler, or processor must be accordingly certified; there is an exemption from certification rule for some operations, for example for organic farmers who sell $5000 or less.

Figure 1.5 Global market of Organic Food: Distribution of Retail sales by single markets 2013 (FiBL & IFOAM 2015).
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Figure 1.6 (a) Versions of the old official EU organic logo (used until July 2010, according to Regulation (EC) No. 889/2008). (b) Versions of the official “Euro-leaf” organic logo of EU (http://ec.europa.eu/agriculture/organic/downloads/logo/index_en.htm).

Figure 1.7 Versions of the organic logo in USA (NOP Regulations, §205.311 USDA Seal).
1.5 Conclusion

People need to be reassured about the quality and safety of the food they consume. Any loss of consumer confidence in a product has impact on markets, trade, and probably even on taxes that governments collect. For example, at the beginning of 2013, the Food Safety Authority of Ireland announced the results of a study that had found horse DNA in frozen beef burgers placed in supermarkets, the prelude to the “horsemeat scandal”. The incident attracted much publicity, affected many countries, and resulted in the immediate decline of sales for relative products, especially in the supermarket chains involved in the initial findings (Yamoah & Yawson 2014) although there was no health safety issues involved (Lees & Toutain 2013). Another incident of what could probably be described as a combination of both adulteration and fraud is the case of the addition of melamine to powdered milk intended for infants in China in 2008, resulting in about 52,000 hospitalizations, 6 deaths and affecting about 300,000 infants (Motarjemi et al. 2014).

Producers (farmers included) seek market recognition and better prices and GI certification seems to enable this, especially in certain market segments. The origin of the food plays a role in consumers’ choices, although this is not easily measured (Profeta et al. 2012). Organic products usually have higher prices as a result of the more favorable willingness-to-pay (WTP) attitude of such consumers. Products with organic logos obtain the consumer’s trust in a specific product, as they are perceived to be of higher quality (Zanoli et al. 2015). A similar pattern seems to exist for products with health claims, as they are perceived as being more nutritious (Stolz et al. 2011). In general, all added-value claims by food producers create new challenges for the respective food authentication authorities.

The conformity of a food or drink to its actual description is checked by state authorities using various analytical techniques. Methods range from simply weighing to more sophisticated state-of-the-art combined analysis using expensive instruments, aided by chemometrics and specialized computer software to process and analyze the accumulated data. Sometimes a macroscopic examination or a tasting panel can change the validation status of a product based on chemical analysis, just by a simple tasting test. For example, in the case of wine and olive oil an organoleptic panel test is a key element procedure included in quality characterization. Another problem are the limits of detection that certain analytical methods have in qualitative or quantitative terms. For example, in certain cases existing methods cannot verify that a product is 100% GMO free due to limits of detection. Finally, even if the perfect analytical protocol could be developed, in order to be effective in practice it has to be accepted in court; in most cases this means being adopted by the existing legislation.

References


**Legislation Acts**


