

## Information in agri-food market: the role of digital technologies

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### 1.- Information and consumer empowerment

Taking the title of the Reg. 1169 of 2011 “on the provision of food information to consumers” seriously, I will try to focus firstly on how information is communicated and on the role of the consumer on the market.

The regulation is placed in a normative framework, where the main task is to empower consumers through instruments addressed to enhancing their ability to become dynamic and aware actors of the market. As stated by the Commission in a document on consumer empowerment: “to make informed decisions, consumers need certain skills, such as the ability to perform simple calculations, to read a label, or to recognise relevant logos”<sup>1</sup>.

From this perspective the case of food information to consumers is an example of interest.

The information asymmetry between consumers and producers has been reduced by the legislators of the European Union through a relevant re-organisation of the provisions concerning information to the public. The Reg. 1169 reveals the evolution in shaping modes and instruments following the innovative strategies of the information-based regulation. Therefore, it focuses on food labelling in order to “benefit citizens by requiring clear, comprehensible and legible labelling of foods” as well as “to ensure

easier compliance and greater clarity for stakeholders”<sup>2</sup>. Moreover, it highlights not only labelling, but more generally food information made available by any means, including modern technological tools.

The advent of new media has led the European legislator to create a comprehensive and evolutionary approach to food information, which has led to the adoption of rules aimed at “covering information provided also by means other than the label”<sup>3</sup>.

Certainly, in 2011 there was a larger number of “conscious consumers” than in past decades. Consequently, on the market a more detailed labelling could, to some extent, be more appreciated. However, as affirmed by Borghi in a comment on the regulation, it’s not so certain that currently the consumer is always an “avid reader”, demanding a more detailed label that satisfies his/her rationality, together with his/her hunger for knowledge<sup>4</sup>.

Therefore, we need to recall some warnings. Firstly, an overload of information can limit the capability of consumers in understanding the essential content. Secondly, shortage of time, lack of technical skills and, thirdly, linguistic and cultural diversity can prevent the consumer from elaborating information into real knowledge.

The Reg. 1169 refers to a new way to point out the nutrition declaration where it seems “appropriate” to add and differentiate additional “forms of expression or presentation of information” in relation to the cultural and behavioural characteristics of the consumers in each country<sup>5</sup>. This provision represents an important step towards a new vision of the consumer (no more as an “average consumer” but a real one), since, as often highlighted, cognitive biases influence thinking and decision making of the real consumer<sup>6</sup>.

(<sup>1</sup>) Commission Staff W- P, Consumer Empowerment in the EU, (SEC(2011) 469 final.

(<sup>2</sup>) Regulation (EU) 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers, recital 9.

(<sup>3</sup>) Ivi, recital 14.

(<sup>4</sup>) P. Borghi, *Risk-related Communication and Food-related Communication: What Information to Consumers?*, in *q. Riv. www.rivistadirittoalimentare*, n. 2-2011, 3- 4.

(<sup>5</sup>) Regulation (EU) No 1169/ 2011 *on the provision of food information to consumers*, cit., recital 43.

(<sup>6</sup>) On these matters, see V. J. Trzaskowski, *Behavioural Economics, Neuroscience, and the Unfair Commercial Practices Directive*, in *J Consum Policy*, 2011 (34), 382-384; A. Di Lauro, *Nuove regole per le informazioni sui prodotti alimentari e nuovi analfabetismi. La costruzione di una “responsabilità del consumatore”*, in *q. Riv. www.rivistadirittoalimentare*, n. 2-2012, 5; and more in general, L. Ammannati, *Il paradigma del consumatore nell’era digitale. Consumatore digitale o digitalizzazione del consumatore?*, in *Riv. Trim. Dir. Ec.*, 1, 2019.

## 2.- Digital technologies and agri-food chain

Regarding the relevant role that information plays in the food sector it is worth analysing what the potential new role of technological innovations in the digital economy is and exploring how the new digital mechanisms will enhance access to food information and consumer protection.

Digital technologies are expected to play a relevant role in generating citizens' confidence in public institutions and the manufacturer. All in all citizens/consumers have two fundamental interests: "the interest in food safety aims at health protection and citizens' well-being; and the interest in the veracity of information received during the selection and purchase of products is based on a relationship of trust between consumers and the food supplier"<sup>7</sup>.

In this framework it is worth recalling at least two crucial measures adopted by the European institutions at the beginning of the century: firstly, the regulation establishing the European Food Safety Authority and, in the aftermath of the 'mad cow' crisis, aimed at harmonizing procedures to guarantee food safety; secondly, the regulation concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms<sup>8</sup>.

A powerful set of new digital technologies can revolutionise some parts of the agri-food chain. Generally digital technologies are seen as an impor-

tant tool to shorten the supply chain. Obvious examples are the "platformisation" of food supply which reduces the need for intermediaries and helps not only reduce search and delivery costs for consumers but also improve food traceability<sup>9</sup>.

The emergence of platform economy, the increasing use of Internet of Things (IoT) and the current and future development of Distributed Ledger Technologies (DLTs) are expected to solve some market failures along the supply chain and, at the same time, to empower consumers in their choices. Consequently, they must be equipped with adequate skills in using digital technologies<sup>10</sup>.

In the age of Internet and Big Data an interesting theoretical but also practical problem is to establish the source of information.

Whilst it is true that UPS can accurately track its packages, such granular provenance evaluation has often not been possible with today's items that are produced and transported in complex, inter-organizational, often international supply chains<sup>11</sup>. However new technologies, namely IoT and DLTs, "promise to offer highly secure and immutable access to supply chain data".

Blockchain technologies in the financial area and nowadays increasingly in the energy sector are developing and are documented in literature, media, and political dimensions. Nevertheless, as affirmed by the first observers, the opportunities as well as the challenges posed by blockchain to food safety, traceability, and sustainable development

(<sup>7</sup>) L. Leone, *Towards new "digital insights." The value of Open Data for food information in Europe*, in *q. Riv.* [www.rivistadirittoalimentare.it](http://www.rivistadirittoalimentare.it), n. 3-2017, 2.

(<sup>8</sup>) See Regulation (EC) No 178/2002 of 28 January 2002 *laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety*; and Regulation (EC) No 1831/2003 of 22 September 2003 *concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms*. On the topics of the first Reg. see esp. S. Gabbi, *Consulenza scientifica Istituzionale e indipendenza: è possibile la quadratura del cerchio?*, in V. Salvatore (a cura), *Le Agenzie dell'Unione Europea. Profili istituzionali e tendenze evolutive*, Polo Interregionale di Eccellenza Jean Monnet, Pavia, 2011, 129 – 160; and on the topics of the second, see esp. P. Dabrowska-Klosinska, *The regulation of GMOs in the EU: conflicts, problems and reforms*, in L. Ammannati (ed.), *Networks. In Search of a Model for European and Global Regulation*, Giappichelli, 2012, 99 – 126, where the interventions in food sector are investigated in the light of risk regulation.

(<sup>9</sup>) CEPS – Centre for European Policy Studies - Barilla Center for Food & Nutrition Foundation, *Digitising Agrifood. Pathways and Challenges*, November 2019, 27.

(<sup>10</sup>) On this issue, see A. Renda "The Age of Foodtech: Optimizing the Agri-Food Chain with Digital Technologies", in R. Valentini, J. Sievenpiper, M. Antonelli and K. Dembska (eds.), *Achieving SDGs through Sustainable Food Systems*, Springer publishing, 2019.

(<sup>11</sup>) H. M. Kim – M. Laskowski, *Towards an Ontology-Driven Blockchain Design for Supply Chain Provenance*, in *Intelligent Systems in Accounting, Finance, and Management*, 2019, 20 (available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2828369](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2828369)) .

have not been fully examined<sup>12</sup>.

In some ways this remark is confirmed by the number of papers published for instance in SSRN on blockchain in agricultural and food sectors: 15 papers in 2019 but in the previous year 1 only.

Generally speaking, the Distributed Ledger Technology (DLT but colloquially known as blockchain) is a technology that maintains a record, or a ledger of transactions in a distributed format across separate nodes. A copy of the blockchain is stored in all computers of the network which periodically synchronize to make sure that all of them share the same database.

Blockchain was developed as a technology intended to disintermediate existing processes and incumbent business models. And it has evolved beyond its initial applications for cryptocurrency to a generic technology that can be used for specific purposes in different industries. Prior to the emergence of the blockchain, there was no opportunity to coordinate activities of different actors over the Internet “without a centralized body ensuring that no one has tampered with the data”. Without such a sort of authority unrelated individuals could not verify that transactions are not fraudulent or invalid<sup>13</sup>.

Theoretically speaking blockchain technology can be referred to as a system of transactions which progressively acquires the status of a “regulatory technology”. Briefly we could say that with the advent of blockchain law is progressively turning into code. Recalling the famous expression of Lessig who already in 1999 affirmed that code, along with market, state and social norms, represents a regulatory tool (“code is law”)<sup>14</sup>, we can observe that law increasingly assumes the characteristic of code (“law is code”) with rules becoming more and more formalized<sup>15</sup>.

The specific feature of this kind of regulation is that rules are enforced *ex ante* since technical rules, unlike legal written in natural language (hence ambiguous and flexible) are completely formalized. So there is no room for interpretation. If DLT technologies become more widely adopted, there will be an increasing need to focus on such decentralized (autonomous) organizations and to regulate their creation and development.

The EU institutions have not yet proposed specific regulation, regarding the potential uses of blockchain technology. However EU Parliament has issued a resolution of 3 October 2018 on *distributed ledger technologies and blockchains: building trust with disintermediation*.

As affirmed in this document, “DLT is a general-purpose technology which can improve transaction cost efficiency by removing intermediaries and intermediation costs, as well as increasing transaction transparency, also reshaping value chains and improving organisational efficiency through trustworthy decentralisation”.

Moreover DLT can introduce “an IT-based paradigm that can democratise data and improve trust and transparency”. Referring to the topic of supply chain DLT can help in improving supply chains and facilitate “monitoring of origin of goods and their ingredients or components, improving transparency, visibility and compliance checking”, “thus reducing the risk of illegal goods entering the supply chain and ensuring consumer protection”<sup>16</sup>.

### 3.- Blockchain and stakeholders' trust

Focusing specifically on the food sector and agricultural industry the blockchain can be used in numerous dimensions such as supply, production proces-

(<sup>12</sup>) Ching-Fu Lin, *Blockchainizing Food Law: Implications for Food Safety, Traceability, and Sustainability*, Conference on Food Law and Policy: Food Safety and Technology Governance, Taipei, May 10-11, 2019 (available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3387467](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3387467)).

(<sup>13</sup>) A. Wright & P. de Filippi, *Decentralized blockchain technology and the rise of lex cryptographia*, 2015, 5 (available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2580664](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2580664)).

(<sup>14</sup>) L. Lessig, *Code: and other Laws of cyberspace*, Basic Books, 1999.

(<sup>15</sup>) On this second expression, see P. De Filippi and S. Hassan, *Blockchain technology as a regulatory technology: from code is law to law is code*, in *First Monday*, 5 December 2016, 4 ss.

(<sup>16</sup>) EU Parliament (2017/2772(RSP)), *Distributed ledger technologies and blockchains: building trust with disintermediation*, n. 16.



ses, food quality monitoring and control of transportation steps as well as waste recycling.

As already highlighted, it is increasingly important the source of information as well as the authenticity and “the ‘credence qualities’ of many goods and services ... in guiding consumer choice”. The lack of verifiability and clarity of various aspects of goods and services such as, as examples, production in compliance with workers’ rights, geographic origin of food, respect of the environmental standards by all players along a supply chain, can lead to problems challenging not only consumers’ behaviour but also business strategies. Facing these critical elements it is worth considering that DLTs and blockchain can help operators improve the integrity and the efficiency of complex supply chain<sup>17</sup>.

Only to recall some recent examples, in 2017, IBM announced a collaboration with a few major food producers and retailers, including Dole, Nestlé, Tyson Foods, Kroger, Unilever, and Walmart, in order to apply technologies such as DLT to address challenges along the global food supply chain. Walmart has further required its upstream suppliers of leafy greens to use the cloud- and blockchain-based “IBM Food Trust” platform by September 2019.

At a global scale, an impressive example is TradeLens which applies blockchain to the world’s global supply chain<sup>18</sup>. Such a platform built on open standards includes more than 20 ports and terminal operators, global container carriers, custom brokers, cargo owners, freight forwarders, transportation and logistics companies and customs autho-

rities in five countries. It enables digital collaboration across the parties involved in international trade. Following this example other platforms have been launched across the world<sup>19</sup>.

DLT enables different parties along a supply chain to trust digital data and has the potential to lower transaction costs and improve the efficiency of agricultural supply chains by reducing the need for monitoring and verification of data.

Some experts have estimated that the cost of trust is in the order of 35% of the total value of economic production. Blockchain is an institutional technology for “industrialising the cost of trust”<sup>20</sup>. The economic benefit of blockchain is that it lowers administrative and monitoring costs associated with transactional data.

We can mention other advantages of this technology such as more certain information and consumer trust resulting from the traceability of the food supply chain.

As suggested, blockchain can help reach and implement the tasks of the Reg. 625 of 2017 which entered into force the 14<sup>th</sup> of December 2019<sup>21</sup>, by introducing a single integrated system of “official controls”<sup>22</sup>. Recalling the general framework of this regulation concerning “food safety, integrity and wholesomeness”, blockchain could support the introduction of a single integrated control system and make controls easier vi-à-vis the excessive number of normative sources. Therefore the blockchain technology could improve efficient integration of the official control instruments also in terms of the quality of products.

(17) CEPS, *Digitizing Agrifood*, cit., 44. In addition, see U. Sengupta, S. Singh and H. Kim, *Meeting Changing Customer Requirements, in Food and Agriculture Through Application of Blockchain Technology*, which focus on the implementation of blockchain technology in the food and agriculture industry in Ontario, esp. on the value of information for stakeholders in the supply chain (available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3429200](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3429200)).

(18) See <https://newsroom.ibm.com/2018-08-09-Maersk-and-IBM-Introduce-TradeLens-Blockchain-Shipping-Solution>

(19) See e.g. GSBN, powered by Oracle in cooperation with Evergreen Marine, CMA CGM, Cosco Shipping, and Yang Ming, representing about a third of total global container ship capacity

(<https://www.supplychaindive.com/news/ocean-carriers-new-blockchain-cosco-cma-cgm/541630/>)

(20) S. Davidson, M. Novak and J. Potts, *The Cost of Trust: A Pilot Study*, 2018 (available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3218761](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3218761)).

(21) Regulation (UE) 2017/625 of the European Parliament and of the Council of 15 March 2017 *on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products*.

(22) F. Albisinni, *Il Regolamento (UE) 2017/625: controlli ufficiali, ciclo della vita, impresa, e globalizzazione*, in *q. Riv. www.rivistadirittoalimentare*, n. 1-2018, 11.

Moreover this kind of technology could be used to contrast phenomena such as counterfeiting, adulteration and fraud, to guarantee the correct maintenance of goods during the transportation as well as the registration of products to be traded. All in all blockchain enables an efficient monitoring along the whole supply chain giving help in challenging potential risks of manipulation<sup>23</sup>.

#### 4.- Regulating blockchain

I often say talking about digital innovation, such technologies always have not only a bright but also a dark side. Here the pros and cons cannot be described in more detail.

I can only observe that there are some criticisms in developing such a techno-regulatory mechanism which may undermine efficiency and accountability of the regulation. The lessons learned from the first cases of DLT/blockchain applications in the supply chain are relevant and focus on the interventions aimed at overcoming the obstacles to the potential development of such a technology.

First, two general remarks. On the one hand, the impact of the technology is still small so far, since only several sectors and industries with complex supply chains are involved. On the other hand, the current mechanisms which we are to deal with is a private/permissioned DLT where the parties agree to share a ledger designed for a specific purpose.

Second, as underlined, technical obstacles resulting from an excessive amount of transactions can limit the correct monitoring of data with regard to the amount of operators involved especially when the nodes are located in different geographic jurisdictions. Only in case of small supply chain when the possibility to register each step of a product is guaranteed the technology is advantageous since it enables all operators of the chain to be informed on the transactions in efficient and transparent way<sup>24</sup>.

Third, these technologies raise important new issues in terms of legal responsibility in the case of errors and damages to third parties. Therefore in some sectors, especially in the financial market, a new dimension of responsibility, the so called 'algorithm responsibility', is arising.

Fourth, efficiency and accountability of blockchain technology rely on accuracy and fairness of information/data transferred by operators into the chain at each step. Therefore DLT application for the supply chain cannot completely solve the problem of information asymmetries, lack of trust and opacity.

Fifth, as observed above, given the lack of flexibility of technical rules, combined with the ex ante enforcement of regulation by code, blockchain technologies cannot distinguish between routine situations and cases that need to be treated differently.

As suggested by several scholars who have analysed these technologies thoroughly<sup>25</sup>, while supporting autonomous systems blockchain technology creates challenges for governments and regulators. They can lose the ability to regulate the activities through traditional means. From this point of view blockchain undermines existing laws and regulations like many other technologies over time. However the powerful characteristic of the technology is its ability to let people create their own system of rules, a sort of private regulatory framework enforced by the underlying protocol of a blockchain based network.

The crucial question is on how governments and regulators can regulate such a technology. The debate is still ongoing.

#### ABSTRACT

*Regarding the relevant role that information plays in the food the paper analyses how the new digital mechanisms will enhance access to food information and consumer protection. A powerful set of*

<sup>(23)</sup> G. Spoto, *Gli utilizzi della Blockchain dell'Internet of Things nel settore degli alimenti*, in *q. Riv.* [www.rivistadirittoalimentare.it](http://www.rivistadirittoalimentare.it), n. 1-2019, 27.

<sup>(24)</sup> Ivi, 20.

<sup>(25)</sup> P. De Filippi – A. Wright, *Blockchain and the Law. The Rule of Code*, Harvard University Press, 2018.

*new digital technologies can revolutionise the agri-food chain. In particular Distributed Ledger Technology (DLT) enables different parties along a supply chain to trust digital data and has the potential to lower transaction costs and improve the efficiency of agricultural supply chains by reducing the need for monitoring and verification of data. All in all these technologies undermine existing regulations and raise important new issues which must be taken into consideration by regulators and legislators.*

*In considerazione del ruolo importante che l'informazione ha nel settore degli alimenti questo contri-*

*buto vuole analizzare come la digitalizzazione può migliorare l'accesso alla informazione alimentare e la tutela dei consumatori. Alcune delle nuove tecnologie digitali possono rivoluzionare la catena agro-alimentare. In particolare la tecnologia DLT permette alle diverse parti della catena di aumentare la fiducia riguardo l'informazione, di ridurre i costi di transazione e di migliorare l'efficienza della stessa catena superando in parte la necessità di monitorare e verificare i dati. In sintesi queste tecnologie mettono in discussione le regolazioni attuali e pongono nuovi e rilevanti problemi che dovranno essere considerati da regolatori e legislatori.*

