Carta di Milano

Microsoft

Spark the Milan Charter

Contributo n° 109

#SparktheMilanCharter

Final Statement

Technology and innovation for the right to food and sustainable development

In collaboration with:

Microsoft

Lab/E LABORATORIO EXPO + EXPO MILANO 2015

In collaborazione con Fondazione Giangiacomo Feltrinelli

Introduction

The Milan Charter is the cultural legacy of Expo Milano 2015, an instrument of global citizenship that is the result of a broad debate between the scientific community, civil society and institutions on the theme of Expo: "Feeding the Planet, Energy for Life". The Milan Charter draws every citizen, association, company or institution to take responsibility to ensure that future generations can enjoy the right to safe, secure and nutritious food as a human right. The right to food, however, is deeply linked with issues such as social equality, sharing economy and sustainable development: technology can play a major role in fostering and implementing many questions that raised from these links. This document is aimed to deepen the issue of how technology can improve the right to food and a more sustainable development, by underlining six major priorities that innovators are facing, and by providing possible solutions.

In particular, implementing innovative technologies for food safety and traceability could help in facing a series of main challenges. When traceability systems are combined with safety and quality management systems, they can make associated food safety measures more effective and efficient. Those technologies should consider smallholders integration in the food supply chain in vision of a broad concept of safety recapped in the concept of "safety democracy". Moreover, food industry, in collaboration with the research arena, are, thus, called to design and implement innovative solutions 'from farm to fork', using technologies all along the food supply chain in addressing the challenges related to traceability and safety improvement considering smallholders as integrated part of the food supply chain.

This means a great effort in food education, in its broadest meaning. Food education is, by now, a great challenge, both in quality and in accessibility terms. As a matter of fact, one of the main goal at the moment should be to create a shared, qualified and accessible technology to share a high quality knowledge about food and sustainable way of using natural resources. Start-ups can create an innovative basis to improve a general, shared and bottom-up education, particularly in urban areas. In our contemporary times, economy and urban society is moving toward a new form of productivity and relations between inhabitants. Commonly, these phenomena are called "sharing economy" and "smart city", and technology, especially ICT technologies, are the typical ground where start-up grows. But start-up, as every innovator in general, have to face two broad challenges: a general lack of data (the so-called data divide) is a particularly severe barrier in creating a context of technological innovation, mainly in the developing countries; similarly, even in developed countries, the difficulty in access or the need for an education in technology (the so-called "digital divide").

Technology can have a deep impact in the management, in a nexus perspective, of fundamental and inter-related resources for human life like water, food and energy. Technology can certainly play a role in improving efficiency and productivity allowing for relevant resource saving through innovative solutions or by creating virtuous processes of circular economy. Furthermore, innovation is fundamental for natural conservation. Biodiversity is increasingly acknowledged as a key resource for producing food and adapting to climate change. The wide plethora of technology applications now available, ranging from

high throughput sequencing supporting research in genetics to innovative tools for precision agriculture, can have a key role in fully analysing, protecting and valuing biodiversity, as well as the territories it is intimately connected with.

As seen above, technology is a key aspect of sustainable growth, in its multiple sides. In this contribution to the Milan Charter, several academic experts, young innovator and researchers provide some operative priorities to let technology improve the main goals the Milan Charter is aimed to. An operative priority is an idea, a question or an issue that innovators are currently facing when they have to deal with a particular issue.

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The Operative Priorities

On September 28th, 2015 experts coming from academia, companies, startups and civil society joined a global discussion on how technology can improve the Milan Charter main goals, i.e. the effort to guarantee the right to food as a fundamental human right and to lead to a more sustainable social and economic development.

Participants were asked to find a joint statement about what they think an operative problem related to specific issue should be considered as a priority for innovators, with an eye on the role of technology as a possible solution. The issues proposed were those related to three general clusters, i.e. food, smart cities and natural resources management.

Each cluster was further divided into two specific topics, resulting in six topics in total: food production and food education for the cluster "Food"; sharing economy and digital divide for the cluster "Smart city"; water, food and energy nexus and biodiversity for the cluster "natural resources management". Following the results of the discussion at the working tables.

Cluster: Food

Topic: Food production

Smart production systems for food safety and traceability

The application of technologies in food production and transformation could be a powerful leverage for shaping more sustainable food production systems in light of the challenges – climate change, urbanization, population growth – that are increasingly calling for innovative 'green' solutions aiming at ensuring both the availability and the fair distribution of food resources for all. In particular, a more efficient use of natural resources as water, soil and biodiversity, as well as the reduction of waste derived from production processes are to be firmly put under the lenses of research in order to design and implement sustainable models for producing food. Other aspects to be thoroughly discussed are the access and the scalability of such new solutions, in order to ensure their full application by those in need to provide them with affordable and nutritious food. Moreover, it is mandatory to give to consumers' safe food. Food safety does not only mean eating healthy food, but also knowing that you are eating healthy food. Knowledge, in this sense, is an important component for shaping more sustainable food production as informed consumers will more likely take responsible choices. Food industry, in collaboration with the research arena, are, thus, called to design and implement innovative solutions 'from farm to fork', using technologies all along the food supply chain in addressing the challenges related to safety improvement. Even more new technologies could be used from smart packaging to smart phones, to deliver food traceability, authentication and safety details directly to the consumers.

The Operative Priority

How traceability technologies are linked to food safety? Is it possible to imagine technological innovations to trace food consistently and efficiently "from farm to fork" and therefore guarantying food safety? The applied technologies depends on food production scale and industrialisation level?

Description of

Food production and distribution systems are becoming more interdependent, integrated and

the Operative Priority

globalised, over 70% of world's food needs[1] . At the same time, foodborne disease outbreaks and incidents have been identified by the WHO as major global public health treats of the 21st century[2]and WHO Executive Board outlined the need of a preventing approach to food safety, with increased surveillance and more rapid response to foodborne outbreaks and contamination incidents[3].
In this contest, traceability, defined as *the ability to follow the movement of a food through specified stage(s) of production, processing and distribution*[4], gains importance in guarding consumers, ensuring food safety and managing reputational risks and responsibility.

On the other hand, simply knowing where a food product can be found in the supply chain does not improve food safety, but when traceability systems are combined with safety and quality management systems, they can make associated food safety measures more effective and efficient[1].

However, the market for safe and traceable food can exclude small-scale agricultural producers who lack the resources to comply with increasingly strict requirements and the adequate knowledge in sophisticated technology applications.

Threats, opportunities, problems related to the Operative Priority:

Implementing traceability technologies for food safety and other purposes does not come without its challenges. Broadly speaking, the main challenges lie in data collection and sharing, processes, technological solutions, business models, costs, and learning.
The topic became more complex when considering consumers perceptions and behaviours. From one side, consumers are sensitised in small-farmer market, even thou farmers are unable to assure food safety requirements, thus running the risk of market marginalization. From the other side food industry, considered from the consumer a safety guaranty, lacks of fast, non-destructive and sustainable technologies to assure a full control of the value chain.

The technologies already on the market are designed for industrial scale productions and have related drawbacks when considering small scale implementation; in particular they have high initial cost, need trained personnel and need an initial acquisition of a large amount of data for obtaining robust results.

Possible solutions for the Operative Priority

The operative priority individuated is a set of innovative technologies that should accomplished with the concept of **identification.** A logical and systematic form of product identification is integral in a traceability system and substance/contaminant/product identification substantially expands the ability to guarantee food safety. Thus, identification would permit both traceability along the chain and safety requirements of the final product.

In light of the issue described above, it is fundamental to integrate and enable smallholders in the food supply chain through innovative technologies in vision of a broad concept of safety recapped in the concept of "**safety democracy**". This idea contains the conception of **access**, both social and economic, to the innovative technology whom results should be shared and coordinated vertically along the chain and horizontally inside the sector, with no marginalization of small farmers. The introduction of new technologies in fact has to be properly tailored with respect of the background both in terms of the most suitable solution for the issues to be solved and the skills of the end-users. Such concern also unveils another major issue likely affecting the spread as well as the effective penetration of technologies: the technical support associated with their introduction. Access to these data makes monitoring of existing processes, rapid responses to changes in the supply chain, and optimal allocation of resources more feasible and precise.

[1] FAO (2013). Coping with the food and agriculture challenge: smallholders' agenda
[2]WHO (2007). The World Health Report 2007: A Safer Future. Geneva.
3 WHO (2002). Global Strategy for Food Safety: Safer Food for Better Health. Geneva
4 CAC (Codex Alimentarius Commission). 2006. "Principles for Traceability/Product Tracing as a Tool within a Food Inspection and Certification System." CAC/GL 60-2006.Rome.

Another key issue regarding innovative technologies proposed as OP is **sharing:** sharing data means sharing knowledge. A cloud approach has been imagined with a twofold advantage. Sharing results will improve the technology performance by enriching databases and calculation algorithms, allocation of information will enable farmers' awareness and training in a view of a worldwide concept of food safety. The whole operation along the supply chain can in fact be improved by the acquisition and exploitation of information resident in the chain itself.

Topic: Food education

New, shared awareness: the role of internet and technology in food education

Food education is primarily a crucial issue concerning the health status of future generations, having the right to know the risks linked to junk food consumption and the knowledge to make the right food choices or the skills to be able to create healthy, wholesome, nutritious meals. Children have to know the origin of their food, the production chain, the concern about food waste reduction and the role of food in public health. Innovative laboratory exercises, community-based workplaces, technological tools and continuing education for students and teachers could be a valuable proposal for a more critical knowledge about nutrition. Food education practices could be also spread along the entire society, redefining expertise and the role of collective participation to science, making it possible to create new connections and to foster innovative research development. Citizen science is represented by the non-professionals, or by the forms of cooperation through collective intelligence (such as hackathon), working with the help of technologies to capture the enormous potential of science. Increased public participation in scientific research will ideally cultivate a citizenship that is knowledgeable about scientific enterprise. Citizen science encourages people to take a stake in the world around them. As a result, the hope is that this informed public will play a valuable role in influencing larger decisions about science policy.

Operative Priority ***Food information: good quality, total access***

Description Information about food means not only objective data, but also culture and tradition. We have to make sure that the information people can access is correct and we have to make sure everybody is able to access it.

In order to reach that goal we have to work on information sources and on collaborative control upon this information. The operative priority is the quality of and access to information.

Knowledge about food is as important as food itself for our health.

Threats, opportunities and problems

Threats and problems may affect two issues. First of all, the quality of the information: information is not always objective and when it comes to talking about cultural aspects of food is often not objective at all; moreover, the sources of information are not always reliable, and when companies are providing information the difference between information and advertising blurs. Another important issue is the access to information: information is not accessible to everybody worldwide.

Opportunities can emerge when people create a collaborative system to share knowledge on food, implement technology to gather objective data from the internet of things and use a rating system to evaluate information and content producers

Possible solutions:

The **proposal** which the Working Table has deliberated is to create a web based platform in which data about food, such as nutrition facts, are collected by smart devices (internet of things) owned by citizens and can be stored in a "cloud" server.

Citizens are part of the knowledge production chain not only as devices owners, but also as content producers: information about food must take into account the cultural and traditional aspect related to it, such as history or recipes for instance.

This kind of content is, however, very subjective and to make sure the quality level of information is high, the platform is based on a peer evaluation system: different categories of contents can be rated by users.

The rating of users on content producers (who are users themselves and can be divided into different categories depending on their level of "food expertise") builds their level of trust amongst the community.

Adding knowledge to technology is what we call innovation, and is what Table 2 wants to reach with this proposal.

Cluster: Smart city

Topic: Sharing economy

Rethink, regenerate and reuse: the future for sustainable economy

The economy of knowledge is spreading not only in advanced economies, but also in urban areas in developing countries. The peer-based production overthrows the trade model and introduces the possibility of a fairer goods access. The sharing economy approach has been embraced by makers' movement or by other less structured bottom up movements, focused on recycling and reusing find in on-line technological platforms not only a place of encounter and discussion, but also the possibility of creating new forms of businesses based on the practices of the sharing economy and open source knowledge. The possibilities linked to knowledge sharing are at the basis of the makers working process, making a job accessible for the entire community. But sharing economy is also at the basis of innovative enterprises at their early stage of development, better known as start-up. A start-up is characterized by a discovery and learning process, increasing skills and knowledge. The potential of start-up lies in partnership, linking traditional enterprises to innovative business based on collaborative culture. Start-up has the challenge to involve public administrations, factories, new business, communities and citizens. Starting from these premises, start up could introduce important improvement both for society and for economy, creating new job positions and skills. What can policy-makers do to better facilitate the sharing economy ecosystems, giving entrepreneurial impulse also to suburban locations?

The Operative Priority (title) ***Lost in transition***

Description

Today we are living in a transition period from old models to new social and economic patterns. The sharing economy approach is one of these new ways to re-think the development strategies and its spreading is strictly connected to technology and how to use and share knowledge.

Most of the people in the world don't know the digital innovation advances: so the great issue is how to cope with this diversity (also between different generations) and how to bridge the gap between technology and people using technology to improve a project, a business and its educational aspects.

Threats, opportunities and problems

There is a need for new legal framework, such as a new set of rules, a new value creation models, such as access, distribution and bottom up approach to create new win win solution. Moreover there is a necessity of more facilitators, i.e the mediators to fulfill the gap between generations and also to reach those people who do not use technology because they do not know how to use it and where it can improve their work: this element came out from the experiences of the startup discussed in the session

Possible solutions

We need to create a neutral platform/infrastructures in order to create the environment to let the people to experiment. Then we need to train people able to create a common code to explain and facilitate the adoption of new technology as ambassadors of those technologies who help people in providing the opportunity to try technology (free piloting).

On a general point of view, we suggest to improve human based solutions and self enforcing trust methodology.

Topic: Digital divide

Overcoming the Digital and Data Wall: Technology for All

Technologies proved to be a powerful leverage for improving the wellbeing of population worldwide. Information and Communication Technologies (ICTs) can help increasing the efficiency of the work of global development stakeholders – including governmental organizations, development agencies, and grassroots organizations. ICTs can also be key to foster peer- to-peer information and knowledge sharing through ad hoc platforms, and most interestingly, ICTs can represent a tool for self-determination and empowerment for marginalized communities when they apply such technologies to drive their own development. Analytics capacities are growing as well — and the combination of these data and the related analytical tools is often referred to as the 'big data' phenomenon. Tapping into such innovative analysis capability on big data can be foundational for the establishment of new virtuous practices, especially in development countries where traditional sources of data are lacking. Having access to technologies and data, and expanding the capacity to process information in the

developing world is one of the priorities in global development – as big data tools will be pivotal for both humanitarian assistance (e.g. disaster risk reduction) and for long-term development planning and implementation.

Operative Priority	**A data-centered platform for sharing data, information, knowledge (e.g.best practices) and tools among agrifood stakeholders (including but not limited to farmers, food distributors, advisory services, etc.), institutions, research institutes, private sector and civil society (e.g. NGOs).**

Description

We started from the assumption that the availability of basic technological infrastructure is both a necessary condition in order to talk about development and sustainability as per the statement "Technology for All.

In the view of that, the issue is that many farmers and other agricultural producers are not taking full advantage of the benefits resulting from analysing ad modelling Big Data in agriculture: many predictive models and a better understanding of the crops and the different methods of cultivation can indeed improve sectoral efficiency i.e. increasing quantity and quality of food production.

Today, data are available thanks to the spreading of technologies such as IoT and mobile connectivity, and the decreasing cost of sensors and actuators. The issue is that too often such data do not become "big": farmers and producers are still wary of sharing and analysing their own data and those of their neighbours. However, the great potential of innovation may come today mainly from the joint analysis of Big Data.
Therefore, it is necessary to implement a sharing technological platform that can be the basis for creating new awareness of the possibilities of agriculture, particularly by placing agricultural producers at the centre of such platform.

The point is to create a distributed technological platform that can enable data collection and analysis from different sources, in order to improve our understandingofagricultural production, food access and use.

Threats, opportunities and problems

A major threat to the success of this platform is the low adhesion and reluctance to data sharing from the platform stakeholders. As already said, farmers and producers are wary of technological tools that seem to use their data (i.e. information coming from crops and cultivation) in order to generate publicly-available knowledge in the future. Indeed, the lack of understanding of the potential of sharing and creation of an ecosystem can undermine the use and effectiveness of the platform.

Another threat regards the role of institutions: they should promote the spread and use of the platform, increasing the networking among both rural and central areas. However, the current lack of resources and promptness in receiving feedbacks from the civil societies and singular entities limits their scope of action.

In particular, it will be particularly difficult to involve SMEs and single entrepreneurs, since they lack the resources to contribute to such an initiative and would need to understand the incentives and benefits of joining such a platform.

Finally, the platform would need to compete with existing platforms worldwide and would benefit from a clear profiling of its target community.

Possible solutions

It is necessary to create a system of incentives and a mechanism of rewarding that can be effective in involving the main players in the agri-food ecosystem to participate to the platform. In view of that, a task force should be formed to better study the socio- economic implications of such incentive (i.e. rights and duties of private sector providing analytical tools in exchange of data, compensation of data owners in case of technological advances, etc.).

The entities that already have the trust of the farming communities should be identified: they can act as promoters of the initiative. Among them, farmer-based organizations clearly show the comparative advantage for such roles.

The government can be the super-partes player facilitating the adoption of the sharing platform: in order to perform this task, the government itself can use innovative technologies (Cloud, analytics, Mobile, Social, IoT, etc…) possibly in partnership with the private sector. New digital technologies can indeed increase the public's ability to involve citizens as well as agrifood stakeholders for receiving feedbacks from them to fine-tune policies, as well as to improve education programs and awareness raising of communities at different levels.

Multinational tech companies can be a driver of the diffusion of the format among countries: according to their social responsibility assessment, they can embrace a model that can have strong positive implications for one of the major issues of global sustainability.

Startups and SMEs in target countries would be interested in participating to the platform to highlight themselves as possible service providers as well to link up with institutions to access to information and resources.

Cluster: Sustainable Development

Topic: Water, food and energy

Technologies to enable the water, food and energy nexus

Water, energy and food are essential issues both towards a more sustainable development and in the fight against poverty. Many studies suggest that water, energy and food demand will increase dramatically in the next decades, due to an increase in the human population, economic development, international commerce, urbanization processes, diversification of diets and climate change. So, water, energy and food are deeply linked: up to 70% of global water is used in the agricultural and food sectors, while it is still an important input in energy production. Energy, by its side, is necessary for all the stage of production, process, pumping, collection and distribution of water. Often, food crops are replaced with energy crops, which require a higher water usage. These trade-off and competitive relationships are important challenges that require the understanding of their deep interdependence. As a matter of fact, the Water, food and energy nexus could make us understand and analyze in a systemic way the interactions between natural environment and human activities. The aim is to reach a more coordinated use of natural resources and to endorse the most effective policies that create synergies between different sectors and institutions.

Operative Priority **How technologies can enable the water, food and energy nexus**

Description Population growth, economic development, the rise of the middle class in developing countries with a new diet needs, climate change and migration are contributing to the increase in the demand of resources which are key for development: food, energy and water. These three elements are strictly interconnected: It is not possible to produce food without energy and water; energy is essential to extract water and for food chain; water is important both for food and energy production. However the problems related to these three elements are frequently treated in a very sectorial way, regardless of the inter-relations, trade-offs and synergies among them. A systematic and holistic approach is need to analyse and manage these resources. How technology and innovation can

enable the nexus and support a more sustainable and equitable management of resources?

Technology can certainly play a role in improving efficiency and productivity allowing for relevant resource saving through innovative solutions or by creating virtuous processes of circular economy. In this cases, the waste of some transformation process becomes the input of a new process which leads to a valuable output, allowing for saving in energy and new raw-materials.

Technology, when it is coupled with analysis and interpretation of data, can provide the necessary information to policy makers to intervene in a nexus perspective.

Threats, opportunities and problems

Technology can enable increases in efficiency and better management in the individual sectors of the nexus. For example, in the food sector, precision agriculture and telematic controls allow better management of agricultural inputs through sensors and monitoring tools. Often they are not able to communicate each other, since they have different supports, variable precision and several units to measure conditions. Moreover output data are not perfectly harmonized and the final users often do not have sufficient technical and analytic skills to interpret big data and get influenced in their everyday decision making.

Useful technologies are sometimes available but are not marketable as they are not economically sustainable or easy to adopt by customers.

The adoption of modern technologies cannot be accessed by all, not only for the lack of means, hardware supports, infrastructures typical of developing countries, but also for the deficiency of technical education. In this context, it is important to develop a mediation between innovative researches and markets applications.

At policy level, technology can provide massive amount of data which could feed the elaboration of algorithms and validated models which consider resource management in a nexus perspective. It is mandatory to describe scenarios to decision makers, to allow the correct decision-making

Possible solutions

Technology can suggest solutions to the food, water, energy nexus when it allows relevant improvements in their management through efficiency and productivity gains, i. e. offering the possibility to get more outputs both in quantitative and qualitative manner with fewer inputs. Technology needs to be accessible, in order to generate benefits to customers and indirectly towards the environment: big data require smarter and more friendly forms of communicating results and advices. Technology transfer needs to be accompanied with training and education.

Open data and best practice platforms can further stimulate the diffusion of virtuous practices and update general knowledge.

More strict cooperation of different experts in the sector of the nexus allows to maintain a wider perspective considering complexity and inter-connections among the different elements. Systematic approach and modelling in considering food, energy and water management can be fed by big data collected through diverse and diffuse technology. Adequate process and analysis of data should lead to decision support systems which provide general scenarios of decision –making, considering the all complex consequences on food, energy and water sectors and their inter-relationships.

Topic: Biodiversity

Technologies for biodiversity

Biodiversity is increasingly considered as a key resource to sustain food production in the long term. Nevertheless, at the global level it has been eroded at an alarming pace over the last decades. Even though the debate is often on the number of food species characterized by a high adaptability to harsh climatic conditions we have irremediably lost, thus, threatening the possibility of producing food under the expected impact of climate change, we should bear in mind that biodiversity does not just allow food production but also a number of functions providing the ecosystem services humankind benefits from. As a collective good biodiversity is particularly difficult to be given the value that it actually has and that is being increasingly acknowledged with the aim of calling urgent actions to arrest its loss and environmental degradation. The role of technologies in this sense could have important implications in assessing, communicating and mainstreaming such a urgency but also in mapping, systematizing and protecting biodiversity resources around the world.

The Operative Priority **How to make biodiversity an issue/value of public interest that can guide single actions embedded into sectoral and inter-sectoral policies?**

Description

Biodiversity is acknowledged as an inherent characteristic of territories and landscapes, whose peculiar profiles contribute to determine. As such, biodiversity needs to be considered, analysed, classified, monitored and valued on the **local scale**, though within the framework of broad initiatives, extending from the local to regional and international level. In this sense, **inter-state cooperation** is paramount, which highlights the nature of biodiversity as a **global political issue** also including social aspects, thus calling for technical ad hoc means embedded in cross-sectoral **integrated policies**.

Therefore, particularly in agriculture that on biodiversity closely depends and impacts, there is the urgency to integrate and disseminate **innovative solutions**- where the role of technology could be the leverage for substantial leaps forward – as well as **good conventional practices** in the framework of political actions combining **top down and bottom up approaches**, with the latter significantly involving **farmers** that are to be considered both the custodians and the managers of a key component of biodiversity, i.e. agrobiodiversity.

In order to disseminate the value of biodiversity, the concept of a **biodiversity footprint** has been proposed as borrowed from the well-established carbon and water footprint concepts. However, the problem about how to provide an **accurate, sharable and unequivocal measure of biodiversity** remains due to the difficulty of translating an extremely complex concept into a single (or a collection of) indicator easy to interpret and monitor over time.

Threats, opportunities and problems

The first challenge to face is the **public invisibility of biodiversity** due also to the complexity and undefined nature of the concept itself and, therefore, its **scarce penetration** into policies, as well as into everyday practices of both food producers and consumers. The main issue discussed is how to activate **a virtuous process** taking into account the different levels biodiversity has to be considered, i.e. local versus global level, emerging vs industrialized countries, small scale vs large scale farming, farmers vs decision makers, producers vs consumers.

Such levels present their own specific issues that need to be thoroughly identified to be properly addressed. During the discussion, the **lack of a proper understanding of the concept** of biodiversity clearly emerged as a main threat to its conservation and valuation. In this sense, the urgency of defining and setting common **methodologies to collect, classify, map and analyze biodiversity** has been highlighted, as well as of ways to **effectively communicate its inherent value**, especially to whom is called to act in the frontline for its conservation and enhancement, i.e. decision makers and farmers.

These subjects have been identified as the main actors to be involved in designing and implementing **biodiversity oriented strategies and programs** in order to have a real impact on the biodiversity component of a landscape. **Research** constitutes the backbone of the advancement towards a clearer definition of biodiversity, as well as the dissemination of its common value as something to protect and reproduce.

Genetics and agroecology, in this sense, offer interesting opportunities to provide a deeper insight of the living organisms contributing to define the biodiversity profile of a territory on the one hand, and the backdrop of models for agricultural systems shaping more sustainable and responsible production and consumption models on the other.

Possible solutions

Due to the lack of information still permeating the concept of biodiversity, the main effort that the experts participating in the discussion called for was the **development of initiatives oriented at its broad spectrum analysis**. The role of genetics in this sense was highlighted in order to map, classify and share biodiversity resources over the world starting from the local context, given their key role in determining its peculiarity. New technologies as **high throughput sequencing and barcoding** – just to mention few –allow researchers to aggregate, tag, map and monitor biodiversity, offering the possibility of linking a territory, as well as its own characteristic products, to its biodiversity resources. In this sense, biodiversity could be itself an added value of high quality food production, towards which the interest of responsible consumers has been constantly growing over last years (this issue is of particular relevance for Italy that has several peculiar high quality food products).

Other simpler technologies could be used to integrate the information provided by the study of genetics and spread rapidly due to their reduced cost and ease of use: this is the case of **mobile technologies for mapping and monitoring biodiversity**.The use of handheld technologies, apart from contributing to the creation of crowdsourced open platforms to access and share data, permits a **wider participation** on the study and, thus, the understanding of biodiversity also through the so-called **citizen science** that would,in turn,positively contribute to the **dissemination and education on biodiversity**. The need for **low cost technologies** is also essential to foster the adoption of solutions – not necessarily innovative – in **low income countries**, especially in enhancing agricultural practices that, if on the one hand can be the leverage for boosting development, on the other could significantly threaten fragile hotspots of biodiversity that often constitutes themselves the most important resources for the countries.

The same urgency, i.e. reshaping and amending food production systems, is also perceived in

industrialized countries, where inaccurate conventional practices have for long produced negative externalities. In this sense, the implementation of **innovative advanced solutions** (es. drones for high resolution image capturing, precision irrigation systems), should come along with **more efficient systems for technical assistance and control** focused on agricultural practices in order to reduce their environmental impacts towards a more rational use of resources. Therefore, the integration of the efforts by governments, international and local entities supporting farmersand the research community, is strongly recommended to give biodiversity the value it has and share it at broad reach.