

WASTE OF KNOWLEDGE AND HUMAN RESOURCES

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The third part of this edition of *Mediterra* looks at a subject that is rarely discussed, even though it is a crucial one: wasted knowledge and human resources. It asserts that a substantial body of knowledge exists throughout the world, that new knowledge is constantly being generated, and that one of the accelerators of development lies in our collective capacity to ensure a better fit between knowledge that is available or being developed to the needs of people, especially the most disadvantaged, who are themselves a source of knowledge, although their capacities are currently undervalued.

This chapter focuses on the way in which food and agricultural knowhow have been accumulated historically, over time. It shows how the scientific process has accelerated the development of knowledge and its mobilization to drive technical progress, and how the industrialization of agriculture and food systems, coupled with the globalization of trade, have produced imbalances that now threaten some traditional knowledge.

Exploring such cognitive dimensions is essential. Indeed, rediscovering, safeguarding and mobilizing empirical local knowledge, combined with scientific knowhow in new systems of knowledge and innovation, is – together with the implementation of inclusive policies – currently one of the most effective and important levers for reducing inequalities and unemployment, especially among young people, consolidating a dynamic for rural and agricultural development that can respond to the many challenges of our time.

The slow generation of food and agricultural knowledge

Reserves of global agricultural knowledge now constitute an irreplaceable human patrimony. Since time immemorial, food and civilization have gone hand in hand. Food systems have progressively improved and become more secure as a result of opening up to new knowledge. The invention of agriculture in Neolithic times,

10,000 years ago, starting in a few locations especially in the Middle East, combined with the population growth of the human species and its sedentarization, was the fruit of a long and slow process of accumulating knowledge based on observing the morphology and biology of harvested plants (especially cereals and legumes), whose grains were used for human consumption before gradually being used as seeds. The beginnings of livestock rearing also display evidence of extensive knowledge of the biology of certain wild species, their behaviour and the quality of their products (meat, milk, hides), with a view to their domestication.

Human ingenuity has enabled almost all land-based ecosystems (with the exception of the most extreme ones, such as those of the poles or very high mountains) to be exploited through the adoption of adapted forms of agriculture and livestock keeping. Down the centuries, a massive reserve of food and agricultural knowhow has been amassed, as a result of long-term observation of natural environments and ecological mechanisms conducive to agriculture and livestock rearing. Today, there is much talk of ecological knowledge, at the heart of agricultural and livestock practices, revealing a detailed knowledge of biodiversity and of balances within ecosystems.

Very early on, trade in agricultural products over long distances led to an exchange of knowledge between different regions of the world. Consider the Mediterranean Bronze Age (second millennium B.C.), with its documented trade in agricultural products between civilizations from the Minoan, then Mycenaean periods in Greece, the Hittite Empire based in Anatolia, Egypt and the countries of the Levant. Later, in the Middle Ages, via the Crusades or the gardens of Muslim horticulturists in Andalusia or Sicily, a number of species were transferred from the Middle East to Europe, among them rice, cotton, buckwheat, sugarcane, mulberry tree, silkworms, asparagus, lettuce, aubergines, melons, squash, pears, plums and peaches.

Since Neolithic times, the history of food and agriculture has been punctuated by periods of acceleration that may be termed agricultural revolutions, separated by long periods, not of immobility, but of transition, during which the way was paved for the next revolution. Marcel Mazoyer and Laurence Roudart (1997) have carefully analysed the different agrarian systems through the ages: the slash-and-burn of forested areas and post-forest savannah systems, hydraulic farming systems (Mesopotamia, Nile Valley), mountain farming systems (e.g. the Inca system), fallow systems and animal-drawn cultivation from the temperate regions of Mediterranean antiquity, fallow systems and heavy animal-drawn cultivation of the Middle Ages in north-west Europe, the end of fallowing in temperate regions during more modern times (from the 16th to 19th centuries), the development of mechanization linked to the industrial revolution in wealthy regions during the 19th century, and finally, the agricultural revolution of the 20th century, with the motorization of agriculture and intensive use of synthetic inputs (fertilizer, phytosanitary products).

Each of these revolutions marked the appearance of different forms of agriculture and the mobilization of new knowledge to develop techniques whose dissemination depended on social and economic changes affecting society as a whole, including those outside the agriculture sector. So the spread of mechanization from the 19th century onwards, mainly in Europe and North America, followed later by that

of motorization, was driven by the energy revolution (hydraulics, steam engines), which was itself at the heart of the industrial revolution in these parts of the world. From then on, agricultural and industrial knowledge became inextricably linked and developed in tandem: industry required a growing volume of agricultural products for its textile and sugar mills, etc., and agriculture very quickly modernized, in keeping with the rapid pace set by progress in the mechanical (motorization) and chemical industries (fertilizer, phytosanitary products). Triumphant science lent a uniform and homogeneous flavour to the knowledge of that time, with the effect of accelerating technological progress. The industrialization of European and North American economies, linked with the rural exodus in Europe, led to a return to larger farm sizes which, together with technical progress, generated substantial gains in productivity.

Today, we are witnessing a new agricultural revolution, with our societies entering the bio-economy era, when biomass has become a raw material for cutting-edge industries (materials, fuels, green chemistry), within agri-food systems that are demanding more and more knowledge. Globally, an essential feature of agriculture is its heterogeneity, with a wide divergence between the different types of farming systems. After decolonization and independence, agricultural industrialization mainly occurred in the wealthy western economies, with very little taking place in tropical countries. African agriculture remained largely based on hand tools with, in some places, use of animal traction. This small-scale family farming, which used little in the way of inputs, constituted a precious reservoir of local ecological knowledge. It continues to offer capacities for adaptation and a degree of flexibility not seen in the industrial agricultural sector. Such factors are an asset, given the disadvantages and the extreme vulnerability of industrial agricultural systems faced with the challenges of climate change, natural resource destruction (soils, biodiversity) and increasingly scarce water resources. For this reason, the growing fragility of small-scale household agriculture – which, despite still showing some signs of vitality, finds it difficult to compete with industrial agriculture within the globalized economy – coupled with the erosion of local agroecological knowledge, is a grave cause for concern. It is crucial to combat this trend towards wastage, which is threatening the diversity of farming systems and their sustainability.

Threats to knowledge linked to traditional and sustainable practices

Different types of agriculture

The advent of industrialized agriculture coupled with increasingly globalized markets poses the question of how to conserve and ensure the survival of local knowledge that is often generated by family farming. This sector's ability to adapt to local conditions offers a reservoir of sometimes ancient knowledge, enriched through trade and migration, which it is critical to safeguard and shape to suit development in the world. Rather than setting industrialized agriculture and household farming in opposition against each other, this is a question of respect for diversity based on sustainability. The major difference between these two types of agricultural

production lies in the fact that industrialized agriculture relies on a salaried labour force with almost all the output destined for market, while family farming, rather than a production model is, strictly speaking, the expression of a lifestyle.

Although difficult to define due to its diversity, family farming can be described as “a means of organizing agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women’s and men’s.¹ Family farming has an important socio-economic, environmental and cultural role.¹”. Despite their predominance – more than 513 million farms out of a total 570 million are family-run, accounting for 80% of the value of global food production (FAO, 2014b) – family farms are often considered as archaic systems destined to die out or even as competition to be eliminated, depending on the context and the agricultural historical background against which they are set. In the Middle East and North Africa, they account for 85% of all farms, and 40% of the region’s population is made up of rural communities whose livelihoods are directly or indirectly linked to agriculture, mainly of the family variety. At the same time, it is important to stress that the vast majority of the region’s people living in poverty are family farmers. Women play a predominant role in this type of agriculture. In developing countries, they make up 43% of the agricultural labour force, producing a very large share of global food crops. Yet they have nothing like the same access to productive resources as their male counterparts (FAO, 2010-2011).

According to the 2010 agricultural census, family farms in southern Europe dominate both in numbers (12.2 million farms accounting for 97% of all farms) and agricultural labour (86.2% of the regular agricultural workforce). For their part, non-family production methods linked to global markets have emerged under the influence of four main phenomena: financialization, urbanization, the globalization of trade and the development of marketing standards.

Family and non-family production models have, over time, either drawn closer together in a complementary manner, or moved into competition with each other, especially on the issue of access to land. The diversity of the links between the two types of farming underscores the diversity of situations. Meanwhile, political choices determine the development of this or that type of production format (Marzin *et al.*, 2014). The dual nature of agricultural systems can be seen in the Mediterranean – in the Middle East and North Africa just as in southern Europe. Family farms dominate in terms of numbers, while the large “industrial” farms (Hervieu and Purseigle, 2013) dominate in terms of cultivated surface area. Family farms tend to produce for household consumption, unlike the big modern farms, which supply food products to national and international markets. Such duality is the result of political agricultural choices in favour of developing modern large-scale farms, with a tendency to uniformize knowledge, at the expense of local knowhow.

The diversity of family farms reflects that of the natural environments in which they are located. They contribute in differing degrees to the management of ecological and social systems, in so doing adapting to local constraints while making the best

1 - According to the international steering committee set up for the International Year of Family Farming in 2014.

possible use of available resources (Feintrenie and Affholder, 2014). The territories and land are their foundations. According to Max Weber, family farms have taken on growing significance due to increased market access linked to the proximity of towns. Despite a global trend towards agricultural industrialization, these small farms continue to survive. There are a number of factors behind this resilience, particularly their capacity to integrate into markets, responding to growing local demand for food.

Family farms also endure thanks to the economies of scale that they achieve when small-scale producers group themselves into efficient professional organizations and invest in the downstream sector of the supply chain. In this way, they can express their full potential, both as a modern production model and as a reservoir of local knowledge. By assuring their integration both upstream and downstream of production, these professional agricultural organizations enable farmers to collectively overcome the challenges that each of them faces, namely the globalization of food systems, the effects of climate change and poor access to financial services, markets and production resources. In so doing, they compensate for the incapacity of policies to respond to their specific needs.

In the Mediterranean, as in all regions of the world, autonomous producer organizations and the common projects that they develop need support, so that they can maintain their place in increasingly complex food systems. By strengthening their economic power, efficiency and autonomy, family farmers who are organized into groups can acquire political weight and participate effectively in the decision-making process. For this reason, they do not just need support in strengthening their organizational capacities, but also a supportive institutional, legislative and policy framework, so that their organizations can develop autonomously, in the best conditions possible.

Ecological knowledge linked to fisheries and aquaculture

According to the latest report on the State of World Fisheries and Aquaculture, fisheries, and particularly small-scale fishing and aquaculture, make a significant contribution to eradicating hunger, promoting health and reducing poverty in the world. Global fish consumption is undergoing unprecedented growth. This sector also generates wealth by creating jobs at a rate that exceeds that of the world's population. Tens of millions of people earn their livelihood from fisheries and aquaculture, providing food for hundreds of millions of others. Between 10 and 12% of the world's population is dependent on the sector for their livelihoods. According to FAO (2014), the sector mobilizes 4.4% of the 1.3 billion people active in the global agricultural sector (compared with 2.7% in 1990). In 2012, women accounted for more than 15% of people working directly in primary fisheries operations.

Fisheries and aquaculture do not have a purely economic contribution to make. They provide social and environmental benefits, offering a source of sustainable prosperity in the process. Like family farming, small-scale fishing is particular for its social dimension and its concern for environmental balance. As a result, it too

is a source of ecological knowledge. With the aim of conserving ecosystems and local traditional knowledge, FAO is promoting sustainable socio-economic management of aquatic resources through an initiative for blue growth. Such management is centred on capture fisheries, aquaculture, ecosystem services and trade and social protection for coastal communities. The initiative seeks a balance between the demand for growth and the need for conservation, but also between industrial and small-scale fisheries and aquaculture. This is an integrated approach that links all stakeholders, the ultimate goal being that of meeting the needs of communities of fishers and fish farmers and their organizations, giving civil society organizations and public authorities greater scope for action by strengthening their capacities to improve the institutional environment.

Small-scale fishing helps to reduce poverty and increases food security worldwide. In order to foster the efforts of vulnerable communities of small-scale fishers and protect their livelihoods, FAO has actively supported the development of voluntary guidelines aimed at ensuring the sustainability of small-scale fishing. It is encouraging and supporting various public and private actors in implementing the guidelines on responsible governance of tenure of land, fisheries and forests in the context of national food security, by raising awareness among different stakeholders and promoting dialogue between them. CIHEAM is backing this effort.

Erosion of knowledge about food

The lowering of transport costs and dissemination of food conservation technologies – core components of globalization – are gradually putting an end to the era of food as a “total social fact” (Mauss, 1950). Fundamentally, dietary practices are a reflection of societies and their place in their natural environment, with the preparation of food ensuring the link between nature and culture (Levi-Strauss, 1968). In many parts of the world, a significant share of food is still made up of locally produced resources and reflects a social order, right up to the setting out of meals. Dietary practices are charged with symbols, marked by religious injunctions (taboos, bans or festive meals). People who travel can witness the huge diversity of eating habits that there are on the planet. Communities often accept monotonous diets, when they do not have to deal with alternating periods of food abundance and scarcity, or even famine. As already observed, there have always been exchanges between the world’s different cuisines, amid the acclimatization of exotic plants or animals (in the time of the Crusades, the Age of Discovery, etc.), but these exchanges were rare and extremely slow. They have not destabilized the original template of local diets, but they have enriched these by offering new possibilities.

For the past 150 years, the agri-food industry has offered a growing proportion of the world’s population a range of food options that would previously have been unthinkable. In recent decades, this trend has accelerated, with the advent of low-cost new foods that are easy to prepare. This has gone hand-in-hand with the implosion of former lifestyles, starting in the West in the 19th century and since spreading much further afield. Part of the food we eat is now produced and distributed on a global scale, based on principles that respect industrial norms (standardization of products, sanitary, process and distribution standards). The former situation, characterized by

much dietary uniformity at local level and strong diversity at global level, has been replaced by a reverse scenario, with diversification of dietary options at individual level and uniformity at global level (Rasse and Debos, 2006). Growing urbanization is helping to drive a massive market of more than 4 billion consumers, which needs to be supplied on a daily basis. Cooking is becoming industrial and technological, impairing the value of local culinary knowhow.

Of course, in this confrontation between uniformization and dietary variation, some forms of resistance persist or emerge. The proliferation of fast food outlets open around the clock has not stopped restaurants from offering typical dishes at set times. The tradition remains of family and festive meals. Dietary practices observed during the period of Ramadan have regained ground during the past decade. Symbols of quality that link products and locations (AOC, PDO, IGP) are growing in number. Alternative agri-food circuits are developing (fairtrade, short supply circuits, community-supported agriculture [CSA]). French gastronomy and the Mediterranean diet have been included in the world heritage by UNESCO.

However, it must be said that these forms of resistance only involve a few niche sectors, which are often linked to high purchasing power. In Africa, food globalization has not yet suppressed local practices. It has not, for example, eliminated *attiéké* from Abijan, *thieboudienne* from Dakar or *ndolé* from Douala. But the overall trend is towards uniformization. In supermarkets, 20% of the best-selling products alone account for 80% of food product sales. Hard discount stores, which are proving increasingly attractive to European consumers, only offer 10% of products sold in supermarkets (Rasse and Debos, 2006). For poor communities, wherever they may be, consuming globally, mass produced industrial food means exposing themselves to the risks of becoming overweight and obese. According to WHO, levels of obesity in the world doubled between 1980 and 2008, by which time there were 500 million obese adults (11%), 1.4 billion overweight adults (35%) and 44 million overweight children (6.7%). By 2030, the number of overweight adults is expected to reach 3.3 billion. Mediterranean countries have not been spared from this phenomenon. For example, in Egypt, three-quarters of women are overweight and one-third of children suffer from stunted growth, while child malnutrition has started rising again since 2003 (Al-Riffai, 2015). "Food modernization" is constantly advancing in Algeria, especially among young urban people, both men and women, with a regular increase in consumption levels of industrial foodstuffs: bakery products, fizzy drinks, sweets, fried food and milk-based desserts. Also evident is the increased popularity of fast food chains – some of them local – a growing tendency to snack between meals and a reduction in the time allotted each day to meals and cooking (Chikhi and Padilla, 2014).

Wasted human resources

We live in a world which, while producing greater and greater wealth, continues to generate more and more socio-economic inequalities. These affect entire segments of society, which are marginalized, or even excluded from the development process. As a result, social and economic exclusion have become chronic. The majority of the world's poor live in rural areas and depend on agriculture for their livelihoods.

Socio-economic exclusion translates into growing numbers of job seekers and lack of education, but also inadequate participation in the process of policy development and implementation. It is critical to invest in education programmes for young people, reinstate reasoned agricultural approaches based on the preservation of reservoirs of local knowledge and promote policies of co-construction designed to combat wastage of human resources.

This unequal distribution of wealth also raises the issue of jobs in the world. The number of job seekers rose to 204 million in 2015 (5.9% of the world's active population), with an additional 30 million since the crisis of 2008. According to *World Employment and Social Outlook – Trends 2015* published by the International Labour Organization (ILO), this figure will continue rising to reach 212 million in 2019 (ILO, 2015b): “Unemployment will continue to rise in the coming years, as the global economy has entered a new period combining slower growth, widening inequalities and turbulence.” (ILO, 2015b). Income disparities are set to increase, with 10% of the richest people earning between 30 and 40% of total global revenue and 10% of the poorest earning between 2 and 7% of this revenue. While the job situation has improved in the United States of America and Japan, unemployment continues to be widespread in a number of advanced economies, especially in Europe. Three-quarters of vulnerable employment² worldwide is concentrated in South Asia and sub-Saharan Africa. This latter region has failed to take advantage of economic growth to create sufficient jobs. In some parts of Latin America and the Caribbean, job prospects have deteriorated. Likewise, the employment situation remains very negative in the Mediterranean, especially in Arab countries and southern Europe.

The forecast for this highly uncertain scenario is that youth will be particularly affected by the crisis. After a period of rapid progress between 2007 and 2010, the global rate of youth unemployment stabilized at 13% between 2012 and 2014, and will probably stay the same for the period 2015-2019³. Among the world's regions, the Middle East and North Africa has the highest rates of youth unemployment, which were as much as 28.2% and 30.5% respectively in 2014, a situation that has affected one in four members of the labour force since 1991 (ILO, 2015a). These figures are considerably higher than the global average. Young women face even greater difficulties, with a labour force participation rate of 25% in the region, beating even the record of the world's lowest employment rate. There can be no doubt that this scourge represents a waste of human resources that is without precedent.

While all regions of the world show a fall in the number of poor workers, or those in vulnerable jobs, it is unacceptable that nearly half of the world's working people are still without access to basic products and services and decent work. The situation for women's employment raises the issue of gender equality, with all the socio-economic consequences that this implies. As has already been seen, this global trend

2 - According to the *Guide to the new Millennium Development Goals Employment Indicators* published by the ILO in 2009, vulnerable employment is a new metric that measures the number of people working in relatively precarious conditions due to their employment situation. Two types of status are considered as “vulnerable”: unpaid family workers and the self-employed, for they are less likely to have formal employment, generally have less access to social advantages or social protection programmes and are more exposed to economic cycles.

3 - Global and regional estimates are based on a definition of young as those under 24 years of age.

towards greater inequalities, which affect both rural and urban areas, is partly due to the employment crisis and has the effect of increasing the risk of social instability, which is particularly acute in countries and regions such as the Mediterranean, where youth unemployment is either high or rising.

This tendency towards wasted and under-utilized human capital (a combination of varied intangible elements that include experience, knowhow, skills and creativity) calls for responses that place individuals at the centre of development programmes (Sullivan, 2000). Rural areas, where the highest poverty rates are concentrated, must be moved higher up the agenda once more, and this is the thinking behind the new Sustainable Development Goals (SDG). Rural dwellers, farmers, livestock keepers, fishers, foresters and their organizations are capable of innovation and finding local solutions that will allow them to adapt to all kinds of changes. One response to this job crisis is to ensure the best possible conditions for rural areas, so that they can once again take their place as engines for social and economic development. Rehabilitating sustainable and reasoned agricultural approaches, in which family farming is a source of provision, can help rural communities, especially the young, to earn a living on their own home ground. Massive investment in this sector, particularly in small-scale family farming with the aim of creating productive employment, represents an effective strategy for combating growing inequalities.

The fight against wasted human capital also involves safeguarding and developing new knowhow, defined as a wealth of knowledge that is constantly evolving. It is important to work to establish a balance between documenting existing knowledge and creating new knowledge. Rural areas are reservoirs of considerable knowledge, and there is an urgent need to make this known and to share it, in order to protect it. While the importance of such knowledge may seem evident, attention has only been paid to this issue fairly recently. In 1996, Anne Stuart (1996) spoke of the transition from an industrial economy to a knowledge-based economy. But, as the OECD observes, when speaking of the knowledge-based economy, it is only in recent years that its growing importance has been acknowledged. Knowledge has now been recognized as a driver of productivity and economic growth.

Towards new knowledge systems and inclusive policies

A new knowledge system based on agricultural innovations

At the beginning of this chapter we mentioned that the accumulation, transmission and exchange of knowledge has always been at the core of agricultural practice and the development of production systems. Scientific progress, which was one of the causes of the industrial revolution, has opened the way for the industrialization of agriculture and the development of a food industry, and has shaped the current globalized food system. Gradually, but with increasing intensity, technical advances in agriculture are being developed in laboratories, and centres of research and experimentation, which are public or, more and more often, private. These centres of

knowledge and economic power have systematically offered technological packages whose adoption has rapidly become a prerequisite for strong economic performance on the part of farmers, and their survival in the face of global competition. The source of agricultural knowledge has therefore progressively eluded farmers, who have become receivers of technologies designed by others and delivery agents in an economic order dominated by the agri-food industries, which are becoming ever more concentrated and powerful. In Europe and the United States of America, the industrialization of food and agriculture has received massive state backing (subsidies and tariff protection, but also training, technical and economic support for farmers) which, after the Second World War, helped to shape an efficient, industrialized agriculture sector, but one that is of declining demographic importance as the rural exodus becomes more and more acute, and land is concentrated in fewer and fewer hands.

The same is not the case in tropical areas of Africa, where scientific progress has only served to modernize cash crop production dominated by the interests of mainly English and French colonial powers. As a result, the vast majority of the world's farmers have been sidelined by science-based technical progress, either because the discoveries could not be applied to agriculture due to particular material conditions (soils, climate, infrastructures, etc.), or because the economic conditions of small-scale subsistence farming, which is predominant in tropical areas, would not allow advances to be implemented (investment capacity, terms of trade and unfavourable price relationships, etc.). Following independence in Africa, development gaps between the old colonial powers and their former colonies led to worldwide demand for a new, less unequal economic order. While the socialist camp gave priority to giving the state back control of means of production and, more specifically, land reform, major investments and training for farmers, the liberal camp focused more on the notion of take-off, outlined by the linear development theory drawn up by American economist Walt Whitman Rostow (1960). The Bretton Woods institutions (MFI, World Bank) were tasked with giving financial support to this vision, in which economies were designed to progress in stages.

In the case of the agriculture of poor tropical countries, the linear development theories took the form of a notion that the accumulated delay could be countered by setting up a chain of top-down linear knowledge, linking science and its discoveries to farmers, along which the knowledge needed for development would be transmitted at an accelerated rate. Technical packages designed by international agro-economic research and adapted to tropical conditions were disseminated by public extension agents, whose job it was to convince farmers to use them. This training and visit method, which was formalized by Daniel Benor in 1977, was widely implemented in the 1970s and at the start of the 1980s. It went hand-in-hand with what was known as the Green Revolution and contributed to a marked increase in agricultural production and greater food security. But such progress was restricted to tropical agricultural areas with the best resources, particularly those with irrigation or heavy rainfall in East and Southeast Asia and Latin America. Elsewhere, and especially in Africa, the revolution was virtually non-existent. In places where it was implemented, it accelerated social differentiation, concentration of land and the rural

exodus, or the impoverishment of small-scale farmers without the means to invest in new technical packages. But the main obstacle that prevented a wider rollout of the Green Revolution began to make itself felt as the years progressed: the extension systems called for by the Benor method, which required an army of agents, quickly became a considerable drain on state budgets, especially towards the end of the 1970s, when the world entered a phase of structural adjustment and the dismantling of public services. The big financial institutions that had helped to fund these systems called on governments to make drastic spending cuts in exchange for budget support to reduce their public deficit. The Green Revolution was over and small-scale farmers in tropical areas found themselves on their own, faced with the challenges posed by globalization and international competition.

The inadequacies of the Green Revolution and the failure of extension systems in tropical areas on the one hand, and the excesses agricultural industrialization in rich countries on the other, challenged the idea of technical progress driven by science and transmitted to farmers through top-down knowledge chains. The notion of technical progress was replaced by one of innovation, which once again positioned economic actors at centre stage: the question was no longer how to transfer the results of science to users, but how farmers and entrepreneurs could themselves promote change and innovation. This was the approach developed by FAO with its Farmer Field Schools, which, through a trial-based system, helps small-scale farmers to gain a better understanding of how things work. The initiative enables them to jointly identify problems, find solutions and develop common strategies for change. However, experience shows that this community of small-scale producers needs the active engagement of all its members, through shared values and full backing for a common mission, which generates mutual benefits that are equitably distributed (Herbel *et al.*, 2012).

Since then, there has been a renewed appreciation of the value of empirical knowledge and farmers' practices, since innovation can only be effective if it is grafted on to knowledge. As a result, new types of knowledge and innovation systems have been developed, combining both the empirical knowhow of practitioners and the scientific knowledge of researchers. At the same time, the need to protect natural resources, adapt to climate change and combat inequalities calls into question the scientific gains of the past few decades, which focused more on the intensive exploitation of resources and the creation of artificial environments. Henceforth, traditional knowledge, or rather ecological knowledge accumulated by farmers over time, was seen as an irreplaceable asset for the development of an alternative type of agriculture, one that respects the equilibrium within agroecosystems and provides opportunities for decent work. Social innovation, based on values of solidarity, equity and emancipation, has become firmly established as an urgent necessity. The notion of strengthening capacities has tended to replace the more top-down ones of instruction or extension: knowledge transfer has given way to knowledge sharing. The role of the knowledge broker has become central. New knowledge and innovation systems bring together, on an equal footing, grassroots practitioners (farmers or entrepreneurs), researchers and knowledge brokers around common projects, where everyone's interests are served. The idea is not to blur the lines between the different trades, but to

ensure that each of these can be carried out, drawing on the skills and achievements of others. Only in this way can there be a rapid flowering of sustainable and effective innovation, including social and organizational innovation, that will correct disparities.

It is interesting to note that the European Commission has set itself the objective of launching knowledge and innovation systems within the European Union that answer these criteria, through a pioneering initiative called the European Innovation Partnership (see Box). Tested in various parts of the world⁴, other initiatives like this one form a foundation for experience and a source of inspiration, conducive to the emergence of new agricultural models, of which the planet and humanity are so greatly in need.

The European Innovation Partnership

The European Innovation Partnership (EIP), set up by the European Commission's Directorate-General for Agriculture and Rural Development, aims to increase the impact of science on development by combining scientific and practical knowledge. It provides for the setting up of:

- operational groups that bring together different actors around the same project (farmers, entrepreneurs, researchers, teachers, technicians, etc.);
- thematic networks bringing together EU operational groups working on identical and similar topics to promote exchanges of experience;
- online resources with updated details of scientific and technical research on topics of common interest;
- multi-stakeholder research projects focused on the development of technical and/or social innovations.

These components are funded by the budget of the second pillar of the common agricultural policy (operational groups and their networks, online resources) and by the Commission's research budget (*Horizon 2020*), a rare and highly interesting example of an explicit and deliberate convergence between two EU strands of policy.

Towards integrated food and agriculture policies

Many of the world's regions, beginning with the Mediterranean, are marked by various political, economic, environmental and social crises. The nature of these raises the issue of food security as a decisive factor in stability and hence the importance of paying close attention to public agricultural policies. Given the wastage that is occurring in all sectors – of knowledge, food and natural resources – and given the growing disparities evident in rural and urban areas, a single sectoral policy would seem inadequate to respond to these challenges. It is therefore critical to turn to intersectoral and inclusive policies based on participatory approaches, in which all actors, including non-state ones, form an integral part of the

4 - For example, participatory research efforts, experiences of farmer-researchers, the Combined Technology Networks of the French Ministry of Agriculture, established projects seeking to promote exchanges between farmers (the *de campesino a campesino* movement), uncontrolled field-testing methodologies, etc.

decision-making process. While remaining the main driver of reforms, public authorities must mobilize all forces possible to ensure that these policies are balanced, innovative and inclusive, as well as being developed and implemented in a participatory manner.

A paradigm shift is therefore called for. In the field of agricultural and rural development, this would enable a switch from a technical approach to a holistic and territorial one, while taking into account the social, economic and political dimensions of development. In this way, local communities would become real actors for development in their area. To do this, national and local governments must develop policies that are more focused on adding value to products and rural development in synergy with urban development, rather than concentrating solely on agricultural production. These policies must also contain specific measures to promote small-scale and family farming, while setting in place a legislative framework that offers legal status and support to both types of agriculture.

Access to funding and investment resources poses the biggest hurdle for Mediterranean family farmers. The share of funding for agriculture in public budgets is very low, compared with the contribution that agriculture makes to the economy. If the new paradigm based on inclusive and functional agricultural approaches (family farming and agroecology) is to develop, governments in the Mediterranean and elsewhere will have to increase responsible agricultural investments⁵ in rural areas, to build the infrastructures needed and set in place a favourable environmental, economic and social policy. As such, several actions are needed.

- On the financial level, existing finance institutions should be strengthened, and there is a need to promote mechanisms for inclusive financial services by setting in place simplified loans that are suited to the situations of family farmers and to develop microfinance institutions in rural areas. Other imperatives include putting in place government credit procedures, so as to encourage banks to lend to small-scale family farmers, alongside insurance and guarantee systems to reduce credit risks. Public finance should be steered towards support for various forms of sustainable agriculture, including family farming, by offering rewards to producers in exchange for the environmental services they provide to society.

- For the development of producer organizations, greater negotiating space should be offered to them, with special attention paid to those that represent small-scale and family farming; there should be more support for developing producer organizations and cooperatives that are economically and financially autonomous, as well as greater efforts to leverage partnerships with civil society to supply services to family farmers. These organizations can play an important role in supplying extension, marketing and social protection services, which in rural areas are often the target of projects that are too fragmented to be effective.

5 - The Committee on World Food Security (CFS) approved “principles for responsible investment in agriculture and food systems” on 15 October 2014.

- For youth, it is critical to ensure greater investment in developing rural infrastructures to attract new enterprises and create new off-farm job opportunities; it is also key to develop programmes that target young farmers, giving them privileged access to land, credit and technical information.
- Finally, it is important to implement the voluntary guidelines for responsible governance of tenure of land, fisheries and forests, in an effort to ensure national food security; there is a need to develop economic incentive programmes for farmers, which encourage reasoned agricultural approaches based on conserving reservoirs of local knowledge. These programmes could be part of policies jointly designed together with key actors, especially family farmers and their organizations.

Conclusion

Combating wasted knowledge and human resources is a theme that still receives too little attention and discussion. This chapter has attempted to explore the different types of knowledge and their development over time, highlighting some changes and innovations needed, including at policy level. Although eroded by globalization, which encourages uniformity, local knowledge systems are proving resilient, and there is growing awareness of their contribution, especially to the sustainability of food systems. The exchange and pooling of knowledge, together with the setting in place of inclusive policies, can offer a valuable response to various severe crises currently facing the world. Knowledge only exists if it is put into practice. Protecting it contributes to the production of new knowledge, since paying heed to reservoirs of knowledge available can have the effect of promoting innovation.

The global economic situation is aggravated by income disparities. The gap between rich and poor continues to widen in a world which, nevertheless, has sufficient resources, including those needed to produce food. Food insecurity, which is acute in rural areas, is now spreading towards urban centres. This trend makes it critical to adopt a global approach to the problem, as well as a traditional sectoral one (urban, rural, agricultural), which should in any case be retained.

As part of this new integrated and functional paradigm, it is crucial to strengthen the governance of food security by setting in place territorial approaches, while encouraging the inclusion and connectivity of regions and marginalized communities. Such a critical, synergistic approach, based on recognition of the diversity of knowledge, offers the advantage of taking into account context specific particularities. It also makes it possible to optimize connections, while promoting the development of integrated food systems. Lastly, by being based on the development of decentralized governance systems, it enables local actors to strengthen their capacities and ability to participate in decision-making. Setting in place spaces for dialogue will therefore make it possible to reduce the gap between decision-makers and local communities.

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