

Preface

It is widely recognized that agriculture – as a primary objective – aims to produce a quantity and quality of food that sufficiently and adequately satisfies the needs of all the planet’s inhabitants, present and future. In addition, agriculture has always supplied non-food, yet essential raw materials for the lives of humans such as fibres (wool, silk, cotton, linen, hemp), animal skins, energy sources (wood, biomass, biofuels) and other materials (for industrial and building applications), all of which have the dual advantage of being renewable and, on the whole, biodegradable. Apart from this, there are two further aspects related to agriculture that must be mentioned:

- agriculture (including forest management) makes an important contribution to rendering many territories ‘inhabitable’ – drainage systems, hill and mountain slope stabilization, utilization of woods, creation of pleasant landscapes etc.;
- other human activities, though relevant in so much that they contribute to generating ‘more human’ living conditions, affect the natural system in a way that is not always compatible with its survival (thus neither that of humans). It is enough to think about the increase in urban areas, roads, railways, bridges, ports, dykes and dams, to the chopping down of forests and destruction of wetlands, to the occupation of soil, diversion of water courses, creation of artificial landscapes etc., to everything that affects climate change (via greenhouse gas emission) directly or indirectly, that alters surface water (rivers, lakes, seas, oceans) and groundwater (aquifers) sources and the soil because it pollutes them, thereby reducing the productivity potential (soil fertility is depressed and ‘blue’ water availability for domestic use or irrigation is reduced, in turn risking desertification or less than ideal conditions for aquatic life). The depletion of energy resources and raw materials is also not to be ignored. Although the above mentioned human activities are only partially pertinent when talking about agriculture, it is important to point out their importance since they are not always sufficiently acknowledged as being a cause of ecological imbalance. To give a single example; greenhouse gas emissions from agriculture (particularly from animal farming) are often spoken about, though overall these emissions represent approximately 15% of the total greenhouse gas emissions worldwide (should the impacts of food production be given the same weight as those of non-agricultural activities?).

Coming back to agriculture, we believe that the title of this book expresses the urgent need to get answers to the following questions: what is the effective role of agriculture in production systems, all on the whole essential for humanity, and how (if at all) can these systems be implemented without putting the ecosystem at risk. Given that well managed agriculture should be recognized as being intrinsically sustainable because of the extensive use of solar energy (a renewable, thus infinite source), it cannot be denied that today humans must take on the role of guaranteeing its own sustainability in all its components: agroecological, economical, ethical-social (and institutional). If this won’t be so, the risk that the planet or at the very least human civilization will come to an end sooner or later will no longer be just a threat, but a very likely outcome. If *Homo sapiens sapiens* was a simple ‘dresser and keeper’ of the earth, in the last two centuries thanks to science and technology he has also become ‘manager’ of the earth, though only partially, and because of this the planet has entered the geological period the ‘Anthropocene’.

Although since its birth agriculture (arable and animal farming) has intervened significantly on nature, the relatively modest human potential has avoided rapid alterations, but most of all prevented any demographic explosion which occurred only in the last 150 years. This was only possible when science and technology revolutionized agriculture (and medicine); it is not by chance that the population has gone from being 1.5 billion people at the beginning of the 1900s to the now 7.3 billion. If the papal Encyclical letter *Laudato si'* (n. 105) is right to affirm that the force of humans is now such as to require a correspondent ability of (self) control, it is equally true that the only threats to the equilibrium are not the greed and thirst for power of some rich, but the now 'tenfold' increased demands of the population. In light of this and of what was observed previously, the most reasonable response is not to 'pull the handbrake' as the ecological supporters of the *Laudato si'* sustain in a sort of 'across-the-board development cut', but to perform a rational 'spending review' based on imposing responsibility on all humanity, each person being responsible for their own actions (as Pope Francis asks in Chapter 6 of the *Laudato si'*). In other words this means making a serious effort to foresee what the planet is realistically able to provide without collapsing (with assistance of course from all the tools that science and technique promise now and in the future) and, as a function of this, adjusts humanity's needs. We should add that humanity's needs depend on the number of people and not only on the individual demands, demands that sometimes are unreasonable.

To do all of this, as stated in the Encyclical *Laudato si'*, requires autonomous and interdisciplinary research (n. 135) and a wise interpretation of the principle of precaution: "this does not mean being opposed to technological innovations that can bring about an improvement in the quality of life" (n. 187). In the last few months all of this, together with a scientific approach to Expo 2015, drove us to compile the present volume that has the intention of looking objectively at human needs in relation to agriculture, though not solely in relation to the foods, but also to a variety of raw materials and forms of energy. What has been difficult for many of those that have contributed to this volume has been the objective of estimating the real potential of the planet; which is influenced, among other things, by choices that have not yet been made as an example, in terms of future energy sources. However, the intention has been that of suggesting the viable (or probable) means via which agriculture can be sustainable.

Since the main theme of Expo is food, this volume focuses largely – though not exclusively – on the criteria with which to define the necessity to produce foods and the sustainability of the production systems.

Food needs

The current situation presents numerous contradictions: 'hyper-fed' populations and populations that suffer from hunger to various extents. What is particularly worrying is the diffusion, throughout the world, of various forms of malnutrition for which not only quantity is a relevant factor so much as the improper use of foods; an excess of sugars-carbohydrates that induces phenomena of overweight and obesity, or a lack of proteins and macronutrients (especially in children) that induces the phenomenon of underweight. None of this helps define how much food is effectively needed (not only in quantity); there is also another very relevant aspect – that of losses-wastes, a topic of much importance because of the extent to which the impact on the ecosystem could be lessened if the losses-wastes should be reduced. Therefore, the problems related to the quantity- quality of food are undeniable and everyone must contribute to solving

them because their resolution involves the choices of individuals (type and amount of food purchased and consumed), as well as political-economical choices (education, tax-incentives and investment in research, structures and infrastructures). With regard to both individual and collective choices, it is being observed that the increase in income – something that itself is *per se* desirable – is changing consumption models, particularly in Asia where there is a shift from a vegetable based diet to a mixed diet with an increased proportion of animal products. This shift increases the demand on natural resources because of the low efficiency of the animals, and for this the dietary shift is being opposed. Despite the fact that a diet with more animal products is positive nutritionally so long as excesses must be avoided, increased earnings in some cases bring about a simple increase in consumption of traditional, typically vegetarian, diets; this is favoured by ecologists that do not always take nutritional aspects into consideration. Both scenarios are emblematic of the difficulties, technical and ethical, of balancing the needs of humans with those of the environment. The much-exalted vegetarian diets are actually ‘catastrophic’ for health – malnutrition from lack of nutrients in children and obesity-diabetes in adults are typical occurrences in the so-called countries in transition (towards development). Is it correct to exalt them just because they are pro- the environment?

Notwithstanding the aforementioned reasoning, a common argument that food production is surplus to our needs but decimated by losses and wastes seems debatable. We retain this to be absolutely untrue, since in both spatial terms (abundance in northern hemisphere, scarcity in southern hemisphere) and temporal terms (green revolution in the 1960s-1970s and actual reduction of productive processes) the problem of food scarcity has been radicalized at a global level. Before 2000, cereal stocks would have been sufficient to feed humanity for little less than 3 months; today they would suffice for less than 60 days. However, what is more important is the fact that very often in the last 15 years production has proven to be inferior to consumption (see in this volume the contribution by Busconi, Marudelli and Marocco), thereby justifying the speculations and price increases. It is therefore no surprise that on the African continent in recent years 80 million ha circa have been acquired by other countries or private entities (land grabbing); dietary need is in fact destined to increase for reasons already explained, as well as because each day there are 220,000 more mouths to feed globally and the earth will be a strategic asset.

Thus, if the food choices and lifestyle of each of us should take account of respective ecological footprint for ethical reasons, then also the nutritional consequences of our choices should be kept in mind: either the minimum or maximum nutritional needs should be respected in order to prevent phenomena of malnutrition (deficiencies or obesity).

Food production

The current production model (agricultural and agro-industrial) of developed countries, being essentially based on technological intensification, would manage to satisfy the global demand for food: it is therefore unfortunate that it is not sufficiently widespread. However, this said, the current production model has a worrying side in that it tends to impoverish the natural resources on which agriculture is based (soil, water, biodiversity) at a rate that is greater than their natural capacity of regeneration, putting the long term sustainability at risk. On the contrary, there are many areas in developing countries where cultivation techniques are still too empirical and have a derisory productivity and production is insufficient. The ecological sustainability in scenarios

such as these is not necessarily optimal – the soils are heavily impoverished because of their incapacity to retain organic substances; water is not managed and remains undrinkable; and biodiversity is at serious risk because of ruthless forest clearing to ‘make wood’, a wood that when burnt, especially for cooking, ‘poisons’ women (and children) and the surrounding area (Bertoni, 2015).

In both cases, a large number of interventions are required, be it with specific and different objectives, but always aimed at guaranteeing the availability of what humans need (particularly quantity and quality of food), as well as ensuring an optimal sustainability (environmental, economical and ethical-social). Doing so requires scientific knowledge (research) and technological innovation, not only in the small family businesses (FAO, 2014), but also in the developed systems since – as stated by Pope Francis (2015a) in his speech on July 7th 2015 at the Pontificia Universidad Católica del Ecuador in Quito – “it is not enough to analyse and describe reality: there is a need to shape environments of creative thinking, discussions that develop alternatives to current problems”. Of course, all of this must be backed up by enlightened political choices at the local and global level so as to correctly draw-up future pathways. Unfortunately, this does not suffice, especially in poor countries; in fact innovation can only enter into the lives of the populations if it is appropriately mediated. And this is one of the most frequent causes of failure of the interventions of so-called development co-operations, regardless of where they come from. The wish is thus that at least the Catholic Church (and laic organizations) that possess the essential peripheral structures, can perform a role that there is no hesitation in defining as ‘sine qua non’, as recently described in Bertoni (2015).

All of this led to the conception and compilation of the present volume that, rather than supplying scientific and technical skills, has the intent of drawing-up a framework that is useful in understanding the nutritional-agricultural system, with all its interactions; interactions that must extend to safeguard the ecosystem that is the ‘home’ of Man and work of the Creator. Since the planet’s sustainability is an essential objective, it seems evident that there are a lot of aspects that need to be looked at in depth (research) and accordingly there are many choices to make (politics) before reaching an acceptable overview of what is truly needed for the good of all humanity. The ‘ideological’ approach that is alas still prevailing must be superseded so that a cost-benefit balance that evaluates ‘good’ in an objective manner can be performed, and performed taking into consideration what is good for both humans and the planet. In particular, working within a Catholic University, it is essential that the just and pressing calls of the Catholic Church with regard to the custody of Creation are embraced, but not from the standpoint of ‘environmentalists’ (as some have interpreted from the recent Encyclical), rather embraced in a pragmatic way so that the environment is safeguarded with respect to humans and in consideration of themselves (in all places at all times).

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