

The Multifunctionality of Agriculture in the third Millennium: the livestock production in the Economical, Environmental and Social Sustainability

Millán MORENO

**Molecular and Applied Animal Cytogenetics Laboratory, Department of Genetics
Gregor J. Mendel Building, Faculty of Veterinary Medicine, University of Córdoba
14071-CORDOBA (SPAIN), e-mail: ge1momim@uco.es**

Abstract. There is no doubt that agriculture, understood in its broadest sense, has the multifunctionality characteristic, ie the agriculture that produces basic and objective benefits (agricultural production and livestock production) while other benefits and services inherent to the ecosystems, the landscape and the culture where it develops are generated. Agriculture in the Third Millennium has the sustainability as one of the most important objectives. Is it reached? Where must we walk? What role in the sustainability should the livestock production play? These are some of the issues discussed in this paper. More and more society demands agricultural practices compatible with environmental values and producing safe and quality food for animals and for humans, but also demanding to ensure sustainable development of rural communities especially in developing countries.

Keywords: agriculture, livestock, genetics, conservation, environment, sustainable development.

INTRODUCTION

In 2008 was held in Johannesburg an intergovernmental plenary assembly of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), established by the World Bank and United Nations in 2002, which summarized the work done by many experts from all regions of the planet about the situation of agriculture in the world today and its future in the different regions. The obtained reports are aimed at those who must take decisions in the field of agriculture, i.e. research groups, national and supranational agencies, academic institutions, etc.

It should be noted that this initiative was born with the basic objective of reviewing and evaluating the effects that the past, the present and the future knowledge, science and agricultural technology have had in the past, may have in the present or may have in the future in reducing hunger and poverty, improving rural livelihoods, public health and equitable development and sustainable from socially, environmentally and economically point of view. But I dare say that the initiative lacks a fundamental part in my opinion if we analyze the agriculture as a whole, entirely. In the report of the IAASTD the agriculture in its broadest sense, covering not only food production but green fodder, fuel, fiber and other products, is studied. But some other issues such as animal production and all that it implies, the implications of the new Biotechnology and Genetics particularly, are ignore. On the other hand the report also refers to the multifunctionality of agriculture. In fact agriculture is very complex and it is, by itself, multifunctional. Agriculture performs many interrelated functions, more properly, agriculture is not just about food production but its improvement, the breeding animals, the environmental improvement, landscapes and above the lives of men. But we must not forget that when we talk about agriculture also we want to talk about livestock, their

problems, the importance of detection, study and conservation of livestock genetic resources, their use as a catalyst for sustainable development in a depressed region or area, the implementation of the new veterinary technologies, etc.

SUSTAINABLE DEVELOPMENT: ARE REACHING THEIR GOALS?

After the Second World War, the need to develop agricultural production systems (agriculture and animal production) to meet the nutritional needs of the world's population and particularly in Europe was recognized. This originated the change in food production systems, extending a more intensive farming with the use of new inputs such as fertilizers, pesticides and pesticides that allowed not to drain off the productivity of cultures and to pass from extensive livestock production systems. This has allowed, and allows to cover food needs, as mentioned above, and to increase benefits for farmers by reducing production costs and consequently lower prices. Since 1960 World food production has been growing about 2% per year on average, being higher in developing countries and lowest in the developed ones.

It should be noted that, as indicated in the report, the strategies implemented have enabled that the human health and nutrition have improved, resulting at the end of the past century enough calories to feed everyone in the world. However it should be also noted that they are now over 900 million people around the world who can not get enough food. Similarly we can mark that about 3,000 million people depend directly on agriculture, livestock, forestry and fisheries and more than half of the planet's inhabitants living in extreme poverty depend only on agriculture to food.

In addition we now know that to improve agricultural production there are new sustainable production techniques, also the increase of the agro-biodiversity and the agro-silviculture but unfortunately in many parts of the world agricultural practices have derived to a decline in both land and water, ecological systems and own autochthonous animal genetic resources. In this sense more than 1,500 million people are affected by land degradation, showing a huge loss of marine and terrestrial resources as well as surface water resources, with the disappearance of half the world's humid ground in the last century.

WHAT IS THE WAY FORWARD?

As we see, despite the success of the strategy introduced in the second half of the twentieth century, there are still many shortcomings that we have to correct. In this sense, the self assembly of the IAASTD reached some conclusions that could help the decision making. Many conclusions refer to the agricultural production itself and the increasing their performance, but we can look some of them that, in my opinion, will have most impact in our future and in the future of the next generations.

The first one relates to continue with the research, development and innovation, and so far has achieved an increase in agricultural yields due to the selection and germplasm amelioration and implementation of new techniques to reduce the use of inputs with environmental impact, which has not avoid that there have been no negative consequences for environmental sustainability.

But it also noted that according to projections based on unchanged policies, current agricultural practices and demographic changes will undoubtedly be produced in the future, the demand for cereals in 2050 will increase around 75% and that the demand for meat will

double. But it must be taking into consideration that 75% of demand growth will occur in developing countries.

With the above scenario makes sense multifunctionality of agriculture, understood as well as how strict food production, feed, fiber and biofuels as a producer of services and, at the end, culture.

Among the conclusions should also be noted, briefly, the role of research (knowledge, science and technology) to solve environmental problems (reduction of emissions of greenhouse gases, etc.) and production (the fight against animal diseases, elaboration of vaccines, selection of the best genotypes, etc.), the role of women bringing their knowledge, skills and experiences in reaching sustainability goals considering, with greater effectiveness, gender issues, the need for greater public investment and encouraging the private companies working to create the conditions for enterprise development conducted at poor rural workers and allowed them to facilitate their access to markets and trade and, how not, an occupational education and extension.

LIVESTOCK AND ENVIRONMENT: SUSTAINABLE ECONOMIC DEVELOPMENT

In this brief article we want to focus a very important part of the multifunctionality of agriculture, all matters relating to livestock. The first thing to consider is to analyze the importance of domestic livestock as a component that helps substantially to the solution of global food demand.

As it is well know in our world ten million animal organisms, less than 0.5% are birds and mammals, is estimated. From the total animals species around 40 are domestic species and 14 of them are serving the 80% of world agricultural production. In this group of domestic animals species there are between 6,000 and 7,000 different breeds in which about 1,600 are endangered and 50 of them disappear every year (particularly in Europe, the 41% of domestic animal breeds existing at the beginning of the twentieth century have disappeared).

According the estimations of supranational agencies (FAO, UNESCO, etc.), agriculture provides a livelihood to 40% of the global population, representing the only livelihood for 70% of the poor living in rural areas of development countries and that depend directly or indirectly on agriculture. It should be also noted that over 40% of the world population depends on the livestock to cover their alimentary needs and all kind of other needs. The origin of the 19% of all world food is animal. Moreover the use of livestock contributes, in an indirect way, to produce other assets such as the traction in farming and crop fertilizer. We can outline that more than 30% of human needs in food and agriculture is provided by the livestock.

To achieve the development objectives and sustainability in a globalized world in which we live we have to act in two areas of action. On one hand the area most scientific-applicative introducing the results of the research, development and innovation in the continue improvement of crops, trees, fish and livestock and the introduction of new sustainable practices in the field of water management, energy and many other natural resources without producing a negative impact on the environment and trying to correct the damage already caused. On the other hand, the management areas without them it would be impossible to carry out the above. In this sense the improvement of organizational capacity, developing new policies, investment and institutional development are essential. The key issue is what might be called imaginative investment. En general public investment has been increasing after that in the nineties there was a significant reduction. Looking the countries we

can see that all industrialized or developing, have reduced public investment in agricultural research except some of them. Private investment has only increased in industrialized ones. It is paradoxical but it has been found by the IAASTD that public investments in science and agricultural technology generated rates of return between 40 and 50% in favourable market conditions, contributing to reach the objectives of development and sustainability, and curiously it can also generate social costs and benefits, environmental, cultural and health very difficult to quantify and especially very hard to identify how to distribute costs and benefits. We propose the imaginative investment to solve this paradox.

Despite the increase in agricultural production over the past 50 years through new agricultural techniques, which has reduced the indicators related to hunger and malnutrition but not eliminate them, and has also enabled the economic growth in many countries, there are still many problems and generating others. Among the former we could include problems of management and mainly problems of insecurity and food sovereignty. Among the latter we could mention, among many others, environmental impacts that it will no doubt produce because the rapid increase of demand for meat and milk that it has just begun to generate. This demand will involve a competition for cultures lands. The increase in the cattle's number in 2050 will be very variable according to regions and countries, especially developing countries. However that this will be in this way, it is essential, first, to increase investment for research related to livestock and secondly, to adopt an integrated strategy in relation to pasturing systems and mixed systems of cultures and livestock production in order to solve the problems that are now affecting the intensive livestock production and offer better prospects for sustainable solutions.

The development itself can complicate the impact of production systems on the environment. We have observed in the developed countries that mechanization and industrialization have contributed to a situation of abandonment, and almost disappearance, of many breeds of big and small ruminants, swine, poultry, etc. perfectly adapted to certain conditions. This has been the result of the change from extensive livestock production based on renewable natural resources to another intensive, with additional problems of diseases caused by the production system itself, based on products of a high energy content and, generally, from foreign origin.

The question in the air and that all agencies and specialists are doing is what the most appropriate strategies to achieve the objectives of economic development and sustainability are or should be. The answer is not easy but we do know is that it has to provide solutions that respect biophysical diversity, socioeconomic and cultural development of rural populations. The incorporation of knowledge and experience obtained elsewhere in the preparation of development and improvement programs to increase productivity, to protect natural resources and livelihoods and of course to minimize the negative impact of agriculture on the environment, will without doubt allow setting the farmers or domestic animals raiser in its environment assuring them enough and appropriate incomes that maintain their lifestyles, health and cultural activities.

The IAASTD proposes a series of challenges for the present century that we can summarize in to reduce hunger in the world and simultaneously increasing food security and respecting food sovereignty; to improve the health of the population; to increase environmental sustainability managing properly natural resources; to increase gender equity; to improve management mainly at the governmental level and of course to increase investment in knowledge, science and technology in agriculture by governments and institutions and to stimulate private investment.

In conclusion we can point out that the main challenges we have in the near future to reach an agriculture and livestock sustainable economically and environmentally are multiple, ranging from the production of a change in consumer attitudes until the markets and de local and global policies enabling the ability of agricultural systems and knowledge and sciences to promote development, to ensure food security and sovereignty, to maximize environmental sustainability and above all to help the small agrarian sector (agricultural and livestock production) will be profitable to reduce poverty.

REFERENCES

1. International Assessment of Agriculture Knowledge, Science and Technology (IAASTD) (2009). Agriculture at a Crossroads. Resumen de la Evaluación Mundial. Island Press, Washinton, DC 2009 (United States of America).
2. International Assessment of Agriculture Knowledge, Science and Technology (IAASTD) (2009). Agriculture at a Crossroads. Resumen del Informe de Síntesis. Island Press, Washinton, DC 2009 (United States of America).
3. FAO (1992). The management of global animal genetic resource. Animal production and Health papers. Rome (Italy), pp.104.
4. Ministerio de Agricultura, Pesca y Alimentación (MAPA) (2003). Libro blanco de Agricultura y desarrollo rural. MAPA, Madrid.
5. Rodríguez Estévez, V. y C. Mata Moreno (2002). Libro blanco de la Agricultura y el Desarrollo Rural: Comunicación: Ganadería sostenible en Andalucía. Papel de la Dehesa en la nueva PAC. Sevilla.