

Swedish Royal Academy of Agriculture and Forestry.

International Symposium of 200 Year Celebration.

“Creating a sustainable future: How to get more out of less in this only one earth”

By Dr Jacques Diouf

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Excellences.

Dear fellows.

Ladies and Gentlemen.

All protocol observed.

Let me first express my gratitude to Dr. Kerstin Nilblaeus, the President of the Swedish Royal Academy of Agriculture and Forestry, Mr. Bo Anderson, the Vice President, the Board and members.

Your venerable Institution has been most gracious, in appointing me as Honorary Member of this distinguished gathering of eminent scientists, devoted to benefiting society, with science and practical experience.

Dear friends.

The international community, since 2000, rightly gave priority to the key facets of poverty across the globe. It decided to address, for all people on planet earth, the most fundamental human right: to ensure the basic needs of people, in a sustainable environment. It set eight goals, identified specific indicators and

organized consultations, among leaders of United Nations member States, for monitoring progress and taking relevant actions.

Two years before the 2015 deadline of these Millennium Development Goals, the International symposium, of the Swedish Royal Academy of Agriculture and Forestry, offers a timely opportunity to go past the present discussions on successes and failures, to focus on the challenges beyond, in particular for our world in 2050.

By then, the world population is expected to be increased, with more than two billion persons, requiring adequate supply and access to food, feedstock, fiber and fuel.

Land and water, the basic finite natural resources “on this only one earth”, are needed for the additional production. They will not follow a parallel path of growth, but instead will be negatively affected by overuse and climate change. Hence the first question to ask, in the warm hospitality of this cold historic Viking city, to the high level participants of the International Symposium on Global Outlook, is: “how to get more out of less?”

We will first review the projections of the economists, second analyze the solutions offered by the researchers and technologists, third refer to the views of social scientists, and four assess the governance response of the politicians.

The Projections.

In the 2012 revision of World Agriculture towards 2030/2050, FAO projects that global agriculture and consumption in 2050 will be 60% higher than in 2005/2007. This is 10% down from earlier estimates. Yet, this level, which will be the result of growth in population and income, compounded by new demands like biofuel, raises questions on how and where such increase in production can be achieved, but also on the relevant constraints of land and water.

The Population

Using the medium projection of the United Nations “World Population Prospects - the 2008 Revision”, we note that population on earth is expected, at an average rate of projected growth of 0.7%, to reach 9.1 billion by 2050.

The annual growth rate of 1.2% of the 2010 decade will add 50 million people every year until mid-2030. For the subsequent period until 2050, the increase will be at a rate of 0.4%, with around 27 million every year. Sub-Saharan Africa, at a rate of 1.8%, is to have 1.7 billion. Africa will reach 2 billion, which would represent around 22% of the global total. South Asia would contribute 25% with a population expected at 2.2 billion.

By definition, food security exists when all people, at all times have physical, social and economic access to sufficient, safe and nutritious food that meet their dietary needs and preferences for an active and healthy life.

Undernourishment or hunger exists when caloric intake is below the minimum dietary energy requirement (the amount of energy needed to perform light activity and to maintain a minimum acceptable weight for attained height).

Food consumption in calories per person and per day has been the key indicator for the evaluation of world hunger. Sub-Saharan Africa has 2238 kcal/person and per day (base 2005/2007) and South Asia 2293 kcal against a world average of 2772 kcal. While the global average is expected, by 2050 to reach 3070 kcal, sub-Saharan Africa will be at 2238 kcal and South Asia at 2820 kcal.

Therefore, the 1996 World Food Summit target of halving the number of undernourished from the base of 811,000 (now evaluated at 794,000) by 2015, most probably will not be achieved. Yet, there is still the possibility of reaching the less ambitious 2000 Millennium Development Goal of cutting by half the proportion of undernourished.

But we could still take comfort from the fact that the projection, based on earlier trends, which showed that the 1996 target would only be achieved by 2150, has now been readjusted to forecast that we will be successful in reaching

this goal between 2040 and 2050, period during which the number of undernourished in developing countries is expected to drop to 318 million.

This welcome development is due to the projected sharp decrease in the rate of growth of the population, the recent reverse of the declining trend in per capita food production and the irruption of sub-Saharan Africa in the group of fast growing economies.

However, the serious challenge in the fight against hunger results from the fact that, the highest demand, for food and nutrition, will be coming from countries that are presently unable to satisfy their requirements and, if past trends are not reversed, they are not expected to do so by 2050.

The Income

Developing countries use a large share of their income for basic needs. In the case of food, they are evaluated at between 50 and 60%, compared to around 10% in developed ones. The evolution, of the per capita gross domestic product of the third world, will therefore be an important factor in assessing the global capacity to generate effective demand for food, feedstock, fiber and fuel.

The World Bank puts the GDP per capita for the world for the period leading to 2005/2007 at 7603 US\$, with a forecast of 13,758 for 2050. The data is respectively 666 and 1,736 for Sub-Saharan Africa; 814 and 3,169 for South Asia, with the corresponding per annum growth rates of 1.36%, 2.20% and 3.14%. This means that, in these regions, we will be witnessing a dramatic increase in effective demand that will need to be met by a corresponding boost in the supply.

Agriculture production

Overall food in kcal/person/day will go from 2772 to 3070 between 2005/2007 and 2050. A big jump in food production will be necessary to meet this demand. But, if it has to be translated in quantitative output, it will also need to take into

consideration the qualitative shift in the dietary patterns, with greater consumption of livestock meat, milk, eggs and vegetable oil.

Cereals: wheat, rice and coarse grains (maize, millet, sorghum, and barley) will continue to be the main source of food (53% presently for developing countries and 47% in 2050)

Although per capita human consumption of cereals has declined since the middle of the years 1990, its overall ratio use, including seeds, animal feed, ethanol, starch and biofuel for industries, will continue to increase.

The consumption per kg per person per year in 2005/2007 of 158 will reach 160 in 2050 for humans and respectively 314 and 330 for all uses.

Livestock products:

This group of products ensures now 22% of the calorie intake and will reach 28% in 2050 for developing countries, against an almost constant level of 35% for developed ones.

The diet change has been spearheaded by a doubling in the consumption of meat (14 to 28 kg), over the past 25 years, up to 2005/2007, essentially because of China and Brazil. This trend will slow down from this 2.6% yearly to 1.6% in the period leading to 2030.

Between 2005/2007 and 2050, meat carcass weight consumption, in kg per person per year, will increase from 39 to 49, while milk jumps from 83 to 99.

Milk and dairy, excluding butter, will go from 83 in 2005/2007 to 99 by 2050, in kg of fresh milk equivalent per person and per year.

Roots and tubers:

Many parts of Africa, Asia and Latin America are major consumers of roots and tubers, banana and plantain. For the world, the kg per person per year intake will go up, from 68 to 77 kg, between 2005/2007 and 2050.

Vegetable oils, oilseeds and products

The consumption of vegetable oil, oilseeds and their other products will increase from 12 to 16 kg per person per year from 2005/2007 to 2050.

Global food consumption.

Thus the food consumption levels will be increased allowing a reduction in the percentage of under-nourished people, the basis for the Millennium development goal. But the more ambitious absolute number set by the World Food Summit would pose a greater challenge, because of the of high population growth in countries with high levels of undernourishment.

Land and water

What then would be the implications for earth finite natural resources, land and water, that sustain our livelihood? They will be deeply subject to climate change with positive measures of adaptation and mitigation, but also man engineered misuse, overuse and pollution.

Presently, out of 7.2 billion hectares of land having a potential for rainfed cultivation, only 1.5 billion hectares of the globe's land surface are being used for crop production in terms of arable land and land under permanent crop. That represents around 12% of the total.

Forests, environmentally protected areas, and urban settlement limit the agriculture use of the other huge potential areas.

Land potential is characterized by an uneven distribution in favor of sub-Saharan Africa and Latin American which account for 90% of such land and there 50% of this resource is concentrated in seven countries. The least endowed regions are in South Asia, the Near East and North Africa.

The availability of water is a matter of even greater concern, as only 2.5% of the world water is freshwater. Two third of this small amount is blocked in the form

of glaciers, ice caps and permafrost. Only 1.35% of the total freshwater could thus be accessed as surface water in rivers, lakes, swamps, snow and ice.

Moreover, 40% of the world's population lives in trans-boundary river basins and more than 90% in countries with basins that cross international borders, thus creating a serious potential for conflicts, as the demographic pressure grows.

Water availability is constrained by physical, infrastructural and institutional factors. Renewable water resources amount to 42000 km³, of which 70% is used for irrigation, 19% for industries and 11% for the municipal needs.

The pressure of irrigation on water resources, for the world, is estimated at 6.5%. But, here also, there is a high geographic variability of such pressure: 58% for Near East and North Africa, 52% for south Asia and around 3% in sub-Saharan Africa. The total withdrawal of Europe is 6% of which 29% for agriculture.

The first challenge for a sustainable future is therefore, the level of efficiency that will be achieved in the individual and combined use of land and water, in terms of input and output ratio, but also in relation to environmental impact.

Researchers, technologists and social scientists would thus be at the forefront, for addressing the problems of productivity and sustainability.

For water, they should allow the increase of infiltration of rainwater into soils, the limitation of the over-extraction of groundwater, but also the reduction of the negative effects of waterlogging and salinization.

Irrigation in developing countries accounts for 20% of the arable land, but 47% of all crop production and 60% of cereal production. Yields of irrigation agriculture systems, are in general twice to three times higher than those of rainfed ones. Irrigated agriculture, which doubled over the last forty years, has however slowed greatly in the years 1980s and early 1990s. In the first decade of the years 2000, it started again to expand; at an annual rate of 0.6%, instead of the 1.2% necessary for the years to come. Water productivity will thus need to accelerate its increase.

For land, they would have to deal with fertility, nutrient retention capacity and depletion, also soil structure, depth, slope and erosion, in particular, through the improvement of management practices in rural areas. They should also address the challenge of urban and per-urban agriculture, as 200 million people are in this

activity and related enterprises, thus contributing to the supply of 800 million urban consumers.

Over the last fifty years, crop production in the world was multiplied by three, because mainly of yield improvement and secondly of arable land expansion. Scientists should provide the fundamental technologies for increasing plant productivity. To have better crop yields, there need to be in particular a greater response to fertilization and a proper protection against pests and diseases. In developing countries, the yield gap between farmers' fields and research experiment centers need to be urgently closed, not to mention the huge difference with the results obtained in international and developed countries institutes.

Livestock is the largest user of agricultural land and is playing a lead role in the changes of global food consumption. Diets are evolving in favor of meat and milk, thus driving the demand for feedstock. It has been a major source of overgrazing and deforestation. Beyond the ongoing work, which is slow but indispensable, on biological and animal health improvements, there is a need to improve the technologies to feed animals, in particular, with cereals and oilmeals.

In forestry, the rate of deforestation and loss of forest from natural causes, while slowing, is still high. It went from 16 million hectares per year in the 1990s, to 13 million hectares per year, in the first decade of the 2000 years. But, due to the compensatory effect of afforestation and natural expansion, the net change was brought down by 35%, in the first decade of the years 2000, compared to the last of the years 1990.

Fish, a source of low cost healthier proteins, provides to 2.9 billion people in the world, 20% of their average per capita intake of animal protein. Fisheries are being progressively taken over by aquaculture which increased its share of total supply from 4% in 1970 to 38% in 2009. Such development will require more technologies that are suitable, for the poor coastal communities practicing artisanal fisheries. Small scale fisheries produce around 50% of the world marine and inland fish catch. They provide employment to more than 90% of the fishers in the world. Women account for 50% of the workforce in the fishing and processing sector.

But around one third of all food produced worldwide, get lost or wasted, in food production and consumption systems. Per capita waste by consumers is between 95 and 115 kg a year in Europe, North America and Oceania, against 6 to 11 kg in sub-Saharan Africa, South and South East Asia. Loss occurs mainly in harvesting, storage, marketing and distribution systems. For developing countries it may reach 40% for some productions.

The conservation, in diverse ecosystems, of biodiversity for animals, plants and microorganisms, in their different genetic and species dimensions, is vital for the survival of humanity. Its effective use for plant breeding would increase productivity, resistance to drought and floods but also resilience to insects, diseases, virus thus allowing preparedness to external biological, climatic and edaphic aggressions. Adoption of integrated pest management would lessen the use of harmful pesticides, thus improving human health and the environment.

Agriculture provides primary products for the production of liquid fuel, chemicals and advanced materials, like natural fiber composites. The agro-food system represents around 30% of end user available energy. It is possible to improve efficiency in the areas of enzymes, fermentation and organisms for processes and products, in the energy, chemical, pharmaceutical, food, textile, pulp and paper industries. But the policies, of subsidies and trade protection, led to the expansion of liquid biofuel which increased from 68.3 million tons in 2006 to 130 million tons in 2011. They need to be seriously amended. Not only did they drive the increase of 45 million hectares in land use, but they moved around 100 million tons of cereals, away from human consumption.

Investments should be reviewed, to allow the development of irrigation systems and to make agricultural production less dependent on the vagaries of rainfall. In sub-Saharan Africa, only 4% of the arable land is irrigated, against 38% in Asia. Priorities should focus, also, on reducing the transaction costs of transportation, in particular with the building of rural roads. The provision of storage facilities, at village and marketing levels will be necessary to reduce the present huge food losses.

Women should be given equal access to land and water, technology and inputs, credit and market. As a consequence, 100 to 150 million more people will have adequate food.

There is a need to guide access to, and use of natural resources through a responsible tenure of land and water, in particular with policies based on the consensus reached at the Committee on World Food Security in 2012.

Last but not least, as agriculture (*lato sensu*) contributes around 30% of total global anthropogenic emissions of greenhouse gas emissions. It is thus a key factor in climate change. Methodologies are needed for adaptation and mitigation, in particular through conservation agriculture, as it is favorable to preserving the environment, and would have low impact on global warming.

But national, as well as international, good governance, which is a political issue, will be vital to properly make the relevant arbitrations of divergent short and long term interests. It will require ethics, vision, strategy, plans, programs and projects, but also laws, regulations, budget, evaluation, control and audit. Such decisions are surely hard and difficult, but they have to be coherent and consistent, for the benefit of the poor and more generally, for all humans, in the global earth village.

Policy decisions will be fundamental in shaping the direction and conditions of meeting the world food security goal in 2050 but, the track record of international commitments, in relation to implementation of decisions made, is certainly not very encouraging. Yet, we should recognize the value of international dialogue, based on objective analysis of situations and use of projected data that lead to negotiations, for arriving at a consensus.

Despite the hopes raised at the first World Food Summit of Heads of State and Governments in 1996, and the alarm set at the second World Food Summit in 2002, the awareness raised in the framework of the Millennium Development goals and the calls on the G8 and the G20, we are still having a little under one billion hungry people, in a world of affluent persons and private companies. The emergency meeting, that followed the 2007/2008 food crisis and the third World Food Summit in 2009, did not fundamentally change the food equation or the hunger and poverty trap.

Fortunately, at national level, good policy and governance ushered many countries in Asia, then in Latin America and now in Africa, out of this this plague

of ancient times, without destroying our environment. But regrettably, the basic international and regional policy flaws have still not been corrected.

International food and agriculture trade flows were multiplied by five, over the past fifty years. Following, the world food crisis of 2007/2008, they have recently been characterized by volatility and upward trends in prices, leading to the strengthening of the Committee on World Food Security, by the G20, in 2011, with the creation of an Agriculture Market and Information System and a High Level Panel of Experts.

The commerce of agriculture commodities is, however, neither free nor fair. Surprisingly, on this question, there is an unusual agreement between Davos and Porto Alegre. Equivalent support, of around one billion dollars per day to agriculture, is being provided by developed countries, having between 2 and 4% of their population in this sector, to the detriment of 60 to 80% of the developing countries population deriving its livelihood from the primary sector. Tariff escalation is depriving these countries of the opportunity to develop their agro industries and enjoy the employment benefit, of value addition to primary products.

We have the knowledge, the experience and the means to address these problems in an equitable way. We should have the imagination, foresight and wisdom to put in place an international system which allows people in agriculture, from developed as well as from developing countries, to earn an income allowing them to have a decent life, in line with the conditions of workers, in other sectors of their respective countries.

The world cannot afford to belittle its rural population. It is indispensable to feed humanity daily, as we need, in 2050, to increase, by 60%, world food production and by 100% that of developing countries.

This rural population is also the guardian of our lands, waters, forests, and wildlife, the foundations of a sustainable environment and of our culture, therefore of our civilization. It, therefore, deserves a compensation for the environment services, rendered to our planet.

The answer to the question: “How to get more, out of less, in this only earth?” is one which did hold true for centuries. “All along our history, Science, through Technology, has been the cornerstone of human progress, providing greater efficiency and productivity”, but the means and tools, it makes available, cannot set the goals and priorities. Other actors in our global village, in particular at social and political levels, need to ensure that these enhanced capacities are rooted in ethics, justice, fraternity and generosity; that they are used for the benefit of our fellow human beings.

“Science sans conscience n’est que ruine de l’âme” : « Science, without conscience, is soul’s complete devastation. »

Excellences,
Dear fellows and friends,
Ladies and gentlemen,
I thank you for your kind attention.

NB. The data used in this speech come mainly from FAO publications, in particular:

- FAO Statistical Year book 2012.
- Looking Ahead in World Food and Agriculture. Perspectives to 2050.
- The 2012 Revision
- The State of the World’s Land and Water Resources for Food and Agriculture.

