BIAC THE VOICE OF BUSINESS AT THE OECD

Innovation in the Agri-Food Chain: BIAC Priorities for the OECD

A BIAC Issues Paper
September 2015

I. The Current State of Play

The world agricultural system is at a critical juncture. With the world population expected to reach over 9 billion by 2050, the global demand for food is projected to increase by at least 2.5 times over current levels. At the same time, food production has to take into account a number of other global challenges, such as climate change, food loss, changing diets, and water scarcity, as well as competing claims, including the need for animal feed, fibre for clothing and biofuels for energy. Global warming is likely to lead to greater incidence of agricultural yield shocks in certain regions, land fragility, and seed fragility, and will add to the complexity of the challenges at hand. The COP 21 Paris Agreement later this year must provide a clear and reliable signal through a long term agreement that protects competitiveness and accelerates the deployment of existing and new low-carbon technologies.

Meeting the challenge of global food security will require both short-term and long-term responses to raise productivity growth and strengthen the supply side of agriculture globally while reducing food waste. Investment in innovation is thus critical to the enhancement of agricultural productivity and efficiencies throughout the agri-food chain as a whole. Further, legal and policy frameworks that create economic incentives for these innovations to occur in a collaborative manner are needed.

Investments in R&D, agricultural production and processes, technology diffusion and uptake as well as extension services, particularly in developing countries, will be essential to increase productivity and output. As low levels of investment in agriculture are a major stumbling block to achieving global food security, investment requirements must be considered urgently and broadly, not only to encompass scientific advances, but also to address the need for appropriate infrastructure, human resources and capacity building.

While we appreciate the ongoing OECD work in this area, **BIAC presents three overarching priorities** for future OECD work in this space:

1. **Enhance the enabling conditions for increased private investment for innovation in the agri-food chain.**
2. **Improve public perception of innovation in the agri-food chain.**
3. **Increase cooperation with the private sector to seize innovation opportunities.**

II. BIAC Priorities for OECD Work on Agriculture and Innovation

1. Create the enabling conditions for increased private investment for innovation in the agri-food chain

The private sector is a major contributor to innovation throughout the food chain, including solutions for sustainable agricultural productivity, the creation of new and improved food products, and approaches to reduce household food waste. However, for the private sector to be able to play its role most effectively, it requires policies that enable greater investment and innovation in agriculture, including science-based regulation of new technology and the protection of intellectual property rights. Establishing legal frameworks that promote investments in research and development (R&D) is essential to meet future needs. The provision of an enabling framework for the private sector that facilitates the necessary financial flows and encourages firms to address food security concerns and promote innovation is essential. Investing in education, research and development, agricultural extension and strengthening rural infrastructures to facilitate market access will also spur innovation.

Creating coherence across the innovation cycle, between supply and demand and across different markets, requires a multifaceted approach. Innovation in a whole range of fields, including creating new ways of working with existing agricultural tools and inventing new technologies, will eventually lead to far-reaching and beneficial changes in food production and consumption.

To enhance the enabling conditions for agri-food chain innovation, such as those described in the Annex, BIAC encourages future OECD work that:

- **Sheds further light on the opportunities for efficiency improvements in the agri-food sector** through innovation, development and application of new and existing technologies and best practices
- **Promotes high quality intellectual property rights** in creating economic incentives and fostering innovation
- **Demonstrates the benefits of trade and investment liberalisation** to facilitate the development and diffusion of technologies
- **Facilitates the development of private-public partnerships (PPPs)** in order to promote research, development and deployment.
- **Fosters international and regional policy and regulatory cooperation** to address global challenges (such as food security, climate change, price volatility, and water scarcity)
- **Encourages international exchange of and access to information and knowledge** (such as banks of research results and data)

- **Supports skills development and skills forecasting,** including closer cooperation between employers and higher education institutions (most notably in the applied agricultural sciences) to address skills shortages

- **Facilitates the development of financing and insurance solutions,** including innovative risk management tools that enable farmers to operate in markets while adapting to increasing price volatility and other risks (such as climate change)

- **Fosters extension services** that promote the deployment of innovative solutions

2. Improve public perception of innovation in the agri-food chain

Public acceptance of new technologies is a well-known challenge in the agri-food sector and needs to be addressed by politicians, businesses, researchers, and scientific NGOs. By communicating how new technologies can contribute to solve problems such as malnutrition, reducing carbon emissions and food security, for example, the public may be more open to embracing these developments. Moreover, understanding the new technologies available may even enhance the attractiveness of the agricultural sector to recruit young talent.

The perceptions between stakeholders about different technologies can often vary significantly, which can ultimately lead to policy changes with respect to the use of certain technologies. If effective and sustainable government approaches for communication and education of sound evidence-based information are not in place, debates can easily become misinformed and can lead to policy decisions that may in some cases have negative implications for global food security over the longer term, such as by leading to inefficient land-use and/or higher food prices. Communication of clear and objective information to the public is therefore essential for developing stronger public knowledge on important policy issues.

In BIAC's view, the OECD has impressive and long-standing experience in generating sound analysis on a wide range of policy issues. Looking to the future, BIAC encourages OECD work that:

- **Defends a science-based approach** to innovation in the agri-food chain

- **Strengthens the communications of OECD key findings** beyond the scope of policy circles towards broader society

3. Increase cooperation with the private sector to seize innovation opportunities

To harness the full power of innovation, there is a need for substantial investment, cooperation and knowledge-sharing. One way to make this possible is through the partnership of public and private sectors, working together for mutual growth and benefit. Such collaborations allow for

goals, resources, expertise and risk to be shared, thereby ensuring scientific innovations and good practices to become valuable tools for farmers and other actors along the food chain.

Successful public-private partnerships can, for example, improve the efficiency of developing locally-adapted innovation, enable distribution of technology, make the most of sustainable agricultural practices, promote the responsible application of new technologies, and provide social and economic value to farmers and communities.

Public and private sectors engaging a new partnership for agricultural innovation need to be able to understand how their specific partnership can complement the many other partnerships that exist. A coordinated strategy with effective communication among all relevant actors is needed in order to make most efficient and effective use of resources. This requires looking at the entire food chain and examining how the objectives of partnerships in one part of the chain could impact upon, and possibly enhance, partnerships in other parts of the chain.

There are also a number of private sector-led innovation opportunities that need to be given the highest attention, such as improved farming techniques, the use of crop protection products and fertilisers, new crop varieties derived through conventional hybrid as well as biotech breeding techniques, including but not limited to biotechnology, and increasingly nanotechnology. A non-exhaustive list of areas where the private sector is making a significant contribution to agri-food chain innovation can be found in the Annex.

BIAC stands ready to work with the OECD to support its analysis and policy advice regarding emerging areas for public-private cooperation aimed at unlocking innovation in the agri-food chain. We encourage OECD work that:

- **Supports coordination among public and private actors across the entire food chain, including the sharing of good practices for public-private partnerships,** drawing upon the unique forum provided by the OECD Food Chain Network

III. Conclusions

Innovation is of central importance to addressing the challenges of global food security, sustainability, and changing consumer preferences. Equipped with its cross-disciplinary analysis and evidence, the OECD is well positioned to advise governments on innovation in the agri-food chain to meet these challenges.

The three overarching priorities outlined in this paper provide strategic direction for future OECD work which we encourage the 2016 OECD Meeting of Agriculture Ministers to take into consideration. We also underline that cooperation across various parts of the OECD is vital for comprehensive analysis and sound advice to governments, including for example the Trade and Agriculture Directorate, the Directorate for Science, Technology and Innovation (DSTI), the Environment Directorate, and others.

Annex

Examples of private sector-led innovation in the agri-food chain

The following is a non-exhaustive list of areas of private sector-led innovation in the agri-food chain.

Improved seeds

- Where appropriate, improved seeds, including those derived through biotechnology, have the potential to make a major contribution to increasing crop yields, nutritional content, and productivity, and mitigating environmental impacts such as climate change.

- Drought-tolerant crop varieties, for example, have the ability to help protect yield potential when water is scarce, while other crop varieties can be produced with genetics that protect against yield losses due to flood conditions.

- Salt-tolerant crops can be developed to allow land that has become unproductive for crops to be used for food production.

- Plants with an improved nitrogen-efficiency can grow and produce high yields with lower amounts of fertiliser or have much higher yields under the same fertiliser input. Such plants would also help to minimise the emission of nitrous greenhouse gases (GHG) and save energy on the production of nitrogen fertiliser an energy intensive process.

- Biotech seeds with built-in protection against insects and targeted crop protection products enable farmers to significantly reduce food losses from pest damage in their field. Indeed, some studies show that global crop losses would double each year without crop protection products. After harvest, proper storage facilities together with post-harvest crop protection products can ensure food remains safeguarded as it travels from a farmer's field to global markets. In the coming years, new biotech traits that delay fruit ripening may improve the shelf life of fruits and vegetables, thus reducing retail-level and consumer-level waste.

- *Example:*

  - *Delayed ripening technology has been applied to extend the shelf life of some types of fresh produce, which will benefit retailers and consumers. Public and private sector research is working on delayed ripening in papaya and melons for areas such as Hawaii and the Philippines where long transport times from the field to market can cause high rates of spoilage. Regions such as Southeast Asia, where papayas are a staple food, stand to benefit with significantly increased availability of nutritious produce for consumers, more income for small-scale farmers and less food waste at the retail level.*

Integrated pest management

- The objective is to produce quality crop yields with techniques that minimise environmental impacts. Pest outbreaks can thus be prevented or limited, by developing and using green mechanical, biological, chemical and other controls only as needed.

Judicious fertiliser use

- The use of fertilisers helps increase cultivated soil carbon reserves by increasing the photosynthetic conversion of CO_2 to biomass that is subsequently converted to soil organic matter.

- Furthermore, the use of specific fertilizers, particularly those containing calcium (Ca), boron (B) and potassium (K), can reduce the incidence of physiological disorders (breakdown and softening) in fruits, vegetables and tubers during the pre- and post-harvest and extend their storage, distribution and shelf-life in the food chain. Firmer fruit, vegetables and tubers are also more resistant to pests and diseases post-harvest, resulting directly and/or indirectly in a reduction in waste/loss in the food chain.

- *Example:*

  - *The fertilizer industry's greatest challenges have to do with reducing greenhouse gas emissions in fertilizer production (especially that of nitrogen fertilizers) and reducing nutrient losses to the environment. To address these improper uses, the global fertilizer industry developed the "4R Nutrient Stewardship Programme", which advocates the right nutrient source at the right rate, right time and right place.*

Improved water management

- Agriculture depends on water availability and water quality, thus it will be increasingly important to develop innovative strategies for sustainable water management. Innovative methods for conserving water on the farm-level are vitally important, such as improved irrigation techniques. Forthcoming OECD work on water hotspots facing agriculture will be important in this regard.

- *Example*:

  - *Project "Unnati" is a partnership between Coca-Cola India and Jain Irrigation Systems Limited. The project aims to harness the higher productivity potential of mango farms, allowing owners of small-sized farms to increase crop yields and improve their livelihoods. The initiative provides field-based training to Indian mango farmers on modern, sustainable agriculture and the adoption of the Ultra-High Density Plantation (UHDP) technique. Using special techniques for pruning, fertigation (the application of fertilizer through an irrigation system), drip irrigation, nutrition management and pest control, these techniques can double mango yields*

and allow nearly 600 trees per acre compared to conventional planting of 40 trees, while decreasing the quantity of water used per kilo of mango production. Moreover, UHDP enables farmers to begin commercial harvests in 3 to 4 years as opposed to the 7 to 9 years required for traditional farming. By the end of 2014, activities resulted in the establishment of approximately 200 demonstration farms, the provision of on-site training and support to an estimated 18,000 farmers by bus, including approximately 3,000 women mango farmers.

Biofortification and biofertilisation

- Fighting micronutrient deficiency through conventional or other forms of breeding and fertilisation could contribute to dramatically improve health and reduce childhood mortality in many countries. Initiatives include beta-carotene enriched rice, iron and zinc enriched rice, etc. Supplementing fertilisers with zinc is one of the most cost-efficient strategies which fights micronutrient deficiencies of soils, plants and people simultaneously.

Best practices to reduce greenhouse gas emissions (GHG) from livestock

- Methane emissions generated through livestock production (a waste product of digestion by ruminants) contribute to a large extent of the agricultural sector's overall greenhouse gas emissions. There are a number of examples of how best practices can help reduce emissions. For instance, research to reduce GHG from livestock is looking at selective breeding and biological means of reducing emissions. Examples include biogas production from animal waste by using co-digestion.

- As large amounts of nutrients and energy are discharged to the environment by animals, leading to nutrient overloads and emissions, efforts need to be made to reduce discharge. For example, recycled nutrients (through good management of manure) help to raise soil fertility and plant productivity.

Leveraging information communication technology (ICT) for agriculture development

- ICT applications in agriculture are limited in developing countries. There is significant potential for maximising gains in agriculture through various ICT applications, such as drought and flood management coupled with crop advice to farmers, waste reduction, risk mitigation and market development. Therefore, it is critical to build capacity among farmers and create conditions that would allow them to access and apply these ICT applications.

Extension

- A key element in supporting agriculture's role is access to information. Extension programmes were originally conceived as a service to "extend" research-based knowledge to the rural sector in order to improve the lives of farmers.

- *Example*:

  - *Bayer Tabela is an initiative developed by Bayer CropScience Indonesia, which combines direct seeded rice cultivation together with a specific agronomic programme and training on growing rice with optimised resources. The approach reduces labour at planting time, improves yields and benefits the environment. Water consumption is reduced by up to 20% and methane emissions by up to 30% compared to traditional transplanted rice cultivation. Farmers benefit from yield increases of up to 10% and can cope better with labour shortages. Consumers benefit from continued supply of affordable quality rice.*

Improved packaging solutions

- A range of packaging solutions is adopted by the food packaging industry to reduce food waste along the food chain, such as anti-microbial packaging, leak-resistant packaging, hermetic seals, vacuum packaging, modified atmosphere packaging, portion control packs, re-sealable packaging, and so on.

Adjustment in farm practices

- Farm mechanisation will be essential for increasing food production in developing countries. Machinery and implements have to be tailor made to the conditions in each of the agro-climate zones. In addition, the development of prediction tool models and on-site diagnostics can optimise farm practices by minimising the inputs (fertiliser, water, agrochemicals) and maximising the yield.

Carbon Sequestration

- The process of transferring atmospheric CO_2 into soil and biotic pools can enhance soil quality, increase agronomic productivity, improve quality of natural waters, and lower rates of anoxia (decrease in the level of oxygen) or hypoxia (dead water) in coastal ecosystems.

Soil Conservation

- Conservation agriculture techniques such as low or no-till agriculture, made possible through the use of herbicides and biotechnology-derived crops, prevents wind and water erosion and loss of ground moisture, improves soil biodiversity, increases soil fertility, and in appropriate, carefully managed cases has the potential to reduce carbon emissions. In addition, by limiting soil disturbance and promoting a permanent soil cover, conservation agriculture can contribute to limiting emissions from agriculture by increasing soil carbon content (i.e. reducing emissions) and preventing erosion.

Enzyme applications

- The number of enzyme applications in food applications has been growing. Enzyme technologies can improve the quality and quantity of food products. Some examples include reducing the content of unsaturated fat in fat spreads, improving vegetable flavour, increasing cheese yield, improving phosphorous use by certain animals, enhancing fibre digestion, and slowing the staling of baked goods.

Improved sales and marketing techniques

- By incorporating food waste reduction strategies into sales and marketing, companies are working to reduce wasteful behaviour.

- *Example*:

  - *Some retailers have been moving towards a single date code on products (e.g. simply "use by" or "best before", instead of also marking "display until") in order to reduce food waste.*

Consumer education

- According to the US Environmental Protection Agency (EPA), food is the single largest component of municipal solid waste reaching landfills and incinerators, while it is reported by the organisation WRAP that almost half of all food waste comes from households and more than 60% of this is avoidable. Adapting and/or changing consumer behaviour is essential to reduce this waste.

- Several retail companies have voluntarily undertaken commitments to raise consumer awareness about food waste. They do this because of the strategic position of the retail sector being in close proximity with consumers, and they have extensive experience in communicating and informing consumers about such issues.

- *Example*:

  - *In 2012, 21 major retail companies and 2 associations endorsed a "Retail Agreement on Waste"[1], in which the companies committed to carry out awareness raising initiatives on food waste and how households can reduce it.*

Innovative measurement techniques

- Indicators for tracking sustainability performance in the food and agriculture sector need to be well balanced and non-biased, as well as fit for purpose and reliable.

[1] Available online by clicking here: http://www.eurocommerce.be/policy-areas/environment/policy-updates/2012/20121009-retail-agreement-on-waste/retail-agreement-on-waste.aspx

- *Examples:*

  - *AgBalance™ is an expert, scientific methodology developed by BASF to measure progress in sustainable agriculture. AgBalance™ assesses the sustainability of solutions and processes in agricultural production systems. It holistically analyses indicators from all of the three dimensions within sustainability, namely environment, society and economy. Results of this holistic assessment provide a scientific basis for informed, fact-based decisions on how to best improve the sustainability of any given production system.*

    In practice, AgBalance™ combines Life Cycle Assessment with environmental, economic and social impact indicators, generalised to varying spatial scales. The methodology comprises up to 70 sustainability indicators, based on a significantly larger number of input data and parameters. Both, detailed in-depth results of individual impact indicators, as well as aggregated results are outputs of AgBalance™ studies.

    Sensitivity and scenario analyses can be employed to study the robustness of the model results, and to investigate trade-offs or the response to external influences. Scenario analysis provides a guardrail for the continuous improvement efforts, thus helping to advance sustainability in agriculture.[2]

  - *Field to Market, The Keystone Alliance for Sustainable Agriculture, is a platform for producers, agribusinesses, food companies and conservation organisations seeking to create sustainable outcomes for agriculture. Field to Market is developing indicators to estimate the environmental, economic, social, and health outcomes of agriculture in the United States. In its first report, released in January 2009, Field to Market evaluated indicators for estimating land use, soil loss, irrigation water use, energy use, and greenhouse gas emissions for agriculture. The initiative is organised and facilitated as non-profit by the Keystone Center, a non-profit dedicated to developing collaborative solutions to societal issues.*[3]

[2] See www.agbalance.agro.basf.com/
[3] See http://www.fieldtomarket.org/