A bioeconomy for Latin America and the Caribbean: opportunities and challenges from a policy perspective[i]

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What is the bioeconomy?

The bioeconomy is a vision of a future society much less dependent on fossil resources for its energy and raw materials needs and where biomass transformation plays a critical role in the production of food, health, fiber and industrial products and energy. It is a response to four major emerging – and convergent - global challenges, including that in the next 20-30 years world population will grow to be nine billion people and global biomass demand will go up for at least 50% over present levels, increasing natural resources scarcities, mounting evidence that cheap oil is a thing of the past and that peak oil production was been reached, and climate change concerns. All of these trends are making evident that "business as usual" is no longer an option and major adjustments in social and economic behaviors are in order, if we run a chance of seriously addressing the Millennium Development Goals (MDG) of eradicating hunger and poverty (MDG1) and assuring environmental sustainably (MDG7). The problems to be confronted are global and, certainly, not new; they have been building up for some time now. What is new today is the coming together of a better understanding of the problems that need to be confronted, the maturity of national and international political processes – United Nations Conferences on Sustainable Development (UNCSDC) MDGs, International Panel on Climate Change (IPCC), among other instances – providing the basis for the needed minimum political commitment for actions that given the global nature of the challenge need also to be global, and a science and technology base that offers concrete hopes and possibilities for an effective change in the course of action.

The bioeconomy concept is increasingly seen as an opportunity to coherently address this complex situation, while at the same time creating new sources equitable economic and social growth.

The LAC potential and role

The Latin America and the Caribbean region is particularly well placed to both contribute and benefit from the emerging bioeconomy. The region is well known for its immense wealth of natural resources, in terms of land, water and biodiversity, all factors of increasing strategic value for a bio-based world. The rapid agricultural transformation occurring in many countries, and the way that the region has rapidly evolved to become a world leader in the exploitation of the new agricultural technologies and in the bio-fuels markets is a clear sign of this potential. A rapid analysis of supply and demand factors clearly points in the direction that, in any possible future scenario, achieving the needed new global equilibriums, has the LAC region playing a critical role.

At the same time, the region has a challenge of its own. Hunger and poverty, although not as dramatic as in other parts of the development world, are continuing preoccupations in the region, especially in the rural areas. These are turning agriculture and biomass production into essential components of any hunger and poverty alleviation strategy. In this context, the bioeconomy in

LAC has a dual set of objectives. At the global level, the region has a critical role in contributing to global food, fiber and energy balances, while improving environmental sustainability. And within the region's boundaries, the bioeconomy is a new source of opportunities for equitable growth through improved agricultural and biomass production. In a historical context the transition towards a LAC bioeconomy also offers the possibility of moving beyond the dichotomist vision of agricultural vs. industrial development that has dominated development strategy discussions since the 1950s, as agriculture – industry linkages expand beyond the traditional views to include a much more complex and strategic set of input – output relationships.

Challenges and transition issues

A society less dependent on fossil fuels will be very different from the one we know today. It will have more decentralized resources, with a different science and technology base and scale requirements, different inter-sector –rural/urban, industrial/agricultural, etc. – and international trade relations as a consequence of the changing balance in strategic resources. Furthermore, contrary to fossil fuel exploitation, biomass production and processing are not necessarily conditioned on scale economies and multimillion-dollar investments. All this is leading to a new economic landscape (comparative advantages, country, sectors, products' competitiveness), and is demanding – as in any new scenario – new policies and institutions to contain and to steer actors' behaviors as to optimize potential benefits and minimize transitional costs for all involved.

A new science base

New approaches should be in the direction of producing "more with less", and hence, getting away from "worse environmental offending" conditions of current agricultural practices. In the long run this will be increasingly achieved through biotechnology – improved resistances, new functionalities, etc. In the short run however, there is still a lot of potential left in conventional technologies, which should (first) be fully exploited. The common issue between the short and the long run is an increase in the knowledge intensity in agriculture and biomass production. Both eco-efficiency and biotechnological approaches have this in common: increased and more precise knowledge to manage the processes associated to the transformation of resources like water, nutrients and solar energy in biomass possible of exploitation by men, through biological entities. Moving in this direction will require increasing and reorienting investments in R&D and the implementation of scientific results into practice. In this sense LAC countries´ performance is quite dismal. There exists significant under-investment in conventional related research areas and only embryonic capacities in biotechnology. Capacity development in these areas is a critical issue, if the potential of the bio-economy is to be taken advantage off.

Human resources and social participation

A successful transition to the bio-economy will require both an intensive effort at human resources development and improved mechanisms for social participation. Bio-based processes require not only a new technological base, which in turns reflects in a rearrangement of the scientific skills base for research and development, but also require the production and management levels as bio-based strategies. Usually these are much more knowledge intensive than conventional approaches. A good example of these tendencies are eco-efficient agricultural approaches, where successful technological innovation is highly dependent both on sophisticated biological sciences capacities and production level human resources (farmers and extension service) able to understand and manage the intrinsic dynamics of biological processes. At a more aggregate level, bio-based strategies also change the established balances within a given society (local, regional, national, international) with respect to access and resource use patterns, benefit distribution and many other aspects of the existing *status quo.* These create the need for better understanding at the community level and clear decision making processes for identifying and managing the emerging trade-offs among the old and the new activities, between the different scales of application, and between the short and the long run. Improved training at all levels, from primary education up-wards, extension programs, the promotion of entrepreneurial capacities, and social communication and decision-making processes are key strategies in this sense.

Bio-refineries and bio-products

Bio-refineries and bio-products are some of the key concepts in the bioeconomy. Bio-refineries, in essence are like oil refineries - facilities aimed at transforming biomass into a broad spectrum of marketable products and energy. Their importance is related both to the efficiency issue – through the possibility of decomposing the raw materials into different product chains, they increase the efficiency of resource use and lower the cost of the primary products – and what they imply in terms of widening the value adding possibilities of agricultural activities and transforming the nature of its links to the rest of the economy, particularly with the industrial sector. In this sense bio-refineries are the cornerstones to the bioeconomy´s response to high prices of oil and, through the better life cycle performance of their products, they are also critical in the environmental performance of a number of industrial and consumer products industries.

Optimizing value chain efficiency

There is a potentially important conflict in achieving the objectives of the bioeconomy. This regards meeting increased food demands (50-70% over present levels) without extensive expansion of agricultural land and at the same time using part of our biomass production efforts to replace present use of fossil resources. How to reconcile these seemingly conflictive tendencies is one of the key challenges in the transitions to the bioeconomy, for which there are neither unique nor simple solutions. The final equilibrium will certainly be a complex mix of many new strategies, involving, among other alternatives, aspects such as the diversifications and expansion of sources of biomass, and more efficient utilization strategies. Regarding the latter an immediate challenge for the transition is a more efficient value chain. At present over 40-60% of what is actually produced is wasted before it reaches its final use or consumption. This represent a huge opportunity to start moving into bioeconomy strategies without creating additional conflicts and pressures on the natural resources base.

Social inclusion through improved rural development opportunities

Meeting the needs of the rural poor is essential to the achievement of MDGs. The bioeconomy offers distinct opportunities to include small scale producers both through the introduction of more eco-efficient production practices and thus an increased food supply with improved environmental performance, and also by creating new income opportunities for rural people by new bio-refinery strategies based on non-food biomass resources and better exploitation of different types of agricultural waste and/or by-products. Existing, and certainly, new bio-based products could serve as a basis for the development of new value chains, and as a minimum for the improvement of existing ones. At the same time, a more reliable and decentralized energy supply would serve as a basis for new economic activities and income generation in the rural areas and the possibility to reach and include those segments of the rural poor suffering from income poverty. By offering a more diversified linkage structure between agriculture and the rest of the economy, the bioeconomy also offers possibilities for a fresh view to poverty alleviation and new rural development strategies. Small scale bio-refinery technologies able to function with different feed stocks that require less investment per unit of product generated than large factories. Hence smaller total investments can speed-up and multiply these opportunities. However, exploiting this potential will require new policies – R&D, logistics, public investment/credit, market access, etc. – recognizing the specificities of rural activities and the small farm sector, and explicit actions directed at helping agricultural producers – particularly the small-scale – and rural communities not only create but also retain bioeconomy value.

New policies and institutional frameworks directed to support decision-making and reorient incentives and investments

Similar to what happened in previous economic cycles, the transition to the bioeconomy not only implies a different knowledge base. It also calls for broader changes in economic and social organization, as well as in individual actors' behaviors – investment orientation, production decisions, and consumer choices. Many of these are strongly influenced by policy and regulations that help generate and contain the new process as well as manage the transaction costs involved in moving from "old" to "new" situations. The drivers of the new bioeconomy mostly regard the future consequences of current economic practices; future events that are already starting

to show in current situations, but still not fully reflected in present market signals. In this context public policy and regulations have a critical role to play in triggering the needed new responses. A few of the areas in need of action for supporting the development of the bioeconomy include the development of the appropriate metrics for the new processes, so that they can be adequately monitored, the integration of policy domains (natural resources, agriculture, rural development, education, science and technology), the reorientation of public investments in infrastructure, education and science and technology together with new incentives to redirect private decision making toward the new areas of economic activity, improved IPR frameworks capable of effectively reflecting the nature of the new scientific and technological parameters as well as the changing role on natural resources in economic processes, together with other aspects such as bio-safety frameworks and the development of market standards for bio-based products, among others.

Past events and way forward

The Latin America and the Caribbean region are already well underway in exploiting the opportunities offered by the bioeconomy. The region is among global leaders in exploiting the benefits of the new biotechnologies. Three of the countries in the region are among the top five users of GM crops, and several more are included in the 15 top countries in terms of these technologies. Also, the region shows emerging eco-efficient agricultural practices, such as no-till, precision agriculture, integrated pest and nutrient managements, and organic agricultural approaches. Additionally, the region is also a leader in bio-energy production and is home to several of the early and best known efforts to institutionalize biodiversity valorization activities. However, in spite of the importance of these activities, no established vision on the bio-economy exists in the region, neither regarding the benefits that could be derived on the foundations provided by these successful experiences. Building such a vision and beyond that, a roadmap and action plan to fill in the gaps and take advantage of the region's strengths, are still a future challenge.

In moving towards this next level, several noteworthy steps have been taken nonetheless. At the scientific level, a number of events specifically targeted to discussing and analyzing opportunities of the bioeconomy in the LAC region were organized with participation of LAC and EU experts, among others. These include a UNIDO co-organized Expert Group Meeting on Industrial Uses of Plants for the Use of bio-materials, in Salvador, Brazil, 17-19 Dec. 2007, and an Expert Meeting on technological applications for biodiversity exploitation was held in Concepcion, Chile, at the end of November 2009. In parallel, the EC FP6 ALCUE-Food project launched a bi-regional Expert Meeting "Towards a Latin-American Knowledge-Based Bioeconomy" on 23-24 June 2008, in Buenos Aires, Argentina[iii].

These events contributed to expose both researchers and policy makers to the potential and needs of the bio-economy. They also provided the basis for the implementation since June 2011 of an FP7 project ALCUE-kbbe, aiming to construct a bi-regional platform of cooperation to accompany the introduction, validation and implementation of the LAC bioeconomy through the cooperation of key stakeholders, actors and experts from the LAC and EU regions. More recently, the LAC bio-economy was the principal theme of the International Agricultural Economists Association (IAAE) Symposium[iv] (Cali, Colombia, 19-20 Sept 2011) during which LAC economists analyzed bioeconomy constraints and opportunities in the region and formulated a first priority agenda for future socio-economic research on the bioeconomy in LAC.

At the political level, the LAC bioeconomy concept has found increasing recognition and active support through the ALCUE Bi-regional Summit on Science and Technology Cooperation (Madrid, May 2010) and subsequent Senior Officials Meetings[v] (SOM) that ultimately resulted in the adoption of the Bioeconomy as one of four proposed Joint Initiatives for Research & Innovation (JIRI), on which to implement the bi-regional S&T cooperation.

To support the SOM strategic initiative, a bi-regional consortium is currently formulating a proposal for a new International Cooperation Network (INCO-Net) instrument for financing by the EC FP7. The 4-year project aims to target bi-regional S&T cooperation to help alleviate climate change impacts, food security & safety, and environmental impacts by means of four sets of JIRI pilot activities, one of which regards the bioeconomy.

Hence, important elements of the bioeconomy are already there, the most obvious opportunities are being recognized, the first key challenges are being analyzed, and sets of key actors and stakeholders are being mobilized, as part of national, bi-regional and international initiatives. The next steps should be in the direction of de-composing the discussion to look at concrete opportunities and needs –policy, institutional, investments, etc. - in specific areas and national/regional/local situations. The aforementioned on-going and future bi-regional projects offer concrete first steps to make this happen.

Foot notes

[i] Prepared in the context of the EC FP7 ALCUE-KBBE Project (www.bioeconomy-alcue.org). It builds on initial work done during the EC FP6 ALCUE-FOOD project (www.inta.gov.ar/alcuefood/meetings/meetings.htm).

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[iii] www.inta.gov.ar/alcuefood/meetings/meetings.htm

[iv] Symposium Concept Note "The Bioeconomy in Latin America and the Caribbean: Towards a socioeconomic research agenda" www.bioeconomy-alcue.org

[v] Minutes of the 2nd Consultation of the ALCUE Working Group on the Bioeconomy, 27-28 September 2011, Paris, France http://www.eularinet.eu/site/event/eularinet_workshop_on_bioeconomy_2nd_alcue_som_consultation/language:eng

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