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BIOECONOMICS AND SUSTAINABLE DEVELOPMENT

According to the conclusion of United Nations Organization, in the XXI century biotechnologies will define the humankind development in all areas of activities first of all in acquisition of food, medicine, agriculture, ecology, and energy. In order to involve innovative transformation of entities of economic activities (agricultural production, processing plants, energy production and distribution, building, transport, medical care, science and education) in the process, it requires a wide range of active mechanisms which allow not only observe the situation but also influence it.

Sustainable development ties together concern for the carrying capacity of natural systems with the social challenges faced by humanity. The term "sustainable development" was used by the Brundtland Commission, which coined what has become the most often-quoted definition of sustainable development: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987; Smith and Rees, 1998). Sustainable development refers to a mode of human development in which resource use aims to meet human needs while ensuring the sustainability of natural systems and the environment, so that these needs can be met not only in the present, but also for generations to come.

The concept of sustainable development may generally be broken down into three constituent parts: environmental sustainability, economic sustainability and sociopolitical sustainability.

From sustainability to bioeconomics

“Sustainable development” constitutes a new, and a yet little analyzed semantic element in the discourse of economists and environmentalists. Beyond the broad consensus which has evolved around this notion, the various currents and schools of thought are competing to establish which theory will prove best adapted to explicate the concept and render its contents usable

The objective of “sustainability” stresses the need for present and future economic development to be conducted with respect for the environmental and for its evolution. This challenge means that, one way or another, economic and ecological dynamics must simultaneously be taken into account. According to Robert Costanza et. al. (1993, p. 546.), the theoretical project currently at temping to bring together economic and ecological principals have their origin in works belonging to the field of “bioeconomics”. (Constanza, 1993)

However, this line of research is to be explored, it should be emphasized from the outset that the expression “bioeconomics” its polysemic. It is used with various acceptations to refer to very different theories and models of economic and ecological analysis. One might eliminate some of these theories and retains only those already established in the theoretical corpus of economic science, of those referring explicitly to the "sustainable development" problematic. Yet, in this writers view, such a "disciplinary" attitude would be tantamount to answering the epistemological questions raised by the science of "sustainability" before those questions are really posed.

On the other hand, consideration of bioeconomics in all its acceptations and ramifications, would seem a useful way of reaching an understanding of the issues and challenges of the bodies of knowledge interwoven around the notion of sustainable development, as much for its definition as for its analytical content. Indeed, although they are very different, the various bioeconomics do share, as their name suggest, the common project of sackingto link the teaching of the living sciences with those of economics. In doing this, these theories seek to transcend certain existing theoretical splits, and to establish a crossdisciplinary dynamic conducive to the elaboration of criteria for judgment and to the definition of prescriptions in the environmental domain. Thus, even if these bioeconomics analyses are not directly produced by the sustainability problematic (which in fact they predate), they may in the end find their place within it, by virtue of the epistemological project motivating them.

Sustainable development and renewable energy sources Similarly, Goodland and Ledec states that "sustainable development implies using renewable resources in a manner which does not eliminate, or degrade them, or otherwise diminish their usefulness for future generations also implies using nonrenewable mineral resources in a manner which does not unnecessarily preclude easy access to them by future generations" (Goodland and Ledec, 1987).

Further, Allen argues that "sustainable utilization is a simple idea: we should utilize species and ecosystems at levels and in ways that allow them to go on renewing themselves"

(Allen, 1980). Veering towards a different direction, the approach of "weak" sustainability accepts that the needs and preferences of future generations will be similar and inane case contingent on the needs and preferences of present generations. Furthermore, the needs/preferences of future generations can be foreseen by extrapolating the evolution of current and past needs/preferences.

The essential characteristic of this approach is the assumption that future generations can substitute the fulfilment of needs and preferences pertinent to the natural environment with the fulfilment of needs and preferences pertinent to manmade elements along as one takes into account that such a substitution also holds true for both past and present generations. The assumption goes on to maintain that, because of the natural environment's degradation, the foregone utility can be substituted by the utility attained by using manmade assets and since this substitution did occur in the past it can continue in the future as well. In this context, the criterion of sustainable development is the per capita utility. As long as the per capita utility is not declining, welfare to be enjoyed by future generations is ensured and therefore sustainability prevails.

This rationale is based on an extension of the existing mainstream welfare criteria to future generations. Indeed, past and present generations accept a lesser fulfilment of preferences regarding the natural environment on condition that other preferences regarding manmade elements are fulfilled to a higher level. It is thus implied that environmental degradation can be continuing if accompanied by other activities which increase welfare to an extent greater than the extent to which welfare, caused by the degraded environment, is lost.

Such an evolution, argues the "weak" sustainability approach, can constitute a sustainable development path. As a result, future generations can do with less environment as long as manmade assets can guarantee a non-declining per capita utility. The implicit assumption underling this argument is that future generations have similar patterns of values with present generations and hence adopt a similar trade-off ratio between environmental utility and manmade utility.

In this context, Pezzey firmly states that "our standard definition of sustainable development will be the criterion of a non-declining per capita utility, because of its self-evident appeal as a criterion of intergenerational equity' (Pezzey, 1989). Pearce et al. defines that sustainable development is a situation in which "the development vector increases monotonically over time" (Pearce et al. 1989; Pearce and Atkinson, 1993; Barbier and Markandaya, 1990). It is, therefore, evident that there exist two fundamentally different directions in the scientific interpretation of the ESED. The direction of strong sustainability supports the maintenance of the existing natural ''capital'' as a condition for the formulation and fulfilment of future generations needs and preferences while the direction of weak sustainability endorses the mainstream criterion of the no declining utility which implicitly permits substitution of the natural environment with manmade capital and/or assets and hence opens the way to further environmental deterioration.

Between the two directions, interpreting the ESED one may detect several approaches valuable indeed which, however, are already deficient in operationability. Indicatively, Bergh and Nijkamp (1990) define the ESED as those dynamics of economic activities, social perceptions and population which provide acceptable levels of life for every human being by ensuring availability of natural resources and ecosystems. Daly speaks of uneconomic growth and proposes physical limits in economic process and in economic growth so that the latter may be a lasting one. This ''steady state'' approach proposes explicitly that economic process and production should not overcome the carrying capacity of ecosystems (Daly, 1999). Georgescu-Roegen envisages grave and irreversible scarcities of natural resources and an exacerbated pollution problem if economic production continues at its current pace. In this context, he foresees irrevocable on sustainability by which future generations will be dealt a far heavier blow (Georgescu-Roegen, 1971, 1976).

It is clear from the above, that there exists a lively scientific dialogue over the ESED and an inexhaustible effort to make the concept operational and decision making relevant. Sadly, considerable lack of operation ability still remains. As a result, future generations can do with less environment as long as manmade assets can guarantee a non-declining per capita utility. Bioeconomics and sustainable development is a title that covers the interactions of the natural environment with the economic process under the target of sustainable development. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Conclusion The first key aspect regarding sustainability in agriculture is the contribution of agricultural biotechnology to biodiversity, greenhouse gas (GHG) reduction, and adaption to climate change. The second important aspect of sustainability is the relationship between sustainability and bioenergy. Climate change impacts can be mitigated from innovative developments in bioenergy and biofuels. However, for these innovations to be globally adopted, their sustainability in the developing world has to exceed that of current technologies. Policies and regulations are – and have been – implemented to encourage technological innovation, yet little research exists that can substantiate the impacts, either positive or negative. The third aspect is the contribution of the bioeconomy to poverty reduction and sustainable development.

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