

## Challenges, Plans and Action

Chemists in Brazil are now observing an interesting scenario: large oil findings have been made recently while the production of ethanol from biomass (sugar cane) is increasing steeply. This is leading chemical industry into a new growth step based on oil and gas as well as on raw materials from renewable resources. This situation is creating much enthusiasm, which is easily understood. However, it also calls for a lot of analysis, decision-taking and careful planning of many persons, including researchers in the chemical sector.

Indeed, not all the news are positive. Two years ago, the long sought-after oil self-sufficiency was announced in Brazil, but in the current year there is already a negative trade balance in excess of US\$ 5 billions and the large-scale use of castor oil for biodiesel production is confirming the negative forecasts that were made when plans were announced. The two cases sum up to a piece of common sense: we cannot please ourselves with fruit that has not yet been picked.

Challenges for the production and utilization of raw materials from biomass are very many and they bring a broad range of problems that have to be solved – and many of these require a very creative chemical input.

A first challenge is the great dependence of Brazilian agriculture on fertilizer imports. The amount of nitrogen fertilizers being currently used includes 50% of imports and the corresponding figures for P and K are roughly 80 and 90%. This situation should cause great concern but it is hardly reflected, for instance, in the published governmental plans for science and technology. Related problems are observed concerning agrochemicals: some major crops in this country are under strong pressure from various pests, requiring another large stream of imports. Together, fertilizers and pesticides respond for a large share of the trade deficit of the Brazilian chemical sector, with a negative impact on the otherwise positive foreign trade balance.

Even worse, it is widely acknowledged that a significant fraction of the fertilizers and pesticides used in the fields do not reach the desired plant or pest targets and thus they

are wasted. As expected, this waste becomes pollution, harming the environment and ourselves.

Solutions to these problems require short and long-term action at different levels that in turn creates tasks and also opportunities for chemical R&D. Many examples can be discussed but we can recall a great success: vinasse from sugar cane ethanol plants was, until not long ago, a bad pollutant responsible for mass fish deaths in many rivers. Nowadays, vinasse is collected, cooled and used in sugar cane plantations as a significant source of N, P and K. The obnoxious smell of rotten vinasse is now replaced by the sweet smell (some find it too sweet) of the cooked cane wine. This is a good example that required much work, including the development of suitable materials for the piping used to drive hot vinasse from the boilers to the storage tanks.

Even experienced professionals acknowledge that there is a lot of still-needed chemical and biochemical knowledge concerning the fates of fertilizers and agrochemicals used, in the plants, animals and in the soil. This knowledge is essential for durable, large-scale production.

The Brazilian Chemical Society is now launching a new effort for updating opportunity and need maps, raising problems and presenting solutions. The first visible output is a forthcoming publication in which experts will present the state of the art in the use of many natural resources, with proposals for their development into new products. This will serve a dual purpose: sharing information and stimulating new thoughts, new plans and, very specially, new actions.

To conclude: prospects are bright, but their development into a bright reality requires a lot of work. Part of this is a great amount of well-conceived, well-performed, state-of-the-art chemical research. This is the contribution that we, chemical researchers and professionals, can and should make.

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