

BIOBEDS IN AGRICULTURE: appropriate technology to minimize the risk of contamination from pesticide use

Increasing demand for food creates opportunities for agriculture in the hemisphere, but also gives rise to challenges, such as how to achieve greater productivity while minimizing the health and environmental risks inherent in pesticide use, by employing appropriate technologies that enable effective application of Good Agricultural Practices.

Agricultural production and pesticide use in Latin America and the Caribbean (LAC)

A recent study conducted by ECLAC, FAO and IICA (2017)¹ demonstrates LAC's strong performance in response to the growing demand for agricultural products, and paints a very promising outlook for fruit and vegetable exporting countries, due primarily to the consolidation and increased demand world for these products.

The study also reveals that over a ten year period, a significant group of countries (among them Chile, Colombia, Guyana, Peru, and the Dominican Republic) experienced sustained growth in production volume and in real agricultural income. On the other hand, in more recent years, while net agro-exporting South American countries (like Argentina, Brazil, Bolivia, Paraguay and Uruguay) increased annual production from 1% to 6%, they saw a decline in real income due to the coinciding fall in international grain and oilseed prices. Other countries, (mostly Caribbean: Belize, Bahamas, Barbados,

Dominica, St. Kitts and Nevis) experienced negative growth in production volume and real agricultural income, mainly due to drought, diseases and pests.

However, in several LAC countries, not only has agricultural production increased, but so too has the use of inputs, such as the pesticides required to control pests and to reduce crop losses. Pesticides are substances or mixtures containing chemical or biological ingredients aimed at repelling, destroying or controlling pests or regulating plant growth (WHO and FAO 2015)².

According to available data, during the 2009 – 2014 period, Ecuador, El Salvador, Peru, Uruguay, Bolivia, Brazil, Colombia and Argentina increased pesticide use in agriculture, in tons of active ingredients (figure 1). Additionally, several countries such as Argentina, Belize, Ecuador, Peru, El Salvador, Bolivia, Trinidad and Tobago, Uruguay and Colombia increased the intensity of use of these substances per area of cultivated land (figure 2). It must be pointed out yet again that production volumes grew in most of these countries, with Peru and Colombia experiencing sustained growth.

1 | ECLAC (Economic Commission for Latin America and the Caribbean, Chile); FAO (Food and Agriculture Organization of the United Nations, Italy); IICA (Inter-American Institute for Cooperation on Agriculture, Costa Rica). 2017. The Outlook for Agriculture and Rural Development in the Americas: A Perspective on Latin America and the Caribbean 2017 – 2018 (online) San José, Costa Rica, IICA. Available at <http://agrirural.org/en>.

2 | World Health Organization, Switzerland; FAO (Food and Agriculture Organization of the United Nations, Italy). 2017. International Code of Conduct on Pesticide Management (online). Rome, Italy. Available at: http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Code_ENG_2017updated.pdf.

Good Agricultural Practices to minimize the health and environmental risks of pesticide use

Capacity development to apply Good Agricultural Practices when handling pesticides is particularly important in order to increase productivity in a sustainable manner (Díaz *et al.* 2017)³. The benefits of pesticides for pest control can therefore be exploited, while protecting the environment as well as human and animal health from the harmful effects of these agrochemicals.

The use of pesticides on crops risks exposing consumers to the toxic substances in post-harvest residue. Thus, control and monitoring of maximum residue levels is imperative in order to guarantee safe food consumption. On the other

3 | Díaz, A; Gebler, L; Maia, L; Medina, L; Trelles, S. 2017. Good agricultural practices for more resilient agricultura: guidelines for producers and governments (online) San José, Costa Rica, IICA. Available online at: <http://www.iica.int/en/publications/buenas-prácticas-agricolas-para-una-agricultura-más-resiliente-lineamientos-para>

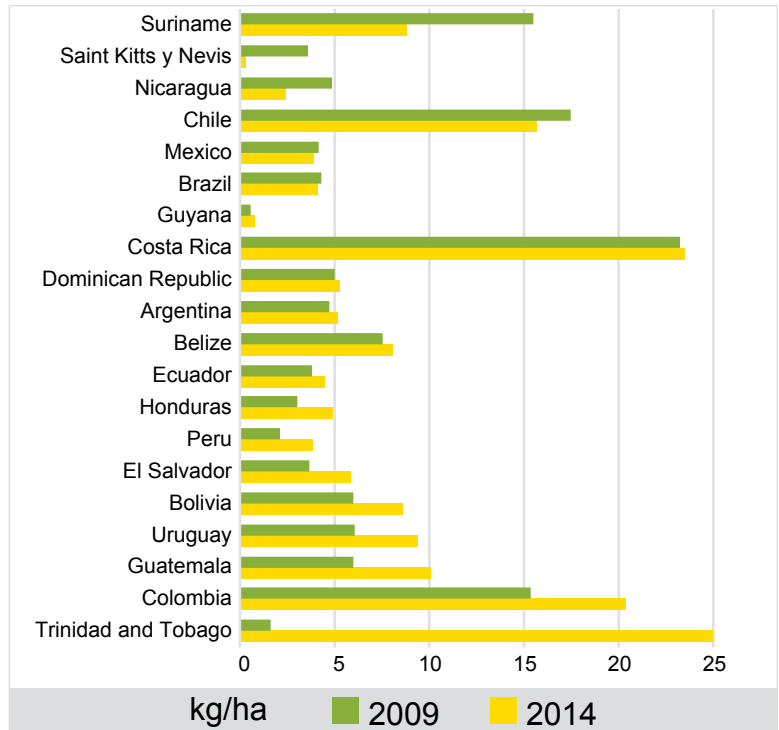


Figure 2 Average pesticide use per area of cultivated land

Note: The data from Costa Rica, Guatemala, Dominican Republic, Nicaragua, Honduras and Guyana represents the most recently available data, as the data for 2014 is not available.

Source: Prepared by author with data from FAOSTAT.

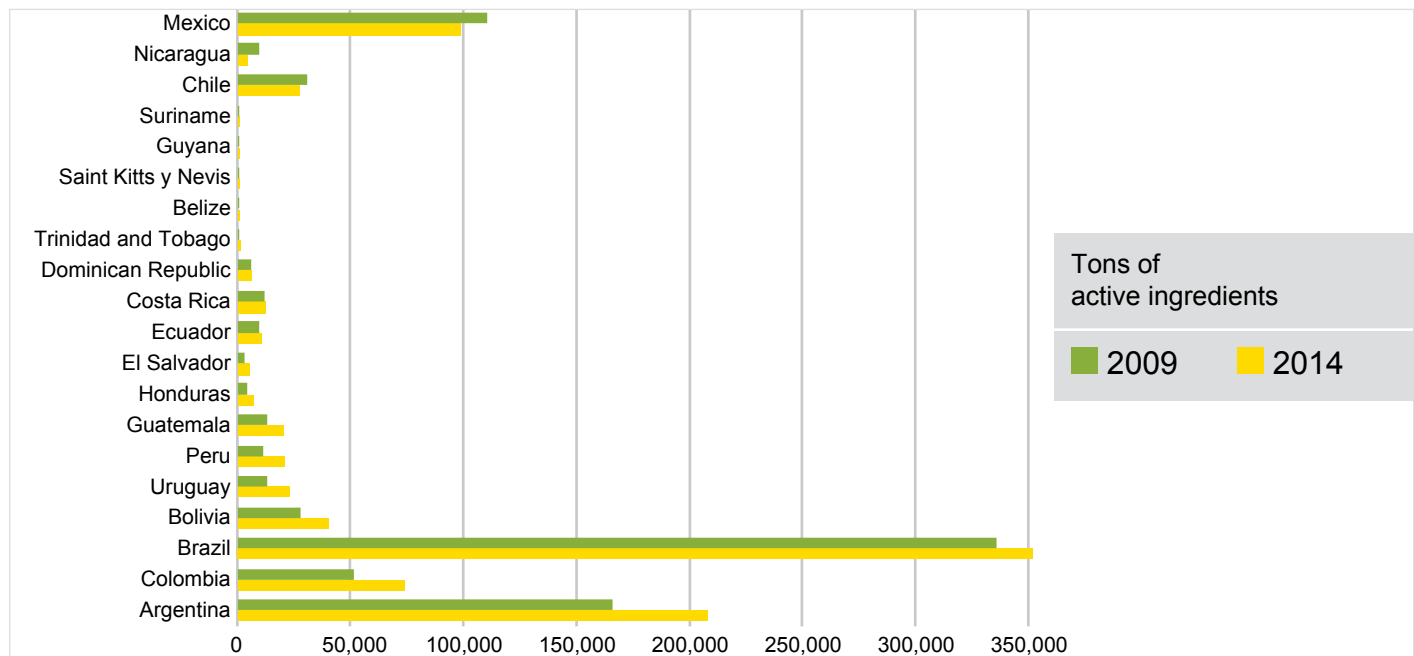


Figure 1 Pesticide use in agriculture

Note: The data from Costa Rica, Guatemala, Dominican Republic, Nicaragua, Honduras and Guyana represents the most recently available data, as the data for 2014 is not available.

Source: Prepared by author with data from FAOSTAT.

hand, an ECLAC, FAO and IICA (2014)⁴ study indicated that pesticide use is one of the primary sources of risk to humans in family farming. It revealed that according to World Health Organization (WHO) estimates, each year three million agricultural workers in developing countries suffer pesticide poisoning, close to 18,000 of whom die as a result of this. The Central America region has one of the highest numbers of reported cases of agrochemical poisoning.

Furthermore, pesticides may contaminate the soil and surface or ground water during application in the field or at point sources (for example, during handling and preparation of mixtures, when washing or filling spray equipment or through accidental spillage), thereby negatively impacting wild flora and fauna and resulting in biodiversity loss.

For these reasons, efforts to manage pesticides should concentrate on mitigating risk, as outlined by the International Code of Conduct on Pesticide Management (WHO and FAO 2015). The code establishes codes of conduct for all entities involved in handling pesticides at all stages, from production to elimination. Its focus is risk reduction, and thus it urges all countries to identify, and where necessary, to desist from using extremely toxic pesticides, placing special emphasis on vulnerable groups and stressing that pesticide use should be kept to a minimum.

It requires producers to employ good practices when handling pesticides at all stages, including when making the decision to apply pesticides and during selection, storage, preparation, application and disposal of containers and residue, in order to reduce the risk of environmental contamination, protect the health of workers and contribute to the safety of the products.

According to Diez et al. (2013)⁵, some studies have shown that point sources are a major cause of environmental

contamination from pesticides. Therefore, if efforts are made to pay special attention to these types of sources when handling pesticides on farms, as a means of employing Good Agricultural Practices, this will have a greater impact on reducing the risk of environmental contamination.

Innovation to reduce the risk of contamination: biobeds

Undoubtedly, significant advances have been made in pesticide handling through the application of Good Agricultural Practices, but primarily for crops destined for the export market that are subject to international market requirements. Producers should be made to implement good practices, regardless of the destination of their products, by employing simple and effective technologies that allow them to reduce the risk of contamination, in particular from point sources. Governments, on the other hand, should introduce stringent processes to implement good practices, including technology transfer, in order to assure the public of adequate production risk management.

Biobed technology is an innovation that agricultural producers can use extensively. Although this technology was developed in Sweden in the 1990s, many LAC farmers still have limited or no knowledge about its application and benefits. Biobeds have been widely studied and improved since their creation, particularly by researchers from different parts of the world, who have driven research through the Ibero-American Biobeds Network, in order to expand the use of this technology in agriculture.

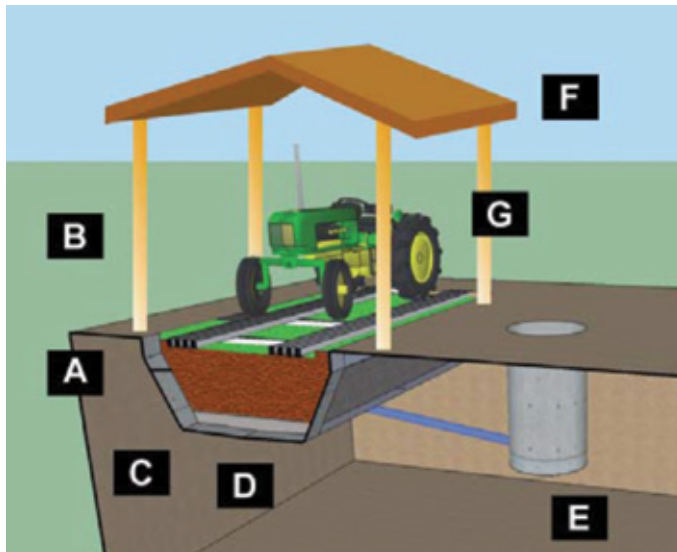
This innovation demonstrates the need for academia and the public and private sectors to work together to encourage application of new technologies by producers and to conduct further research.

The following figures illustrate the structure of biobeds, where spraying equipment can be filled, pesticide residue disposed of, and empty pesticide containers washed. This technology is a simple, low cost and efficient means of degrading pesticides used in agriculture, thus preventing environmental contamination.

4 | ECLAC (Economic Commission for Latin America and the Caribbean, Chile); FAO (Food and Agriculture Organization of the United Nations, Italy); IICA (Inter-American Institute for Cooperation on Agriculture, Costa Rica). 2014. Bulletin: Risk management for family agriculture in LAC (online). San José, Costa Rica, IICA. Available at: <http://repiica.iica.int/docs/b3705e/b3705e.pdf>.

5 | Diez, MC; Palma, G; Altamirano, C; Briceño, G; Calderón, C; Díaz, J; Rubilar, O; Tortella, G. 2013. Manual de construcción y operación de lechos biológicos (Manual for Biobed Construction and Operation) (online) Temuco, Chile, Universidad de la Frontera. Available (in Spanish only) at <https://lechosbiologicos.files.wordpress.com/2013/08/manual.pdf>

Biobeds



Biobed components: biomix (A), grass covering (B), gravel layer (C), waterproofing system (D), recirculation system (E), protective roof (F) and support system for application equipment. (G).

Source: Diez *et al.* 2013.



Biobed installation at EMBRAPA, Southern Rio Grande region, Brazil.

For the use of small producers.

Thus, as part of efforts to increase agricultural resilience through comprehensive risk management, IICA and the Brazilian Agricultural Research Corporation (EMPRAPA) organized a technical forum entitled *“Biobeds in Agriculture: a good practice for protecting health and reducing environmental risk”* (available at <http://goo.gl/UAiyBE>), to promote proper handling of pesticides, thereby reducing the risk of environmental contamination and protecting health.

Finally, considering that LAC is becoming an even more significant participant in the world agrifood market, in the future this region will play an even greater role as a global supplier of food and agricultural raw materials (ECLAC, FAO and IICA 2017). Thus, the primary challenge for LAC agriculture will be to increase agricultural productivity in a sustainable manner through the use of better agricultural practices and to thereby contribute to achieving the goals of the 2030 Agenda for Sustainable Development.

Inter-American Institute for Cooperation on Agriculture Headquarters

P.O. Box 55-2220 San José

Vázquez de Coronado, San Isidro 11101- Costa Rica

Tel.: (506) 2216-0222/ Fax (506) 2216-0233. www.iica.int

For more information, please contact: alejandra.diaz@iica.int • luciano.gebler@embrapa.br