

## Annex B: Relevant information from Costa Rica and other Central American countries

Ethoprophos ranked 18<sup>th</sup> in the volumes of pesticides imported into the Central American region during 2000-2004 and 10<sup>th</sup> in Costa Rican imports during 1977-2006 (3081 tons).

**Human health effects:** Ethoprophos is one of the most common causes of acute or lethal pesticide poisoning incidents. In Costa Rica it was detected in dust inside houses and schools close to banana plantations in Limón province (in 2002 studies). In Panama it has been detected in swab tests and in Honduras ethoprophos residues were found in vegetables (in 1994)(3).

Survey of pesticide use practices by indigenous peoples in high poverty areas in Costa Rica's Atlantic Coast showed that over 60% of households interviewed use pesticides on plantain smallholdings, and of these, 84% applied nematicides. Only 31% reported using some type of protective clothing during application.(4)

IRET research to generate hazard indicators for human health effects in Costa Rica has assessed volumes used in specific crops and known international hazard classification data for acute and chronic effects. In the results, ethoprophos was identified as one of seven active ingredients recommended for use monitoring in relation to extreme or high acute toxicity (5).

**Ecotoxicology: Costa Rican studies:** Ethoprophos was found in drinking water in Sixaola basin in 2006 and in surface waters of River Suerte river basin and the Tortuguero conservation areas during 1993-1998 at concentrations which represent low acute risk but very high chronic risk for aquatic organisms. It was found in 25% of water samples in the conservation areas. Residues were also found in 2001 and 2007 in surface waters in canals, streams and rivers in pineapple cultivation areas in Pocora Siquirrez and the Caribbean zone. In non-target organisms, residues have been documented in fur samples from sloths living around banana and pineapple farms in the Caribbean zone and in aquatic organisms following mass kill incidents.

Recent research on cholinesterase activity testing of the native tropical fish *Astyanax aeneus* as a biomarker for pesticide exposure in Costa Rican banana plantations showed that significant cholinesterase inhibition takes place in brain and muscle tissue of fish exposed to ethoprophos in lab tests (6). IRET has also conducted acute toxicity testing of ethoprophos and chlorpyrifos on *Daphnia* spp. water fleas and on the guapote fish *Parachromis dovii* (7). Chlorpyrifos is more toxic to both groups than ethoprophos. Cholinesterase inhibition in guapote fish was observed in lab tests using contaminated water collected from the field, with reduced enzyme action recorded at levels below the LC50 for both chemicals. The native waterflea *D. ambigua* was found to be more sensitive to both chemicals than the standard test organism *D. magna* and could serve as a useful indicator species for Costa Rican aquatic ecotoxicological risk assessment.

### Footnotes:

3. Information translated from the database in IRET's Pesticide Manual for Central America, via <http://www.plaguicidasdecentroamerica.una.ac.cr/>

4. Polidoro et al. (2008) Pesticide application practices, pest knowledge, and cost-benefits of plantain production in the Bribri-Cabécar Indigenous Territories, Costa Rica. *Environmental Research* 108(1):98-106

5. Bravo et al. (2013) Agriculture pesticides use as a tool for monitoring health hazards. *Uniciencia* 27 351-376 (in Spanish).

6. Mena Torres et al. (2014). Use of cholinesterase activity as a biomarker of pesticide exposure used on Costa Rican banana plantations in the native tropical fish *Astyanax aeneus* (Günther, 1860) *Journal of Environmental Biology* 35(1)35-42

7. Diepens et al. (2014). Effect of pesticides used in banana and pineapple plantations on aquatic ecosystems in Costa Rica. *Journal of Environmental Biology* 35 73-84.