DOSSIER ABRASCO

A warning about the impact of pesticides on Health

Part 1 – Pesticides, Food Safety and Health

Brazilian Association of Collective Health

ABRASCO Inter WGs Group of Dialogues and Convergences

Executive Committee of the Dossier

Rio de Janeiro, World Nutrition - Rio 2012

Catalog record

Carneiro, F F; Pignati, W; Rigotto, R M; Augusto, L G S. Rizollo, A; Muller, N M; Alexandre, V P. Friedrich, K; Mello, M S C. Dossiê ABRASCO –Um alerta sobre os impactos dos agrotóxicos na saúde. ABRASCO, Rio de Janeiro, abril de 2012. 1ª Parte. 98p.

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Cover photo courtesy of Prof. W. Pignati and Luz Tápia

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List of Abbreviations and Acronyms

ACTH – Adrenocorticotrophic hormone

ANDA – National Association for Fertilizer Diffusion

ANVISA – National Health Surveillance Agency

ABRASCO – Brazilian Association of Collective Health

COGERH - Company of Management of Water Resources

CONAMA – National Environmental Council

CONSEA – National Food and Nutritional Safety Council

CNSAN – National Food and Nutritional Safety Conference

CPqAM – Aggeu Magalhães Research Center

DNA – Deoxyribonucleic acid

DDE – dichloro-diphenyl-dichloro-ethane

DDT – dichloro-diphenyl-trichloro-ethane

DF – Federal District

DL50 – 50% lethal dose

DVSAST – Department of Surveillance in Environmental and Work Health

PPE – Personal Protective Equipment

FAO – Food and Agriculture Organization

FIOCRUZ – Oswaldo Cruz Foundation

FSH – Follicle Stimulating Hormone

GC-ECD – Gas Chromatography with electron capture detector

WGs – Work Groups

AI – Active Ingredient

IARC- International Agency for Research on Cancer

IBGE – Brazilian Institute of Geography and Statistics

IBAMA – Brazilian Institute on Environment and Renewable Natural Resources

IgG – Immunoglobulin G

ADI – Acceptable Daily Intake

INCA – Brazilian National Cancer Institute

INCQS – National Institute Quality Control in Health

INDEA-MT – Institute for Agricultural Defense from Mato Grosso

HCH - Hexachlorocyclohexane

GH – Growth Hormone

LH – Luteinizing Hormone

LC-MS – Liquid Chromatography with mass spectrometry

MRL – maximum residue limit

HPT –Hypothalamus, pituitary and thyroid axis

MAPA – Ministry of Agriculture

MMA – Brazilian Ministry of Environment

MS – Ministry of Health

MT – Ministry of Work

NA – non-authorized pesticides

MPS – Brazilian Ministry of Social Welfare

NPK - Nitrogen, Phosphorus, Potassium

PARA – Program for the Analysis of Pesticide Residues in Food

PRL - Prolactin

RDC – Resolution of the Executive Board

SAA – Water Supply System

SAAE – Autonomous Water and Sewage Service

SCE – Sister Chromatid Exchange

SINDAG – National Union of the Agricultural Defense Products Industry

SISCOMEX – Integrated System for International Trade

SISNAMA – National Environmental System

SMS-BG – Bento Gonçalves Municipal Health Secretariat

SISAGUA – System of Information of Surveillance of water quality for human consumption

SVS- Health Surveillance System

UnB – University of Brasília

UPE –University of Pernambuco

UFC – Federal University of Ceará

UFG – Federal University of Goiás

UFMG – Federal University of Minas Gerais

UFMT – Federal University of Mato Grosso

UFPEL – Federal University of Pelotas

UNIRIO – Federal University of Rio de Janeiro State

TSH – Thyroid Stimulating Hormone

T3 - Triiodothyronine

T4 - Thyroxine

Contents

List of Charts and Figures

List of Tables

Foreword

This dossier is a warning of the Brazilian Association of Collective Health – ABRASCO to the Brazilian society and the State. It registers and diffuses the concern of researchers, professors and professionals with the increasing escalate of the use of pesticides in the country and environment and people contamination coming from it, with severe impact on public health.

It expresses, in this way, the ABRASCO commitment with the health of the population, in the context of reprimarization of the economy, expansion of agricultural frontiers for exporting commodities, affirmation of the model of conservative agricultural modernization and the chemical-dependent monoculture. Soybean, sugarcane, cotton and eucalyptus are examples of cultures that have been occupying arable land more and more, to feed the cycle of either agrofuel, cellulose or iron-steel and not people, at the same time they advance over biomes such as the Brazilian cerrado and the Amazon, imposing limits to the peasant way of life and the peasant food production, and consuming about half of the more than a billion liters of pesticides dumped on Earth annually.

The identification of numerous studies that prove the serious and diversified harms to health promoted by these biocidal agents encourages this initiative. Noting the amplitude of the population to which this risk is imposed stresses its relevance: pesticide factory workers, agriculture workers, the ones from public health and other sectors; the population around the factories and the agricultural areas; besides contaminated food consumers – all the population, as it has been evidenced by official data.

The dossier initiative was originated from ABRASCO dialogues with contemporary challenges, rooted in researches, Congresses, Seminars and the Work Groups, especially of Health & Environment, Nutrition, Worker Health and Health Promotion. It is maintained with the intention of contributing to the effective exercise of the right to health and the public policies responsible for this guarantee.

At the time it instigated us to an innovative interdisciplinary work aiming at understanding the diversified and complex aspects of the question of pesticides, the design of this Dossier put us face to face with the enormity of the problem and the task of approaching it properly. By recognizing our limits, we assumed we would not prepare an exhaustive and comprehensive document, in order not to delay the urgent mission of bringing the problem to the public.

The expectation is to positively mobilize the different social actors to the question, proceeding with the task of describing even more completely, characterizing its structural determination, identifying the knowledge gap and, very especially, the gaps in actions devoted to the promotion and protection of health of the population and the planet.

Be Alert!

Luiz Augusto Facchini

ABRASCO President

Why a dossier?

In the last three years Brazil has been occupying the position of the largest pesticide consumer in the world. The impacts on public health are wide because they achieve vast territories and involve different population groups, such as workers in several activity fields, those who live around factories and farms, other than all of us who consume contaminated food products. Such impacts are associated with our current development model, devoted mainly to the production of primary goods for exporting.

In recent events of the Brazilian Association of Collective Health (ABRASCO), such as the I Brazilian Symposium of Environmental Health and the V Brazilian Congress of Human Social Sciences in Health, motions were approved suggesting a better involvement of our entity with these questions, mainly those related to pesticides.

The ABRASCO Health and Environment WG has been producing reflections on this theme and, in their workshop organized in the VIII Brazilian Congress of Epidemiology, it decided to contribute with the initiative of building, together with the ABRASCO WGs, Commissions and associated members, a Dossier on the impacts of pesticides on Health in Brazil.

This Dossier aims at warning, through scientific evidences, the national and international public authorities and the society in general for the development of public policies that can protect and promote human health and that of the ecosystems impacted by the pesticides.

The Dossier will be released during the three most important events related to the theme that will take place in 2012: The World Nutrition Congress in April, the United Nations Conference on Sustainable Development (Rio+20) – the People´s Summit at Rio+20 for Social and Environmental Justice, in June, both in Rio de Janeiro, and the X Brazilian Congress on Collective Health, from ABRASCO, in November, in Porto Alegre.

The construction process

The ABRASCO Directors approved the composition of an executive group composed by members of the Work Groups (WGs) and associated members that manifested their interest in contributing with the design of the Dossier, after a widespread call of the entity.

Chart 01 informs the composition of this executive group.

Chart 01. Appointment of associated members to compose the executive group for the design of this Dossier on the Impacts of Pesticides on Health

WGs and Committees	Names	Institutions
Health and Environment	Fernando Carneiro Raquel Rigotto Lia Giraldo da Silva Augusto	UnB UFC UPE and CPqAM FIOCRUZ
Workers Health	Wanderlei Pignati	UFMT
Nutrition	Anelise Rizollo	UnB
Health Promotion	Veruska Prado Alexandre	UFG
Associate appointed by the Head Office	Neice Muller Faria	SMS-BG/UFPEL

Collaborators:

	Karen Friedrich –	INCQS/FIOCRUZ
	Marcia Sarpa de Campos Mello	INCA UNIRIO

After the group was constituted and the initial debates were carried out, it was decided that the document would be organized in three parts with distinct focus, so as to allow a better appreciation of each one, at the same time it widens the disclosure among scientists and the society:

Part 1 – Pesticides, Food Safety and Health – released in the World Nutrition Congress, in April 2012, Rio de Janeiro.

Part 2 – Pesticides, Health and Sustainability – released in the United Nations Conference on Sustainable Development (Rio+20) – People´s Summit in Rio+20 for Social and Environmental Justice, in June 2012, Rio de Janeiro.

Part 3 – Pesticides, Knowledge and Citizenship – released in the X Brazilian Congress of Collective Health, in November 2012, Porto Alegre.

Part 1 – Pesticides, Food Safety and Health

1.1 Food production and the massive use of pesticides in Brazil

The Brazilian agricultural productive process is more and more dependent on pesticides and chemical fertilizers. The pesticides law (Brazil 1989) and the decree that regulates this law (Brazil 2002) define that these substances are: “the products and the agents of physical, chemical or biological processes, destined to use in the sectors of production, storage and processing of agricultural products, in pastures, in the protection of forests, either native or implanted and other ecosystems and also in urban, water and industrial environments, whose aim is to alter the composition of flora and fauna, besides preserving it from the harmful action of living beings considered nocive”.

According to data of the National Health Surveillance Agency (ANVISA) and the Observatory of Pesticide Industry from UFPR, released during the 2nd Seminar on Pesticide Market and Regulation, which happened in Brasília (DF), in April 2012, while in the last ten years, the world pesticide market increased 93%, the Brazilian market increased 190%. In 2008, Brazil surpassed the United States and assumed the position of largest world pesticide market.

In the last harvest, which involves the second semester of 2010 and the first semester of 2011, the national market of pesticides sales negotiated 936 thousand tons of products, 833 thousand tons produced in the country and 246 thousand tons being imported (ANVISA & UFPR, 2012).

In 2010, the national market negotiated around US$ 7.3 billion and represented 19% of the global pesticide market. In 2011 there was an increase of 16.3% in sales, reaching US$ 8.5 billion, the crops of soybean, corn, cotton and sugarcane representing 80% of the total sales in the sector (SINDAG, 2012). On the other hand, the United States were responsible for 17% of the world market, which was about US$ 51.2 billion (ANVISA & UFPR, 2012).

According to the study, there is a concentration of the pesticide market in determined product categories. Herbicides, for example, represented 45% of the total pesticides commercialized. Fungicides respond for 14% of the national market, the insecticides 12% and the remaining pesticide categories correspond to 29% (ANVISA & UFPR, 2012).

In the harvest of 2011 in Brazil, 71 million hectares of temporary crops were planted (soybean, corn, sugarcane, cotton) and also permanent ones (coffee, citric fruits, fruits, eucalyptus), which corresponds to about 853 million liters (formulated products) of pesticides pulverized on these crops, mainly herbicides, fungicides and insecticides, representing an average use of 12 liters/hectare and average environmental/occupational/food exposure of 4.5 liters of pesticides per inhabitant (IBGE/SIDRA, 2012; SINDAG, 2011).

Chart 02 below, on the Brazilian agricultural production from 2002 to 2011, shows that some produces adopted in the daily lives of a good part of the Brazilians (rice, beans, manioc) keep with the same area planted in the period, while soybean, corn, sorghum and cotton had increased crop area, expanding the production for exporting and/or animal feeding as monoculture and in confined areas, as can be seen in **chart 3**. Besides that, part of the sugarcane that also had increased cultivation area, will be transformed in ethanol and part of the soybean oil in biodiesel, implementing the transformation cycle of food in biofuel.

Chart 02. Brazilian agricultural production from **2002 to 2011, in millions of hectares**

Brazil	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Cotton	0,8	0,7	1,2	1,3	0,9	1,1	1,1	1,2	1,4	1,7
Rice	3,2	3,2	3,8	4,0	3,0	2,9	2,9	2,8	2,9	2,8
Rubber	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,1
Coffee	2,4	2,4	2,4	2,3	2,3	2,3	2,3	2,2	2,1	2,2
Cane	5,2	5,4	5,6	5,8	6,4	7,1	8,2	9,5	10,0	11,0
Beans	4,3	4,4	4,3	4,0	4,2	4,0	4,0	4,0	4,3	3,7
Manioc	1,7	1,6	1,8	1,9	2,0	1,9	2,0	2,1	1,8	1,8
Corn	12,3	13,3	12,9	12,2	13	14	14,7	15,5	13,6	13,6
Soybean	16,4	18,5	21,6	23,4	22,1	20,6	21,1	21,6	22,2	22,7
Sorghum	0,5	0,8	0,9	0,8	0,7	0,7	0,8	1,1	0,8	0,7
Wheat	2,2	2,6	2,8	2,4	1,8	1,9	2,4	2,6	2,4	2,2
Citrus	0,9	1	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9
Others	4,5	4,5	4,7	5,1	5,1	4,9	4,8	4,8	6,4	7,8
Total	**54,5**	**58,5**	**63,0**	**64,3**	**62,6**	**62,3**	**65,3**	**68,8**	**69,0**	**71,1**

Source: IBGE/SIDRA, 2012; MAPA, 2010.

Chart 03. Brazilian livestock production from 2002 to 2011, in millions of animals

Brazil	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Cattle	185,3	195,6	204,5	207,2	205,9	199,8	202,3	204,9	209,5	213,7
Swine	31,9	32,3	33,1	34,1	35,2	35,9	36,8	37,7	39,0	39,7
Poult	703,7	737,5	759,5	812,5	819,9	930	994,3	1063	1028,2	1048,7
Chicken	180,4	183,8	184,8	186,6	191,6	197,6	207,7	218,3	210,8	215,0
Others	39,1	40	41,1	42,6	43,4	42,8	44,4	46	48,9	49,9
Total	**1140,5**	**1189,2**	**1223**	**1282,8**	**1296**	**1406,2**	**1485,5**	**1569,9**	**1536,3**	**1567**

Source: IBGE/SIDRA, 2012; MAPA, 2010.

In **chart 04**, it is possible to see the increasing consumption of pesticides and chemical fertilizers by the Brazilian agriculture, proportional to the increase in monocultures, more and more dependent on chemical substances. The use of pesticides was calculated using data from 2008 to 2010 released by SINDAG (2009, 2011) and for 2002 to 2007 an estimate was done using the average consumption in each culture per hectare based on data released and the annual production informed by IBGE (2012) and projection designed by MAPA (2010). The use of chemical fertilizers calls the attention for soybean (200Kg/ha), corn (100Kg/ha) and cotton (500Kg/ha), calculated through data published by ANDA (2011).

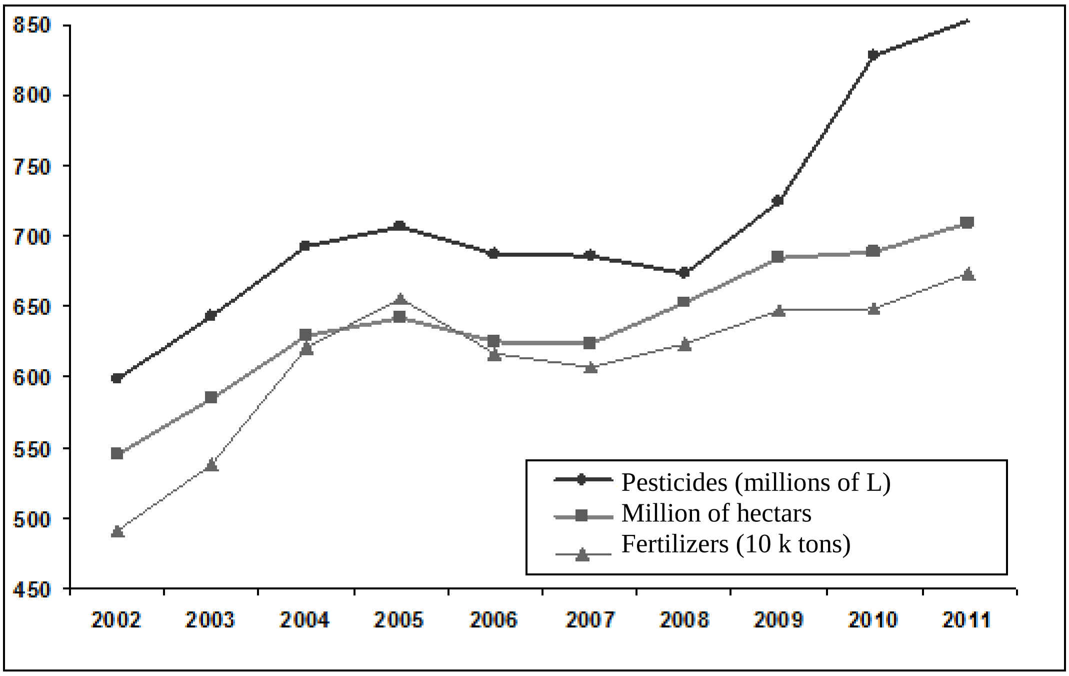
Chart 04. Consumption of pesticides and chemical fertilizers in Brazilian crops, from 2002 to 2011

BRAZIL	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Pesticides (millions of L)	**599,5**	**643,5**	**693,0**	**706,2**	**687,5**	**686,4**	**673,9**	**725,0**	**827,8**	**852,8**
Fertilizers (millions of Kg)	**4910**	**5380**	**6210**	**6550**	**6170**	**6070**	**6240**	**6470**	**6497**	**6743**

Source: SINDAG, 2009 and 2011; ANDA, 2011; IBGE/SIDRA, 2012; MAPA, 2010.

In Figure 01, it is possible to observe that the average pesticide consumption has been increasing in relation to the cultivated area, that meaning, it was 10.5 liters per hectare (l/ha) in 2002 and 12.0 l/ha in 2011. Such an increase is related to several factors, such as the expansion of plantation of transgenic soybean which amplifies the use of glyphosate, the increasing resistance of weeds, fungus and insects, demanding higher consumption of pesticides and/or the increase in diseases in the crops, such as the Asian soybean rust, which increases the use of fungicides. An important stimulus to the consumption comes from the decreased prices and the absurd tax exemption for pesticides, making farmers use more quantity per hectare (Pignati and Machado, 2011). In relation to chemical fertilizers, the average consumption per hectare kept at the same level in the period.

Figure 01. Agricultural production and consumption of pesticides and chemical fertilizers in Brazilian crops, from 2002 to 2011



Source: SINDAG, 2009 and 2011; ANDA, 2011; IBGE/SIDRA, 2012; MAPA, 2010.

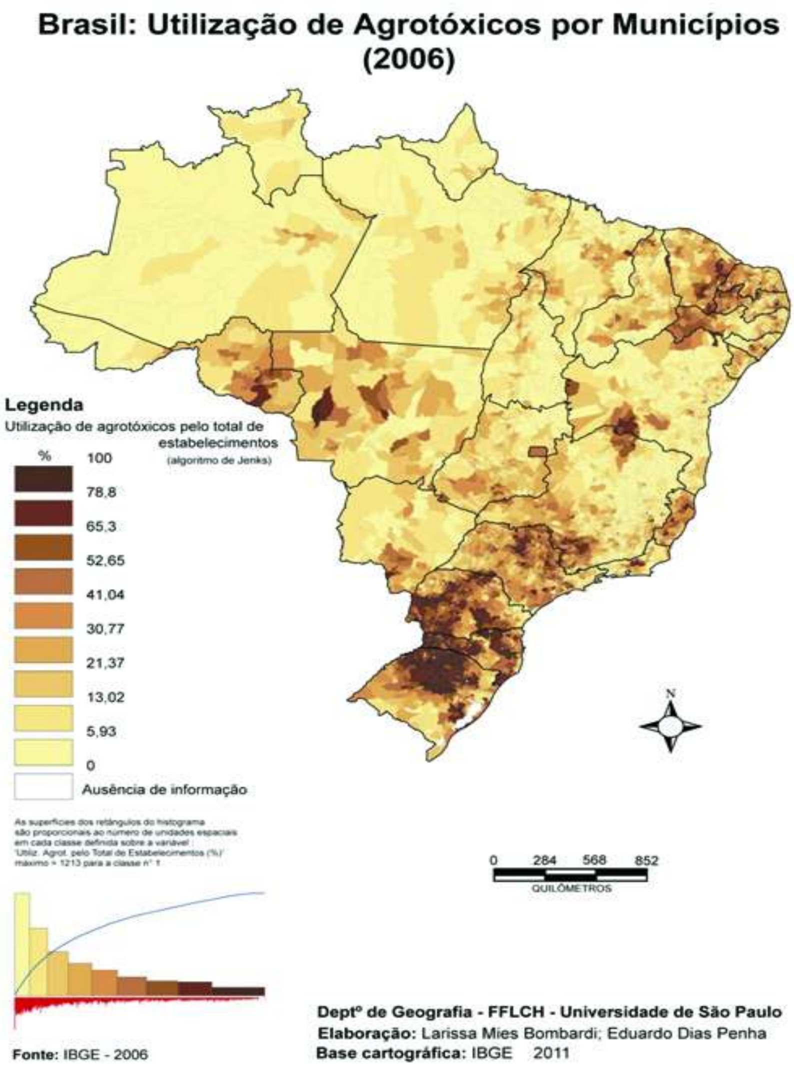
This volume of pesticides was consumed by various types of culture, soybean using 40% of the total volume between herbicides, insecticides, fungicides, acaricides and others (adjuvants, surfactants and regulators). Next comes corn with 15%, sugarcane and cotton with 10%, then citric fruits with 7%, coffee (3%), wheat (3%), rice (3%), beans (2%), pastures (1%), potato (1%), tomato (1%), apple (0.5%), banana (0.2%) and the remaining cultures consumed 3.3% of a total of 852.8 millions of liters of pesticides pulverized on these crops in 2011, according to SINDAG (2009, 2011) and projection from MAPA (2010).

In order to calculate the quantity of pesticides used per culture type, we use the national average from chart 02 (hectares of crop) and chart 04 (pesticide consumption), plus the data informed above on the consumption/culture and paired with the data of consumption/culture/hectare provided by the databank of INDEA-MT (2011) and Moreira et al (2010). These information indicate that the average consumption of pesticides (herbicides, insecticides and fungicides) per hectare of soybean was 12 liters, of corn, 6 liters/ha; of cotton 28l/ha; of sugarcane 4.8l/ha; of citric fruits 23l/ha; of coffee 10l/ha; rice 10l/ha; wheat 10l/ha and beans 5l/ha.

About 434 active ingredients (AI) and 2,400 formulations of pesticides are registered in the Ministry of Health, MAPA and MMA and are allowed in Brazil according to the use criteria and indications established in its Mongraphs. However, of the 50 most commonly used ones in the crops of our country, 22 are prohibited in the European Union. At ANVISA 14 pesticides are in revision process, since 2008: four of those have been prohibited (cyhexatin and trichloform), and the metamidophos will be removed from the market in June 2012 and the endosulfan in June 2013. Fosmet and acephate had its use restricted, besides studies showing this should be banished. Other two have already concluded the public revision process (phorate and parathion-methyl) and the remaining have already had their technical notes revised: lactofen, furan, paraquat, tiran, glyphosate, abamectin (ANVISA, 2008; ANVISA, 2012a; ANVISA 2012b).

Based on data of the Brazilian Agricultural and Livestock Census (IBGE, 2006), Bombardi (2011) indicates the intensity of use of pesticides per city in Brazil (**Figure 02**). It is verified that 27% of the small properties (0-10 hectares) use pesticides, 36% of the properties from 10 to 100 hectares and in the ones larger than 100 hectares, 80% use pesticides.

Figure 02. Pesticide Use per Brazilian City in 2006



It is possible to observe in this map that the greatest concentrations of pesticide use coincide with the regions of greater intensity of monocultures of soybean, corn, sugarcane, citric fruits, cotton and rice. Mato Grosso is the biggest consumer of pesticides, representing 18.9%, followed by São Paulo (14.5%), Paraná (14.3%), Rio Grande do Sul (10.8%), Goiás (8.8%), Minas Gerais (9.0%), Bahia (6.5%), Mato Grosso do Sul (4.7%), Santa Catarina (2.1%). The other states consumed 10.4% of the total of Brazil, according to IBGE (2006), SINDAG (2011) and Theisen (2012).

In relation to vegetables, based on data available in the specialized literature (FAO, 2008), the consumption of fungicides reached a potential area of approximately 800 thousand hectares, against 21 million hectares only in soybean culture. This reveals a concerning situation of concentration in the use of the active ingredient of the fungicide per area o vegetable plantation in Brazil, possibly reaching from eight to 16 times more pesticides per hectare than that used in the culture of soybean, for example. In a simple comparison, it is estimated that the use concentration of fungicide active ingredient in soybean in Brazil, in the year 2008 was 0.5 liters per hectare, very lower than the estimate of four to eight liters per hectare in vegetables, on average. It is possible to verify that about 20% of the commercialization of fungicide active ingredient in Brazil is destined to the use in vegetables. In this way, one can infer that the use of pesticides in vegetables, especially fungicides exposes the consumer in a frequent and dangerous way, also exposing the environment and the workers to chemical contamination due to the use of pesticides (Almeida et al, 2009).

If the current scenario is sufficiently of concern, on the point of view of public health, one has to consider that the perspectives are of an aggravation of the problems in the next years. According to MAPA projections for 2020/2021, the production of commodities for exporting should increase in proportions of 55% for soybean, 56.46% for corn, 45.8% for sugar, and others (**Table 1**). As these are chemical-dependent monocultures, the current tendencies of contamination should be increased and amplified.

Table 1. Brazil – export projections 2010/11 to 2020/2021.

Product	Unit	2010/11	2020/2021	Variation (%)
Cotton Lint	Million ton	0.5	0.8	68.4
Corn	Million ton	9.1	14.3	56.46
Soybean	Million ton	29.3	40.7	39.06
Soybean meal	Million ton	13.9	15.4	10.84
Soybean oil	Million ton	1.4	1.5	3.95
Orange juice	Million ton	2.1	2.7	27.7
Poultry	Million ton	3.9	5.2	33.7
Beef	Million ton	1.8	2.3	29.42
Pork	Million ton	0.6	0.8	31.16
Coffee	Million bags	33.7	42.09*	24.89
Sugar	Million ton	28.4	41.4	45.87
Milk	Million liters	0.2	0.3	50.49
Paper	Million ton	2.1	2.7	26.18
Cellulose	Million ton	8.9	12.5	40.60

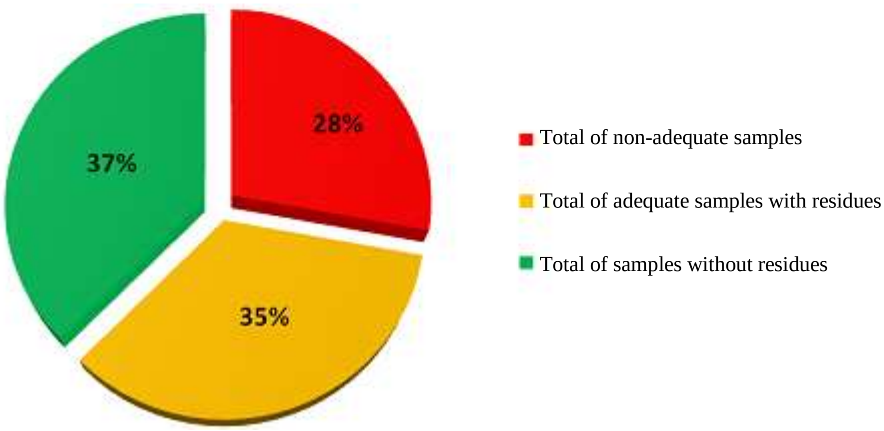
Source: AGE/Map and SGE / Embrapa
* refers to 2019/20

1.2 Scientific evidences related to the risks to human health of exposure to pesticides through food intake

1.2.1 Pesticide residues in food in Brazil

One third of the food consumed daily by the Brazilians is contaminated by pesticides, according to analysis of samples collected in all 26 states of Brazil, performed by the Program for the Analysis of Pesticide Residues in Food (PARA) from ANVISA (2011). **Figure 3** evidences that 63% of the samples analyzed presented pesticide contamination, and 28% present non-authorized active ingredients (NA) for that kind of culture and/or surpassed the maximum residue limits (MRL) considered acceptable. Other 35% presented pesticide contamination, but within these limits. If these numbers already outline a scenery of great concern on the point of view of public health, they might not adequately reflect the dimensions of the problem, either because there is a lot of ignorance and scientific uncertainties built in the definition of these limits, or because the 37% of sample without residue refer to the active ingredients studied, 235 in 2010- which does not allow to confirm the absence of the others (about 400), including glyphosate, largely used (40% of sales) and not studied in PARA.

Figure 03. Distribution of the samples according to the presence or absence of pesticide residues. PARA, 2010.



Source: ANVISA, 2011

It is possible to highlight also that the average level of contamination of the samples of the 26 Brazilian states is distributed by the agricultural cultures the following way: green/red pepper (91.8%), strawberry (63.4%), cucumber (57.4%), carrot (49.6%), pineapple (32.8%), beet (32.6%) and papaya (30.4%), besides other cultures analyzed and registered with pesticide residues, according to chart 05 (**Chart 5**) (ANVISA, 2011).

Chart 05: Number of samples analyzed per culture and improper results. PARA, 2010.

Product	Number of analyzed samples (NS)			NS	> LMR	>LMR and NS			Total Non satisfactory
	(1)		(2)			(3)		(2+3)	
Nº	%		Nº	%	Nº	%		Nº	%
Pineapple	122	20	16,4%	10	8,2%	10	8,2%	40	32,8%
Lettuce	131	68	51,9%	0	0,0%	3	2,3%	71	54,2%
Rice	148	11	7,4%	0	0,0%	0	0,0%	11	7,4%
Potato	145	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Beetroot	144	44	30,6%	2	1,4%	1	0,7%	47	32,6%
Onion	131	4	3,1%	0	0,0%	0	0,0%	4	3,1%
Carrot	141	69	48,9%	0	0,0%	1	0,7%	70	49,6%
Kale	144	35	24,3%	4	2,8%	7	4,9%	46	31,9%
Beans	153	8	5,2%	2	1,3%	0	0,0%	10	6,5%
Orange	148	15	10,1%	3	2,0%	0	0,0%	18	12,2%
Apple	146	8	5,5%	5	3,4%	0	0,0%	13	8,9%
Papaya	148	32	21,6%	10	6,8%	3	2,0%	45	30,4%
Mango	125	05	4,0%	0	0,0%	0	0,0%	5	4,0%
Strawberry	112	58	51,8%	3	2,7%	10	8,9%	71	63,4%
Cucumber	136	76	55,9%	2	1,5%	0	0,0%	78	57,4%
Pepper	146	124	84,9%	0	0,0%	10	6,8%	134	91,8%
Cabbage	127	8	6,3%	0	0,0%	0	0,0%	08	6,3%
Tomato	141	20	14,2%	1	0,7%	2	1,4%	23	16,3%
Total	**2488**	**605**	**24,3%**	**42**	**1,7%**	**47**	**1,9%**	**694**	**27,9%**

Source: ANVISA, 2011

Out of a total of 2488 samples analyzed and presented in item 3 of Chart 5, 605 samples presented active ingredients (AIs) of non-authorized pesticides (NA) for that culture and 47 surpassed the Maximum Residue Levels (MRL) established by the Brazilian Guidelines. Summing up items 2 and 3, we get to 694 non-adequate samples or 27.9% of the total analyzed.

Besides that, 208 samples or 30% of the total analyzed presented active ingredients (AIs) which are in process of toxicological reevaluation by ANVISA (2008) or have sale discontinuity already defined. However, they represent 70% of the total volume of pesticide consumed in our crops, where are included glyphosate, endosulfan, metamidophos, 2.4D, parathion-methyl and acephate. This is confirmed by data of national manufacture, according to reports of pesticide commercialization provided by companies to ANVISA (ANVISA & UFPR, 2012) or imported and registered at the

Integrated System of International Trade (SISCOMEX), where it is possible to verify that the active ingredients in reevaluation keep being imported in large scale by Brazil.

The use of one or more pesticides in cultures for which they are not authorized, mainly the ones under reevaluation or programmed discontinuity due to high toxicity, presents negative consequences to human and environmental health. One of them is the increase in food unsafety for consumers who ingest the specific food contaminated with AIs, because its use, for being absolutely irregular was not considered in the calculation of Acceptable Daily Ingestion (ADI) and this insecurity is aggravated as this pesticide is found in several products consumed in our daily diet. According to ANVISA:

> these are active ingredients with confirmed elevated degree of acute toxicity and that cause neurological, reproductive and hormonal problems and even cancer. Besides being prohibited in several places in the world, such as European Union and the United States, there are pressures from the agricultural sector to maintain these three products (endosulfan, metamidophos and acephate) in Brazil, even after being removed voluntarily in other countries (ANVISA, 2010).

1.2.2 Pesticide residues in food and harms to health

Even though some of the active ingredients can be classified as median or low toxic compounds – based on their acute effects – one cannot forget the chronic effects that can occur months, years or even decades after exposure, manifesting in several diseases such as cancer, congenial malformation, endocrine, neurological and mind disturbances. **Chart 06** introduces the symptoms of acute and chronic intoxication of the main chemical groups of pesticides.

Chart 06. Classification and acute and chronic effects and/or symptoms from pesticides

Classification according to the pest it controls	**Classification according to the chemical group**	**Symptoms of acute poisoning**	**Symptoms of chronic poisoning**
Insecticides	**Organophosphates and carbamates**	Weakness, abdominal cramps, vomiting, muscle spasms and convulsions	delayed neurotoxic effects, chromosomal changes and contact dermatitis
	Organochlorines	Nausea, vomiting, involuntary muscle contractions	Liver damage, cardiac arrhythmias, renal lesions and peripheral neuropathies
	Synthetic Pyrethroids	Irritation of the conjunctiva, sneezing, excitement, convulsions	Allergies, asthma, mucous irritation, hypersensitivity
Fungicides	**Dithiocarbamates**	Dizziness, vomiting, muscle tremors, headache	Respiratory allergies, dermatitis, Parkinson's disease, cancers
	Phentolamides	-	Teratogenesis
Herbicides	**Dinitropherol and pentachlorophenol**	Difficulty breathing, hyperthermia, convulsions	Cancers (PCP-dioxin formation), chloracne
	Phenoxy-acetic	Loss of appetite, nausea, vomiting, muscle twitching	Induction of hepatic enzymes, cancers, Teratogenesis
	Dipyridyl	Nasal bleeding, weakness, fainting, conjunctivitis	Liver damage, contact dermatitis, pulmonary fibrosis

Source: PAHO/WHO, (1996).

The pesticides related below have been found in food analyzed by the Program of Analysis of Pesticide Residues in Food (PARA) from ANVISA, either in levels above maximum allowed limit or in cultures in which they are not authorized.

The pesticides from the pyrethroid group, used in agriculture, in the domestic environment and in public health campaigns as insecticide are associated with several serious effects to health. Cypermethrin (class II) is toxic to rat embryos, including post-implantation loss of fetus and visceral malformation (ASSAYED et al, 2010). Similar effects – neonatal deaths and congenital malformations – were described in human beings who plant cotton (RUPA et al, 1991). The mutagenic and genotoxic potential of cypermethrin was proved in different studies: chromosomal aberrations, micronuclear induction, spermatozoa alterations, dominant lethal mutations, sister chromatid exchange were observed in mice (BHUNYA and PATI, 1988; SHUKLA and TANEJA, 2002; CHAUHAN, AGARWAL and SUNDARARAMAN, 1997). In human lymphocytes treated with cypermethrin, chromosomal aberrations and sister chromatid exchanges were also observed (KOCAMAN and TOPAKTAS, 2009). Besides that, cypermethrin induced tumor promotion in mice (SHUKLA, YADAV and ARORA, 2002) and, when treated orally, testosterone level alterations were observed with consequent decrease in the number of spermatozoa (WANG et al, 2010), deleterious effects on the reproductive system (DAHAMNA et al, 2010), also after exposure in intra-uterine life (WANG et al, 2011) and also in rats exposed orally (ELBETIEHA et al, 2001).

Neurobehavioral disturbances were also observed in different studies (MCDANIEL and MOSER, 1993; SMITH and SODERLUND, 1998; WOLANSKY and HARRILL, 2008).

Epoxiconazole, from the triazole group and toxicological class III, is a pesticide used as a fungicide in several crops and interferes with the production of male and female sex hormones, as described using in vitro cell lines (KJAERSTAD et al, 2010) and in vivo (TAXVIG et al, 2007; MONOD et al, 2004). In birds it also promoted decreased production of spermatozoa and alteration in the morphology of testicles (GROTE et al, 2008). In other studies with rats, exposure to epoxiconazole during pregnancy led to the alteration of the reproductive development and fetal loss (TAXVIG et al, 2007; TAXVIG et al, 2008).

Fenpropathrin (class II) promotes neuromotor alterations (WOLANSKY et al, 2006; WEINER et al, 2009). Permethrin (class III), insecticide, is associated to multiple myeloma in human beings (RUSIECKI et al, 2009) and is classified as a possible carcinogen by the North American Environmental Protection Agency (US – EPA). In rats, this ingredient caused neurobehavioral deficits (ABDEL-RAHMAN et al, 2004). Lambda-cihalothrin (class III), insecticide, is associated with the appearance of neuromotor disturbances (WOLANSKY et al, 2006).

Betacyfluthrin (class III), pesticide, insecticide, induced the formation of micronuclei in human lymphocytes exposed in vitro and chromosomal aberrations in rats (ILA et al, 2008). Other deleterious effects were also observed, such as fetal malformation in mice (SYED et al, 2010), decreased male reproductive function in rats through antagonism of the androgen receptor in vitro (ZHANG et al, 2008) and neurobehavioral alterations (WOLANSKY and HARRILL, 2008; WOLANSKY et al, 2006; CROFTON e REITER, 1988).

The organophosphates, a group of insecticides, cause several effects to human health. To name a few, Chlorpyrifos (class II), an insecticide, showed itself neurotoxic according to a review by Eaton and others (2008) and disrupted the axis of thyroid hormone in mice when exposure occurs in intrauterine life (HAVILAND et al, 2010; DE ANGELIS et al, 2009). Besides that, Chlorpyrifos has also interfered with the male reproductive system in male mice treated orally, induced histopathological changes in testicles and led to a reduced count in sperms and animal fertility (JOSHI, MATHUR and GULATI, 2007).

Dichlorvos (Class II), an insecticide, changed the sperm count and induced histopathological changes of mice, effects which impact animal fertility (PEROBELLI et al, 2010; OKAMURA et al, 2009).

Prophenophos (class II), an insecticide, induces the genetic harm in culture of human lymphocytes (PRABHAVATHY et al, 2006) and chromosomal aberrations in mice that were orally exposed (FAHMY e ABDALLA, 1998). It also changed the male reproductive system of mice treated orally, in which histopathological changes of the testicles and synthesis of hormone deficiency. (MOUSTAFA et al, 2007).

Carbendazim is a benzimidazole (class III), a fungicide, that causes chromosomal aberrations (KIRSCH-VOLDERS et al, 2003; Mccarroll et al, 2002) and endocrine disruption of the male reproductive system of mice (HESS; NAKAI, 2000; NAKAI et al, 2002; GRAY et al, 1989; GRAY et al, 1988). Carbendazim was also responsible for the contamination of Brazilian Orange juice returned by the American government because this pesticide is not registered in that country (FDA, 2012).

Prochloraz, an imidazolyl-carboxamide (class I) is an endocrine disruptor of different axis, reducing production and synthesis of corticosteroid hormones, female and male sex hormones, and causing harm to several physiological functions that are essential to life, such as male fertility, nutrients metabolism and regulation of the immune system (NORIEGA et al., 2005; KJAERSTAD et al, 2010; HIGLEY et al, 2010; OHLSSON et al, 2009; MULLER et al, 2009; LAIER et al., 2006; VINGGAARD et al., 2005). Another severe effect observed was the appearance of fetal malformations in rats (NORIEGA et al, 2005).

Chlorothalonil, isophtalonitrile (Class III pesticide), um a non-genotoxic carcinogenic (RAKITSKY et al, 2000) has also caused the embryotoxicity in rats orally exposed (FARAG et al, 2006; GREENLEE et al, 2004) and effects over the development of rats (DE CASTRO et al, 2000).

Tebuconazole, triazole (Class IV), is a fungicide, and provokes changes in the reproductive function of rats, changing other parameters such as hormone synthesis and causing feminization of males exposed during gestation and lactation (TAXVIG et al, 2007) and neural development (MOSER et al, 2001).

Both α-Endosulfan and β-Endosulfan, Endosulfan isomers, are insecticides and provoke genotoxic effects, because they induce breaks in DNA strands sister chromatid exchange and increased frequency of micronuclei (LU et al., 2000; Bajpayee et al, 2006), besides inhibition of apoptosis (ANTHERIEU, et al, 2007). Endosulfan and its α and β isomers induced the *in vitro* proliferation of human breast cancer cells (MCF-7JE et al, 2005) and may, hence, be involved in the development of breast cancer, probably due to its estrogenic potential (SOTO, CHUNG and SONNENSCHEIN, 1994).

Endosulfan may affect the endocrine system and the organic metabolism, through its activities in the pituitary, thyroid and adrenal glands, breast, ovaries and testicles, provoking effects in the body metabolism, altering the hormone production, such as, growth hormone (GH), prolactin (PRL), adrenocorticotropic hormone (ACTH), thyroid-stimulating hormone (TSH), follicle stimulating hormone (FSH), luteinizing hormone (LH), triiodothyronine (T3), thyroxine (T4), sex hormones (BELDOMENICO et al, 2007) and other endocrine components (ARNOLD et al, 1996). This organochlorine also causes testicular atrophy, parathyroid hyperplasia, weight increase of the pituitary gland and the uterus (ENVIRONMENTAL PROTECTION AGENCY, 2002), reduced female fertility due to endometriosis (FOSTER AND AGARWAL, 2002), reduction in male fertility with impaired sperm production, semen quality and sperm motility in rodents (DALSENTER et al, 1999).

Endosulfan is also immunosuppressive in low doses, causing decreased production of humoral antibodies, of cellular immune response: decreased function of macrophages and decreased IgG serum levels (ATSDR, 2000; ABADIN et al, 2006; AGGARWAL et al, 2008) and induction of death of natural killer T cells, which act in the tumor suppression (KANNAN et al, 2000), so that Endosulfan would act in tumor development.

Methamidophos is an insecticide which presents a genotoxic effect, since it induces the sister chromatid exchange *in vitro* and in rodents (Naturforsch, 1987) e chromosomal aberrations in the formation of micronuclei in Wistar rats. It was positive in the Ames test in Salmonella typhimurium strains TA98 and TA100 (Karabay and Oguz, 2005). Rats orally exposed to methamidophos showed reduced levels of T3, T4 and TSH (SATAR et al, 2005) and ultrastructural alterations of the thyroid (SATAR et al, 2008), acting directly either in the thyroid tissue or in the regulation of PTH axis (SATAR et al, 2008). Besides this important hormonal regulation axis, the methamidophos also alters the ACTH, corticosterone and aldosterone levels (SPASSOVA, WHITE and SINGH, 2000).

The methamidophos, an insecticide that has pronounced immunosuppressive effect, reduces the proliferation of lymphocytes of the thymus and the ability to form antibodies (TIEFENBACH and WICHNER, 1985; TIEFENBACH, HENNINGHAUSEN and WICHNER, 1990).

The trichlorfon, an insecticide, has an effect on reproduction and causes chromosome non-disjunction in different cell types (CUKURCAM et al, 1994; YIN et al, 1998; TIAN, ISHIKAWA and YAMAUCH, 2000; DOHERTY, 1996), also inducing aneuploidy in spermatocytes of rats (SUN, 2000). Similar effects were observed in human epidemiology studies, such as: a) congenital abnormalities and Down syndrome in a village in Hungary, where pregnant women in that region were exposed to trichlorfon through a diet with contaminated fish (CZEIZEL et al. 1993); b) increased incidence of chromosome breaks (BAO et al (1974 apud IPCS, 2000); c) increased incidence of chromatid breaks in lymphocytes (KIRALY et al, 1979 apud IPCS, 2000).

Trichlorfon is also considered an is also considered an endocrine disrupter by the federal agency for the environment in Germany (UMWELTBUNDESAMT, 2001; HONG et al, 2007a), as it provokes several effects in the reproductive system, such as decreased number of sperm, seminal fluid volume, motility and viability of sperm (ENDS, 1999; HANNA et al, 1966; LEBRUN and CERF, 1960) and pregnancy loss, fetal abnormalities, decreased number of live fetuses, pregnancy rates, lack of primary follicles (HALLENBECK and CUNNINGHAM-BURNS, 1985; DOULL, 1962), structural changes in the thyroid and adrenal glands in rats (NICOLAU, 1983).

Several studies show that trichlorfon has high capacity of causing neurotoxic effects such as cholinergic syndrome, delayed polyneuropathy, neuropathic esterase and intermediate syndrome in human beings (VASILESCU and FLORESCU, 1980; JOHNSON, 1981; SHIRAISHI et al, 1983; VASILESCU; ALEXIANU; DAN, 1984; AKIMOV and KOLESNICHENKO, 1985; CSIK, MOTIKA and MAROSI, 1986; ABOU-DONIA and LAPADULA, 1990; DE FREITAS et al, 1990; SHEETS et al, 1997; YASHIMITA et al, 1997; LOTTI e MORETTO, 2005) and also in laboratory animals (BERGE et al., 1986; MEHL et al, 1994; HJELDE et al, 1998; MEHL et al, 2000; FONNUM; LOCK, 2000; MEHL et al, 2007; FLASKOS et al, 1999; HONORATO DE OLIVEIRA et al, 2002; ABDELSALAM, 1999; XIE et al, 1998; SHEETS et al, 1997; Hjelde et al 1998; Varsik et al 2005).

Trichlorfon has also caused immunosuppression in fishes (SIWICKI et al, 1990; DUNIER, SIWICKI and DEMAËL, 1991; CHANG et al, 2006) and in both mice (CASALE et al, 1993) and rabbit cells (DESI, VARGA and FARKAS, 1972; DESI, VARGA and FARKAS, 1980).

Methyl parathion is an insecticide that causes mutation in the Ames test and chromosomal aberrations and breaks of DNA in biological samples of exposed human beings (HERBOLD, 1983; SUNIL KUMAR et. al. 1993; RASHID and MUMMA, 1984). It also provokes chromosomal aberrations and micronuclei induction in rodents (MATHEW et al. 1992; VIJAYARAGHAVA and NAGARAJAN; 1994; GROVER and MAHLI, 1987; NARAYANA et al. 2005; GROVER and MALHI, 1985; VIJAYARAGHAVA and NAGARAJAN, 1994).

Methyl parathion is also an endocrine disrupter, since it induces hyperglycemia and hypoinsulinemia in rats (LUKASZEWICZ-HUSSAIN et al, 1985) and increased activity of aromatase, an enzyme responsible for conversion of androgens into estrogens (LAVILLE et al, 2006) and estrogenic effect *in vitro* (CARVÉDI et al, 1996). In poultry, decreased levels of the LH and testosterone hormones; as well as decreased weight of testicles, seminiferous tubule diameter, number of normal sperm and changes in the germ cells was observed (MAITRA et al, 2008). In rats, alterations in the reproductive function of females with changes in the estrous cycle were observed (BUDREAU et al, 1973; SORTUR & KALIWAL, 1992; KALIWAL and RAO, 1983; KUMAR and UPPAL, 1986; DHONDUP; KALIWAL, 1997; ASMATHBANU and KALIWAL, 1997), count and morphology of sperm (NARAYANA et al, 2006; MATHEW et al, 1992; NARAYANA et al, 2005; SAXENA et al, 1980) affecting the reproductive system of males (MAITRA & MITRA, 2008) and females (RATTNER et al, 1982).

Methyl parathion has also caused reduced proliferation T lymph (PARK; LEE, 1978; LEE et al, 1979), inhibition of chemotaxis of human neutrophils (LEE, 1979), reduced IL-2 (LIMA and VEGA, 2005) and reduced production of antibodies (INSTITÓRIS et al, 1992; CRITTENDEN et al, 1998). Acute poisoning in human beings was observed in several studies (Mccann et al, 2002; RUBIN et al, 2002a; RUBIN et al, 2002b; HILL JR. et al, 2002; WASLEY et al, 2002; REHNER et al, 2000). Neurotoxic effects in laboratory animals corroborate the effects found in human beings (SUN et al, 2003)

Phorate, an insecticide, is immunosuppressor in mice in doses that correspond to the occupational human exposure (MOROWATI, 1998). Phorate provokes chromosomal aberrations *in vivo* in bone marrow cells of mice, such as exchanges between chromatid, breaks and deletion (MALH and GROVER, 1987), clastogenicity, increased recombination (SCE) in cells of human lymphocytes (SOBTI et al, 1982) and induction of micronuclei (GROVER and MALHI, 1985). In human beings, severe cases of poisoning from phorate were registered (MISSION, 2006; THANAL, 2001), even after the adoption of good practices of hygiene and use of PPE (KASHYAP et al, 1984).

In **Chart 07,** we list the problems and/or aggravations to health caused by Active Ingredients of pesticides under reassessment / or already banned with respective use restrictions in several countries throughout the world.

Chart 07. Toxic effects of active ingredients of banned pesticides or under reassessment with respective use restriction in the world

Pesticides	Related Problems	Banned or Restricted
Abamectin	Acute toxicity and suspicion of reproductive toxicity of the active ingredient and its metabolites	European Community - **banned**
Acephate	Neurotoxicity, suspicion of carcinogenicity and reproductive toxicity and the need of reassessing the Acceptable Daily Intake.	European Community - **banned**
Carbofuran	High acute toxicity, suspicion of ED	European Community, United States - **banned**
Cyhexatin	High acute toxicity, suspicion of carcinogenicity for human beings, reproductive toxicity and neurotoxicity	European Community, Japan, United States, Canada - **banned.** Exclusive se for citrus in Brazil , 2010
Endosulfan	High acute toxicity, suspicion of ED and reproductive toxicity.	European Community - **banned,** India (only production authorized) To be banned in Brazil as of July 2013
Phorate	High acute toxicity and neurotoxicity	European Community, United States - **banned**
Phosmet	Neurotoxicity	European Community - banned
Glyphosate	Cases of poisoning, request review of the Acceptable Daily Ingestion (ADI) by the registrant company, need of control of impurities present in the technical product and possible adverse toxicological effects	Revision of Acceptable Daily Ingestion (ADI)
Lactofen	Carcinogenic to human beings	European Community - **banned**
Methamidophos	High acute toxicity and neurotoxicity.	European Community, China, India - **banned**. To be banned in Brazil as of July 2012
Paraquat	High acute toxicity and toxicity	European Community - **banned**
Methyl parathion	Neurotoxicity, suspicion of ED, mutagenicity and carcinogenicity	European Community, China- **banned**
Thiram	Studies demonstrate mutagenicity, reproductive toxicity and suspicion of ED	United States - **banned**
Trichlorfom	Neurotoxicity, carcinogenic potential and reproductive toxicity	European Community- **banned.** Banned in Brazil as of 2010

Source: ANVISA, 2008; ANVISA & UFPR, 2012.

Although briefly gathered here, the evidence already available of pesticide damage to the health alert to the severity of the problem, insofar as they dialogue with the groups of prevalent diseases in morbidity and mortality in the country. Notwithstanding this, such knowledge enable us to see only the tip of the iceberg, because the large majority of studies comes from either in vitro or animal analysis, and those studies analyze exposure to only one active ingredient, which is a rare situation in the daily life of people, who may intake, in only one food, dozens of active ingredients. As shown in the item about the challenges to the knowledge, very little is known about the effects of multiple exposures and to low doses.

1.2.3 Pesticide Contamination of Water Consumed by Man and of Rain

The problem regarding pesticides in water for human consumption in Brazil is not a subject largely researched and with the small number of official sources of accessible information for consultation. According to the Sanitation and Health Atlas by IBGE, issued in 2011:

> Considering that cities which declare pollution of contamination, together, sewage, pesticide residues and improper disposal of garbage were reported as responsible for 72% of pollution incidence in the uptake in surface waters, 54% in deep wells and 60% in shallow wells.

In **Figure 4,** the cities who reported pesticide pollution in water according to IBGE, 2011 are highlighted.

Figure 4. Cities that reported pesticide pollution in water, Brazil, 2011

Poluição por agrotóxicos na captação de água – pollution by pesticide in water catchment; Tipos de captação por município – types of catchment by municipality; Superficial – superficial; Poço profundo – deep well; Poço raso – shallow well; Mais de uma opção – more than one option

Source: IBGE Atlas of Sanitation, 2011.

Data from the Ministry of Health analyzed by Neto (2010) reported that out of the totality of Water Supply Systems (SAA) subscribed in SISAGUA (System of Information of Surveillance of water quality for human consumption) in 2008, 24% reveal information regarding the control of water quality for pesticide parameters and only 0.5% show information regarding the surveillance of water quality for such substances (whose responsibility is of the health sector). […] It can be also highlighted that the data presented refer to the averages of 16 Federal States, since 11 states have not carried out such analysis and / or have not fed that information system with data from 2008 (NETO, 2010, p. 21).

When we analyze retrospectively the ordinances that regulate the parameters of Brazilian drinking water, an increase in the parameters for monitoring can be seen. In the **first** norm of Brazilian drinking water, Ordinance No. 56/MS/1977, the presence of 12 types of pesticides, 10 inorganic chemical products (heavy metals), no organic chemical product (solvents) and no secondary chemical product of house disinfection was allowed. In the **second** norm of Brazilian drinking water, Ordinance No. 36/MS/1990, the presence of 13 types of pesticides, 11 inorganic chemical products (heavy metals), 07 organic chemical products (solvents) and 02 secondary chemicals of house disinfection was allowed. In the **third** norm of Brazilian drinking water, which was recently under revision, Ordinance No. 518/MS/2004, the presence of 22 types of pesticides, 13 inorganic chemical products (heavy metals), 13 organic chemical products (solvents) and 06 secondary chemicals of house disinfection was allowed. In the **fourth** and recent Ordinance of Brazilian drinking water No. 2.914/MS/2011, the presence of 27 types of pesticides, 15 inorganic chemical products (heavy metals), 15 organic chemical products (solvents) and 07 secondary chemicals of house disinfection may be allowed and permission for the use of algicides in water sources and treatment plants.

The increase in the number of chemical substances listed in the Ordinance that defines the criteria of water quality for human consumption reflects, throughout time, the increasing pollution of the industrial productive process that uses heavy metals and solvents; of the agriculture process that uses dozens of pesticides and chemical fertilizers; and of residential pollution that uses many products in house disinfection. This increase may lead to a culture of naturalization and consequent trivialization of contamination, as if this serious form of pollution were legalized. On the other hand, why monitor less than 10% of active ingredients that are officially registered in the country? If it is not be feasible to include in the legislation the monitoring of all of them – around 600, is it reasonable to approve the registration of these biocides, covered under the paradigm of “safe use”? Even those who should also be subject to monitoring, according to the current legislation, they have been poorly overseen, due to the lack of a public network of laboratories for the toxicological analysis in order to meet the massive and increasing use of pesticides in the country, as will be shown later. There is also a fourth problem to take into consideration, which is the establishment of maximum limits of residues acceptable for each of the active ingredients, without establishing a maximum number of ingredients per sample, the sum of their concentrations of their combined effects.

Due to this relative lack of information, this Dossier will use studies about the contamination of drinking water and rain carried out in some Brazilian states which use pesticides massively, such as in the states of Ceará and Mato Grosso..

1.2.4 Pesticide Contamination of Waters in Ceará

The expansion of the agriculture frontiers reached the semi-arid of the Brazilian northeast with the establishment of transnational and national enterprises which, being benefitted from the easy access to land and water, turn themselves especially to irrigated horticulture and shrimp farming for export. The production model of agro-hydrobusiness is featured by the monoculture in large areas, preceded by deforestation and consequent impairment of biodiversity, and the dependence on the intensive use of fertilizers and pesticides to meet productivity goals

In the state of Ceará, the "Epidemiological study of the population from the region named Baixo Jaguaribe who is exposed to environmental contamination in areas where pesticides are used"[1] addressed the levels of Occupational Health and Environmental Health which were impacted by the deterritorialization process induced by agricultural modernization (Rigotto, 2011).

It was verified that, following the example of what has been happening in the country, the pesticide consumption in the state is being intensified: sales increased approximately 100%, from 1,649 tons of commercial products of all classes in 2005, to 3,284 tons in 2009. As for the active ingredients, the increase in the same period is of 963.3%, from 674 tons in 2005 to 6,493 tons in 2009 (MARINHO, 2010).

As for food contamination, the study investigated the contamination of water for human consumption, from the concerns brought by the communities of Chapada do Apodi, in the towns of Limoeiro do Norte and Quixeré. They are both supplied by the Autonomous Service of Water and Sewage – SAAE, which proceed to disinfect the water that runs through the irrigated channels of Jaguaribe-Apodi using chlorine tablets. This water can be contaminated by pesticides from the different ways of spraying and disposal of packages. Among those, the aerial spraying, adopted in the banana crops, and carried out between six to eight times a year, in areas with around 2,950 hectares,

[1] Research supported by the Ministry of Health and CNPq, through Notice MCT-CNPq/MS-SCTIE-DECIT/CT-Saúde – Nº 24/2006.

using fungicides of toxicological classes 1 and 2 (extremely toxic and highly toxic) and environmental class 2 (very dangerous) can be highlighted.

In these channels, in the SAAE water tanks and in deep wells, 24 water samples (in triplicate) were collected and analyzed by the Laboratory of the Interdisciplinary Center for Advanced Environmental Studies of the Federal University of Minas Gerais - UFMG, using the technique of Liquid Chromatography coupled to Mass Spectrometry with Electrospray Ionization (LC-MS). The machine is an ESI-MS Chromatograph, LCQ-FLEET model by Thermo Scientific. The results showed the presence of pesticides in all the samples, and it is important to highlight the presence of at least three up to 10 different active ingredients in each sample, which characterizes the multi-exposure (**Chart 8**).

Chart 08. Results from laboratory analysis for the identification of pesticide residues in Chapada do Apodi, Ceará, 2009

DESCRIPTION OF SITE AND COLLECTION	PESTICIDES IDENTIFIED IN SAMPLES
Tap in the town of Santa Fé	Fosetyl, Procymidone, Tepraloxydim, Flumioxacin, Carbaryl
Water in the town of Santa Maria	Imidacloprid, Procymidone, Tepraloxydim, Carbaryl, Azoxystrobi, Fenitrothion
Water of the channel that runs towards Santa Maria	Carbaryl, Carbofuran, Procymidone, Fenitrothion, Tebuconazole, Clethodin, Endosulfan, Abamectin
Water (sludge) in the pump house 2	Carbofuran, Procymidone, Fenitrothion, Carbaryl, Prochloraz, Deltamethrin, Chlorpyrifos
water in the pump house 4	Carbofuran, Procymidone, Fenitrothion, Carbaryl
water in the pump house 3	Procymidone, Difenoconazole, Carbaryl, Fosetyl, Carbofuran
Water, main reservoir	Carbofuran, Procymidone, Carbaryl, Fenitrothion
water in the pump house 1B	Imidacloprid, Procymidone, Carbaryl, Fenitrothion
water in the pump house 5B	Carbofuran, Procymidone, Carbaryl
water in the pump house 5A	Carbofuran, Procymidone, Tepraloxydim, Carbaryl, Difenoconazole
water in the pump house 6	Carbofuran, Procymidone, Carbaryl, Fenitrothion
water in the pump house 7A	Carbofuran, Procymidone, Fenitrothion, Flumioxazine, Carbaryl, Azoxystrobi
water in the pump house 7B	Carbofuran, Procymidone, Fenitrothion, Carbaryl, Clethodin
water in the pump house 8B	Fenitrothion, Procymidone, Tepraloxydim, Tebuconazole, Carbaryl, Endosulfan, Fosetyl, Carbofuran
water in the pump house 8A	Carbofuran, Procymidone, Fenitrothion, Tepraloxidym, Tebuconazole, Flumioxazine, Carbaryl, Difenoconazole, Cyromazine, Clethodin
Well water, in the region of Tome, property of Valdo de Cassia	Cyromazine, , Carbofuran, Fenitrothion, Procymidone, Fenitrothion, Tepraloxidym, Clethodin, Difenoconazole, Carbaryl, Abamectin, Tebuconazole
Well water, region of Lagoa da Casca, property of Pedro	Carbaryl, Procymidone, Clethodin
Well water for drinking water supply, town of Lagoa da Casca	Fosetyl, Carbaryl, Procymidone, Tebuconazole, Clethodin, Abamectin
Well water for drinking water supply, town of Lagoa da Casca	Carbofuran, Fenitrothion, Procymidone, Tebuconazole, Carbaryl
Well water, region of Carnaúba, property of Nonato de Jesom	Carbaryl, Carbofuran, Procymidone, Fenitrothion, Tepraloxidym, Epoxiconazole, Tebuconazole, Clethodin
Well water, region of Carnaúba, property of Bracache	Glyphosate, Cyromazine, Carbaryl, Carbofuran, Fenitrothion, Procymidone
Well water, region of Carnaúba, property of Dagoberto	Glyphosate, Carbaryl, Carbofuran, Procymidone, Fenitrothion,Tebuconazole
Sample collection of water in the Center of drinking water supply SAAE, region of Cabeça Preta	Glyphosate, Carbaryl, Carbofuran, Procymidone, Epoxiconazole, Endosulfan, Abamectin

Source: MARINHO, 2010

It should be noted that several active ingredients identified in water samples either were or are currently under reassessment by the Sanitation Surveillance National

Agency – ANVISA, of the Ministry of Health, aiming at either banning or restriction, such as Glyphosate, Abamectin**,** Carbofuran, Endosulfan and Phosmet.

Data from the Final Report of the Participative Management Plan of the Aquifers of the Potiguar Watershed, in the portion related to the State of Ceará, published by the Company of Management of Water Resources – COGERH, corroborate the contamination of the ground water of the Jandaíra Aquifer, since out of the ten samples, six revealed the presence of pesticides (**Table 2**).

Table 02. Results from pesticide residual analysis of the Potiguar watershed, 2009

No.	Sample	June/2008		October/2008	
		Pesticide	Conc. (µg/L)	Pesticide	Conc. (µg/L)
1	COG/TAN/0017	-	-	-	-
2	COG/TAN/0001	Cyromazine	0.02	-	-
		Diazinon	0.03	-	
3	COG/ALS/0005	Diazinon	0.01	-	-
4	COG/LIN/0017	-	-	-	-
5	COG/LIN/0030	Diazinon	0.01	-	-
6	COG/QUE/0083	-	-	-	-
7	COG/QUE/0043	Flutriafol	0.01	-	-
8	COG/QUE/0105	-	-	-	-
9	COG/QUE/0137	-	-	-	-
10	COG/QUE/0020	Flutriafol	0.02	Ametrine	0.03
		Propiconazole (I and II)	0.05		

Source: MARINHO 2010

1.2.5 Pesticide contamination of water and rain in Mato Grosso

Mato Grosso is the largest Brazilian producer of soybean, corn, cotton and livestock, and in the year 2010 cultivated 9.6 million hectares among soybean, corn, cotton and sugar cane and sprayed on these crops around 110 million liters of pesticides (IBGE, 2011; INDEA, 2011; Pignati and Machado, 2011). Among the five largest producers, the town of Lucas do Rio Verde is highlighted, with 37 thousand inhabitants, which produced in 2010, approximately 420 thousand hectares among soybean, corn and cotton, and consumed 5.1 million liters of pesticides on these crops (IBGE, 2011 and INDEA, 2011).

Researchers from UFMT analyzed the “enlarged rural accident” or the “pesticide rain” that hit the urban area of Lucas do Rio Verde in the year 2006 when farmers dried out transgenic soybeans to be harvested with paraquat aerial spraying in the outskirts of the town, causing 180 beds of medicinal plants to "burn" in the city center, as well as vegetables in 65 ranches around the town, and triggered an outbreak of acute poisoning in children and elderly (PIGNATI et al., 2007; MACHADO, 2008).

During the years from 2007 to 2010, a research by UFMT and FIOCRUZ was carried out in Lucas Rio Verde, coordinated by Moreira et al. (2010) along with teachers and students from 04 schools, one of which is established downtown, the second in the urban/rural interface, and two rural schools, in which some environmental, human, animal and epidemiological components related to the pesticide risks were assessed.

The data were collected, analyzed and showed:

a) environmental / occupational / food exposure of 136 liters of pesticides per inhabitant during the year 2010 (MOREIRA et al., 2010; IBGE, 2011; INDEA, 2011);

b) pesticide spraying by means of planes and tractors was carried out within 10 meters of drinking water sources, streams, livestock, homes and outskirts of the city, violating the Decree MT/2283/2009 which limits to 300 meters the spraying by tractor or sprayer of those places and violated IN/MAPA/02/2008 which limits to 500 meters pesticide aerial spraying of those locations (MOREIRA et al., 2010);

c) contamination with residues of several types of pesticides in 83% drinking water wells of schools; 56% of rain samples (courtyard of those schools); and 25% of air samples (courtyard of schools) monitored for two years (MOREIRA et al., 2010);

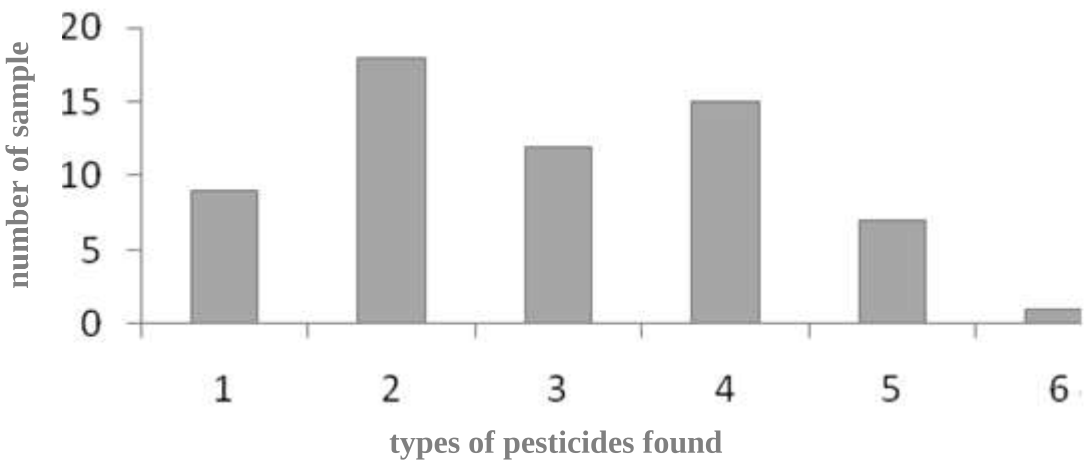
d) presence of residues of several types of pesticides in sediments of two lagoons, similar to those types of residues found in the blood of frogs, and it can be highlighted that the incidence of congenital malformation in these animals was four times higher than in the control lagoon (MOREIRA et al., 2010);

1.2.6 Pesticide Contamination of Breast Milk

Part of the pesticides used has the ability to disperse in the atmosphere, and part may accumulate in the human body, including in human breast milk. When consumed by the newly-born, the contaminated milk may cause harm to health, as these babies are more vulnerable to the exposure to chemical agents present in the environment, due to their physiological features and also because they nearly exclusively are fed with breast milk until they are six months old. Research was carried out by UFMT aiming at determining pesticide residues in breast milk of mothers residing in Lucas do Rio Verde – MT (PALMA, 2011). Breast milk samples were collected from sixty two nursing mothers (n=62), who were breastfeeding from the second to the eighth week after birth, who lived in Lucas do Rio Verde. Ten substances (trifluralin, α-HCH, lindane, aldrin, α-Endosulfan, p,p'- DDE, β-Endosulfan, p,p'-DDT, cypermethrin and deltamethrin) were determined using the multi-residue analysis by ultrasound and solid phase dispersion extraction method, celite®, as well as identification and quantification (internal standardization, heptane) by GC-ECD. Successive extractions were carried out with n-hexane: acetone, (1:1, v/v) and n-hexane: dichloromethane (4:1, v/v). Analyses were carried out in duplicate.

The majority of donators (95 %) were, on average, 26 years old, and 30% were primiparous and lived in the urban area of the town. All the analyzed samples had at least one type of pesticide analyzed, as noted in **Figure 5**. It can be observed that in most of the samples, more than one type of pesticide was detected. The frequency of detection of each pesticide is shown in **Chart 09**.

Figure 5. Types of pesticides detected in samples of breast milk in Lucas do Rio Verde-MT, in 2010



Source: PALMA, 2011

Chart 09. Frequency of detection of pesticides analyzed in the milk of 62 nursing mothers in Lucas do Rio Verde-MT, in 2010

Substance	% detection
p,p'- DDE	100
β-endosulfan	44
Deltamethrin	37
Aldrin	32
α-endosulfan	32
α-HCH	18
p,p'- DDT	13
Trifluralin	11
Lindane	6
Cypermethrin	0

Source: PALMA, 2011

All the breast milk samples out of a sample of sixty two nursing mothers from Lucas do Rio Verde-MT showed at least one type of pesticide analyzed. The results may come from occupational, environmental and food exposure of the agricultural production process that exposed the population to 136 liters of pesticides per inhabitant in the season of 2010. Under that exposure, pregnant women and nursing mothers are included, who may have been contaminated this year or in previous years (PALMA, 2011; PIGNATI and MACHADO, 2007).

1.3 Challenges to Science

1.3.1 Multi-exposure, GM and science limits to protect health

There are many knowledge gaps when it comes to assessing the multi-exposure or the combined exposure to pesticides. The large majority of the risk assessment models can only analyze the exposure to an active substance or formulated product, whilst in the actual world, populations are exposed to a mix of toxic products whose synergic effects (or potentiating effects) are unknown or are not taken into account. Besides mixed exposure, the penetration ways in the body are also varied, and may occur either orally, through inhalation, or dermal, simultaneously. These simultaneous presences are not considered in experimental studies. Although they may modify the toxicokinetics of the pesticide, making it more harmful, the animal experimental model to verify toxicity is designed for only a single route of exposure. It is, therefore, another limitation of the experimental methods and extrapolation of results for situations out of context facing the reality of human exposure.

In order to assess the extent of this challenge, we related a study carried out in the Serra Gaúcha, in Rio Grande do Sul, which addresses this subject.

In Bento Gonçalves/RS, in the year 2006, a descriptive study with 241 fruit farmers was carried out in two phases: in the periods of low and high use of pesticides. Through a standardized questionnaire, data regarding the following were collected: the kind of rural property (productive unit), occupational exposure to pesticides, socio-demographic and health problem related. The harms related to pesticides were characterized according to the reports of poisoning events, referred signs / symptoms and which are noted in situations of acute or chronic poisoning by pesticides, and the result of analysis of plasma cholinesterase. All the productive units used pesticides of several toxicological groups and classes. On average, 12 types of pesticides were used (DP = 4.8), ranging from four to thirty. In the 20 days before the second period, on average, around five different commercial products were used, up to 23. In total, 180 different commercial brands were informed, classified into 37 chemical groups. Out of this total, around 30% were irregular, and three of them (1.7%) were either banned or had their registration cancelled; 32 (17.8%) were not included in the Pesticide Information System – SIA; 17 (9.4%) were not identified in any registration source.

Chart 10 shows the main products used in the properties, and we can highlight the Glyphosate herbicide (98.3%) and the Organophosphates-OF (97.4%) insecticides. The use of arsenic as a formicide was reported in 20% of the properties (FARIA, ROSA, & FACCHINI 2009).

Chart 10. Main products used in the properties in Bento Gonçalves, RS, 2006, (n = 235)

Chemical Group	**n**	**% of properties**
Glyphosate and Glycines (herbicides)	231	98.3%
Organophosphates (insecticides)	229	97.4%
Uses 3 or more types of Organophosphates	136	57.4%
Dicarboximides (fungicides captan, folpet, iprodione, others)	207	88.8%
Dithiocarbamates - total (fungicides)	204	86.8%
Dithiocarbamates associated with other products	61	26.0%
Pyrethrins or pyrethroids (insecticides)	130	55.3%
Fipronil (insecticides, formicides)	120	51.1%
Imidazoles (benzimidazole and other fungicides)	113	48.1%
Copper sulphate and copper compounds (fungicides)	101	43.0%
Inorganic (sulphate sulfur, zinc, lime, tin and others)	87	37.0%
Bipyridyl – paraquat (herbicides)	78	33.2%
Anthraquinone (fungicides)	68	29.0%
Triazoles (tebuconazole and others fungicides)	67	28.5%
Arsenicals (insecticides, formicides)	46	19.6%
Alaninates (fungicides)	32	13.6%
Other agricultural pesticides	30	12.8%
Growth Regulators (Cyanamide and others)	15	6.4%
Mix of chemical groups	14	5.9%
Veterinarian product	14	5.9%
Other formicides	10	4.3%
Urea Compounds	5	2.1%
Antibiotics	3	1.3%
Product for biological control	3	1.3%
Unidentified product	3	1.3%

1- Ignored data was excluded from the calculation
2- Triazines, Dodine (guanidine), Phenoxy acid: 1 property (0,4%)
Source: Faria, NMX; Rosa, JAR; Facchini,LA, 2009.

Augusto et al (2009) published an analysis of this matter, from a critical view on the role of research and science before the impacts of pesticides on health that we show next.

In mid-70s, when we were still experiencing the developmental period under the state of exception (military regime), the government established the National Plan of Pesticide, conditioning the rural credit to the compulsory use of pesticides. This measure was so strong that most of the farmers quickly started to produce only using these poisons as basis. Also, the academy, especially the schools of Agronomy education, hegemonically adopted this model in the curriculum and research. The set up of Embrapa also followed this hegemonic trend. Thus, the economic policy was harmonized with the technical, scientific and professional development policies.

In order to reinforce the dependant chemical model, the academy has always received great incentives to give support to what is unsustainable; a subordinated science, which helps to hide the harms instead of appreciating the evidences of injuries that the real world shows every single day.

The assessment of the impact of pesticides on health arising from the consumption of food produced with the use of pesticides is carried out, fundamentally, based on animal experimental studies, in which the main indicator is the Acceptable Daily Ingestion – ADI.

It starts with the belief that the human body can ingest, inhale or absorb a certain amount daily, without bringing consequences to health. ADI derives from another concept, the no observed adverse effects level (NOAEL). Through a mathematical abstraction, this number is extrapolated to humans. Thus, an acceptable value for human exposure is sought after. These indicators have no scientific sustainability when we want to address health protection. It is in fact a way of reductionist use of toxicology to support the use of poison, creating scientistic alibis to hinder the understanding of the determination of human poisoning, especially chronic, resulting from combined exposure by low and long-term doses.

Once the goal of a pesticide is to kill certain “uncomfortable” beings for agriculture (there is a biocide goal), its essence is, therefore, toxic. The chemical synthesis was largely developed in the first decades of the 20^{th} century, mainly during the two world wars, whose aim was to produce chemical weapons to decimate the enemy (human beings). DDT, synthesized in 1939, triggered this productive chain. When the second world war was over, most of the war industries searched for other applications of their products: the elimination pests of agriculture, livestock and endemic diseases transmitted by vectors. Public Health helped to legitimize the introduction of these toxic products and to hinder their harms on the grounds of "fighting" those vectors.

We know that the use of these products in open systems (the environment) prevents any effective control measure, but this is not taken into account either. There is no way of locking up these contamination sources and protecting the environmental compartments (water, land and air) and the ecosystems. In a diffuse and undetermined way, both consumers and workers are exposed to these poisons, since they are generally present in the food of the population and in the work environment of the farmer.

As we noticed, although the use of mixed pesticides is current in the agricultural practice that was standardized by the market and by the governmental policy, this situation is not addressed in the law regulating the use of pesticides.

There is no induction for research regarding the interaction of these mixed substances and the potentiating of their negative effects to health, to the environment and to the food and nutritional safety.

Another important matter when assessing the harms of the agricultural model that is dependent on pesticides and chemical fertilizers is the fact that the contexts (in which pesticides are used) are not taken into account, which are extremely vulnerable from the social, political, environmental, economic, institutional and scientific perspective. There is a truly global blackmail that imposes its use. On behalf of African, Asian and Latin American famine, the livestock that feeds Europeans and North Americans is fattened, at the expense of social and environmental externalities incurred and paid by these people, without having their problems regarding human rights to access to land and others solved.

As the acute effects on human health are the most visible ones, the information gathered from these malignancies comes from the information data systems on deaths and emergency hospital admissions of people poisoned by these products. Most of the identified cases are due to occupational exposure or suicide attempts. There is no way of directly assessing the exposure effects due to contaminated food and water, which concurs for the hindering of this malignancy. It would be necessary to use predictive models based on the precaution principle to estimate the risk situations to which vulnerable population-based groups are submitted. The health services and personnel have never been and are not duly trained to diagnose the effects related to pesticide exposure, such as neuropathy, immunotoxicity, endocrine changes, the effects on the reproductive system, on the development and growth and production of tumors, among other negative effects. Without these diagnoses, the diseases connected to pesticides are not evidenced, and they are hidden in favor of market interests.

Again evidences on animal experimental studies are sought after. A complex and complicated way to proceed to malignancy evidences, restricted to a few research centers in the world, usually where the mother companies of the industries that produce these active substances are settled. Arbitrary standards, considered as being scientific, guide the systems of registration and authorization for commercial sale in the world.

The health public protection, based on wide safety, is inhibited by the market interests, which, in turn, have an institutional framework that gives the shielding required to maintain the virtuous cycle of its economy, and thus the hindering process is closed, in favor of the use of these technical products supported by the governments.

The policies based on risk assessment generally determine exposures or initial points, which are virtually safe, with which protections measures are sought after. As we have seen, they are not taken, since the evidence model is based on a biological science which is considered enough for a subject that is beyond it (because it is complex and non-linear).

It is known that exposure to low doses of pesticides induces cellular death, cytotoxicity, the reduction of cell viability, effects which are not taken into account. Actually, they should be effect indicators, and could be adjusted in a model of health surveillance that is more precautionary.

When assessing the everyday scales of exposure, it is necessary to link them to “subclinical” signs and symptoms, not only with serious illness or death events. The risk assessment model assumes linear relationship between exposure and effect, but takes acceptable thresholds of exposure that may show only the grosser effects.

The vulnerabilities of the known methods are used for maintaining the risk situation. Below the “acceptable” dose, the effects do not “behave” as predictable. Therefore, risk analysis ways were invented in order to seek for the reason of the cause, but not the relationship among the elements that compose the process of the determination of the phenomenon and where the actual possibilities of transformation are found. The reversal of the burden of proof is not practiced by the companies and regulatory systems that do not require they do it.

The regulatory bodies should not be responsible for proving that a pesticide is toxic; it should be the duty of the companies to demonstrate with equal rigor that they are not harmful to human health or to the environment. When there is doubt or studies are not enough, we should take into account the precautionary principle, which guides the action when an activity, a situation or a product represents threats of harms to human health or to the environment. The precautionary measures must be taken, even when it is not possible to fully establish he scientific proofs of the relationship between cause and effect.

The non-linear relationship between exposure and effects and the non-monotonic relationship between independent and dependent variables are disregarded or treated as “bias”. Notwithstanding this, the interactions observed are state-dependent of multiple constraints, such as: co-exposures, age, gender, nutrition, physiological situations, work conditions, life conditions, etc.

The response systems of the human body may have individual biological amplifiers, and this should be taken into account, because the human being does not behave as if he were an “average man” or a machine.

Multiple events are involved in real life, with multiple value-thresholds which occur simultaneously and which the applied science is not able to measure, let alone to recognize them as possibilities.

As to the Sanitation Surveillance National Agency – ANVISA – the search of an assessment and an information process in order to meet the aspects of public health protection, it is not properly supported by the set of the remaining governmental bodies, which makes its action difficult for the effective control of the harmful effects of the pesticide use.

A number of questions which we do not properly understand force us to make new questions regarding pesticides, and to show how fragile the scientific grounds that support their use for either agriculture or public health purposes are.

How do reactions with all proteins that interact in the body take place, as an integrated system? How does the acetylcholinesterase inhibition can predict other effects which were not assessed in those exposed? Is the dosimetry used for the phenomena concerning the metabolism and the toxicokinetics perfectly adequate? Are the susceptibility differences (age and genetics) taken into account in the assessment of the effects of pesticides? Are all the sources of exposure (food and water consumption, for example) included in the balance of exposure? Are the multiple exposure and all agents that act simultaneously and potentiate the toxicity taken into account?

It can be concluded that assessments carried out in order to infer how harmful pesticides are determine only the apparent linearity sources. In fact, the non-linear relationships among biological phenomena and among social contexts which impose overload of work and exposure to human beings and to ecosystems are not researched nor are the cultural aspects related to nourishment.

The recognized events are those which are only within the disease and death grade, but not within that of life and health. The risk assessment that is practiced is not adapted to the reality to which pesticides are applied.

Before so many knowledge gaps and so many vulnerabilities, we should ask: is it lawful to keep the pesticides in use in agriculture in this context? Why is the reversal of the burden of proof not required from the companies? What is the role of university to develop methods that actually assess the negative impacts of technologies before the realistic conditions of its use in society and the actual conditions of protection, as well as from precautionary concepts?

Another situation that must deserve the attention of public health are the GM plants destined either directly or indirectly to human nourishment, since they do not discard the use of pesticides for their production. The initial discourse that the GM in agriculture would be technology to inhibit the pesticide use fell into disrepute. In the case of the **Roundup Ready**® soybean, which is tolerant to glyphosate, for example, this does not correspond to the truth, as it induces a higher consumption of this herbicide. The glyphosate itself represents around 40% of pesticide consumption in Brazil. The phenomenon of the resistance of unwanted adventitious plants to this poison is also noted, which requires higher amount of its application as well as its association with other pesticides. Besides, in the process of harvesting this GM soybean, other extremely toxic herbicides are used as a desiccants or maturing, such as Paraquat, Diquate and 2.4 D. The increase in herbicide consumption in soybean production is responsible for the prominent position of Brazil as the higher purchaser of pesticides in the world market, enlarging the harmful situation for food safety, for health and for the environment. Besides the issue regarding the associated pesticides, the GM technology in food production deserves a further investigation with the food and health safety perspective, which is not the specific object of this dossier.

1.3.2 Challenges for the public policies of pesticide control and regulation and for the promotion of healthy productive processes

ABRASCO, through its associates in its large congresses, has been called to stand before the issue of pesticides, so as to fulfill its mission of contributing to address the public health problems of the Brazilian society. Despite this Dossier is not a comprehensive document, it is a step towards it, as it has enough scientific evidences to subside the decision-making so that the State can exercise its constitutional role of protecting health and the environment.

This commitment can be seen by means of the approval of two motions, the first in the I Brazilian Symposium of Environmental Health, which took place in Belém do Pará, in December 2009, and the second in the Brazilian Congress of Humanities and Social Sciences in Health, which took place in São Paulo in April 2011(Appendix I) which pointed out that ABRASCO needs to develop:

"*research, technology, design frameworks, provide support to bodies and institutions that are committed to the promotion of health of the Brazilian society, and with the social movements so as to protect health and the environment in the promotion of territories that are pesticide-free, and to boost the agroecology transition towards a healthy and sustainable production and consumption";*

and

"That ABRASCO shall support the Permanent National Campaign against Pesticides and for Health",

CONSEA – National Food and Nutritional Safety Council is a space for the articulation between government and civil society in the proposition of guidelines for actions in the food and nutrition field. In the perspective of building public policies related to the subject of production, supply and consumption, it organized a number of Exposure of Reasons for the President Dilma Rousseff, whose recurrent subject is the fight against pesticide use. The Exposure of Reasons are formal tools of communication between the Council and the President which report the decisions made by the advisors concerning the plenary sessions. In 2012 the subjects that involved pesticides were: GM beans, biodiversity, school nourishment and healthy nourishment, family agriculture and agroecological transitions, and others.

With the qualification of the debate regarding the social control on the subject, which was seen before under the supervision and control perspective, this subject was expanding to the size of banning, suspension of tax subsidies until it reached the status of the design of policies and alternatives to its use with the establishment of mechanisms of production of agrosustainable food – agroecology, and which would dialogue with the familiar and rural agricultural segment.

In this debate, another fundamental aspect was also the agreement on the concept of healthy and proper nourishment, which established again the logic of production and consumption as parts of a whole and with common principles and practices, in which the food sovereign is an aggregate value of the process. CONSEA sheltered a multidisciplinary Work Group that built the concept of healthy and proper nourishment, as: the achievement of a basic human right, ensuring permanent and regular access, socially fairly, to a nourishment practice that is appropriate to the biological and social aspects of an individual, according to the cycle of life and special nourishment needs, based on the local traditional reference. It must meet the principles of variety, balance, moderation, pleasure (taste), gender dimensions and ethnicity, as well as ways of production that are environmentally sustainable, free of physical, chemical and biological contaminants, as well as GM organisms. This concept explains the perspective of nourishment that is free of pesticide and GM foods (BRAZIL, 2007).

The report of the 4th National Conference on Food Security and Nutrition (CNSAN), which occurred in 2011 (Appendix III) was also researched. It is important to mention that the proposals and motion presented are also subsidies for the design of public policies that are largely supported by scientific evidences as pointed out in the items before mentioned in this Dossier.

1.3.3 Risks of the use of toxic residues in the production of micronutrients for agriculture

The use of industrial residues designated as raw material for the manufacture of micronutrients used as agricultural input, their definitions and treatment given to the dangerous residues present in them are being discussed by the Technical Board of

Environmental Quality and Waste Management of the National Environmental Council - CONAMA, which presented a proposal for approval, and it is another toxic-agricultural legitimation.

Besides pesticides, chemical fertilizers and GM plants which harm life in its essence, we are in the eve of this other crime against nature and human health. The resolution that intends to turn legal and regulate the use of industrial residues in the manufacture of micronutrients for agricultural use, establishing Maximum Allowed Limits of toxic contaminants, will irremediably affect the quality of soils.

The permission to use dangerous residues from the foundry and steel industries in the production of micronutrients for agriculture is another concession from the Federal Government to the entrepreneurs' interests and will widen the current situation of contamination and food unsafety, because the possibility of contamination of the soils by Lead, Cadmium, Mercury, Arsenic, Manganese, Organochlorines, Dioxins and Furans, elements that are unnecessary to plants and harmful to human health. What is in the game is the soil, which is fundamental to present and future generations.

It is not possible to establish maximum allowed levels for the human exposure to these contaminants, as many of them produce irreversible effects and are not dose-dependents, once the chronic exposure in low doses can indeed affect health adversely. Industry workers and rural workers will be the first and heavily punished by this resolution.

The proposal of CONAMA resolution is totally unfounded and ungrounded. The position we assume in the level of the Inter WGs Group of Dialogues and Convergences in the First World Congress of Nutrition and Health, Rio de Janeiro, April 2012 é is that these companies of micronutrients and fertilizers for agriculture be forbidden to use industrial residues with pollutants and toxic substances for human health in any concentration (see **Appendix 1**).

1.3.4 Agroecology as a strategy for health promotion

The proposition of a warning text of the debate regarding pesticides is essential to ensure full rights established after huge fights carried out by researchers of collective health that are now called to unveil the invisible "veil" concerning the issue of the pesticide impact on human health.

This action, aimed at making visible the health-disease process arising from the use of various chemical products in the basic source of life, the food, comes from a network of care that covers from the food production to the consumers' table. The latter, whether institutionalized or not, are all vulnerable to either the exposure or the contamination process, as highlighted before. Notwithstanding this, we can here highlight that the debate concerning the differences of exposure in the chain production and food consumption permeates additional issues, including those related to gender, access to several rights, such as education in the fields and technical advice for the sustainable cultivation.

The so-called healthy productive processes comprise the less conflicting and exploratory relationships in the countryside, considering herein the land use and the work relations. Karam (2004) from a study in the metropolitan region of Curitiba, identified the rural worker woman, with origin in the traditional properties, as the one responsible for the beginning of the conversion of the conventional production system into the agroecological system. Among the strategies adopted for this change, the women would invest their work in gardens near their houses, where they would cultivate food for their families and would trade the surplus, showing their partners the feasibility and profitability of a cultivation that is less aggressive to the environment. However, we should highlight that, when adopting the agroecological cultivation as a business, the social role of the woman worker remained the same, mainly limited to the boundaries of the property (KARAM, 2004).

The matter regarding education in the field must be considered as beyond a public school near the rural residencies, but including the insertion of rural life and routine in the educational process. With this respect Saldanha, Antongiovanni & Scarim (2009) identified in the agroecology practice a way for the appreciation of the knowledge of rural men and women, by rescuing the traditional food production and with the use of “green” inputs, besides exploring and re-value the collective and participative work.

In this sense, we can also highlight the role of technical advice that can be simply summarized in a cycle of actions beginning with learning the reality where this farmer is within, learning their life routine, production routine and their determinants and through which new meanings are built, always taking into account that life in the rural environment occurs within a global context that guide questions and conducts of rural workers (MEDINA, 2011). With this regard is the issue regarding the use of pesticides and refers to the subject previously addressed in the discussion concerning the FOR with the identification of banned chemicals for cultures.

The overcome of these challenges are derived from a complex struggle in which we can observe that the technical advice and rural extension in Brazil are going through a deconstruction process and, where it exists, it is strongly based on the logic of technology and unsustainable production against the preservation of biomes. This debate deserves the attention of the health area, because just as in order to consume the health workers advise consumers, rural workers need support based on a dialogical approach, which involves those actors of the make-reflect-make process, considering, in this cycle, the appreciation of knowledges, besides the matters of gender and generation (MEDINA, 2011).

Final Considerations and Proposals

With 70 million Brazilians under food and nutritional unsafely, according to IBGE (2006) and with 90% of them intaking fruits and vegetables below the recommended amount for a **healthy diet**, to overcome this problem it is necessary to change the agrochemical and trading model for an agroecological-based model, with social control and public participation. It is a long-term political decision, in which continuing education and research must also be strengthened towards this perspective.

It is essential that the academy adds to this collective construction in supportive and sustainable ways of social life organization, which entwine the execution of land reform, which strengthen the experiences built by peasants communities regarding alternatives for development, such as the agroecological system, and which promote the active and autonomous participation of peasants in the definition of public policies with productive practices that respect life and the environment.

Considering the scientific evidences organized in this Dossier, ABRASCO proposes tem feasible and urgent concrete actions, aimed to face the pesticide issue as a public health problem:

1. *Prioritize the implementation of a National Agroecology Policy, to the detriment of the public financing of agrobusiness.*

2. *Boost international debates and the facing of concentration and oligopoly of the world food system, intended to establish norms and rules that discipline the acting of transnational corporations and agents in the agrofood chains, so as to fight the successive violations against the human right to adequate feeding, such as the development of barriers against international trading of pesticides;*

3. *Boost and support the production of knowledges and the technical and scientific education concerning the pesticide issue in its various dimensions, facing the theoretical and methodological challenges, facilitating interdisciplinarity, the ecology of knowledges and the articulation between the research groups and with society, and ensure the proper approach to the subject at different levels and disciplines of the educational system.*

4. *Ban pesticides that are already prohibited in other countries and that present severe risks to human health and to the environment, moving forward aiming at a new technological conversion towards an agriculture that is free of pesticides, GM and chemical fertilizers. Prohibit the introduction of new pesticides in any concentration, such as the CONAMA proposal to use industrial residues contaminated by dangerous substances in the production of micronutrients for agriculture.*

5. *Review the drinking water parameters, regulated by Ordinance 2914/2011 of the Ministry of Health, in view of limiting the number of acceptable chemical substances (pesticides, solvents and metals) and reduce the levels of their Maximum Allowed Values as well as they carry out its surveillance throughout the national territory.*

6. *Ban the aerial spraying of pesticides, due to the large and rapid expansion of this kind of application of poisons, especially in areas of monoculture, exposing territories and populations to increasing doses of toxic contaminants causing harm to human health and to ecosystems.*

7. *Suspend ICMS, PIS/PASEP, COFINS and IPI tax exemptions granted to pesticides (respectively, through Convenance nº 100/97, Decree nº 5.195/2004 and Decree 6.006/2006) and the disclosure for society of the costs imposed by the measures of assistance and damage repair.*

8. *Strengthen and widen the policies regarding the purchase of food produced without pesticides school feeding.*

9. *Strengthen and widen the Program of Pesticide Residue Analysis in Food - PARA, by ANVISA, including processed food, water, meats, other fresh foods, based on a laboratorial framework of regional public health throughout the country.*

10. *Consider the following evidences for the registry and reassessment of pesticides: epidemiological; chronic effects, including low concentrations and multiexposure; clinical signs and symptoms in exposed populations, anatomo-pathological and predictive indicators. Establish short terms for the reassessment of registered pesticides.*

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Appendix 1

Document of the ABRASCO's Working Group on Health and Environment

Regarding the Position concerning CONAMA's Resolution on micronutrients

The working group on Health and Environment of the Brazilian Association of Collective Health-ABRASCO, meeting the request of DVSAST / SVS / MS (Ministry o Health) disagrees with CONAMA's intention to approve a resolution establishing the proposition of Maximum Allowed Limits for contaminants in industrial waste of the process of micronutrients manufacturing for agricultural use. To do so it presents these considerations:

Introduction

As a result of the "green revolution" traditional agriculture, which lasted until the 70s, has been subordinated to an economic model of chemical dependent technology base for monoculture expansion, mechanization and intensification of the plunder of natural resources, usage of public goods and tax incentives, private appropriation of profits and socialization of the burden. Today, Brazil has sustained its economy mainly by exporting agricultural and mineral commodities. The assurance of this production in the global market is based on intensive use of pesticides, water, soil, energy, chemical fertilizers and tax incentives.

In addition to the severe contamination of water sources, soils suffer many impacts by the intensive use of chemical fertilizers, pesticides and GMOs, and by irrigation. The main consequences of this model for the soil are: the loss of vital organisms, salinization and erosion, requiring more industrial inputs for correction due to this degradation and more land is required for replacement of dead and irrecoverable soils in the medium term and sometimes in long term.

This perverse cycle of Brazilian agricultural production has made Brazil the largest world market of pesticides since 2009, although it doesn't occupy the same position in the production of food to the population, which is actually guaranteed by family farmers. Besides all these consequences, the social and environmental injustices promoted by this model affect rural populations and cities, public health and ecosystems, which are ignored externalities.

As if it was not enough all this human tragedy, which only benefits the agribusiness agents, the industrial sector concerned wishes to legalize the use of hazardous waste in the production of micronutrients for agriculture. These wastes come from the foundry and steel industries, among other national and multinational companies.

If this industry's interest is served by the Federal Government, represented by the National Environmental Council - CONAMA, the current situation of **food unsafety,** will expand, as has been repeatedly demonstrated by the National Sanitary Surveillance Agency - ANVISA, by its program of analysis of pesticide residues (PARA) and the various health information systems, which, although insufficient, provide important evidence of these nuisances to human health.

What are micronutrients for agriculture and the implications of its production to health?

The chemical-dependent agriculture requires a variety of products for the correction of the deficiencies of the soil. Among these are micro-nutrients, made from mineral existing in nature, such as boron, cobalt, copper, iron, manganese, molybdenum, nickel and zinc.

From the end of the 70s, industries that make micronutrients seek low cost raw materials and for such use illegal hazardous industrial waste, even importing toxic waste matter from other countries, for example, the U.S., Canada, Mexico, Spain, Holland and England, thus circumventing the Basel Convention and the IRS, as demonstrated in several cargo seizures at the port of Santos in the decade of 80. This illegal practice is also breaking Federal environmental legislation in several states.

Since then, lots of tax analysis show that these hazardous industrial waste also have other highly toxic inorganic and organic chemicals that are not used by plant metabolism, such as Arsenic, Mercury, Lead, Cadmium, Chromium, Organochlorines, Dioxins and Furans. The accumulation of these substances in food, soil, sediment and water resources puts ecosystems and public health under high risks of negative impacts related to them.

In Chart 1 there is a synopsis of the major adverse effects on human health, in particular the effects of chronic exposure.

Chart 1: Summary of human health effects associated with hazardous industrial waste that could pollute micronutrients used in agriculture if used in its production.

Toxic substance	**Clinical effects on human health**
Arsenic	It is classified as carcinogen by IARC, International Agency for Research on Cancer, and the exposure to it is associated with skin, lung and liver cancer. Also mentioned as potentially mutagenic.
Cadmium	Cadmium is a highly cumulative element. Chronic Poisoning: renal impairment, causing increased excretion of glucose and amino acids; increase in kidney stones and urinary calcium, promoting bone decalcification and increasing the risk pseudo fractures of the tibia, femur, pelvis and scapula. It produces pulmonary emphysema and peribronchial and perivascular fibrosis.
Lead	Chronic Poisoning: lead poisoning. It interferes with the biosynthesis of intermediate heme, hemoglobin; encephalopathy, irritability, headache, muscle twitching, hallucinations, loss of memory and ability to concentrate, muscle weakness, hyperesthesia, analgesia and anesthesia of the affected area; slow and progressive renal failure, and liver disorders . Exposed laboratory animals developed cancer.
Chrome	Harmful effects to: skin, mucous membranes; broncho-pulmonary, renal and gastrointestinal tissues. It is **carcinogen**.
Manganese	Psychomotor and neurological alterations (muscle hypertonia of the face and legs), muscle pain, impaired speech, micrograph and irregular writing.
Mercury	Acute poisoning: bronchitis and pneumonitis, can lead to death. Chronic intoxication - Hydragyria: affects essential enzyme

	systems, promotes neuropsychiatric disorders and decreased urinary excretion.
Organochlorines	Liver and kidney damage, peripheral neuropathy and cancer.
Dioxins and furans	Chronic Effects: carcinogenesis; negative effects on the immune system; affects the modulation of hormones, receptors and growth factors, with negative impacts on development. Toxicity to the male reproductive system: • Testicular atrophy • Reducing the size of the genitals • Feminized behavioral responses • Decreased sperm count • Abnormal testicular structure • Feminized hormonal responses Toxicity to the female reproductive system: • Decreased fertility • Ovarian dysfunction • Inability to maintain pregnancy • Endometriosis

Source: prepared by Working group Environmental Health from ABRASCO

Micronutrients Industries are generally associated with the fertilizer ones. The mixture of contaminated **micro**nutrients with industrial waste with **macro**nutrients NPK (Nitrogen, Phosphorus, Potassium) is what will take harmful chemicals to agricultural . To illustrate we resort to the analysis of samples of chimney, made in 1984, of all fertilizer industries existing in Cubatão, which showed contamination by lead reaching 50 000 ppm in the final product and that did not come from phosphate rock (raw material) but from the used residue that was contaminated (Conama Electronic Process, 2012).

Need for regulation and the precautionary measures

It is important to standardize the formulation of micronutrients, but it is only possible to consider the use of industrial wastes with the removal of pollutants, and not with the establishment of acceptable levels of contamination. The removal of these pollutants is necessary and feasible and should be done through adoption of appropriate technologies for treatment:

It is also essential that this regulation brings the commitment of supervision on the implementation of these products in the soil. This issue should also be examined in depth by the National Health Council, by the National Security Chemical Council and the National Food Security and Nutrition Council. It is not possible to accept that a legislative resolution on a matter with so important impacts to public health is restricted to only one Council or Ministry. Brazil has experience in developing policies and ministerial resolutions on other issues, where they relate to multiple industries. The Ministry of Health in this regard cannot concur with its vote among many others, which make up CONAMA in an atmosphere of conflict of interest, which ignore aspects of public health.

The use of industrial waste reported as raw material for the manufacture of suppliers of micronutrients used as an agricultural input and the definitions and treatment to be given to hazardous waste are under discussion by the Technical Board of Environmental Quality and Waste Management of CONAMA, which submitted a proposal for approval. And it is about it that the Working Group Health and Environment of ABRASCO stands, since the basic issues under discussion are fundamental to public health. The Working Group Health and Environment from Abrasco is consistent with the manifestation of the Public Prosecution Office of São Paulo State which states that none of SISNAMA's agencies may establish rules that "involves the deterioration of soil quality through the introduction of pollutants." It is not because the illegal introduction of pollutants in soil is common and there is insufficient surveillance action that we must accept its legalization. So we have a number of difficulties arising from institutional vulnerabilities, from the limits of the available methods for ensuring compliance to non-pollution and detection of negative effects on human health (MP SP, 2011).

If we do not have a diagnosis of our soils in relation to metals, it is not possible to develop a model that sets parameters of acceptable levels of pollutants such as lead, cadmium, chromium, arsenic in industrial waste to be used in the production of micronutrients.

If the clandestine and illegal use of such hazardous wastes in the Brazilian agricultural practice is old and done without environmental control of soils and if synergy with other substances, such pesticides, is unknown, the question is: what quality control and environmental monitoring have IBAMA, ANVISA, MS and MAP effectively got? Are there sufficient reliable and representative data performed in Brazil on the behavior of these pollutants and their effects on plants and soil organisms? Is there a geochemical mapping of soils in Brazil? What is the quality standard for soils in Brazil, taking into account its diversity? Who will be exposed? How will the health surveillance of the exposed be made?

It is known that Brazilian soils, besides their diversity, have many different situations and modes of use. They are not homogeneous, have a wide variety of profiles, which imply the difference in behavior of pollutants. All this becomes even more confusing when the Ministry of Agriculture, Livestock and Supply (MAPA) without assessment and environmental standards, admits a parameter from a normative statement of an acceptable value for various pollutants (lead, cadmium, arsenic) in the final product of fertilizers and micronutrients.

Instead of discussing the establishment of acceptable levels of addition of hazardous waste in the production of micronutrients for agriculture, it would be better and more feasible to try to remove the pollutants from industrial wastes to perform recycling with due safety, since there are technologies for this. Also the management issue should be an important point of discussion for a CONAMA resolution on this topic.

What is at stake is the soil, which is critical for present and future generations. The quality standards for air, water and soil are distinct, since they have different dynamics. For example, heavy metals deposited in the soil will be cumulative, will enter plants and move to other bodies, and will be bio-magnified bio-accumulated in the food chain, and still go to other soils and groundwater. Therefore, this accumulation has to be taken into consideration and it is not being considered.

Beyond the issues of food security, we must consider the health problems of workers in existing production processes and labor involved in manufacture and use of micronutrients. It is not possible to establish maximum limits for human exposure to these contaminants, since many of them produce effects that are not dose-dependent, and besides, chronic exposure to low doses can affect health. Industrial workers and rural areas will be the first and most intensely harmed. Since these are chronically exposed to dangerous products, which are cumulative and whose toxicity to most is not dependent on the concentration and exposure time, which may cause serious and irreversible damage to health even when chronic exposure is to low concentrations.

A number of difficulties need to be faced, and some are listed below:

1- The technologies in use by micronutrients and fertilizers industries do not guarantee the removal of contaminants. Despite the existence of other more efficient technologies (use of ion exchange resins, processes by electrolysis or even subsequent calcination processes), these companies claim economic infeasibility, obviously preferring to use the waste as raw material, thus contradicting the principles of precaution and prevention in the Federal Constitution (MP SP, 2011).

2- The entire chain of production and application of micronutrients have to be subjected to extremely rigorous and continuous management control, and in harmony with the actions of regulation and supervision of all bodies. The question is, what is the capacity of oversight agencies with regard to the control management of these sources, covering all of the above considered?

3- if the micronutrient supply chain is allowed to use industrial wastes containing contaminants that are not of interest for plants, should be reclassified in regard to its risk condition and its work activities should also undergo reclassification concerning the maximum unsanitary condition for the workers involved. All this must be considered before publication of the resolution. On can ask, how the Ministry of Technology, the Ministry of Health, and the Social Security and Welfare Ministry are positioned on this issue?

4- Waste that comes from abroad (imported as micronutrients) is even more difficult to control. We are not able to know whether it was or not diluted before being exported to here, further extending the existing vulnerabilities in the face of these hazardous wastes, which are not to be disregarded. They are highly toxic products entering the food chain and pollute various environmental compartments and directly expose workers in factories and farmers (Electronic Process CONAMA, 2012).

5- In the draft resolution which is to be approved by CONAMA waste imports were not contemplated, when opposing the restrictions observed by the Basel Convention and the serious environmental risks to human health.

6- Having in mind a considerable ignorance of the conditions of its generation, of the management conditions of pollution sources by which this waste was generated, of the procedures used in the treatment of this waste (which may involve the process of dilution and mixing with other waste) and the procedures used in laboratories, in terms of testing required for proper characterization and classification of this waste (Electronic Process CONAMA 2012), the resolution must provide safeguards to protect the health and environmental facing the institutional, territorial, demographic and toxicological vulnerabilities scenarios that are related to their use of industrial waste in the production of micronutrients.

7- The resolution under discussion does not support or attest to the feasibility of effective control and oversight of the proposed rules.

8- There is the need to involve the various sectors sympathetic to the issue and this resolution cannot be produced disregarding the possible negative impacts to human health, either by environmental, plants and food pollution or by unhealthy conditions at work.

We conclude that there is total rejection and lack of sustainability in the CONAMA draft resolution which seeks to establish a Maximum Acceptable Limit to known toxic substances in the composition of industrial waste.

Thus in regard to the Federal Constitution and the Law of National Policy on Environment itself that states that the government and the community promote the maintenance and improvement of environmental quality and healthy quality of life for present and future generations as well as the Basel Convention, the position of the Working Group Health and Environment from ABRASCO is that fertilizers and micronutrient companies for agricultural use should be forbidden of using industrial waste and toxic pollutants to human health at any concentration. Our position is contrary to regulation of the use of industrial waste in the production of fertilizers and micronutrients. Our position is contrary to the accepted limits of concentration of products hazardous to health in the production of plants and vegetables for direct or indirect human consumption.

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Parecer do Ministério Público do Estado de São Paulo [download] , Upload em: 25-01-2012

March 2012
Health and Environment WG of Abrasco

Appendix 2

ABRASCO motions related to pesticides

I BRAZILIAN SYMPOSIUM ON ENVIRONMENTAL HEALTH - ABRASCO

MOTION AGAINST THE USE OF PESTICIDES AND FOR THE LIFE

Considering that:

i. Since 2008 Brazil is the largest consumer of pesticides in the world;

ii. Brazil is the largest consumer of pesticides already banned in other countries;

iii. The commercial release of these pesticides results in contamination of ecosystems and water matrices, soils and air, producing serious health problems in rural and urban areas;

iv. Studies show that the level and extent of use of pesticides in Brazil is compromising the quality of food and water for human consumption;

v. The practice of aerial spraying of biocides contaminates large areas beyond the areas of application, polluting and impacting the biodiversity of the environment, including rainwater;

vi. The agribusiness congressional caucus and the transnational corporations, responsible for agribusiness and the induction and expansion of the technology package GM-pesticides-fertilizers are constantly pressuring regulators in order to relax the rules, such as the revision of Decree n.518 of the Ministry Health, extending the permission to use pesticides;

vii. That Via Campesina is joining social organizations, academia and research institutions, to promote the Permanent Campaign Against Pesticides and for Life which will be launched on April 7, 2011 - World Health Day.

2. In that sense, researchers, professionals and other environmental health activists, present at this symposium, reaffirm the commitment and responsibility to develop researches, technology, train staff, provide support to organizations and institutions committed to promoting health in Brazilian society; and to social movements in order to protect health and the environment in the promotion of territories free of pesticides and promote agro-ecological transition to healthy and sustainable production and consumption;

3. ABRASCO shall support the Permanent Campaign Against Pesticides and for Life, which already has support from other scientific societies as Latin American Association of Rural Sociology.

Belém do Pará, December 10, 2010

V Brazilian Congress of Humanities and Social Sciences in Health - ABRASCO

MOTION AGAINST THE USE OF PESTICIDES AND FOR THE LIFE *

Brazil is the largest consumer of pesticides in the world, and most of these products have been banned by other countries. The commercial release of these pesticides results in contamination of ecosystems and water matrices, soils and air, producing serious health problems in rural and urban areas; National bodies like the National Council of Food and Nutritional Security is warning the presidency on this issue. There is a pressing need for more control by the Brazilian State, both for the registration of pesticides and the products that are not allowed in the country.

Studies in the field of collective health show that the level and extent of use of pesticides in Brazil is compromising the quality of food and water for human consumption; In this context it is worth noting that the right to suitable food and nutrition, according to the constitutional amendment 64/2010, is being violated. Practices of aerial spraying of biocides contaminate large areas beyond the areas of application, polluting and impacting the biodiversity of the environment, including rainwater.

A recent and emblematic case of the role of public health to demonstrate these impacts was the study on breast milk contamination with pesticides in Mato Grosso. Researchers Wanderlei Pignati and Danielly Cristina Palma, from the Collective Health Institute of Federal University of Mato Grosso, conducted a major study, with an impact on national media. Unfortunately, these health workers have come under pressures of all kinds related to the seriousness of its findings. This points out to a need for reflection within ABRASCO aimed at establishing mechanisms that ensure protection to scientists who are being threatened by groups of commercial interests, in this case, the agribusiness.

The agribusiness congressional caucus and the transnational corporations, responsible for agribusiness and the induction and expansion of the technology package

GM-pesticides-fertilizers are also constantly pressuring regulators in order to relax legislation.

Via Campesina is joining social organizations, academia and research institutions to promote the Permanent Campaign Against Pesticides and for Life which will be launched on April 7, 2011 - World Health Day. ABRASCO was called to join this campaign, as the motion passed at the First Brazilian Symposium on Environmental Health, held in Belem / PA, in December 2010.

Finally, ABRASCO, meeting in its V Congress of Social Sciences and Humanities in Health, is alerting the public and public authorities to the need for emergency measures:

1. *Ban the aerial spraying of pesticides, taking into account the large and rapid expansion of this form of application of poisons, especially in areas of monoculture, exposing larger territories and populations to the contamination with toxic substances. These operations, of questionable and improbable control of accidental and technical drift, have been performed because of weak and poorly enforced legislation, which violates the constitutional right to healthy environment, and have resulted in serious impacts on human health and ecosystems in general, including the production of rain contaminated with pesticides and the contamination of aquifers.*

2. *Suspend the exemption of ICMS, PIS / PASEP, COFINS and IPI granted to pesticides (respectively, through the Convention No. 100/97, Decree 5.195/2004 and Decree 6.006/2006), in view of its character of stimulation of the use of products designed to be toxic biocides, which certainly reflects the placement of Brazil as the world's largest consumer of pesticides in the last three years, and the externalization of costs to society imposed by the assistance and damage repairing measures, and recovery of environmental compartments and degraded contaminated.*

3. *Develop and implement a set of public policies that allow the overcoming of the system of agribusiness and the transition to the system of Agro-ecology, including with regard to funding, reversing and rescuing the huge social and environmental debt induced by policies that, since the 1970s, impose the financing and purchase of pesticides. Such policies shall be constructed in a participatory context, from the accumulated knowledge on the diverse ongoing experiences in peasant family farming*

in Brazil and its actors. With environmental and food contamination mainly promoted by the use of pesticides in Brazil, it is the duty of the state operate urgently effective public policies to enforce the collective right to a responsible farming and committed with the health of the population. And not just with the goals of easy money and irresponsible in social and environmental terms.

Appendix 3

Motions and proposals of the 4th National Conference on Food Security and Nutrition (CNSAN) related to pesticides

4th National Conference on Food and Nutrition Safety

Motion against the use of pesticides and in defense of life

The delegates(s) of the 4th National Conference on Food Security, held in Salvador, between 7 and 10 November 2011, report, through this motion, the damage to health and the environment caused by pesticides. Brazil is the largest consumer of pesticides in the world, and most of these products have been banned by other countries. The commercial release of these pesticides results in contamination of ecosystems, water and atmospheric matrices, producing serious health problems in rural and urban areas; Studies in the field of collective health show that the level and extent of use of pesticides in Brazil is compromising the quality of food and water for human consumption; In this context it is worth noting that the human right to suitable food and nutrition, according to the constitutional amendment 64/2010, is being violated. Practices of aerial spraying of biocides contaminate large areas beyond the areas of application, polluting and impacting the biodiversity of the environment, including rainwater. The congressional agribusiness caucus and the 98 transnational corporations are responsible for agribusiness and the induction and expansion of the technology package (pesticides, GMOs and fertilizers), making constant pressure on the regulators in order to relax the rules and evade surveillance. In this sense, we adhere to the "Permanent Campaign against Pesticides and for Life", released in April 2011 by Via Campesina, together with organizations, academia, research institutions and social movements, and ask for crackdown by the government and civil society , in order to enable:

1. The punishment of the killers and masterminds in the murderer of the environmentalist and community leader Zé Maria do Tomé, who gave his life fighting aerial spraying of pesticides in the Chapada do Apodi (state of Ceará);

2. The immediate withdrawal of the exemption from taxes on production and marketing of pesticides and the determining maximum tax, as with cigarettes and alcohol, and that the proceeds of this tax are earmarked for financing the Health System and public policies strengthening agro-ecology;

3. The ban on aerial spraying of pesticides throughout the Brazilian territory;

4. The ban on advertising of pesticides in the media;

5. Access to information through labeling that report the presence of

pesticides in food;

6. The prohibition, in Brazil, of pesticides already banned in other countries;

7. The immediate ban on the manufacture, importation and marketing of all products being reassessed by ANVISA and the immediate compliance of the determination of ANVISA (RDC 10/2008 and 01/2011), which bans the use of methamidophos poison.

Proposals approved at the 4th CNSAN (2011) related to pesticides

It is essential to structure a policy to progressively reduce the use of pesticides and immediately ban the use of those who have been banned in other countries and that present serious risks to human health and the environment, with the termination of tax subsidies.

Progressive replacement of the use of pesticides by agroecological practices, providing technical training, with an immediate ban of pesticides that were banned in other countries, (...) and the end of tax subsidies, besides the adoption of efficient mechanisms of control and monitoring;

Regulation of Acceptable Daily Intake of Pesticides - IDA, taking into accounts, in its calculation, the dietary risk to vulnerable populations such as children and the elderly, not just the adult with average body weight of 60 kg;

Prioritize the acquisition of food produced without pesticides for school meals, through the implementation of specific policies.

Boosting international discussions on concentration and oligopoly on global food system, in order to establish rules and regulations governing the activities of transnational corporations and the major players present in the agro-food chains, in order to combat the repeated violations of the human right to proper food, such as the creation of barriers against international trade in pesticides;

Implement a policy of progressive reduction of pesticide use, and any government policy that encourages their use should be abolished or restructured, and effective and transparent mechanisms should be created to ensure control, monitoring and supervision of production, import, export, marketing and use of pesticides in Brazilian agriculture, through:

a. Immediate ban on use of pesticides that were banned in other countries and that have serious risks to human health and the environment and limit the ground spraying near homes, schools, rivers and springs;

b. Fostering research, production and use of products and processes of agroecological base in the phyto and animal health control;

c. Suspension of tax incentives for industries that produce and sell pesticides, with overtaxation to the activity.

Enlarge processes of monitoring and controlling water quality, as provided in MS Ordinance No. 518/04, to identify contamination by pesticides and heavy metals in the water distributed to the population. In cases of contamination, it should be ensured the effective implementation of sanctions and punishments and immediate correction of the violation. It is necessary to structure a system of reporting and monitoring on water quality, ensuring the participation of civil society organizations to provide better conditions for monitoring and social control. Ensure in urban or peri-urban areas that the municipal government or companies licensed by the polluters of water of the towns are also made responsible with the intensification of surveillance and immediate effective punishment.