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Pesticide export to institutionally vulnerable countries, who is responsible? - An assessment of the practices and strategies of a Danish company in Brazil

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Abstract

In this paper we argue that existing institutional systems for controlling global production chains of hazardous products have mainly focused on suppliers' conduct, production management and trade, but not given enough attention to the use of such products, especially in Institutionally Vulnerable Countries (IVCs). The paper is based on a variety of concepts which were brought together from diverse knowledge areas: vulnerability (risk theory), double standards and pollution havens (economy and international trade), actor network theory (sociology of technology), Corporate Social Responsibility and Supply Chain Management (corporate strategy).

The paper is based on a literature survey of existing public and voluntary regulatory schemes and a case study of the social and environmental strategies and practices of Cheminova, a Danish pesticide producer and wholesaler, in Brazil. The analyses show a company that gradually has been forced to adapt practices developed in industrialised countries to institutional and social vulnerable contexts like Brazil. The analysis suggests the company is not fully aware of the environmental and social conditions of agricultural work in Brazil, or sufficiently motivated to develop proper practices.

The paper finishes by discussing the possibilities and limitations of concepts like EPR (Extended Producer Responsibility) to ensure more responsible practice connected to the export of hazardous products to IVCs. Without arguing for a possible "safe use" of pesticides, we propose that making producers responsible for the impacts caused by the use of their hazardous products is necessary for a transition towards agriculture practices that cause less harm to people and the environment. We evaluate possible initiatives that could be used in creating and monitoring such responsibilities, including the creation of a solidarity network involving consumers, workers' unions, farmers' associations and social movements in both industrialised countries and IVCs.

Keywords: Institutionally vulnerable countries; product chain; transnational companies; pesticides; Brazil; Denmark

1 Introduction

In this paper we argue that existing institutional systems for controlling global production chains of hazardous products have mainly focused on suppliers' conduct, production management and trade, but not given enough attention to the use of such products, especially in Institutionally Vulnerable Countries (IVCs). We propose that Extended Producer Responsibility (EPR) could be a useful paradigm for creating schemes to reduce social and environmental impacts of hazardous products in these countries.

Development of transnational product chains and the associated transference of production activities from industrialised countries to IVCs, such as newly industrialised countries and other peripheral countries, have been evaluated from different perspectives. Such analyses have identified that many transnational corporations (TNCs) do not apply the same environmental and health precautions required in their home country when sourcing or manufacturing their products in IVCs. These practices originated analytical concepts such as pollution havens, double standards and unfair trade.

New governance instruments and institutions have been created as an attempt to improve this situation. Nevertheless, these initiatives have mainly been concerned with material and component acquisition, product manufacturing and trade of products and not with the **use** of hazardous products in IVCs. For example, organisations with diverse profiles have created various Corporate Social Responsibility (CSR) certificates and labels (e.g. SA8000, AA1000, Fair Trade) as an attempt to reduce abuse in the transference of supply chains to IVCs. Environmental Management Systems (EMS) based on ISO 14001 seems primarily to be used to ensure that TNCs and their subsidiaries monitor their environmental aspects during production and manufacturing. Ideally these EMS standards and CSR schemes could also be used as framework for developing management systems, which **also** focus on the use of hazardous products in the countries where a company distributes and sells its products. Besides this, the Prior Informed Consent (PIC) scheme adopted during the Rotterdam Convention has been created to supervise trade and to avoid exporting companies to take advantages of the lack of institutional capacity in IVCs, which import hazardous chemicals.

Along the paper, we also analyse a case study: the environmental and health strategies and practices of Cheminova, a Danish pesticide producer and wholesaler, in Brazil. The analyses show a company that, due to a new business strategy with direct sale to farmers in more countries, gradually is forced to adapt practices developed in industrialised countries to an institutional and social vulnerable context like Brazil. The analysis suggests the company is not fully aware of the environmental and social conditions of agricultural work in Brazil, or sufficiently motivated to develop proper practices. The study also identifies the need of better understanding regarding the shaping of product and market strategies of companies selling hazardous products in IVCs, including the need of new research methodologies that identify actual management practices and not only the declared policies and management systems.

The paper finishes by discussing the possibilities and limitations of concepts like EPR (Extended Producer Responsibility) to ensure more responsible practice connected to the export of hazardous

products to IVCs. Without arguing for a possible "safe use" of pesticides, we propose that making producers responsible for the impacts caused by the use of their hazardous products is necessary for a transition towards agriculture practices that cause less harm to people and the environment. We evaluate possible initiatives that could be used in creating and monitoring such responsibilities, including the creation of a solidarity network involving consumers, workers' unions, farmers' associations and social movements in both industrialised countries and IVCs that not only pressure companies that produce hazardous products, but also national agencies and international institutions for monitoring and regulating the use of pesticides and other hazardous products more effectively.

2 Research methods

The paper is based on a variety of concepts which were brought together from diverse knowledge areas. Some of these concepts relate to vulnerability (risk theory), double standards and pollution havens (economy and international trade), actor network theory (sociology of technology), Corporate Social Responsibility and Supply Chain Management (corporate strategy).

As the research concerns how TNCs deal with multiple variables when adapting to different contexts, it was necessary to evaluate diverse specific variables in an actual context. In addition, information sources were dispersed in two different countries: Brazil and Denmark. Because of these characteristics, we considered the case study as an appropriate research method to deal with the problem (Yin, 2005).

The paper is based on an iterative methodology where one step in the data collection inspired the next step in order to cover both Brazilian and Danish perspectives on Cheminova's practice in Brazil. As part of the data collection we refer to official documents in Brazil, the company's CSR Reports, and interviews with governmental officials in Brazil as well as company representatives in Denmark.

3 Institutionally vulnerable countries and pesticides

3.1 Defining vulnerability

The concept of vulnerability, which has been developed in the field of disasters, may be used in analyses of the shaping of environmental and health risks. It is linked to social, economic, and cultural processes that influence how specific populations and regions handle different types of risk problems. Vulnerability can be understood as the reduced capacity of some populations to survive, resist, or recover from risk situations and events such as industrial risks or diseases. Along these lines, vulnerability varies according to space and time scales, depending on historical conditions of ecosystems or socio-technical systems (Porto & Fernandes, 2006).

Global development dynamics produce historical configurations that influence the local level where risk situations and events occur through the social (re)production of vulnerable populations and institutions. Changes at the local level (i.e., the development of new social movements, labour relations, and safety management models) can impact global levels by transforming patterns of risk regulation and public policies. As a result, the literature presents two main types of vulnerabilities.

On the one hand, social vulnerability relates to specific social groups that are more vulnerable on the basis of particular characteristics, such as class, gender, age, or race, which make them more likely to be unable to solve the problems they have to face. On the other, hand, institutional vulnerability has to do with how a society uses its juridical frameworks, technical knowledge and human resources to deal with policies, decision-making and imbalance of forces (C. M. Freitas et al., 2001).

When we use the concept of institutional vulnerability to evaluate pesticide industry, many issues emerge, considering both technical and political aspects.

From the technical point of view, in many IVCs, governments are usually unable of performing their own research on product ecotoxicology, due to lack of human or financial resources, and have to rely solely on information given by companies (Ecobichon, 2001). At the same time, as these countries do not have adequate laboratories, they cannot carry out tests to evaluate for example the presence of pesticide residue on food (Dinham, 2003). Additionally, the lack of technical staff inhibits the proper poisoning reporting procedures in hospitals, which make it impossible to develop reliable epidemiological studies (London & Bailie, 2001).

On the political side, problems appear in the two different fronts. First, it has been identified that companies, particularly large TNCs, have a strong influence over government decisions concerning food production. This aspect could be expected as most IVCs rely on food export to have access to strong currency, which creates a general perception of a need of constant production increase (Albavera, 2004). This “inertial” characteristic, though, is intensified by the existence of a “rotating door” between industry and government, with people from companies often working in public positions, and vice-versa (Rosenthal, 2005). Other important political aspect is the unequal access to legal institutions and to justice. According to Riggs & Waples (2003), rural workers who became ill because of exposition to pesticides have little access to systems of justice, which are usually weak and exposed to political pressure. As a result, even when major preventable contamination occurs, the companies are not held responsible (Rosenthal, 2003).

In the recent past, Brazil has been presented to the international community as a strong emerging country. For example, international media indicated the country might become the 5th largest world economy by 2020 (Yapp, 2011). In spite of the positive economic results, Brazil has shown recently various vulnerable aspects related to the implementation of environmental and health policies. In general, in spite of its broad and complex environmental legislation, the country’s environmental capacity has been considered rather low, mainly because of political influence of economic groups (Hochstetler, 2002). Besides that, chemical safety policies have been described as inefficient and fragmented, and existing legal framework has not been considered viable (C. M. Freitas et al., 2001). Additionally, evidence shows that the Pesticide Act (Law 7.802/1989) created to reduce risks associated to pesticide uses has been ineffective due to inappropriate monitoring and enforcement (Waichman, Eve, & Nina, 2007).

In summary, different from industrialised countries; Brazil, as other IVCs, presents limited institutional capacity to ensure that hazardous products, including pesticides, are properly managed

in the country. This high level of institutional vulnerability creates, then, considerable risk to people who handle these products.

3.2 Pesticide international production chain

The debate about the environmental impact of international production chain of hazardous products has been on the agenda for many years, but is still far from consensual. If there are many authors proposing that international trade contributes positively to environmental protection, there is at least the same amount, arguing it creates many new negative environmental impacts.

On the one hand, there are authors who defend that international trade has positive effects on the environmental management of companies located in peripheral countries (Hansen, 1999). Along these lines, "environmental upgrading" is described as a process which allows companies to improve their environmental performance concerning material efficiency, management systems and waste control. These authors propose that TNCs could induce environmental upgrading in peripheral countries using three different strategies. First, they could set standards for suppliers, such as requiring specific management system or defining unacceptable practices. A second strategy would concern creating monitoring mechanisms or performing periodic audits to evaluate suppliers' environmental performance. Finally, there are situations when TNCs could offer technical support to their partners in order to help them in finding technological solutions or improving their governance practices (Jeppesen & Hansen, 2004). These issues are debated in more detail in section 4.

On the other hand, there are various authors who argue that globalisation of production chains is likely to induce peripheral countries to become specialised in pollution-intensive activities. One of the main concepts associated to this idea is the Pollution Haven Hypothesis (PHH). This concept proposes that differences in environmental regulation are likely to create comparative advantages between industrialised and peripheral countries, and induce TNCs to displace their polluting activities to the countries with lax environmental standards (Baggs, 2009; Cole, 2004; Kearsley & Riddel, 2010).

Although the PHH is rather intuitively and defensible from a rhetorical point of view; it is not easily verified using existing data. Different authors have performed in-depth reviews of the issue, and often found ambiguous results or weak indications of such displacement, therefore very few have been able to fully deny the PHH (Baggs, 2009; Busse, 2004; Cole, 2004; Rothman, 1998).

Most reviews on the PHH have dealt with international trade in general, not necessarily focusing in a particular industry. Hansen (1999) criticises the exporting of banned or severely restricted products from industrialised to peripheral countries as an example of relocation of polluting production, and Lowry and Frank (1999) question the ethics behind such practice. This is not a new issue, though, in 1977, the Kenyan government denounced that industrialised countries were dumping banned hazardous chemicals in peripheral countries; however the practice intensified and became more complex in the recent past, as TNCs also transferred the production of banned pesticides from the headquarters in the North to subsidiaries in the South (Barrios, 2004).

No comprehensive study relating PHH, production displacement and pesticides has been identified. Nevertheless, a few studies have described this process based on information from specific countries.

The exports of banned and severely restricted pesticides from the USA have been monitored since the middle 1990s. Studies indicate that between 1992 and 2003, pesticide producers located in the USA have exported, in average, 10,2 million pounds per year of banned or non-registered pesticides, most of which to IVCs (Smith, 2001; Smith & Root, 1999; Smith, Kerr, & Sadripour, 2008). In a study of Brazilian pesticide imports, similar behaviour has been identified (Porto, Milanez, Soares, & Meyer, 2010).

Ethical issues have not been restricted to the trade of banned pesticides from industrialised countries to peripheral ones, but also to the *modus operandi* adopted by TNCs, when operating in IVCs. In recent years, Brazilian National Health Surveillance Agency (Anvisa) managed to improve its monitoring system and defined pesticide production and use as a priority issue. Since then, many TNCs have been fined and penalised for disobeying Brazilian legislation (Anvisa, 2009a) (Anvisa, 2009b) (Anvisa, 2009c) (Anvisa, 2011a).

3.3 Exposure to pesticides in IVCs

Among the various hazardous products created by the modern society, pesticides call particular attention and special criticism. The debate on pesticides has to do not only with their composition and hazard level, but also with the way they are used. The majority of hazardous products are used under strict safety procedures to avoid their release to the environment. On contrary, pesticides are deliberately applied in open air, by trucks and airplanes, and diluted in the air, water and soil. In other words, pesticides "are released into the environment because they are hazardous to life forms" (Smith et al., 2008, p. 176).

Moreover, they are intentionally applied on people's food. The connection between pesticides and agriculture has to do with the broad use the sector makes of pesticides; it is responsible for, roughly, 85% of the world pesticide consumption (Yáñez et al., 2002).

Other particular aspect of pesticides is the way they are applied. Hazardous products, in general, have a complex nature: when released in the environment they react with other products or with natural elements, changing their composition and some of their properties. Pesticides are intentionally mixed when applied on the crops and it is not uncommon that farmers apply, at the same time, insecticides, herbicides and fungicides. In the long term, the constant use of pesticides increases the occurrence of tolerant pests, which demands the simultaneous application of two or three active ingredients (Colborn, 2006). This situation leads to situations of cumulative risks and high complexity, particularly when one considers that most toxicological tests exam isolated active ingredients in laboratory conditions. Therefore, the real risk faced by farmers is probably much higher than that described on pesticide labels.

As any other hazardous product, pesticides should be used under strict procedures in order to avoid the contamination of workers and the environment. However, the reality found in IVCs, particularly involving small farmers, indicates that the scenario described in the labels is very difficult to be

turned into reality. First, it must be considered that small famers usually have very little schooling and that pesticide labels use technical language, what makes difficult to farmers to properly understand the procedures. As a consequence, farmers are not fully aware of the application procedures and re-entry periods (how long time farmers have to wait before entering a field whoch has been sprayed with pesticides). Besides that, small farmers usually spend the whole day on the field, eating, drinking and smoking during pesticide application. Additionally, due to the lack of proper waste collection systems, empty containers are inadequately disposed of, contaminating soil and water courses, or even being reused to store food and beverages. Other important issue concerns the use of individual protective equipment, which is not designed to tropical conditions and is very expensive. Finally, there is the issue involving child labour in small farms and the exposition of children to pesticides (Dinham, 2003; Ecobichon, 2001; C. M. Freitas et al., 2001; Waichman et al., 2007)

The combination of this scenario with the use of hazardous pesticides creates a high risk context. This reality is faced by many farmers in Brazil, and other IVCs, resulting in a considerable high number of intoxications (Soares, Almeida, & Moro, 2003) (Dinham, 2003). In order to monitor problems associated with chemical intoxication, the Brazilian Ministry of Health created the National System of Toxicological Information. In spite a general problem of underreporting, particularly in rural areas, data from the system indicates that, in 2008, pesticides used in the agriculture were responsible for 34% of deaths caused by chemical intoxication in the country, a rate that increased to 42% in the following year (Sinitox, 2008, 2009). After evaluating health expenses, Soares and Porto (2009) estimated that costs to the public health system caused by pesticide acute intoxication could reach up to US$ 89.5 million per year only in Paraná state.

Facts described above could induce one to assume that pesticide intoxication is a problem only concerning misuse by small farmers and to argue that proper training and educational programmes could solve the problem. Nevertheless, intoxication by pesticides is not caused only by small farmers, but also associated to large “professional” farmers.

The debate about pesticide use in IVCs should not ignore the cash crops for export, such as sugarcane, soybeans and fruits as, at least in the Brazilian case, they are responsible for more than half of the pesticide consumption (Dasgupta, Mamingi, & Meisner, 2001). A study about aerial pesticide application on soy plantation has identified that farmers do not notify accidents and apply pesticides close to water courses and houses. In Lucas do Rio Verde, the Brazilian largest soy producer, every year a plume of pesticides fall on the urban area, destroying veggie gardens and creating a high risk situations to people’s health (Pignati, Machado, & Cabral, 2007). Other research, in the same city, identified traces of pesticides, including DDT, in breast milk of all women who volunteered to the study, 95% of whom lived in the urban area (Palma, Pignati, Lourencetti, & Uecker, 2010).

The reality of pesticide use in IVCs is so complex, that it does not create risk only to farmers and people living close to plantations, but threatens the population in general due to pollution of a substantial part of the food (Anvisa, 2011b).

The risk of pesticide contamination may also happen during its disposal. Due to the high cost of modern pesticides, farmers in IVCs tend to use old and more persistent pesticides, increasing the risks associated with these products (Ecobichon, 2001). According to some FAO estimates, there are 500,000 tons of obsolete pesticides stocked in IVCs, including Persistent Organic Pollutants (POPs), like aldrin and DDT (Brown, 2001). Diverse international aid programmes have offered technical support to IVCs who wished to destroy these products in incinerators and cement kilns, but various operational failures have been identified (Karstensen et al., 2006; Schimpf, 1996).

4 Some attempts to reduce chemical contamination in IVCs

Transnational product chains involving industrialised countries and IVCs are part of the background for new systems of international regulation. These systems are briefly discussed here, according to the stage of the product life cycle to which they are related.

4.1 Supply chain: Corporate Social Responsibility schemes

At the product level, 'product chains', often called 'supply chains' is a relevant theoretical perspective for analysis of the relations between a company and its suppliers (Jeppesen & Hansen, 2004).

In a world where companies become more specialised and globalised, various types of supplier – customer relationships have been identified. A first proposal has been presented by Hansen (1999), who refers to two types of product chains: management of controlled affiliates and management of non-controlled foreign entities (organised through franchising, licensing, subcontracting or strategic alliances). Adopting a more strategic perspective, Cox (2004) developed a typology describing a range of possible relations; from focus on cheapest possible price in the search for suppliers and frequent changes of suppliers, to strategic partnership where customer and develop mutual dependence. Along the same lines, Stranddorf et al. (2002) found that the more focus companies have on quality and environment, the more they develop long-term relationships with their suppliers while at the same limiting the number of suppliers.

The management in these global supply chains has been part of the main focus of the existing CSR schemes. The concern with CSR was raised, in part, because TNCs that outsource their production are not covered by the legislation of their home country. At the same time, IVCs may not have proper legislation enforcement systems. When debating this issue, Crane and Matten (2007) refer to Carroll's pyramid of corporate responsibilities, which include the economic, legal, ethical and philanthropic responsibilities.

The relationship between CSR and global supply chains mainly results from two aspects. First, the fact that the image of large retailers or brand-owners is more sensitive to public exposition; second due to the possibilities of poor labour conditions or unethical subcontracting in IVCs. At the same time, as most global supply chains are usually centralised by a TNC that plays a pivotal role in controlling the production system (Robinson, 2010), large corporations pressure can influence suppliers' governance structure and alter their behaviours (Lund-Thomsen & Nadvi, 2010). The debate about corporate responsibility is broad and complex and most of this discussion concerns

business ethics, which focuses on the relations between company and society. In order to avoid this kind of behaviour and in order to enable documentation of responsible practice, various schemes have been put in place, most of which based on voluntary standards, such as AA1000, SA8000 and ISO 26000.

In spite of their increasing acceptance, CSR standards have also been broadly criticised. Some of the problems in the implementation of such standards have to do with a traditional top-down approach in the application of the norms, which does not consider local realities and tends to promote a "westernisation" of the world. A second issue relates to the real capacity of the institutional frames established around these standards to influence far upstream in the production chain, and not only changing behaviour of direct suppliers. Finally, authors also have pointed out problems concerning the auditing strategies; on the one hand, some standards are not verified by third parts, which create doubts about their actual implementation, on the other hand, standards based on external monitoring usually rely on weak auditing systems, which are usually pre-announced and performed during short visits (Ciliberti, de Haan, de Groot, & Pontrandolfo, 2011; Lund-Thomsen, 2008).

4.2 Production and use: Environmental Management Systems and the Stockholm Convention

Similarly to CSR, different norms and standards have been created in an attempt to create management systems (EMS) that could enable TNCs to manage the environmental aspects of their pratice. Various standards have been put in place around the world with ISO 14001 as the most common. I can be used in relation to the sale and use of products, although it is left to the company to decide whether this is feasible.

As far as hazardous products are concerned, industry created the Responsible Care Programme, an EMS developed by chemical manufacturers as a reply to public concern about the risks and hazards of chemical production (Riggs & Waples, 2003). The programme was first proposed by the Canadian Chemical Producers Association (CCPA), in 1985; and adopted by the USA Chemical Manufacturers Association (CMA) two years later, in consequence of the enormous pressures chemical producers were suffering after the accident in Bhopal and the Superfund Amendment and Reauthorisation Act (Rayport & Lodge, 1991).

After being adopted by CMA, the programme became worldly famous and was broadly incorporated; by 2008 it was already used by 53 Chemical Manufacturers National Associations. The programme is based on a list of central principles, including continuous improvement, efficient natural resources use, waste minimisation, communication with interest parts, and cooperation among companies, governments and communities (Rayport & Lodge, 1991; Tapper, 1997).

Both hazardous-product specific codes and general EMS are currently broadly used, mainly by TNCs. In spite of this general acceptance, various limitations have also been identified in their implementation, particularly for being considered weak in the control of companies (M. S. Jørgensen et al., 2010). Other specific problems have also been identified concerning environmental norms. First, some authors argue these standards do not guarantee environmental improvements; i.e.

they ensure firms will monitor their environmental aspects, but do not force them to reduce their environmental impacts. Second, the standards have been developed looking at the need and context of industrialised countries and are, not necessarily, fully transferable to IVCs. Finally, the norms obligate companies to follow national legislation, so they let companies practice double standards or adopt decentralised environmental management (Blaza & Chambers, 1997; Gleckman & Krut, 1997; Lund-Thomsen, 2008).

Apart from these management instruments, some international organisations have also proposed public regulation that attempt to influence pesticide production. Maybe, the most important has been the Stockholm Convention on Persistent Organic Pollutants, which entered into force in 2004 and, currently, comprises 21 hazardous products, including various pesticides. According to the Convention, the production and use of chemicals listed in its Annex A must be prohibited or eliminated as well as their import and export. Additionally, a second group of components, listed in the Annex B, must have their production and use restricted (UNEP, 2010). Nevertheless, the list of banned pesticides is considerably limited.

4.3 Trade: the Rotterdam Convention and the Basel Convention

As discussed in section 3.2, at least since the 1970s, there have been complains concerning patterns of international trade with pesticides. The International Code of Conduct on the Distribution and Use of Pesticides was adopted in 1985 and the London Guidelines for the Exchange of Information on Chemicals in International Trade was signed two years later (Barrios, 2004). Currently, the most important regulatory instrument designed to reduce risks involved in pesticide trade is the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.

This Convention entered into force in 2004, and was designed as an instrument to legally bind the Prior Informed Consent (PIC) procedure, which had been voluntarily introduced in 1989. The PIC system was designed as a strategy to allow government to refuse accepting pesticides that have been banned or severely restricted in the exporting countries. The system defines a list of 11 industrial products, four pesticide formulations and 28 pesticides for which special procedures must take place before trade. According to the Convention, countries have to notify a central body about the legal status of the pesticides they intend to export. This information is kept available for the importing countries which have the right to evaluate the situation and decide if they want to accept the cargo or not. Following the Rotterdam rules, the deal cannot take place if the importing country refuses to accept the product (Barrios, 2004; Ecobichon, 2001; Smith et al., 2008; UNEP, 2011a).

In spite of the advances the Convention promoted, there has been also some criticism. These claims are usually associated with the concept of the “circle of poison” or the “pesticide boomerang”. Authors argue the use of persistent pesticides was considered a threat to industrialised countries, because after being exported to IVCs and used incorrectly, these pesticides would return to industrialised societies via contaminated crops or marine food chain. For example, Hulebak (1987) mentions that almost 50% of green coffee imported by the USA contained traces of pesticides banned in that country. The fact that POPs residues would not degrade along time and the consequent exposition of population in industrialised countries, made these governments pressure

for a stronger regulation and for the POPs elimination, as it is done through the Stockholm Convention. On the other hand, non-persistent pesticides, such as organophosphates and carbamates, did not create such risk because, even when used incorrectly, they would decompose, before reaching ports in industrialised countries. Therefore, governments did not see the need for banning such products, and limited the Rotterdam Convention to an instrument, which only required information exchange. One of the ironies behind these decisions is that non-persistent pesticides require more frequent application and are usually more acutely toxic to farmers, therefore increasing the threat to their health and environment (Barrios, 2004; Smith et al., 2008).

In addition to this general problem, other problems have also been identified in the Rotterdam Convention. Barrios (2004) mentions that in order to refuse importing a particular pesticide, countries need to produce complex reports, which require specific national legislation, toxicology laboratories and technical capacity to evaluate information provided by exporting countries. The author maintains that IVCs do not have the capacity to perform such tasks, being unable to properly use the PIC system. Additionally, she remarks that, in spite of IVCs' pressure for the inclusion of instruments regarding financial and technological support to implement the convention, such aspects have not been properly considered in the Convention.

Besides the Rotterdam Convention, other international agreement has also been put in place as an attempt to regulate a very particular trade of hazardous products: the imports and exports of hazardous waste. The Basel Convention on the control of transboundary movements of hazardous wastes and their disposal was adopted in 1989, and entered into force in 1992. Among the controlled products, it includes waste from the production, formulation and use of biocides, phytopharmaceuticals and wood preserving chemicals (Baggs, 2009; Brown, 2001; UNEP, 2011b).

4.4 Pesticide use: some isolated initiatives

We argue there is no specific institutional scheme designed to ensure that pesticides do not intoxicate farmers or contaminate the environment during the use phase. The existing literature mentions some isolated initiatives related to education programmes; nevertheless, these proposals seem too simplistic to properly address the problem. Along this section, we briefly assess these initiatives and, afterwards, evaluate their implementation by Cheminova in Brazil.

In the 1960s, the national associations of pesticide manufacturers created the International Group of National Associations of Manufacturers of Agrochemical Products (GIFAP); which had among its objectives, to develop the "Safe Use" Programme. This organisation was renamed as Global Crop Protection Federation and evolved, in the 2000s, to CropLife International, which has the commitment of "supporting the safe and responsible use of the industry's products" (CropLife International, 2011).

The idea of promoting the "safe use" of pesticides was first developed in the 1970s, when GIFAP worked together with FAO. This initiative was a sector answer to the increasing pressure made by the United Nations Environmental Program (UNEP), the WHO and various Non-governmental organisations (NGOs). The programme was translated into a voluntary code of conducts, launched in 1986, mainly focused on pesticide technical aspects and user training (Murray & Taylor, 2000).

The Code, though, has been severely criticised for having limitations. The programme is based on the assumption that simple information is enough to change social behaviour. This supposition, however, has already been proved false in many other examples, such as smoking and wearing seat belts, and there is no reason to believe it would be effective when applied to pesticides. In addition, it also ignores that pesticide use is defined by a combination of structural factors such as credit system, distributors marketing, lack of education, and cost and inconvenience of individual protection equipment (Murray & Taylor, 2000; Zilberman & Castillo, 1994). According to Murray & Taylor (2000) training projects have limited effectiveness because farmers' motivation was usually temporary and campaigns only attracted those who were already concerned with pesticides.

A second instrument used together with educational programmes is the printing of pictograms in the pesticides labels, proposed by FAO and GIFAP in the late 1980s as an alternative way to communicate risk and technical information to non-literate farmers in IVCs. The choice of this instrument was based on the recognition that farmers did not have access to proper technical guidance in these countries, and labels were the only access they had to risk information. However, label information is rarely noticed by farmers and there is little proof that labels have managed to change farmers' behaviour (Rother, 2008). A survey with small farmers in the Brazilian Amazon, Waichman et al. (2007), found that no interviewee could identify all the 14 pictograms currently used in the labels, and more than 50% were unable to understand the meaning of a single picture. In a similar research in South Africa, Rother (2008) concluded that more than half of farmers did not know what a pesticide label was and, when confronted with a list of 10 pictograms, only one pictogram had a correct comprehension rate over 50%.

In summary, manufacturers have created isolated voluntary initiatives, mainly based on informational strategies. Literature suggests these instruments have shown very limited effectiveness as, we argue, they have been based a simplistic understanding of farming in IVCs, as we discuss in the following section.

5 The Cheminova case in Brazil

5.1 The firm

Cheminova is a public limited company owned by Auriga Industries A/S. Auriga is quoted on the Copenhagen Stock Exchange with the Aarhus University Research Foundation as the largest shareholder. In 2010, Auriga's annual revenue was over EUR 750 million. Cheminova's main markets are Europe (36%), Latin America (27%) and Australia and New Zealand (16%).

Cheminova owns three production facilities; one in Denmark, which exports most of its production and two others in India and Australia, which manufacture products mainly for local consumption. In 2010, Cheminova traded its products in more than 100 countries, had subsidiaries in more than 30 countries, and more than 2,000 employees, hereof 1,200 outside Denmark (Cheminova, 2011).

The company's main activity is development, production and marketing of pesticides and sees itself as "a leading supplier of insecticides and an important supplier of herbicides and fungicides" (Auriga, 2011, p. 18). As far as products are concerned, insecticides are responsible for 37% of the

company's results and herbicides for 32% (Auriga, 2011). The firm describes its objective as "to be the best innovative global supplier of generic products within the agrochemical industry" (Cheminova, 2007, p. 9).

5.2 Social and environmental practices

Cheminova justifies its business by making references to global problems with starvation and contagious diseases, and argues that while "[in] Denmark, we do not suffer from starvation or diseases such as malaria – and this makes it difficult for people to understand that, elsewhere, it may be necessary to resort to extreme measures in order to ensure food on the table" (Cheminova, 2007, p. 3).

Another strategy has been the release of CSR Reports. Cheminova made its first report available in 2007 and has since then published new reports every year. The CSR Reports are audited and regular visits are performed in production facilities as well as sales companies (Cheminova, 2007, p. 10).

Cheminova describes its practice as "product stewardship" based on risk reduction and portrays its strategy as focused on reducing the use of the most toxic products. Cheminova practices informative labelling, communicating the correct use of its products, develop less toxic formulation and phase out Class I products (according to WHO classification system). The development of some new products, though, focuses on microencapsulating the same hazardous component, instead of abandoning the use of particular active ingredient (Cheminova, 2007). Microencapsulation implies that the active ingredient is contained within an encapsulating wall or skin of cross-linked polyamide-polyurea by a component which is water soluble, whereby the formulation is said to become less toxic (Microencapsulated methyl and ethyl parathion…,1976).

Cheminova has a rather complex product chain structure with around 900 suppliers of production materials, including raw material, fine chemicals, plant protection products and packaging. The company claims its environmental and social responsibility also extends to its suppliers, based on code of conducts for suppliers, various audits, and training (Cheminova, 2007, 2008). The need for such code is seen as a consequence of the increasing internationalisation of Cheminova, as the company states it wants to ensure that it "is operated in full compliance with international conventions, local legislation and the management philosophy and values which are promoted in the entire group" (Cheminova, 2007, p. 10)

Cheminova is a member of the Responsible Care programme. The Danish production unit was certified according to the OHSAS 18001 and ISO 14000 standards in 2007, and the technical division of the Indian unit, in 2011. The Australian facility was incorporated in 2011 and got in the same year the ISO 14000 certification (Cheminova, 2011).

Cheminova's corporate responsibility has been created, to a large extent, as a reply to Danish citizens' pressure. In 1997, a Danish video showed a number of poisoning incidents in Central America associated with methyl parathion produced by Cheminova, which forced the company to withdraw selling the pesticide in Nicaragua (Rosenthal, 2003). In 2006, a Danish newspaper published articles describing the misuse of methyl parathion in Brazil and criticism by FAO representatives towards the company, which was one of the main suppliers of this active ingredient

in Latin America (C. B. Thomsen, 2006). This series of articles was the background for the company's development of CSR reports from 2007; “based on a public debate in 2006 over a number of environmental issues relating to Cheminova’s business activities, it was decided to start CSR reporting” (Cheminova, 2007, p. 9).

5.3 Practices in Brazil

The CSR reports also mention some specific programmes the company has implemented in Brazil.

5.3.1 Informative campaigns

As far as information and awareness campaigns are concerned Cheminova seems to be still following the idea of “safe use” and facing the same limitations we discussed in section 4.4.

The recent years Cheminova has organised informational activities based on meetings and “field days” in order to support the development of “safe use” of its products. During these meetings, apart from a video about pesticide handling, Cheminova distributes brochures containing instructions and pictograms explaining the proper use of individual protective equipment (Cheminova, 2008). Considering the low educational level of Brazilian farmers, it can be assumed that written material, such as the brochures, is of very little use. Alternatively, the video could be a more effective strategy to communicate with illiterate farmers, but it is still based on the "information dissemination" paradigm and is seen by a limited number of farmers.

In addition, Cheminova’s “Safe Use” Programme seems to misunderstand the company’s role and responsibility in ensuring that its product does not harm the users. In 2007, Cheminova created an “educative” motto, which stated: “Cheminova is warning: Individual Protective Equipment or Intensive Care Unit – you decide” (Cheminova, 2008). This campaign presents a series of limitations. Firstly, it indicates the extent to which the company ignores the Brazilian reality, as it assumes it is the users’ own choices whether they use protective equipment. Secondly, it suggests that pesticide intoxication only results from lack of individual protective equipment use. Finally, it signsls the company is not taking responsibility for the intoxication cases as manufacturer and transfers the full responsibility to the farm workers.

5.3.2 Use of larger packaging and focus on large famers

In another attempt to minimise pesticide intoxication among farmers in Brazil, Cheminova adopted the strategy to sell Class I pesticides – i.e. extremely hazardous and highly hazardous according to WHO classification – only to so-called professional farmers. According to the company’s CSR Report “Class I products based on methyl parathion and methamidophos will not be sold in small containers, and the sale will be limited to professional farmers” (Cheminova, 2007, p. 21). Additionally, in the same year, Cheminova stated that it would only sell Class I pesticides in states which had more developed farming conditions.

In this case, the company also seems to misunderstand the complexity of the pesticide market in Brazil. As discussed in section 3.3, larger farmers also cause pesticide contamination and intoxication, mainly through aerial spray. Additionally, the control of pesticide sale and use in Brazil is poorly controlled and supervised (C. M. Freitas et al., 2001). Neither government, nor the

company can ensure that pesticides sold to large farmers will not be transferred to smaller ones, or that pesticides sold in one state might be used in a different one.

5.3.3 Product phase out

Since its first CSR Report, Cheminova has been disclaiming a phase out plan of its Class I products, which would take place between 2007 and 2010. The plan concerned, mainly, IVCs as the company would still trade its Class I products in countries such as Australia, Italy and the USA. The phase out schedule varied from country to country – for example trade of methyl parathion would be interrupted in 2007 in Taiwan and two years later in Mexico. The company explained this behaviour as a strategy to maintain its market-share, while introducing substitute pesticides (Cheminova, 2007). In Brazil, the company intended to phase out methamidophos and methyl parathion.

Cheminova concluded the phase out of methamidophos in Brazil in 2009; although the product had already been banned in EU in the previous year. The company decided to replace methamidophos by chlorpyrifos and acephate. Although the first has its use authorised in the European Union and Brazil, the latter has been banned in EU in 2003 and included in a Brazilian re-evaluation programme in 2008 (Anvisa, 2008; Cheminova, 2011; European Commission, 2011).

The phase out of methyl parathion has also been controversial. As Cheminova disclaims in its CSR report, it has not given up on this chemical, but only stopped trading the emulsifiable concentrate form in 2010. The company maintained the trade of methyl parathion in micro capsules, as it is not considered Class I by WHO. Nevertheless, the product has been prohibited in the EU, in any form, since 2003.

5.3.4 Pesticide re-evaluation

In Brazil, the pesticide legislation defines that the Ministries of Agriculture, Health and Environment, within the scope of their respective areas of competency, are responsible for promoting the re-evaluation of pesticide registration as the result of any evidence of risks that justify the discontinuation of the use of registered products. This is a crucial process because in Brazil, differently from Europe, pesticide registration does not expire. The process is performed by agencies of the three ministries and is preceded by a public consultation. Anvisa, on the behalf of the Ministry of Health, has been re-evaluating the health risks of pesticides since 2000.

Anvisa planned to re-evaluate 14 active ingredients in 2008, as a result of new restrictions in the international arena, as well as evidences available in scientific literature. However, different transnational pesticide producers and the National Union of Pesticide Producers (SINDAG) went to the courts to interrupt the re-evaluation process. SINDAG took Anvisa to the courts in 2008, in an attempt to block the re-evaluation of nine pesticides (carbofuran, endosulfan, methamidophos, methyl parathion, paraquat, phorate, phosmet, thiram and trichlorfon) but the courts decided that Anvisa should carry forward the re-evaluation (Anvisa, 2009d).

Cheminova is a member of SINDAG and, in a first moment, did not oppose the initiative against Anvisa's attempt to create safer regulation for Brazil. Besides the support to the SINDAG initiative Cheminova, together with four other companies, sent a letter to the agency requiring the agency to halt the re-evaluation of especially methyl parathionand pressuring against the product ban. Instead

of methyl parathion, Cheminova proposes to sell malathion, which use is authorised in Brazil and in the EU (Anvisa, 2008; Cheminova, 2011; European Commission, 2011).The company's behaviour was denounced in Denmark and Cheminova heavily criticised (C. B. Thomsen, 2008a). As a result of domestic complaints, the company changed its behaviour and publicly disclaimed that it did not oppose the re-evaluation of pesticides in Brazil and thereby reduced SINDAG's pressure on Anvisa (C. B. Thomsen, 2008b).

6 What can we learn: new schemes to reduce intoxication during the use of hazardous products in IVCs

Along this paper, we have described the main schemes and their ability to reduce the risk of environmental contamination and people intoxication by hazardous products and especially pesticides in IVCs. We have argued that the protection of IVCs from restrictions to what pesticides which can be produced and sold in IVCs is limited. Although there are some voluntary codes of conduct regarding the use of pesticides in IVCs, such as the "Safe Use" Programme, our analysis of Cheminova's practices in Brazil indicate such campaigns are incipient and have limited effectiveness. Therefore, in this section, we discuss the possibilities of other concepts like EPR (Extended Producer Responsibility) to ensure more responsible practices connected to the use of hazardous products in IVCs.

This discussion is based on the assumption that pesticide contamination and intoxication are not accidents, but foreseeable and preventable events which take place due to the structural conditions under which pesticides are used in IVCs (Rosenthal, 2003). It is also inspired by other initiatives which have attempted to make pesticide industry accountable for such events based on the Polluter Pays Principle (PPP), as mentioned by Riggs & Waples (2003). PPP was successful in the early 1970s and 1980s, in dealing with situations of pollution at point source, when it was proposed that once companies were made accountable for their environmental externalities, they would try to reduce environmental impacts and the associated private costs.

However, in the late 1980s, governments had to adopt new paradigms to deal with dispersed pollution. The main EPR experiences in place deal with solid waste, such as packaging waste and end-of-life vehicles, both in industrialised countries (Mayers, 2007) and in IVCs (Milanez & Bührs, 2009); nevertheless the concept is broader and can be also applied to other products. OECD discusses who is responsible for pollution:

> "Who is the polluter? [...] If a motor vehicle is polluting and noisy, there is no doubt that the polluter is the person using it, but it does not follow that he should be made directly responsible for the damage or should be target of preventive measures. Here the consumer is a passive agent without responsibility for the pollution, since he does not more than use a product whose characteristics do not depend on him [...]" (OECD, 1975, p. 26).

Along these lines, the EPR principle assumes there are situations, when users (in our case farmers) cause environmental and health impacts due to the use of products whose characteristics they cannot change. EPR, based on a preventive strategy, proposes that design is the most critical activity in defining product environmental characteristics and argues that producers have the

capacity and responsibility to develop new products that are easier and cheaper to deal with in an environmentally responsible manner (Davis, 2000; OECD, 2001).

EPR moves forward, when compared with PPP, because it looks at products and has a life-cycle approach. The application of this principle makes producers responsible, not only for the environmental impacts of their production sites, but for the environmental aspects of their products during their whole life-cycle (Li & Geiser, 2004; Lindhqvist, 2000).

Although EPR policies have initially been implemented at the local scale, the European experience on packaging waste shows it can also address problems in transnational product chains. The principle has inspired diverse policy instruments, including take-back programmes, efficiency standards, bans and restrictions, fees and environmental labelling (OECD, 2001).

The transference of responsibilities for the impacts of pesticide use to the producers could be expected to encourage various positive changes. In the short term, companies are expected to take the responsibility for the application of their products, which would considerably reduce the cases of contamination or intoxication. This initiative, though, would increase their operational costs so, in the middle-term, they would be expected to globally adopt the substitution principle, as proposed by the Swedish legislation (Smith et al., 2008), phasing out the most hazardous products for which there are less perilous products. As a long-term effect, an EPR-based instrument could stimulate the transition to other agriculture practices, less dependent on hazardous chemicals, such as organic farming or maybe Integrated Pest Management (Dinham, 2003; Pretty et al., 2005).

7 Final remarks: how to control TNCs' behaviour

In spite of the positive contribution the implementation of an EPR scheme could promote, the solely creation of this system does not seem to be sufficient. Similarly, instruments described in section 4 have been in place for some time, and still have many flaws and limitations. For example, even when TNCs have a large number of suppliers with a broad range of capacities and levels of commitments, CSR systems are based on codes of conduct and sometimes audits, a very narrow form to know the actual suppliers' practices. Similarly, in spite of the advances of the Rotterdam Convention, it did not prevent the possibility of industrialised countries to produce and export non-registered and banned pesticides to IVCs (Porto et al., 2010; Smith et al., 2008). If the Convention had condemned these practices, many situations of double standards regarding pesticides could have been lessened. We argue that global society needs new ways of monitoring and controlling the behaviour of this industry.

According to Hansen (1999) four types of forces shape the environmental management in transnational product chains: regulatory forces, market forces, sector specific forces and company sector forces. However, at least in IVCs, TNCs are the strongest player on the arena and have proved to be able to use these forces for their own benefit. At the same time, curbing the inadequate use of pesticides challenge the industry's interest, as their rational behaviour includes, among others, continually increasing their market and extending the patent life of their products (Riggs & Waples, 2003). The Cheminova case study illustrates how firms' interests are translated into practice. On the one side, the company claims it complies with the law of the countries it operates

in, but at the same time, it pressures government against legislation improvements that could diminish its financial outcomes.

As argued by Jørgensen and Forman (2009),when analysing corporate practice, it is important to distinguish between the intentions expressed in policies, the actual efforts done and the outcome of these efforts. Howard-Grenville et al. (2008) draw up from organizational theory internal factors that can be expected to contribute to corporate environmental practices. Such factors shape whether and how members of a firm or facility interpret external regulatory, social, and economic conditions as problems and, how these members choose to solve the selected problems. At the same time, it is important to understand how technologies designed under "lab conditions" are put into practice. For example, the concept of "script" (Akrich, 1992) compares the plans for the practice as envisioned by the manufacturer and the role the manufacturer allocates, consciously or unconsciously, to different parts of a future, imagined practice. When analysing the shaping of chemical products and their use, it is important not only to focus on the product itself as a technical artefact, but to look at all those elements that influence the practice with the product, like the user, the prescriptions for use, equipment for use, safety equipment, safety information etc. (M. S. Jørgensen, Milanez, & Porto, 2011).

Therefore, only looking at decisions in TNCs' headquarters or at the CSR reports seem to be an insufficient strategy when analysing how these companies actually operate and the local user practrices. Considering the high complexity of these issues, new strategies and forces for monitoring and controlling TNCs strategies seem to be necessary, in order to encourage more responsible practices. A possible new force that could fulfil this role could be based on social movements and international solidarity; nevertheless, this type of dynamics still needs to be better understood. The Actor-Network Theory (ANT) is a framework that seems capable of providing such support, because it enables analyses of the network relations among various elements and is flexible enough to allow evaluating the role of actors with various interests acting in different places (Callon, 1986; Latour, 1992).

Diverse actors are likely to have different roles in building such monitoring and controlling networks. First of all, the involvement of farmers from IVCs is fundamental. The design of monitoring strategies in headquarters in Genève or Rome without the participation of workers and communities is unfeasible and a bottom-up approach seems desirable (Lund-Thomsen, 2008). These farmers are expected to explain how they work the land, their traditions and their own pest management strategies.

Other important players in the pesticide product chain are workers from industrialised countries. For example, the European International Food Workers Union (IUF) has been an active critic of the "Safe Use" Programme. In different situations, IUF has expressed its concerns about the training methodologies adopted by pesticides TNCs and also proposed strategies to provide independent monitoring and external verification of companies' initiatives (Murray & Taylor, 2000). Exchange experiences between workers from IVCs and industrialised countries seem an important strategy to help the first to create new strategies to reduce exposition.

A third group that should take place in the network involves food consumers from industrialised countries. Due to World Trade Organisation (WTO) agreements, importing countries' governments can only impose restriction to products with pesticide residues above limits, but there is nothing they can do in situations when pesticides contaminate land and water in IVCs. On the other hand, consumers from these countries can have a say and pressure for products which do not harm farmers and the environment in IVCs (Tait & Bruce, 2001). In this case, supermarkets and retailers have a special role to play, once they also have their CSR codes and are sensitive to consumers' perception and scrutiny (Robinson, 2010).

In addition to all these, also domestic and international NGOs concerned with environmental issues, public health, consumers' right, land access, food sovereignty, traditional peoples' right etc. could play a role. All these different perspectives have to be recognised and consulted when debating the use and consequences of pesticides.

In conclusion, public regulation is necessary, but not sufficient; our analysis indicates a need for cooperation between different NGOs in order to put pressure on pesticide TNCs, food TNCs and retailer TNCs to ensure a more committed practice in relation to pesticides. There are already some initiatives in place; bringing them together and increasing their strength and capacity seem to be an important task to reduce risks created by pesticides worldwide and, particularly, in IVCs.

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