Governing pesticide use in vegetable production in Vietnam

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Governing pesticide use in vegetable production in Vietnam

Pham Van Hoi

Thesis

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Preface

The economic liberalization initiated in Vietnam in the middle of the 1980s contributed to the intensification of agriculture and to the involvement of private actors in the food sector. The use of pesticides increased considerably which in turn caused anxiety among the Vietnamese consumers about the safety of their food as well as growing concerns about environmental pollution. Though Vietnamese governments devoted lots of efforts to strengthen their control of the pesticide industry and of farmers' pesticide use to secure food safety, they largely failed to get the relevant actors in line with this policy. At the same time, private actors whose role in food safety control is partly legally acknowledged have not yet been able to remediate the state failure in this respect. This dramatic situation formed the starting point for this PhD-thesis which intends to look for positive contributions to improve the situation.

This thesis is developed from valuable information and experiences that many Vietnamese farmers, pesticide and vegetable retailers, consumers, vegetable processors/exporters, and agricultural officials willingly shared with me during my surveys. I am greatly indebted to all of them.

My promoter Arthur Mol and my daily supervisor Peter Oosterveer guided me throughout the entire research. They sharpened my research questions and research papers. I am especially impressed and inspired by their bright ideas, free writing style, encouragement and patience. This thesis and research papers would not have been developed into a scientific publication without their involvement and support. I learned a lot from them, not only with respect to scientific knowledge and critical thinking, but also regarding to their very friendly behavior.

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Finally, I would like to express my appreciation and love to my late father who had to work hard during his whole life to allow his children to pursue their schooling, to my mother and my parents-in-law who have been inspiring me and took care of my little family in Hanoi during my stay in Wageningen, to my brothers, sisters, and relatives for their endless care and support, and finally to my beloved daughter Van Ha and to my wife who has encouraged and inspired me during the whole period of my research.

Pham Van Hoi
Wageningen, the Netherlands, 2010

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Abbreviations

ADB	Asian Development Bank
AI	Active ingredient
CPV	Communist Party of Vietnam
CSA	Community-Support Agriculture
DANIDA	Danish International Development Agency
EMT	Ecological modernization theory
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization of the United Nations
GSO	General Statistics Office of Vietnam
GTZ	German Agency for Technical Cooperation
HPC	Hanoi People Committee (Vietnam)
ICAMA	Institute for the Control of Agrochemicals, Ministry of Agriculture (China)
IFPRI	International Food Policy Research Institute
IPCS	The International Programme on Chemical Safety (WHO)
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MOF	Ministry of Finance (Vietnam)
MRL	Maximum Residue Limit
NEA	Vietnam Environment Administration
OECD	Organisation for Economic Co-operation and Development
PHI	Pesticide preharvest interval
SRV	Social Republic of Vietnam
UNDP	United Nations Development Programme
VCCI	Vietnam Chamber of Commerce and Industry
VNCI	Vietnam Competitiveness Initiatives
Vietnamnet	VietNamNet Online Newspaper
Vinachem	Vietnam National Chemical Corporation
Vnexpress	Express News Vietnam
MP	Farm monitoring period
VND	Vietnamese currency (dong)

Chapter 1

Introduction

1.1 Background information and problem statement

Vietnam has been an agriculture-based country for a long time. Its area covers 33 million ha, of which about 29% is agricultural land. The total population was 85 millions in 2007 (GSO, 2008a). However, owing to the mountainous topography of the country, a large part of the population is living in the densely populated Red River (North) and Mekong (South) deltas. These deltas are considered the rice bowls of Vietnam. Following Vietnams' economic liberalization, initiated in the 1980s, the share of agriculture (including forestry and fisheries) in the total GDP had been reduced from 38.7% in 1990 (GSO, 2007b) to 20.3% in 2007 (GSO, 2008a). However, agriculture remains of vital importance for Vietnam, because about 73% of the total population is living in the rural areas (GSO, 2007a). The majority of the people in the countryside depend for their livelihood on agricultural activities. A large part of the Vietnamese GDP in recent years is drawn from exports of fossil fuels and minerals. In agriculture, Vietnam has become the world leader in rice and coffee export (GSO, 2008a).

With an increasing population, decreasing available agricultural land and increasing domestic as well as foreign demand for agricultural products, farmers have extended and intensified agriculture and enhanced yields since the early 1990s. The vegetable production area has increased remarkably, i.e. from 322,900 ha in 1990 to 642,600 ha in 2007 (FAOSTAT, 2009). Given a modest improvement in productivity, i.e., from 10.0 ton/ha in 1990 to 11.8 ton/ha in 2007, the increase of vegetable production over the last two decades is mainly explained by the increase of production area (Figure 1.1). An increasing use of agrochemical inputs has paralleled the expansion of vegetable production area and contributed to yield increases.

Farmers in Vietnam started to use pesticides in agriculture at the end of the 1950s. At that time, the national volume of pesticides used was about 100 ton (Anh, 2002). In the 1980s, there were about 20 types of active ingredients used in agriculture in Vietnam, among which Aldrin, Dieldrin, Heptachlor, Lindane, Methamidophos and Methyl-parathion were the most common ones. Following economic liberalization, farmers have been allotted agricultural land and given rights to make decisions over their farming

practices, and private actors have been allowed to participate in pesticide import and distribution. This has led to a remarkable increase in pesticide use in agriculture in Vietnam. For instance, between 1990 and 1999, the average volume of pesticides used per hectare of agricultural crops increased more than 100 per cent (Anh, 2002). This trend has continued up till now, along with increased imports of pesticides, i.e., from 33,700 tonnes in 1999 to 76,000 tonnes in 2007 (Anh, 2002; Vinachem, 2008b). In parallel, the number of pesticide trade names increased from 837 in 1999 to 3,019 in 2008 (MARD, 1999; 2008).

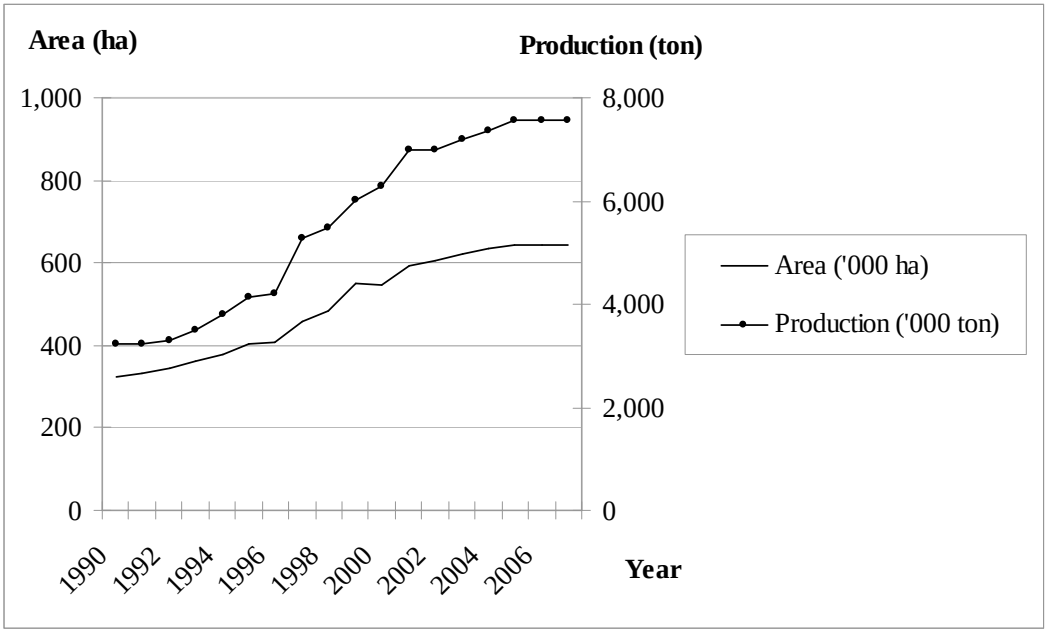

Figure 1.1 Vegetable production in Vietnam (1990-2007)

Source: (FAOSTAT, 2009)[1]

Among the agricultural crops, vegetables are the most vulnerable to pests and diseases. Most of the vegetables produced require a good appearance to attract consumers. This requirement causes vegetables to be subjected to more pesticide treatments as compared to other crops. In addition, most farmers use pesticides intensively, much more than instructed on the labels (Huan and Anh, 2002). Intensive and improper pesticide use on vegetables in the field results in high pesticide residues on products. More than 28% of vegetable samples collected in Hanoi had pesticide residues that were two to six times higher than the Maximum Residue Level (Thi and Ha, 2002). Vegetables have been thus considered the most dangerous food by Vietnamese consumers (Figuié, 2003).

[1] The data is excluding water melon

Annually, thousands of Vietnamese consumers are poisoned by food contaminated with chemicals. Besides acute poisoning due to direct and indirect exposure to pesticides, chronic pesticide poisoning could have an effect on millions of Vietnamese farmers. In Vietnam the annual cost of pesticide-related domestic human health and of lost export opportunities for vegetables and fruits remains very high (WorldBank, 2006). Besides human health, pesticide use also endangers water quality and ecosystems in the fertile river deltas in northern and southern Vietnam (Berg, 2001). Pesticides lead to a loss of species, to changes in food webs and as a result to an increase of algae biomass (Brink et al, 2003). Moreover, pesticides may leach to groundwater and, herewith, pollute drinking and irrigation water resources.

1.2 Overview of Vietnamese pesticide policy

Given the increased use of pesticides and the emerging problems related to pesticides in agriculture, the government of Vietnam started to regulate pesticide imports, management and use of pesticides from the 1980s onwards. At first, regulation was related to listing legal pesticides that can be used in different sectors in Vietnam, including agriculture as a major sector. This list still serves as the legal basic for pesticide imports, formulation, distribution, and use, and is of key importance for state pesticide management at the local level. From 1992 onwards, the pesticide list has been specified into three categories: (i) permitted pesticides, (ii) pesticides permitted with restricted use, and (iii) banned pesticides. The list is annually updated by new, registered pesticides. Pesticides that are banned by regulation, or are not re-registered after a given time period due to poor quality or market demand, disappear from the list.

From the beginning of the 1990s, with the issue of the Decree no. 92-CP (SRV, 1993), pesticides gained further state attention and control in Vietnam. This Decree formed the first comprehensively legal document on pesticides management. It outlined: (i) the objectives of plant protection, (ii) the requirements for pesticide production, formulation, distribution and use, (iii) the responsibility and rights of relevant state offices in monitoring and inspecting activities related to pesticides, and (iv) the establishment of a plant protection system from central government to district level.

Besides the main aim of pest and disease control, the Decree also emphasized pesticide safety for human health, animals and the environment. Advertisement of pesticides permitted with restricted use was prohibited.

While a pesticide policy has been formulated on paper**,** its implementation and effectiveness in agricultural practices seems to show a limited result. Hazardous and banned pesticides are still found in local markets, and the use of pesticides in farming practices do not often follow the guidelines issued by the authorities (Quang, 2001). Extremely toxic pesticides such as Ceresan--a product of mercury--, DDT, Methyl parathion, and Methamidophos are still used by farmers on vegetables (Anh, 2002). In 1999 phosphate and carbamat based pesticides still accounted for 41.6% and 32.2% of total pesticides imported into Vietnam, respectively. Although the imports of more environmentally safe pyrethroid and newly produced pesticides are increasing, in 1999 they only accounted for 22.2% and 3.9% of the total, respectively (Anh, 2002).

Various reasons were evoked for the failure of implementing pesticide policies in Vietnam, such as (i) limited administrative and enforcement resources, (ii) lack of monitoring, (iii) lack of sufficient knowledge of and incentives for regulators, especially local ones who are predominantly focused on regional economic growth, (iv) lack of environmental standards, (v) failing coordination and consistency in implementing the various legal provisions, and (vi) constraints in communication and extension (Anh, 2002; Phuong, 1996)**.** There is also no effective system of law enforcement on pesticide imports and of labeling of pesticides. That explains why the same pesticide (active ingredients and additives) may have different trade names owing to different import companies, who apply with different names for registration of a certain pesticide. This confuses farmers in selecting and using pesticides (Anh, 2002), as well as raises difficulties for authorities in pesticide management. In addition, poor cooperation and coordination between and among relevant authorities of Vietnam also accounts for the current disorder in national pesticide management (Huan and Anh, 2001).

These reasons could be largely related to state institutions that are not focused on agricultural sustainable development, nor on the well-being of the rural population of

Vietnam. Despite its share of 20.3% of the total GDP, agriculture receives only 4.8% of total national investment budget. Of this 4.8%, 52.7% comes from the state budget and the rest is financed by the private sector (GSO, 2007a). Agriculture also receives less protection as compared to other economic sectors (Hoa and Grote, 2004). In addition, the weak agricultural research base also contributes to the lack of sustainability and productivity of Vietnamese agriculture. More than 30 agricultural research institutes exist, with little coordination and cooperation within and among them (ADB, 2000). To complicate the situation, there is a very low level of budgetary support to these institutes, even when compared to other countries in the region. Vietnam spends about 0.08 per cent of its agricultural GDP on agricultural research, compared to 6 per cent in China, and 10 per cent in Malaysia, Pakistan, and Thailand. As a result the current budget does not allow adequate agricultural research (ADB, 2000).

1.3 Emerging non-state actors

Given the very limited achievement of the Vietnamese state in controlling pesticide use, as well as in pushing vegetable production towards a more sustainable system, one could expect private actors to assist the state in implementing pesticide policy and in achieving sustainable vegetable production. Following economic liberalization, it has been observed that two private governance mechanisms are emerging. The growing pressure of domestic middle-class citizen-consumers for safe food and environmental concerns, and of global sustainable food demand, especially from developed countries with stringent import standards, open up new potentials for improving the environmental performance of vegetable production and residue safe products.

With nearly 6 million tons consumed per year, vegetables (excluding potatoes and sweet potatoes) represent the second most consumed food category in Vietnam, after rice (more than 13 million tons consumed per year) (Figuié, 2003). From 1990 to 2003, vegetable consumption/capita/year almost doubled, with an annual average growth rate of 4.8%/year: a relatively high rate as compared with those of fish/seafood, fruit and rice (FAOSTAT, 2009). This reflects a generally better food intake of Vietnamese people in recent years. With 83 kg of vegetables consumed/person/year, Vietnamese

consumers have been able to meet the standard of daily micro-nutrient requirements.[2] However, the increasing access to, and intake of, vegetables turns out to go hand in hand with an increasing risk associated with contaminated vegetables, especially referring to pesticides.

Challenged by the increasing worries and fears of negative health effects from consuming unsafe vegetables, the demand of domestic consumers for safe vegetables seems to increase, especially for the emerging middle class in Vietnam. But several problems occur in articulating this demand, for instance with respect to transparency, traceability and information exchange (Son et al, 2003). Better coordination and information exchange between consumers, retailers and producers is badly needed (Figuié, 2003) to strengthen the supply chain of safe vegetables as well as of fruits. Production cooperatives and state organizations can play a role in facilitating, enabling, stimulating and even regulating such information and coordination questions.

Vietnam's further integration in the international economy (via the ASEAN membership in 1995, APEC membership in 1998, and WTO membership in 2007) helps to expand Vietnam's vegetable exports. Vegetables form an important export product of Vietnam, with a value of US$259 million in 2006, increasing from US$52 million in 1990 (GSO, 2006b; 2008b). Aware of the potential of vegetable production and of the importance of export in the national GDP, the Vietnamese state aims to increase the vegetable and fruit exports up to 1 billion US$ in 2015 (VCCI, 2007). The domestic market, with emerging high-end consumers, and the export markets, especially those of developed countries, are assumed to increasingly force Vietnam to improve vegetable production, especially in terms of product quality, marketing and production circumstances. Through various incentives and pressures food and commodity chains are expected to push Vietnam's vegetable producers to a reduction in pesticide use and to a switch to the use of less harmful and more specific pesticides.

[2] According to Ali and Tsou 1996, an intake of 200 gram is considered necessary for daily micro-nutrient requirement of a person (cited in Jansen et al, 1996).

1.4 Objectives of the study

Given the emerging awareness of pesticide effects on people's health and the environment, especially through vegetable production, various projects and studies have been conducted in Vietnam to reduce pesticide use in vegetable production, either financed by the Vietnamese state or by international donors such as ADB, IFPRI, DANIA, FAO, GTZ etc.[3] These projects and studies have produced a huge amount of reports related to the *status quo* as well as improvement strategies of vegetable production and pesticide use in Vietnam. However, these reports (ADB, 2000; Hoa and Grote, 2004; IFPRI and MARD, 2002) hardly touch on the quantitative use of pesticides on vegetables, on the pesticide distribution systems or on the impact of vegetable supply chains – both domestic and international – on farmer's vegetable production practices and their pesticide use. In addition, since the publication of these reports many things have changed significantly. For instance, at the end of the 1990s and the early 2000s, agricultural export to China accounted for a large share of total agricultural exports (56%), while export to Russia contributed with only a small share (IFPRI and MARD, 2002). However, according to Vietnam Customs, at present, agricultural export to Russia surpassed that to China (Hieu, 2009) (this tendency is also reflected in Chapter 5 of this thesis).

The present study is designed to fill the gap in vegetable production knowledge especially in terms of pesticide use in relation to specific marketing practices, processing, and exporting in the Red River Delta, North Vietnam. More specifically, this study aims to:

1. Evaluate the trend of pesticide use at farm level, focusing on vegetable production;
2. Evaluate state pesticide policy, with respect to pesticide distribution and use in the vegetable sector;

[3] For instance, in 2004 ADB and Department of International Cooperation and Foreign Affair (DFID) of the United Kingdom launched a multi-millions project titled Market for the Poor. The project covers three countries including Vietnam, Laos, and Cambodia. The project explores roles of the markets and the extent to which the poor are able to benefit from these markets. The project is also designed to build capacity to support pro-poor market development.

3. Assess the qualitative and quantitative impact of international food networks and domestic vegetables demand on the 'greening' of vegetable production and products;
4. Draw conclusions and formulate recommendations for further public and private cooperation for moving towards more environmentally sound vegetable production and products.

1.5 Theoretical framing

Environmental regulation has traditionally been perceived as primarily a state activity, due to the nature of the environment as a public good. Consequently, studies on environmental pollution have often been framed in terms of state regulatory analyses. Research on environmental policy and governance consisted of analyses of state policies and governmental authorities. But already from the mid 1980s onwards, when new scientific insights and facts emerged on role of the ecosystem plays as a substance base for sustainability and continuous development of modern societies, and global environmental problems with high consequences risk dominated the agendas (such as global warming, climate change, biodiversity loss, and food risk), individual nations faced higher degrees of uncertainty about the causes of these problems and the impacts of possible policy options (Smith and Connelly, 2003). These difficulties and uncertainties challenge the state as a single authority, which can no longer represent and adequately cover different interests groups that make up modern society. In controlling environmental quality the bureaucratic state became criticized for being inflexible, economically inefficient and unjust, unable to monitor and control the billions of material and energy transformations taking place each day, and incapable of stimulating companies to adopt more progressive environmental behavior (Huber, 1991a;b cited in Mol, 1995). The role of the state was further challenged under conditions of globalization. As Mol (2001) summarized, under globalization the state lost the ability and willingness to detail the pattern, regularities, and order of societies, and increasingly only turns to regulating mobility and ensuring the conditions for favorable interactions. Jänicke (1986) coins this all with the term "state failure", referring to the situation in which the state falls short in governing environmental quality and providing

environmental goods in modern societies. From the 1990s onwards, this has resulted in the involvement of numerous actors in regulatory and governance activities on the environment, which were traditionally left to the state. This is reflected, among others, in the growing popularity of policy network and policy community analyses (Mol, 1995; Smith, 1993). Policy making and implementation processes which involve different voices from different social actors were increasingly believed to better achieve its goals in practice. As stated by Dryzek (1987 cited in Smith and Connelly, 2003), deliberative institutions are likely to be more "ecologically rational". They have the ability to respond to the high levels of complexity, uncertainty and collective action problems associated with many contemporary environmental problems. The recent literature on environmental governance further illustrates the end of strict state-based analyses (Keohane, 2002; Litfin, 1998; Young, 2000).

The era of globalization, characterized by transnational governance and the emergence of private actors with growing roles and demands in decision making processes, has served as the historical background for the emergence of the Ecological Modernization (EM) theory. This theory tries to interpret and understand the historical development and transformation that took place in modern societies since the 1970s while struggling with emerging (global) environmental problems. Though admitting the increasingly important role of non-state actors in environmental protection, EM theorists confirm that the role of the state is not vanished or diminished. Instead, it requires stronger state regulation and intervention in order to compensate for the externalities and other irrationalities associated with market forces (Mol, 1995) and to some extent, the other way around. Despite ongoing globalization, with less strict boundary between and among nations via exchanges of goods, culture and even politics, Brenner (2004; cited in Beauregard, 2006) however, argues that the greater permeability of national boundaries does not mean the "end" of the nation-state. The plethora of work on regionalism and multilevel governance tends to recognize the continuing priority given to the central state (Jessop 2002 cited in Winter, 2006). The role of the state not only lies in macro-socioeconomic and political decision making and legitimation, but also in mediating the circulation of capital, cultural norms and environmental values, so as to influence the development of agriculture (Atkins and Bowler, 2001). It is thus observed,

and argued, that the role of the state remains important to safeguard the interest of consumers and to let markets operate efficiently (especially under conditions of externalities and information asymmetry) (Azmat and Coghill, 2005). Thus, it is not a matter a strong state or a weak state in governing environmental quality, but it is a matter of how the state properly functions with the active participation of non-state actors in this field. In this sense, EM theory promotes a new approach in environmental protection: from top down, command-and-control and hierarchical policies towards more consensual, participative, market oriented, and network steering.

The turn to network and governance perspectives and studies has also emerged in agricultural policy analyses in the 1990s. Although of relatively recent origin, there is now a rich literature within the rural social sciences on systems of provision and agrofood network approaches related to agriculture and food (Fine, 1998; Goodman, 2002; Goodman and DuPuis, 2002; Lockie, 2000; Marsden, 2000; McMichael, 1996). This literature gives evidence of the increasing importance of networks in the performance of agriculture and farmers. It is no longer sufficient to study farmers in isolation from their social environment, but we have to include the public and private actors and institutions in the networks and systems of provision around farmers in order to understand agricultural production and the changes taking place. In these approaches the role of governmental authorities and policies in 'governing' and structuring agriculture and farmers now is more balanced. State as much as non-state actors and institutions are interpreted as equally relevant in understanding and governing food production. These perspectives have been particularly strengthened following the recent debates on globalization and on the 'withering away' of the state. Both from above, by transnational global companies, and from below, by subnational governmental and non-governmental agencies, agricultural state policies are claimed to be undermined and are – according to some – no longer the principal actors triggering change, especially in environmental protection area.

Recent innovations in these agro-food network approaches come together with the so-called 'qualitative turn' and the attention to consumption. Many environmental innovations that have been introduced by private companies and public utilities during

the last decade, are said to be primarily initiated by the wish and power of consumers (Spaargaren and Van Vliet, 2000). The quality of food and food production and the increasing role of consumers in structuring agro-food networks and chains towards, among others, environmentally safe and sound food production and products, have lately received special attention (Dagevos, 2004; Nestle, 2002; 2004; Vellema and Boselie, 2003; Warde, 1997). Here, the perspectives on agro-food networks meet with the environmental social science literature and with the literature on governance. These shifts in attention towards quality and consumers/consumption are related to a variety of real and perceived changes in global food production and wider processes of globalization, as has been so colorfully portrayed in the risk society literature (as pointed out by Mol and Bulkeley, 2002; Mol et al, 1997; Oosterveer, 2002). The emergence of new - non-state - actors on the stage of food safety and environmental governance is criticized by some scholars as a weakening of nation-state institutions, while others interpret this as a necessary complementary force in safeguarding food safety and the rural environment, in an age marked by globalization. In developing countries, where state institutions on the environment and food safety are still less strong compared to their counterparts in OECD countries, the 'complementary argument' might have additional weight.

However, up till now most research on the qualitative turn and on consumers and chain inversion in agro-food networks has been restricted to developed countries, such as the contributions in the journals *Sociologia Ruralis, Rural Sociology* and *International Journal of Sociology of Agriculture and Food*. Only few studies on organic food focus on production in the south, e.g. those on labeling systems for fair trade or organic products. Hardly any study focuses on the role of consumers in developing countries in restructuring agro-food networks towards more environmentally sound ones. To some extent this is logical and understandable as most purchasing power, most of the environmentally concerned citizen-consumers, and most of the powerful multinationals in the agro-food sector are located in the North. However, with the rapid development in especially - but not only - Southeast and East Asian economies, one wonders to what extent these innovative contributions on the qualitative turn and on consumer empowerment have, or will, become relevant outside the Northern hemisphere.

EM theory discusses the transformation in the role of nation-states and the growing role played by non-state actors in governing environmental quality as political modernization. In general, political modernization expresses the changing relations between state, market and civil society in various stages of the institutionalization of environmental politics. Political modernization is critical towards, and deviates from, the idea of a central, monopolistic, and strong bureaucratic state. Though EM theory has increasingly gained its importance in environmental sociology, it has been criticized on its Eurocentricity and poor-generalizability to other societies in the world. This is because the ecological modernization theory is based on certain presumptions, which do not always apply to for instance developing regions, i.e., (i) the existence of a welfare state, (ii) advanced technological development in a highly industrialized society, (iii) a state regulated market economy, and (iv) a relatively profound and widespread environmental consciousness (Mol, 1995). Given the highly centralized Vietnamese state with a limited capacity, can EM theory be relevant to explain, or shed a light on, current and future innovations in environmental protection in Vietnam?

Though Vietnam has still a one-party and highly centralized state, increasing attention is being paid to the environment. Public participation in environmental protection has to a certain extent been legitimized. In the recently amended Environmental Law, for instance, people are given the right to complain about environmental problems to local or higher authorities (Article 33), and polluters must compensate the people who suffer from pollution (Article 49 and 52) (O'Rourke, 2002). This does have some positive results regarding pollution at factories/companies. According to O'Rourke (O'Rourke, 1995), local demands and protests[4] have played a critical role in implementation environmental policies, particularly at city and provincial levels. By the same token, Phuong and Mol (2004) also consider communities in Vietnam as a "driving force" for environmental regulation and protection. They even suggest that the government can further mobilize and support these community actions through environmental information and awareness programs, and through policies that on the one hand provide more incentives to the public to participate in policy making, and on the other hand

[4] Recently, environmental pollution has been increasingly subjected to legal proceedings made by local people to authorities, only second after land-use right conflict (Van, 2009)

open up the policy making process to these "non-conventional" contributors. Regarding pollution caused by agricultural activities, in the 1993 Land Law farmers have an obligation "to comply with regulations on environmental protection, not causing damage to the legal interests of adjacent land users." (Article 19, Chapter IV) (McCann, 2005). With increasing environmental problems and food risks associated with chemical pesticides, the question remains, however, how Vietnamese non-state actors (i.e., farmers, consumers and other market actors) have complied with these state regulations and triggering changes on environmental protection? Can they become a driving force for compensating the weak state in governing food and environmental quality via promoting the greening of vegetable production in Vietnam?

Vietnamese pesticide policy has largely failed owing to its limited authority of central state agencies, poor coordination among these state agencies, and problems of limited capacities, corruption, and poor coordination at the local implementing state agencies (Huan and Anh, 2001). But these state failures in governing pesticides in agricultures do not automatically mean that a switch to market actors or public participation is a viable alternative that will result to a significant improvement in the environmental and food safety consequences of current vegetable production and consumption.

This study applies an Ecological Modernization perspective on the roles played by the Vietnamese state and by the non-state actors in agrofood networks (such as, farmers, cooperatives, agricultural input service providers, consumers, exporters) in the greening of agricultural production and food products in Vietnam. The theoretical interrelations between and among these actors are presented in Figure 1.2. This theoretical perspective helps us as a frame for investigating the answers to the research questions formulated above. But at the same time the frame itself also bring a new research topic to the fore. In searching for similar developments towards multi-actor governance on agro-environmental practices and food quality in developing countries as have been identified in OECD countries, we also evaluate the usefulness of a western Ecological Modernization frame for studying the greening of agrofood sectors in Vietnam and comparable developing countries.

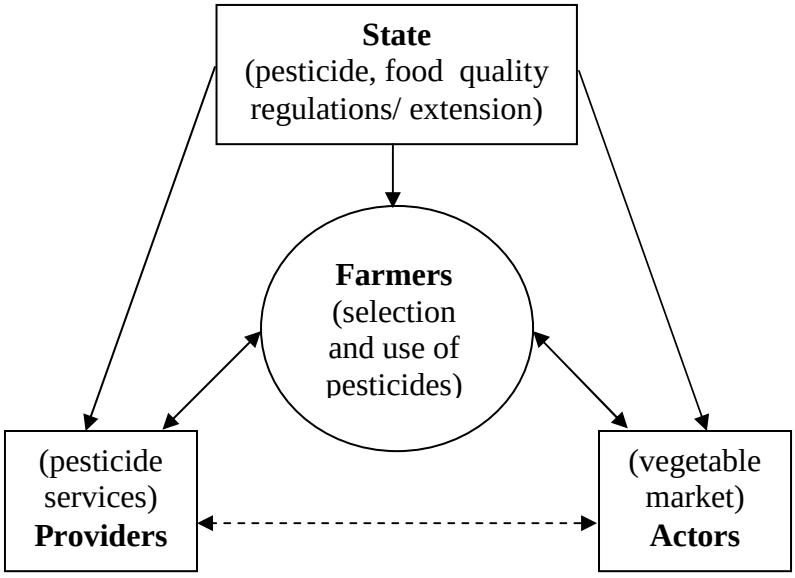

Figure 1.2 Inter-relations between and among actors

1.6 Research methodology

The research site: the Red River delta

The Red River delta (RRD) is one of the seven ecological regions of Vietnam. It consists of 11 provinces: Hanoi, Vinh Phuc, Bac Ninh, Ha Tay, Hai Duong, Hai Phong, Hung Yen, Thai Binh, Ha Nam, Nam Dinh, and Ninh Binh. The area of the region is 1,486,200 hectares large, of which 756,300 hectares (51%) are used for agriculture. The region is densely populated with a total of 18.4 million inhabitants (21.6% of total national population) at an average of 1,238 persons per km^2. Of this population, 13.8 million (75%) live in rural areas. The unemployment rate is 5.7% (GSO, 2007a). The region is the most densely populated one in the country and thus the farmsize is very small, with an average of less than 0.4 ha per farm household (Huan and Anh, 2002).

RRD contributed with 17.4% to the total national agricultural output value in 2007 (GSO, 2007a). Many kinds of vegetables are grown as part of a rice-based system. The vegetable production area has increased in all ecological regions of Vietnam, also in RRD. In 2005, vegetable production areas and total vegetable products of the RRD were roughly 25% and 30% of total national vegetable production area and products, respectively, making the RRD the largest vegetable producing region in terms of

production output in the country (Rauhoaquavn, 2007) (Table 1.1). The high productivity of vegetable production in the RRD reflects intensive farming practices in the region, especially when compared with other regions in the country. The intensive farming practices are the result of an increased cropping index, as well as of an increased shift of farmers to chemical pesticides and fertilizers (see more in Chapter 4 of this thesis). With the personal vegetable consumption of 83 kg/year, RRD farmers have produced a large surplus of vegetables for the rest of the country. Unlike rice that is produced mostly for household consumption, vegetables have further integrated farmers into the market, from which they acquire cash income as well as agricultural information and marketing skills. Moreover, a higher labour input is required in vegetable production compared to cereal crops. Vegetable production thus has a comparative advantage in the densely populated RRD, with its high unemployment rate.

Table 1.1 vegetable productions in regions of Vietnam in 1999 and 2005

Region	Grown area ('000 ha)		Yield (ton/ha)		Production ('000 tons)	
	1999	*2005*	*1999*	*2005*	*1999*	*2005*
The Red River Delta	126.7	158.6	15.7	18.0	1,988.9	2,852.8
Northern Midlands and Highlands	60.7	91.1	10.5	11.1	637.8	1008
Northern Centrals	52.7	68.5	8.1	9.8	427.8	670.2
Coastal Southern Centrals	30.9	44.0	10.9	14.0	336.7	616.4
Central Highlands	25.1	49.0	17.8	20.2	445.6	988.2
South-Eastern Area	64.2	59.6	9.4	13.0	604.9	772.1
The Mekong River Delta	99.3	164.3	13.6	16.6	1,350.5	2,732.6
Total	*459.6*	*635.1*	*12.6*	*15.2*	*5,792.2*	*9,640.3*

Source: (Rauhoaquavn, 2007).

The present empirical study was mainly done in six provinces in the RRD: Hanoi, Hai Duong, Hung Yen, Nam Dinh, Ninh Binh and Thai Binh (Figure 1.3). It was, however, centered in Hanoi which takes a large share of the vegetable market in the RRD and has a higher demand for and spending on safe vegetables by Hanoi consumers (Chapter 5 of this thesis). The market for safe vegetables is assumed to be a motive for farmers in changing their vegetable production practices. Most of the research thus was done in Hanoi and two adjacent provinces: Hung Yen and Hai Duong. By selecting these provinces, the study aimed to identify the possible effects of the high-end market of Hanoi on vegetable farming practices in a wide range of farming contexts in the RRD. In addition, the organization of vegetable production varies between these provinces,

from more intensive in and close to Hanoi, to less intensive in Hai Duong and Hung Yen provinces. The other three provinces were mainly visited for a survey on exporters (see more in Chapter 5 of this thesis). Together these areas are representative for the existing variation in the RRD.

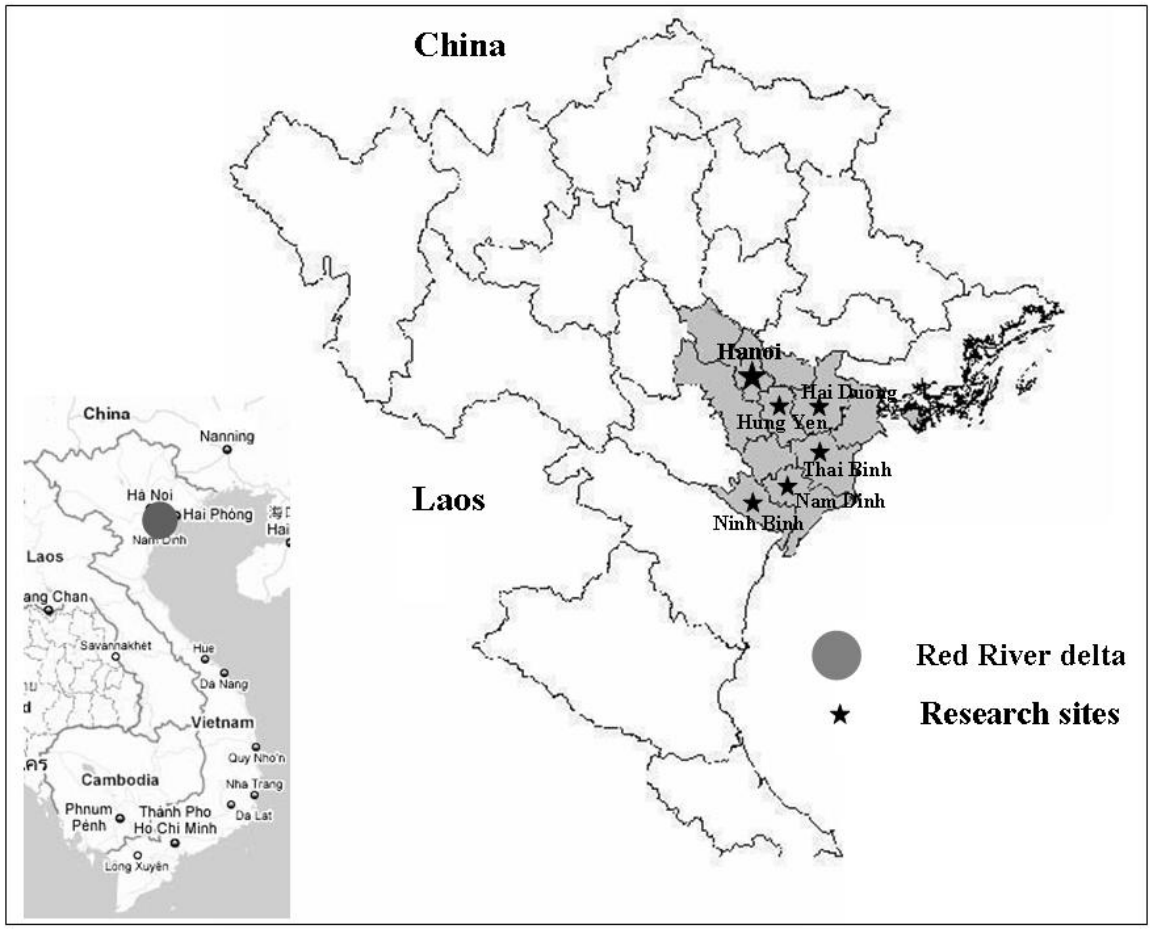

Figure 1.3 The Red River delta and research sites

Research methods

Under poor economic conditions, small-scale farming practices and poor extension services, Vietnamese vegetable farmers are clearly bounded by economic interest in their farming practices. That makes them also open for an increasing use of pesticides to save their crops from pest and disease attacks. But economic rationalities alone are often a poor predictor of farmer behavior. This research is designed to evaluate current pesticide reliance of vegetable farmers in the Red River delta, Vietnam and factors influencing their motives regarding their selection and use of pesticides. Policy evaluation methodologies and network analyses are used in operationalising the

theoretical concepts into research strategies and methods, following earlier research experiences (Dieu, 2003; EEA, 2001; Mol, 1995; Smith, 1993). The project is thus divided in three interrelated subprojects:

(i) a sub-project on state pesticide policy evaluation,

(ii) a subproject on the influence of domestic vegetable distribution systems and consumption in sustainable agro-food production, and

(iii) a subproject on the influence of global agro-food networks on domestic vegetable production.

Each sub-project combines a specific methodology of qualitative and quantitative research methods, detailed as follows:

a. In evaluating the effectiveness of the current state pesticide policy of the Vietnamese government on vegetable production in the RRD, a systematic approach as outlined by the European Environmental Agency (2001) is followed. After identifying the policy goals and policy measures as outlined in government documents, these policies will be evaluated using collected data on pesticide distribution by retailers as well as on the quality and quantity of pesticide use by farmers. Data were collected by surveys and farm monitoring, focusing on two provinces: Hanoi and Hai Duong (see Appendix 1, 2 for the questionnaire for farmer's survey and pesticide retailer's survey, respectively; Appendix 3 for the farm monitoring form). The surveys were carried out in the two provinces, while the farm monitoring was conducted in Dong Anh district, a major vegetable growing area of Hanoi Province. 32 farmers were monitored on a daily basis, from August 2006 to March 2007, for all their farming activities. The farm monitoring was partly a replication of the farmer's sample that was monitored within the VEGSYS Project.[5] This repetition allows a comparison between two different periods and allows tracking changes that occurred over time, i.e., a 4 year period. In-depth interviews with 13 farmers, 6 pesticide companies and shops, and 13 representatives from governmental agencies will reveal the functioning of the policy network, in order to explain and understand the causes and backgrounds of policy output,

[5] Sustainable technologies for pest and disease management and soil fertility management in smallholder vegetable production in Sichuan, China and Red River Delta, Vietnam. The farm monitoring was conducted from August 2002 and March 2003 (http://www.vegsys.nl).

outcome and performance on pesticide use. (See Appendix 4, 5, and 6 for the checklist for the in-depth interviews with farmers, with pesticide retailers, and with governmental officials, respectively).

b. In assessing the influence of Vietnamese vegetable distribution systems and consumption in the greening of agro-food production and products in the RRD, we will rely on two main methods. The farmer's survey in the two provinces of the RRD will especially enable us to get insight in (i) vegetable farming practices targeted for different marketing channels, such as conventional and nonconventional markets, safe vegetable shops or supermarkets; (ii) some of the motives behind changes in pesticide use of farmers; and (iii) insight in the distribution channels of these crops. In investigating how and why domestic consumers influence the greening of vegetable production and products, and how these are, or might be, combined with governmental policies, we will carry out surveys among 87 vegetable retailers and 225 vegetable consumers, focusing on Hanoi where traditional vegetables and safe vegetables coexist[6] (see Appendix 7 and 8 for the questionnaires for safe and for traditional vegetable retailers, respectively; see Appendix 9 and 10 for the questionnaires for safe and traditional vegetable consumers, respectively). The interviewees were selected from both normal and safe vegetable marketing channels. These surveys are aimed to understand the functioning of the consumption-end of domestic agro-food network, as well as motives behind and constraints faced by different actors towards the greening of vegetable production in the RRD, Vietnam.

c. In assessing the impact of international food networks on the greening of Vietnamese vegetable production and food products we will use a similar strategy. To find out how and why these global actors and networks influence the greening of vegetable production and how governmental policies join forces, or not, with them, we will carry out a survey on a limited number of 30 vegetable and fruit

[6] From 1995, the Hanoi government started a Safe Vegetable Production Program. Safe vegetable production has to follow specific conditions and procedures, mainly referring to nonchemical contaminated production soil, use of decomposed manure, non-contaminated irrigation water, adoption of IMP and use of low-toxic pesticides and requirements on chemical and pathogen residues (MARD, 1998b). Vegetables not legally certified following these conditions and procedures, are named traditional vegetables.

processors/exporters in eight provinces of which six are within the RRD[7] (see Appendix 11 for the questionnaire for vegetable processors/exporters). To get further insight on the functioning of the procurement system adopted by exporters, four collectors who assist exporters in coordinating and managing vegetable and fruit production at farmer's level were also interviewed (see Appendix 12 for the checklist for vegetable collectors).

Finally, our analyses of the three sub-projects, together with an international literature review on these subjects, should enable us to analyze and identify possibilities for innovating and improving existing pesticide governance in Vietnam. The combination of state and non-state actors and institutions, and the activation of domestic and international agro-food networks, will be the main foci for recommendations.

1.7 Scope of research and structure of thesis

This thesis consists of 6 chapters. This first chapter has provided background information from which the research questions have been formulated. Chapter 2 details pesticide use, and its trends, in vegetable production in the RRD, as well as some major factors that play a role in farmer's selection and use of pesticides. Chapter 3 analyzes Vietnamese state pesticide policies and their successes, as well as their failures, in achieving their goals. The limitation of state policies in promoting a reduction of reliance on pesticide use is also analyzed. This is done especially through analyzing trends in pesticide trade names and quantities legally allowed to enter the Vietnamese pesticide market. Chapter 4 focuses on domestic vegetable supply networks and their influence on pesticide use at farm levels. In this chapter, routine practices of vegetable producers, wholesalers, retailers and consumers are presented. By investigating the marketing channels of both normal and safe vegetables, constraints for promoting production and consumption of safe vegetables are determined. In a similar stream, Chapter 5 investigates the current situation of vegetable processors and exporters, their impacts on farmers, focusing on their current practices and strategies in controlling

[7] The two provinces that are not within the RRD are Thanh Hoa and Bac Giang. These were also selected because they contribute a large share of vegetable and fruit exports from North Vietnam.

pesticide uses by farmers. Finally, Chapter 6 presents the final analysis and conclusions drawn from the research results. It further formulates major recommendations to promote public-private cooperation in the greening of vegetable production in the RRD, Vietnam.

Chapter 2

Pesticide distribution and use in vegetable production in the Red River delta of Vietnam[8]

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Abstract

For a long time pesticides attracted interest from the Vietnamese governments and farmers for their positive effects in protecting crop yield losses resulting from pests and other plant diseases. Recently, the negative effects of pesticides on human health, natural food chains, and the environment are increasingly being taken into account by both state and non-state actors. Striking a balance between positive and negative effects is complicated as most likely, pesticides will continue to maintain their vital role in an agriculture-based country such as Vietnam. However, recently a shift can be noticed in farmers' selection and application of pesticides, initiated mainly by farmers themselves and to a lesser extent also by other actors such as the government, pesticide companies and distributors. This article provides an empirical insight into this shift, based on the results from research in four provinces in the Red River Delta. Possible implications for policies towards greening pesticide handling practices in vegetable production are drawn such as removing inexpensive pesticides (often associated with high toxicity) out of the market, giving technical training on pesticide selection and use to farmers, and reconsidering the role different actors can play in future safe vegetable production programs.

Key words: pesticide distribution, pesticide use, toxicity, environment, agriculture, Red River Delta.

2.1 Developments in pesticide use in agriculture

Vietnam is a country with a long history of agricultural production. This sector has been and will remain a major motor for the national economy as well as for the livelihood and wellbeing of a major part of its population. Since Vietnam adopted a policy promoting a market economy in the mid-1980s, agricultural production has become more diversified whereby the area used for growing vegetables has increased remarkably, i.e., from 328,200 hectares in 1995 to 452,900 hectares in 2000 and 525,900 hectares in 2005 (FAOSTAT, 2007). The Ministry of Agriculture and Rural Development has even planned to expand this are to 800,000 hectares by 2010 (MARD, 2004b). This expansion of the area destined for vegetable growing in Vietnam, goes together with a remarkable increase of the total quantity of pesticides used for this activity leading to several health and environmental problems. This section will explore

this history to provide a background for the empirical study on the changes in pesticide use in Vietnam.

The initial promotion of the use of pesticides by the Vietnamese government was greatly facilitated by the centralised management and collectivised production, which dominated economic policies between 1959 and the early 1980s (Xuan, 1995). By 1988, following Vietnam's *Doi Moi* (or Renovation) policy towards a market orientation, the distribution of agricultural inputs was removed from the control of cooperatives (Rigg, 1997)--the prevailing unit for agricultural production promoted by the Vietnamese government during the collectivization production period, i.e., from the end of the 1950s until the beginning of the 1980s--and given into the hands of private entrepreneurs who got engaged in the import, formulation, and distribution of pesticides for agricultural crops. In less than 40 years the initial pesticide use of just 100 tons per year in the 1950s (Anh, 2002) had multiplied 150 times by 1991 (Oanh, 2005). Particularly as a result of the privatization of agricultural production in Vietnam, pesticides were applied even more intensively, and their use therefore grew rapidly from 15,000 tons in 1991 to 35,000 tons in 2002 (Oanh, 2005). The expenditures for pesticide imports increased 13.5 times between 1991 and 2006 (Oanh, 2005; Vinanet, 2007). These rapid changes not only concerned the quantities, but also the types of pesticides used. The numbers of both active ingredients and pesticide formulations/re-branded products distributed and used in Vietnam increased remarkably, especially during the last decade. On average, 38 new types of pesticides were registered annually in the years between 1997 and 2001, and 149 during the period from 2002 to 2007 (MARD, 1997; 1998b; 1999; 2001b; 2002a; 2003a; 2004a; 2005b; 2006b; 2007b) (Figure 2.1).

Currently, pesticide use per hectare is higher in the production of vegetables. In one of the major agricultural areas--the Red River Delta--the average amount of pesticides used is 5.52 kg/ha/cropping season for vegetables compared with 3.34 kg/ha for rice, 0.88 kg/ha for other food crops (e.g., maize and sweet potato), 3.34 kg/ha for short-season industrial crops (e.g., soybean and peanut), and 3.08 kg/ha for long-season industrial crops (e.g., tea and coffee). These figures are comparable with other ecological regions of Vietnam (Anh, 2002).

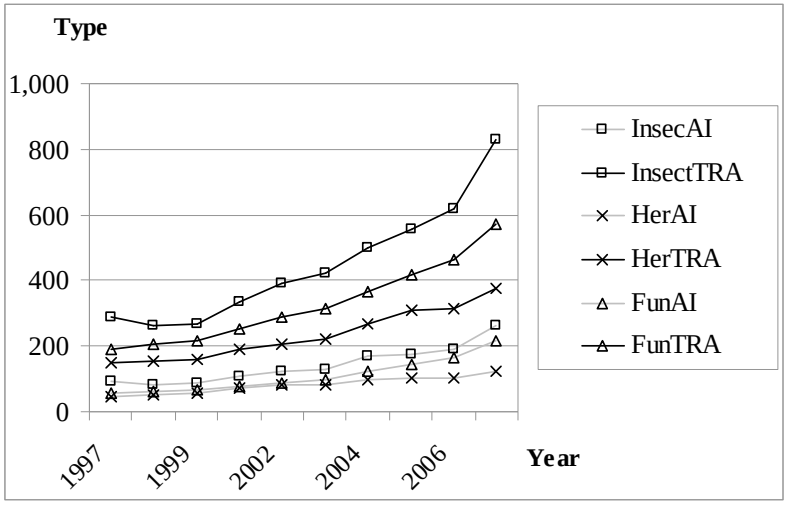

Figure 2.1 Types of pesticides (in AI and formulation) distributed in Vietnam (1997-2007)

AI, active ingredient; InsecAI, insecticide AI; InsectTRA, insecticide trading names; HerAI, herbicide AI; HerTRA, herbicide trading names; FunAI, fungicide AI; FunTRA, fungicide trading names

Source: Ministry of Agriculture and Rural Development (1997–2007).

The increased use of pesticides has positive effects such as higher cropping yields and, to a certain extent, improved quality of the products. However, pesticides also have negative health effects for the actors directly or indirectly involved in the food supply chain (such as farmers, traders, and consumers) especially when pesticides are improperly applied. Poor farmer knowledge on the content, use and risks of these chemicals, ineffective governmental enforcement of pesticides' regulations (Anh, 2002; Tra, 2003), and strong profit-driven interests among pesticide traders and users, have led to an increased use of cheap and rather hazardous pesticides in Vietnam in the 1990s (Anh, 2002; Quyen et al, 1995). In this situation, the Vietnamese population has been threatened by the health risks associated with direct and indirect exposure to pesticides. For instance, in 2002 more than 7,000 cases of food poisoning from pesticide residues (involving 7,647 people) were reported, causing 277 deaths in 37 of the 61 provinces (Xuyen, 2003). These numbers of acute poisoning from direct and indirect exposure to pesticides do not include the numerous cases of 'silent' casualties by pesticides (Chau, 2003; Quang, 2001).

Given these problems, agricultural authorities at ministerial, provincial and district levels have recently invested much to redirect vegetable farming practices to become

less pesticide-based. Many training courses on technical knowledge, integrated pest management and the proper use of pesticides have been organized for farmers. In addition, field demonstrations and zone-planning for so-called 'safe vegetable production' (the production follows a set of procedures regarding good soil and water condition, use of less toxic chemical inputs, clean seed/seedlings, and adoption of integrated pest management strategy) have been implemented especially in the peri-urban areas of Hanoi and in Hai Duong and Hung Yen provinces. However, it is not clear whether these interventions by the agricultural authorities have resulted in improvements in distribution and use of pesticides, as extensive and reliable information on pesticide trading and on farmers' practices in using pesticides is lacking.

Against this background, this empirical study focuses on two main objectives. First, as so little is known about the developments in pesticide distribution and use in Vietnam, our first objective was to assess the recent changes in this field, emphasizing the Red River Delta. Our second objective was to explain how these changes are taking place, focusing on the state actors and non-state actors involved in the distribution and application of pesticides. This research will provide a more thorough understanding of the decisions farmers make in selecting and using pesticides. After introducing the research methodology, a detailed analysis of the pesticide distribution practices is presented. This is followed by an analysis of the factors that influence pesticide selection and use by farmers. The final section formulates conclusions and recommendations for a more environmentally friendly use of pesticides.

2.2 Methodology

This article is based on two field studies in the Red River delta in northern Vietnam, supplemented with a considerable number of interviews with stakeholders and informants.

A first empirical study was done on the distribution and use of pesticides and carried out in two provinces in the Red River delta: Hanoi and Hai Duong (see Figure 1.3). These provinces were selected because they produce large quantities of vegetables for markets

in different provinces and regions throughout Vietnam. In Hanoi, the major vegetables were cauliflowers, choysum, kohlrabi, wax gourd, wrapped heart mustard, headed cabbage, and carrot. These vegetables are most grown in winter and early spring. In summer, farmers grow rice and maize as major crops and some vegetables such as choysum, wax gourd, wrapped heart mustard, and bitter melon. By contrast, in Hai Duong, the types of vegetables grown are less diverse. The major vegetables are headed cabbage, wrapped heart mustard, cucumber, and kohlrabi. These are mainly grown in winter. In summer, farmers often grow water melon, rice, and maize with a small area for headed cabbage, wrapped heart mustard, and cucumber. Major insects and diseases on vegetables are: flea beetle, imported cabbage webworm, diamond back moth, cotton bollworm, white fly, aphid, black cutworm, Rhizotonia, Xanthomonas, and Alternaria. In addition, the organization of vegetable production varies between these provinces, from more intensive in Hanoi to less intensive in Hai Duong province. As such, these areas are representative of the existing variation in Red River delta.

For the first empirical study, a farmers' survey was conducted from September to November, 2006. In each province, two communities--one which the state had targeted for 'safe vegetable production' and another without such policy which therefore can be called 'traditional vegetable production'--were selected. In each community between 30 and 33 farmers were systematically randomly selected, resulting in a total survey of 125 farmers. These 125 farmers were interviewed with the help of structured questionnaires to understand their agricultural practices and socioeconomic conditions, i.e., land availability, labour availability, level of education, their present and past (5-7 years ago) vegetable farming activities. These background data were supplemented with questions on related issues such as the insect pests and diseases they encounter, their access to pesticides, to technical know-how, and to the vegetable market, with a focus on the pesticides' selection and use and on the actors and factors that influence their decision-making. Because farmers do not record or remember the exact names of the pesticides they have used, the research team borrowed all types of pesticides available in the large retailing shops in the area as sample for the interviewees. Each researcher brought a sample of about 40 types of pesticides and each farmer was requested to select the 5 pesticides they most regularly and recently applied. These 5 pesticides were then used to

guide follow-up questions on toxic classification, pesticide cocktailing practices, and pre-harvest interval.

Parallel with this survey, an additional number of 32 farmers in Dong Anh district, Hanoi, were monitored on a daily basis between August 2006 and March 2007 for all their farming activities. Similar monitoring data had been gathered before from these 32 farm households between August 2002 and March 2003 in the VEGSYS Project (Sustainable technologies for pest and disease management and soil fertility management in smallholder vegetable production in Sichuan, China and Red River Delta, Vietnam, http://www.vegsys.nl). This repetition allows a longitudinal comparison to track changes over time. The monitoring from August 2002 to March 2003 and from August 2006 to March 2007 will be termed monitoring period 1 and 2, respectively (hereafter MP1 and MP2). A total of 199 primary production units with a sown area of 7.57 ha had been monitored in MP1 and 225 primary production units with a sown area of 8.16 ha in MP2 (a primary production unit is a full cycle of a certain crop grown on a specific plot).

Data originating from the farmers' survey are mostly reported based on the percentage of farmers' responses. In addition, by using SPSS software, several observed variables have been analyzed to determine factors that explain farmers' decision-making regarding pesticide selection and use. Discriminant analysis of the observed variables is also used to determine differences between the two groups of farmers (i.e. safe vegetable and traditional vegetable production) and the two provinces. Quantitative data from farm monitoring are presented by average pesticide application (means) and statistically analyzed with Independent-Samples T Test to determine whether there is any change in pesticide application practices between MP1 and MP2.

Finally, this article also includes information gathered through semi-structured interviews with 5 staff members from agricultural departments, 8 officials from plant protection departments, 2 researchers, 6 pesticide retailers and staff from pesticide companies. These interviews were supplemented with additional open interviews with 13 farmers in two other provinces--Hung Yen, and Nam Dinh provinces (see Figure

2)—to supplement those in Hanoi and Hai Duong provinces with a focus on recent changes in practices of pesticide distribution and application on vegetables as well as on the drivers for those changes.

2.3 Pesticide distribution: beyond short-term profits?

Since the introduction of the Doi Moi policy in the 1980s the involvement of private actors in different sectors of the Vietnamese economy increased, including in the import, formulation and distribution of pesticides. Though government documents contain strict regulations for these activities, weak enforcement by the state has resulted in disorderly practices in marketing and handling pesticides. Recently however, as we will argue in this section, increased competition between pesticide companies and retailers, and a growing awareness among farmers of their potential negative effects, have resulted in some signs of improvement in pesticide practices (including the import, formulation, and distribution) in Vietnam.

At present, the pesticide distribution system in the country is in the hands of a large number of small-scale private businesses. The number of companies involved in formulation and distribution of pesticides increased from 137 in 1999 to 193 in 2006 (MARD, 1999; 2006b). Parallel with this trend, the number of pesticide retailers increased even faster. The number of retailers (excluding part-timers who often do not register their business) was estimated at around 19,000 in 2001 (Van, 2002), which grew significantly over the following years. For instance, the number of retailers inspected by Plant Protection Department officials in 2002 already totaled 27,578 (Tra, 2003) while a number of retailers still remained un-inspected. Since Vietnamese data are often not very reliable; these data would mean an increase of over 40% in one year (Mol, 2009).

This rapid growth in the number of pesticide companies and retailers is an indication for the fact that the pesticide market in Vietnam is highly lucrative and ‘parasitic’. ‘Parasitic’ pesticide, in this sense, refers to cheap pesticides often with low effectiveness produced and/or packaged by small-scale Vietnamese pesticide companies. It is often

applied in a cocktail with other pesticides, mostly of better quality, rather than used separately. Farmers were pushed to apply certain pesticides by retailers on whom they most rely on for guidance on the selection and application of pesticides. The market opportunities were particularly high when the official regulations that define pesticides as a special product for which formulation, trade, and use is only allowed under specific conditions such as certificates for technical know-how, business, health etc., were not (completely) followed (SRV, 2001). Due to the general inadequacy in governmental enforcement of this policy, there were many companies violating the existing regulations. For instance, a comprehensive nation-wide inspection conducted by the Plant Protection Department in 2000 (Huan and Anh, 2002) found that out of the 10,233 pesticide retailers controlled, 5,132 (50.2%) had no adequate storage facility for pesticides, and that many stores failed to follow the safety guidelines. Pesticides were repeatedly stored near human foods and animal feed. Moreover, this Plant Protection Department inspection reported that 2,388 retailers (23.4%) had no official permission to perform their business, and as many as 8,868 retailers (86.7%) had no certificate on technical pesticide knowledge (Huan and Anh, 2002). In 2002, the inspection of 27,578 pesticide retailers detected 5,183 (18.8%) breaking the regulations. The number of retailers violating the official regulations even increased to 19.9% in 2003, according to the inspection (Tra, 2003). At another occasion during the same period, out of 36 pesticide companies inspected, 10 were violating the regulations (Tra, 2003).

Simultaneously, there was substantial trade in illegal pesticides (mainly of highly toxic products). The nation-wide inspection in 2000, detected 2,500 kg of banned pesticides, and 4,753 liters and 5,645 kg of illegally imported pesticides (Huan and Anh, 2002). In 2001, government officials confiscated 7,959.5 kg of illegal pesticides when inspecting pesticide retailers (Van, 2002). However, as the inspection only applies visual and easy-to-check indicators regarding retailing and trading practices in pesticides, more ‘sophisticated’ violations are often not detected. So inspectors verify the presence of formal certificates on technical know-how for pesticide companies, of storage facilities for retailers, of information about the origin and expiry dates of the pesticides, and of information labels on the packaged pesticides, but they can not control the chemical composition of the inert ingredients which are used as carriers or bulk agents for the

pesticides. In fact, inert ingredients may have biological activity of their own, and thus they may be toxic to humans and environment (U.S. EPA 2002 cited in Cox and Surgan, 2006). Also, the compatibility between the real percentage of AI(s), the real types of AI(s) and the information on AI(s) that is mentioned on the labels cannot be checked. For instance, our respondents from the pesticide companies, retailers and even many farmers suspect that some types of pesticides registered as from biological origin could in reality be from chemical sources, because they have a quick impact and high efficacy. Another strategy regularly applied by pesticide companies that evade regulations, which is greatly facilitated by the limited time available for inspection by the official teams, is to use different information labels for large packages (intended for official inspection) and for small packages (intended for farmers). Our field research discovered several examples of such label discrepancies in a pesticide shop in Gia Lam, Hanoi: the pre-harvest interval for the pesticide Reasgant 1.8EC (Abamectin) was 7 days according to the information on the large packages, but the label on the small packages mentioned only 3 days, which makes this product more attractive for farmers. Similarly, the pre-harvest interval for the pesticide Pounce 50EC (Permethrin) recommended on the large package was 12 days, while on the small package only 7 days was mentioned. Other pesticides such as PhiRonin 50SC (Fipronil) did not even have any pre-harvest interval information on the small packages at all, though on the large packages 14 days (for rice and beans) was indicated. We also found that several companies renewed the expiry date for already expired pesticides or even engaged in the production of counterfeit pesticides.

Given the competition between pesticide companies, introducing new products on the market is a key strategy to maintain (or expand) market share and profit. Foreign pesticide companies, such as Syngenta, Monsanto and Bayer, seem to adopt a bottom-up approach in introducing and promoting their products. When they put a new product on the market, they often start with an extensive and intensive promotion program and offer the product to farmers for free, before really engaging in trading it commercially. By contrast, domestic Vietnamese companies generally adopt a top-down, often parasitic, approach. The main reason for this difference is that unofficial open-door pesticide policy from the Vietnamese Ministry of Agriculture and Rural Development

prevents companies from gaining a monopoly on a particular product for a certain period of time. Apart from this, the rapid emergence of resistance against pesticides among crops is shortening the period of effectiveness for many [formulated] pesticides with old AIs (mainly originating from China). For these reasons, once a local Vietnamese company decides to market a new product, it will do this as quickly as possible to take advantage of the temporary opportunities, for which an extensive retailer network is essential. Vietnamese companies do not have enough financial resources to invest in a prior extensive and intensive promotion program like foreign companies can. Pesticide companies rely on retailers to sell their products as farmers are heavily dependent on them for the selection of pesticides and information about their use. Thus introducing 'new' products on the market is a combined strategy for companies and retailers to maintain (or improve) their market position. Although, such 'new' products often do not really have a new composition, their successful introduction offers large benefits for both the company and the retailer because farmers are not yet familiar with the product and have no idea about its real price. Developing and registering 'new' products is also a strategy in the competition between wholesalers and retailers operating on the same location. As the same product may be registered under different trading names, each wholesaler and his retailing network will have access to one or only a limited number of these trading names. By adopting the strategy of offering special commission fees for their retailers, many smaller Vietnamese pesticide companies have been able to successfully expand their business, illustrated by the growing number of pesticide products registered by Vietnamese companies in recent years (MARD, 2001b; 2002a; 2003a; 2004a; 2005b; 2006b). The weak and ineffective government enforcement of regulations regarding pesticide formulation, distribution and use, allows many small-scale Vietnamese pesticide companies to put cheap and little effective products on the pesticide menu of farmers. Retailers and farmers are aware that if these cheap pesticides are used separately they will have only limited effect in controlling pests and diseases and consequently, they are more and more combining them into solutions known as 'cocktails.'

In Vietnam no formal collaboration exists between pesticide companies, although some negotiations have been ongoing between the large-scale pesticide companies to establish

an association to fight counterfeit pesticides and unfair competition, but this has not yet generated a concrete result. For many years competition from small-scale pesticide companies has been modest, as they did not really challenge the market shares and/or profitability of the large-scale companies. After having enjoyed lucrative profits on this easy market for a number of years, however, Vietnamese pesticide companies are currently challenged by more intense competition. They have to find a strategy to secure their longer-term interests and though they still continue selling parasitic pesticides for short-term profits, they have started to look as well for products with greater intrinsic value (i.e. new compounds) for which they face less competition. This comes together with attempts to increase their reputation among retailers and farmers. Respondents from pesticide companies indicated that they now have to take care not only of their short-term profits, the efficacy of a pesticide and its retailing price, but also of the potential resurgence of the pest resulting from repetitive use by farmers of certain of their products, as it could jeopardize their name and reputation.

Similarly, none of the interviewed pesticide retailers has cooperated with other retailers, not even through exchanges of pesticides or information. They are just competing with each other to protect their present business niche, but this has become more challenging in recent years. Since farmers are gaining increased knowledge on pesticides, a retailer who lacks technical know-how will be pushed out of the market if farmers find out he gave them wrong information about the selection and application of a pesticide. In combination with the increasing awareness among retailers of the potentially harmful effects of pesticides, this has meant an end of pesticide sales by many retailers. This has especially occurred in Hanoi, where farmers are increasingly becoming less dependent on retailers for technical know-how and financial services. For instance, the number of year-round pesticide retailers in Dong Anh district reduced from 128 to 28 between 1998 and 2006, while the number of year-round pesticide retailers in Hai Duong fell from 820 to 750 from 2005 to 2007. Retailers stop their business because of reducing financial benefits as a consequence of increased competition. A pesticide retailer in Soc Son district, Hanoi revealed that in the 1990s, he could earn 20 to 25 million VND/year (or roughly US$1,300 to 1,600) from pesticide retailing, but in 2003 and 2004 he only earned 5 – 7 million VND/year (US$300 to 400), because three other retailers started a

similar business in the village. He stopped his pesticide retailing activities in 2005. Retailers explain that in order to keep their clients satisfied they nowadays have to sell more expensive pesticides of high efficacy (meaning newer and safer compounds such as Abamectin, Acetamiprid, and Indoxacarb).

Several other factors have contributed to the decline in use of illegal pesticides since the year 2000. Farm household income has increased due to off-farm employment and therefore farmers are willing to spend more for better quality pesticides, especially for those relying on hired labour for pesticide application. Farmers want to control pests with the first application in order to reduce reapplication costs and labour requirements. This new trend discourages retailers from selling cheaper, less effective and less reliable pesticides (often of Chinese origin). Another reason for reduced use of illegal pesticides is enforcement by state authorities. Retailers repeatedly had to wait for several hours to get illegal pesticides from wholesalers, because these pesticides were kept in secret places and were only taken out if wholesalers felt they were not observed by the responsible state officials (for instance at the end of the day). Moreover, once caught with illegal pesticides, retailers may be forced to pay bribes to officials. One retailer in Hung Yen province said that after he was inspected with illegal pesticides, the money he had to bribe officials was a half of the total benefit that he could get from pesticide business in a year. Finally, farmers themselves have contributed to reduced use of illegal pesticides. For instance, our research found that in February 2005, about 7,000 square meters of wrapped heart mustard rotted in a village of Dong Anh district. The farmers attributed the damage to the illegal pesticide and together with they wrote a letter to the communal authorities and in response, the retailer was fined. The retailer still continues his pesticide sales business but with a reduced number of clients and is no longer selling illegal products.

2.4 Pesticide use: towards less toxic active ingredients

In this section we will report on the results of the survey among 125 farmers to gain better insights in their past and actual pesticide use and in the factors explaining changes in their practices. These data are supplemented with the findings from a farm

monitoring study conducted among 32 farmers from August, 2006 to March, 2007 in Dong Anh district, Hanoi (termed as MP2). The data from this farm monitoring study are compared with the results from a previous study done from August 2002 to March 2003 (termed as MP1).

From the survey, a total of 282 responses were collected from 125 farmers about their use of pesticides 5 - 7 years ago. Of all pesticides used in that period 19% belonged to the highest toxicity as classified by World Health Organization (class Ia), and 25% to class Ib, 28% fell under class II, and 16% to class III and U (unlikely to present an acute hazard in normal use) (IPCS, 2004). The rest is either not listed by World Health Organization or contained unknown AIs. For current pesticide use, 505 responses were collected and of the pesticides used in this period, less than 1% was categorized under class Ib of toxicity. The rest belonged to the classes II, III, U and unknown. It deserves mentioning here that, according to other institutions, many unknown pesticides (i.e., Acetamiprid, Abamectin, and Indoxacarb) contained low acute and chronic toxic material. Pesticides with unknown AIs accounted for 8.5% in farmers' use 5 – 7 years ago and 5.1% currently (Table 2.1).

Table 2.1 Changes in the toxicity of pesticides used by Vietnamese farmers in two provinces during two time periods

Toxic class (by World Health Organization)	Number of farmers (5 – 7 years ago)			Number of farmers (at the time of the survey)		
	Hanoi	Hai Duong	Percentage (%)	Hanoi	Hai Duong	Percentage (%)
Ia	32	22	19.1	0	0	0.0
Ib	41	30	25.2	1	1	0.4
II	54	24	27.7	115	73	37.2
III	8	2	3.5	4	24	5.5
U	13	22	12.4	82	47	25.5
Unknown(a)	3	7	3.5	38	94	26.1
Unknown(b)	3	21	8.5	3	23	5.1

Unknown(a), pesticides with known AI but not listed in IPCS 2004. Unknown(b), pesticides with unknown AI

Insecticides are the most used pesticide and they account for 79% and 77% of the total pesticide selected by farmers 5 – 7 years ago and currently, respectively. The farm monitoring results showed that over time relatively more insecticides are being used, increasing from 48% to 65% of the total quantity of AI in the pesticides used in MP1

and MP2, respectively. Herbicide use is also growing, though not at a similar rate; from 4 to 13%. By contrast, the use of fungicides is declining; down from 48% to 22% of the total AI in pesticides used by farmers when comparing the two monitoring periods.

The results from farm monitoring furthermore confirm the impression that farmers rely more on pesticides from toxic class II and less on those from class U in MP2 as compared with MP1. This can be explained by the reduction in the use of fungicides which formed the most-often applied pesticide in toxic class U. Better knowledge of farmers on insects and diseases partly explain the reduction of fungicides used in MP2. For instance, in the MP1, farmers often failed to correctly distinguish between the damages caused by mites and thrips from those resulting from fungi and therefore they relied on fungicides to treat pests. Besides, there is also a remarkable change in the types of pesticides used over time. Pesticides of unknown AI, which accounted for 7.70% of the total pesticide volume of 84.8 kg (in finished form) in MP1, fell to 1.23% of the total volume of 106.8 kg in MP2 (Table 2). It is important to note that according to Table 1, farmers reported a significantly higher use of pesticides with toxic class Ia in the period 5-7 years ago than the findings for MP1 reported in Table 2. This could be explained by the different approaches adopted for data gathering, i.e. more qualitative indications in Table 1 compared to the quantitative findings used for Table 2.2.

Table 2.2 Quantity and value of pesticides used by farmers in Hanoi during two time periods

Toxic class (by World Health Organization)	MP1				MP2			
	Frequency of use (%)	Finished form (%)	AI (%)	Value (%)	Frequency of use (%)	Finished form (%)	AI (%)	Value (%)
Ib	1.6	2.0	1.6	3.5	0.9	1.1	1.1	1.5
II	27.1	24.6	18.4	30.6	31.8	41.0	40.6	29.0
III	4.7	11.1	8.7	7.5	3.8	3.1	3.7	3.4
U	25.6	32.4	39.9	23.9	22.8	27.6	31.3	19.0
Unknown(a)	31.94	22.32	31.4	26.51	39.57	26.05	23.3	45.78
Unknown(b)	9.07	7.70	-	8.11	1.09	1.23	-	1.27
Total (in value)*	1,697.0	84.8	42.5	551.9	2,209.0	106.8	43.8	969.9

*Unit for frequency of use is number, finished form and AI is kg, and value is US$. Unknown(a), pesticides with known AI but not listed in IPCS 2004. Unknown(b), pesticides with unknown AI

A shift from more toxic to less toxic AIs between MP1 and MP2 was confirmed from pesticide expenditure data. For example, in MP1 the value (cost/ha) of the 10 most used

pesticides accounted for roughly 74% of total AI quantity, but only for 57% of the total value. By contrast, in MP2, these 10 pesticides accounted only for 60% of the total AI quantity used, but 68% of their total value. The increased use of pesticides such as Acetamiprid and Indoxacarb and the reduction of Endosulfan in MP2 indicate a shift towards the application of newer and safer compounds; this also signifies a trend towards the use of more expensive pesticides (Table 2.3).

Table 2.3 The 10 pesticides used most by farmers in Hanoi during two time periods

AI	Toxic class (by World Health Organization)	MP1			MP2		
		Frequency of use (%)	AI quantity (%)	Value (%)	Frequency of use (%)	AI quantity (%)	Value (%)
Insecticide							
Nereistoxin	Unknown	16.0	21.5	8.4	8.7	18.5	4.0
Abamectin	Unknown	10.3	0.3	13.3	11.2	0.1	12.3
Cypermethrin	II	9.3	2.9	8.0	3.2	0.5	2.4
Endosulfan	II	5.1	4.7	6.5	-	-	-
Fenobucarb	II	3.0	2.3	3.0	8.1	20.8	7.1
Acetamiprid	Unknown	-	-	-	7.5	0.7	6.1
Chlorpyriphos	II	-	-	-	4.1	4.8	5.1
Indoxacarb	Unknown	-	-	-	4.7	0.6	15.4
Permethrin	II	-	-	-	6.8	2.1	7.2
Fungicide							
Zineb	U	7.5	26.2	6.2	-	-	-
Validamycin	U	5.5	0.4	2.7	8.9	0.9	3.7
Mancozeb	U	3.1	7.3	5.1	-	-	-
Copper Hydroxide	III	1.2	5.2	2.3	-	-	-
Herbicide							
Butachlor	U	3.0	3.1	1.6	4.3	10.7	5.2
Total		63.9	73.7	57.0	70.1	59.6	68.3

This shift towards increasing use of more expensive and safer pesticides was also statistically confirmed. The Independent-Samples T Test analysis did not confirm a significant difference in the quantity of pesticides used per ha (both in finished form and in terms of AI) between MP1 and MP2 for both farm household-based and primary production-unit based analysis. The analysis however confirmed the significance of the difference between the pesticides used in MP1 and MP2 in terms of their value (df=60, $p<0.01$ and df=415, $p<0.01$ for household-based and primary production unit-based T Test, respectively).

During the survey most farmers reported the use of more than five types of pesticides during one cropping season. Efficacy was the most important selection criterion for 92% of the farmers, while only 6.4% regarded toxicity to themselves and consumers as their most important consideration in pesticide selection. None of the farmers reported that they were concerned about the toxicity for themselves or consumers 5-7 years ago. Almost 97% of farmers asserted that the types of pesticides presently marketed and used are much more diverse than in the past. In addition, 72% of farmers stated that pesticides are safer today than they were in the past based on their own observations and personal experiences. For instance, farmers mentioned that at present they feel less tired after spraying pesticides and that they find less or no aquatic animals dead after spraying compared with the past. This impression is contradicted by 12% of the farmers, who think that pesticides are currently more toxic compared with 5-7 years ago.

A large majority (62%) of the farmers interviewed was not able to determine the World Health Organization-classified toxicity of the 5 pesticides they use most often. The rest could determine the toxicity of some or all of these 5 types. Farmers who knew the toxicity of some types have mainly learnt this by heart on the basis of information acquired from their neighbors or from the retailers. Those who could determine the toxicity of all 5 types of pesticides relied on the color of the barcode on the pesticide package/bottle and they got additional information from the pesticide labels. Pesticides that claimed to be biological were automatically considered safe by the farmers. Another tool farmers relied on in determining the toxicity of pesticides is the pre-harvest interval. The shorter the pre-harvest interval, the safer they considered the pesticide. Despite the fact that the majority of the farmers could not determine the toxicity of the pesticides they used, most of them were not really concerned about their toxicity as such. Up to 42% of the farmers said they take toxicity into account when they purchase and use pesticides.

According to the farmers' survey, up to 75% of the farmers apply a higher dosage than recommended and only 25% of the farmers stick to the recommended dose. Around 27% of the farmers always combine two or more different types of pesticides in each

spray. Roughly 2% of the farmers said that they never use pesticides in a cocktail. The rest reported that they could cocktail pesticides when they find serious attacks of pests and diseases. Similarly, during the farm monitoring study, the application of 'pesticide cocktails' dominated the spraying practices of farmers. In terms of their frequency, the combination of two pesticides for one spray increased remarkably, from 28% in MP1 to 41% in MP2. Sometimes the cocktail even consisted of more than two different types of pesticides (in finished form) (Table 2.4).

Table 2.4 Pesticide spraying practices of farmers in Hanoi during two time periods

Number of pesticide combined for one spray	MP1		MP2	
	Frequency of application (%)	AI quantity (%)	Frequency of application (%)	AI quantity (%)
1	42.7	34.0	43.6	38.6
2	28.0	30.2	41.0	39.8
3	9.0	18.7	13.2	18.0
4	1.9	2.8	2.1	3.4
5	0.4	0.8	0.2	0.2
Undetermined	18.1	13.6	0.0	0.0

Both the farmers' survey and the farm monitoring clearly showed that all (100%) farmers in the Red River delta rely on pesticides as their main tool for controlling pests and diseases. However, next to pesticides, up to 42% of the farmers interviewed also apply other pest controlling methods such as manual control, crop rotation and field clearing. In particular, 5% of the farmers reported that they apply crop rotation and soil treatment seasonally or periodically to reduce the development of pests and other diseases. According to farmers, clearing the fields after harvesting vegetables (or even without harvesting them if the market price is too low) is nowadays done more often than in the past, because they witnessed a significant effect on reducing the expansion of pests and diseases. Also new methods are emerging. For instance, a farmer in Hai Duong province discovered by accident a biological method to control *Spodoptera litura* – an insect that has strong negative effects on vegetable production:

> *'Until two cropping seasons ago, after harvesting kohlrabi, I sprayed pesticides to kill the insects that remained in the soil, including Spodoptera litura. However, when I ploughed the soil in preparation of the next planting season, I found that the Spodoptera litura insects were highly concentrated in the few kohlrabi roots that were left in the field. So, I concluded that pesticides could not effectively control these insects since they live in the soil. During the next season when I found that the vegetable was damaged by the insects,*

> *I therefore collected kohlrabi leaves growing on other fields and put them on the soil beds to attract the insects. I started this job at about 4 or 5 pm and returned to my vegetable fields at 7 or 8 pm with a flash light and a tank. Kohlrabi leaves were carefully picked up and the insects were released into the tank by shaking the leaves. The leaves were then put back on the soil bed. Early next morning, I collected the insects from the kohlrabi leaves again. By doing so, I significantly controlled Spodoptera litura without using pesticides specifically for this insect. I did tell my neighbors and some of them have started to apply this controlling method as well.'*

An example of less pesticide-based vegetable production is also found in Nam Dinh province. In some areas, farmers grow baby cucumber under contract with processing companies. At the early growing stage when the plant has only 2 to 3 leaves, it is often seriously attacked by leafminer. The conventional pesticide spraying method turns out to be less successful. For this, in recent years, instead of spraying pesticides, the farmers inject pesticide directly into pedicels of plant leaves. This pest control method not only helps farmers successfully control leafminer, but also save them up to 60% of pesticide quantity (in finished form), as revealed by farmers, as compared to the conventional method of spraying.

2.5 Factors influencing pesticide practices of farmers

As presented in the previous section, no statistical difference could be observed in quantity of pesticides used by farmers (/ha/cropping season) when comparing 2002 and 2007. However, the study proved that there is a difference between the two years in terms of the value of the pesticides that farmers used (/ha/cropping season). This section will help to explain the different factors that play a role in farmers' daily decisions in selecting and handling pesticides.

The survey showed that farmers often judge the quality of the pesticides they apply on the basis of cash cost per tank of pesticide. For farmers in Hanoi, one tank worth 6,000-7,000 VND would be acceptable both in terms of their financial capacity and their perception of effective pest control under average circumstances. Farmers in Hai Duong, consider spending a little less, i.e. 5,000-6,000 VND for a tank, as acceptable. This perception of pesticide use based on financial expenditure can lead to the wrong

application of pesticides, for instance, applying pesticide cocktails as mentioned above or using pesticides above/below the recommended dosage. For instance, in Dong Anh and Gia Lam district (Hanoi), we found examples of farmers who applied one package of Amate 150SC which is technically suggested for treatment of about 120 m^2 of vegetable area, for more than 200 m^2! In order to save time and labour, some farmers increase the concentration of pesticide and reduce the volume of the tanks compared with the technical prescriptions for treating the crop.

In our pesticide monitoring study we found that, based on the information from the 1,267 cases of pesticides applied during MP2, the average amount spent by farmers for one tank of pesticides is 5,280 VND (Table 2.5). Although somewhat arbitrary, we can assume that pesticides sold for less than 2,000 VND/package (to be applied in one tank) are inexpensive. On the basis of this assumption, we found that 28.4% of the total number of tanks contained inexpensive pesticides. Of the 111 different types of pesticides (in finished form) used by the farmers that were monitored, 25 were bought for less than 2,000 VND/package. The 25 cheap pesticides accounted for 26.4% of the total quantity of pesticide AI, but only for 11.2% of the total pesticide cost. When farmers prioritize the reduction of risks from pests and diseases to save their crops, they tend to rely on pesticide cocktails. In general, the more pesticides are combined in the cocktail, the more expensive this is as well. Finally, farmers apply inexpensive pesticides for additional spray(s) if they consider the previous application not as effective as expected.

Table 2.5 Average cost for one tank of pesticide in Hanoi in the second monitoring period (MP2)

Number of pesticide combined for one spray	Frequency of application	Average cost (in VND)	Standard deviation
1	552	4,051.3	3,641.3
2	519	5,491.5	3,806.9
3	167	7,922.9	4,959.0
4	27	9,525.3	3,456.1
5	2	11,537.1	329.2
Average	1,267	5,280.0	4,149.1

A Principal Components Analysis applied on 7 variables coded from 1 to 4, resulted in 3 major groups of interrelated variables explaining the use of pesticides. Factor 1 (% of variance: 27.77) can be interpreted as ‘pesticide knowledge’ of farmers. This factor is

accounted for mainly by the variables Farmers' ability to classify pesticide toxicity, Farmers' concern for pesticide toxicity, and Technical training. Farmers with more technical training are more capable of classifying pesticide toxicity and seem more concerned about pesticide toxicity in their selection and use. Factor 2 (% of variance: 16.53) can be interpreted as 'farmers' perception'. This factor is explained by two major variables: Farmers' perception on incidence of damage caused by pests and diseases and Farmers' perception on pesticide toxicity. Farmers who perceive that current problems of pests and diseases are more serious also perceive that current pesticides are more toxic than those in the past. It could be assumed that the higher the risks caused by pests and diseases are perceived, the more farmers intend to use toxic pesticides. Factor 3 (% of variance: 15.59) is interpreted as the 'information sources' based on which farmers make their selection and use of pesticides. There is a negative relation between the variables of Education level and Information sources for pesticide selection and use. This means that farmers of higher education level rely on fewer sources of information for their selection and use of pesticides. In this case, they preferably rely on their own knowledge, acquired from daily farming practices, rather than on external sources such as neighbors, retailers and/or extension staff (Table 2.6).

Table 2.6 Factors affecting farmers' selection and use of pesticides in two provinces (Principal components analysis: Rotated Component Matrix)

Variables	Factor/Loading		
	Factor 1	Factor 2	Factor 3
Farmers' ability to classify pesticide toxicity	**0.86**	0.04	0.04
Farmers' concern for pesticide toxicity	**0.86**	0.08	-0.15
Technical training	**0.59**	-0.31	0.08
Farmers' perception on incidence of damage caused by pests and diseases	-0.09	**0.75**	-0.06
Farmers' perception on pesticide toxicity	0.04	**0.71**	0.07
Education level	0.20	-0.12	**0.77**
Number of information sources for pesticide selection and use	0.25	-0.14	**-0.69**
% of variance	28.27	16.73	15.78
Factor interpretation	Pesticide knowledge	Farmers' perception	Information sources

Variables indicated in bold values are considered for interpretation by the representative factor, n = 125. Bartlett's Test of Sphericity is significant at $p<0.01$

A Discriminant Analysis of the 7 variables used for our factor analysis was carried out comparing safe vegetable producers with their traditional vegetable colleagues, and

Hanoi with Hai Duong farmers. The discriminate analysis of safe vegetable versus traditional vegetable growers gave high loadings for the variables Farmers' ability in the classification of pesticide toxicity, Farmers' concern for pesticide toxicity, and Technical training. There is a statistically significant difference between these two groups of farmers (p<0.1). More technical training for farmers under safe vegetable program explains for this difference. There is also a statistically significant difference between farmers in Hanoi and those in Hai Duong (p<0.01). These two groups are not only significantly distinct in 'pesticide knowledge', but also in 'perception' on pesticide toxicity and the incidence of damage caused by pests and diseases, as well as the number of information sources to which farmers refer in their selection and use of pesticides (Table 2.7).

Table 2.7 Differences in pesticide knowledge between farmer's groups in two provinces (Discriminant analysis: Structure Matrix)

Variables	Loadings	
	Safe-traditional vegetables	Hanoi-Haiduong
Farmers' ability to classify pesticide toxicity	**0.77**	**0.49**
Farmers' concern for pesticide toxicity	**0.75**	**0.31**
Technical training	**0.67**	**0.49**
Farmers' perception on pesticide toxicity	-0.18	**0.38**
Farmers' perception on incident of damage caused by pests and diseases	-0.06	**-0.33**
Number of information sources for pesticide selection and use	0.06	**-0.39**
Education level	-0.01	0.20

Variables indicated in bold are considered for interpretation by the representative factor, n = 125, valid cases = 76%. For Safe-traditional vegetables discriminant analysis, Wilks' Lambda = 0.87; p=0.09 and for Hanoi – Haiduong, Wilks' Lambda = 0.76, p<0.01.

2.6 Conclusions

The institutional setting in Vietnam for a change in pesticide distribution and use towards fewer and fewer toxic active ingredients is slow, but somewhat promising. A highly profitable market, with ineffective state inspection and enforcement, and poorly informed farmers that were strongly dependent on retailers and pesticide producers together created a difficult situation for environmental improvements in pesticide management. Nevertheless, this study found clear evidence for the presence of an increasing number of vegetable farmers in Vietnam that changed practices of pesticide

use, because of the health risks associated with pesticides and economic trade-offs, i.e. between labour and pesticide costs. Especially farmers in Hanoi showed increased preference for using pesticides with shorter pre-harvest intervals and higher costs, which are perceived as indications for safer pesticides. This trend goes together with a clear reduction in the use of pesticides with unknown AIs, which are often condemned as illegal and highly toxic in Vietnam. Although limited, this improvement in pesticide use can be considered a success, especially given the increasing intensification in vegetable production at the research sites (for instance in Dong Anh district, Hanoi, the cropping index increased from 1.41 in MP1 to 1.74 in MP2).

Farmers are remarkably concerned about the toxicity of the pesticides they use. Our study revealed that the selection and use of pesticides are, among others, influenced by the farmers' technical knowledge, their perception of the risks associated with pest and disease attacks and with pesticide toxicity, and the information sources to which farmers have access. Red River Delta farmers seem to develop from passive into reflexive users with respect to pesticide selection and application. Notably in Hanoi, farmers have become less dependent on pesticide retailers, both for their technical information and for financial support. Moreover, in certain cases, they are even 'whistleblowers' on the sale of illegal pesticides by these retailers. The combination of an increased awareness among farmers of the cost-effectiveness of pesticide use and of the negative effects of pesticides, with a somewhat more effective enforcement of state regulations, has contributed to the revealed shift towards the distribution and application of more expensive and safer pesticides, and to the decreased use of pesticides with unknown active ingredients.

But much still remains to be improved. Though parasitic and inexpensive pesticides account only for a small percentage of the total pesticide expenditure of farmers for all vegetable crops in MP2 (11.2%), they are responsible for a much higher percentage of the total quantity of active ingredients (26.4%), as shown in the results of our second farm monitoring study in Dong Anh district, Hanoi. These products do not contribute much to the control of pests and diseases, at least from retailers' and farmers' perspectives, but add heavily to the impact and burden on the environment and human

health. Quick removal of these pesticides from the market via state intervention is thus technically and economically possible and could be strongly suggested. Otherwise, although farmers are increasingly getting rid of 'parasitic' pesticides while improving their knowledge and experience of these pesticides, it will take a long time until a substantial percentage of farmers will decide to fully get rid of these pesticides.

The efforts by the Vietnamese authorities to promote 'safe vegetable' production practices, with relatively high costs (Duc, 2005), have achieved some results at the farm level. So far, this government program, with its extensive technical training provided to farmers, has led to differences in the 'pesticide knowledge' and 'pesticide cocktailing practices' of 'safe vegetable' farmers compared to 'traditional vegetable' farmers. However, the differences in pesticide use practices between Hanoi and Hai Duong should be explained rather by the technical knowledge and financial capacity of farmers and the intensification of vegetable production than purely by governmental interventions, notably by differences in investments (e.g. in so-called net houses, which protect plants (growing inside) from attacks of insects) and in the use of zoning areas for safe vegetable production. Future official programs on safe vegetable production should be based on a careful evaluation and analysis of the impacts of the program so far, and in particular pay attention to other actors playing a role in successful improvements in practices of pesticide use.

Given the poor economic conditions of the small-scale and fragmented landholdings of Vietnamese farmers, and – to a lesser extent – the state of Vietnamese pesticide companies, a radical move away from pesticide use in the Vietnamese agricultural sector is not likely in the short term. Pesticides will, for the moment, remain of vital importance for Vietnam's agriculture in general and for vegetable production in the Red River Delta in particular. But a shift towards the reduction of pesticide use in vegetable production and the distribution of products with newer and safer compounds is possible and badly needed to protect human health and the environment. As shown above, this shift has already started. In particular, several innovations by farmers and–to a lesser extent–pesticide companies and retailers can be witnessed. These small shifts and innovations will certainly take time before gaining sufficient momentum and

geographical spreading throughout the Red River Delta region. The further integration of Vietnam into the world economy, as well as an active governmental intervention strategy will hopefully result in Vietnam joining the international trend towards "the gradual but relentless transition from chemical to *more environmental friendly and* biological pest control..." (Mol, 1995; italic added). The process of greening pesticide distribution and use in Vietnam may be slow so far, but is most likely to continue in the foreseeable future.

Chapter 3

State governance of pesticide use and trade in Vietnam[9]

[9] This chapter has been submitted to *NJAS Wageningen Journal of Life Sciences* as: Pham Van Hoi, A.P.J. Mol and P. Oosterveer (forthcoming), State governance of pesticide use and trade in Vietnam.

'For man, when perfected, is the best of animals, but, when separated from law and justice, he is the worst of all' (Aristotle, Book One, Part II)

Abstract

Vietnam is facing serious challenges with respect to the amount and toxicity of the pesticides used. With hardly any domestic pesticides production, Vietnam experienced an exponential growth of both the quantity and the value of imported pesticides in recent years. And the increasing import of newly formulated (and safer) pesticides has not replaced or reduced the highly toxic pesticides with low efficacy. The improper use of pesticides by farmers (too high dosages, cocktailing of pesticides, inadequate pre-harvest intervals etc.) has further contributed to the environmental and health problems resulting from pesticides, especially in poorer areas. Despite a growth in pesticide policies and regulation, the state has been unable to regulate the pesticide market. The main causes behind the state failure in pesticide market regulation are the governance structure, large corruption, information distortion and a failing legal system. To some extent, and in some more wealthy areas, famers and retailers have emerged successfully as new pesticide governance actors. But an overall improvement of pesticide registration and pesticide use can only rely on better government intervention: more stringent implementation and enforcement of regulations, more effective promotion of IPM-based pest control, further public participation in implementation and higher ethics within government.

Key words: pesticide, state, retailer, farmer, market and environment.

3.1 Introduction

Pesticide use in agriculture has two sides. On the one hand it increases agricultural production and output through the reduction of pests and diseases and related crop loss. On the other hand, the continuous reliance on pesticides in agriculture poses serious threats to both the ecosystem and human health.

As an agriculture-based country, Vietnam is presently paying high costs for its reliance on pesticides. With just a few active ingredients produced domestically, pesticide imports into Vietnam are approximately US$500 millions/year at present. However, the indirect costs are much higher: social and environmental costs related to pesticide use, the loss of export opportunities due to high pesticide residues on products, and an

instable agricultural productivity associated with a degraded agro-ecosystem. In 2002, more than 7,000 cases (involving 7,647 people) of food poisoning by pesticide residues were reported, causing 277 deaths in 37 out of the 61 provinces (Xuyen, 2003). These numbers exclude 'silent' casualties by pesticides (Quang, 2001). Besides acute poisoning due to direct and indirect exposure to pesticides, chronic pesticide poisoning could have an effect on 2 million Vietnamese farmers (Trung et al., cited in Oanh, 2005). The annual cost of pesticide-related domestic human health and of lost export opportunities for vegetables and fruits in Vietnam is estimated at US$700 millions (WorldBank, 2006). This equals the total estimated export income of vegetables and fruits in 2010 (VCCI, 2007). And in that figure the environmental costs of pesticide use are not even included yet.

While initially state authorities in all countries heavily supported pesticide use, more recently state efforts concentrated on reducing or even getting rid of a heavy reliance on (toxic) pesticides in agriculture. State authorities in all countries have played a major role in pesticide regulation, which directly and indirectly affects industrial pesticide production, pesticide distribution and their use in agriculture. Firstly, state authorities are involved in banning certain (toxic) pesticides like POPs (following the Stockholm Convention), or the US "Big Green" (Zilberman et al, 1991). Secondly, states have restricted the market entry of new or the use of existing pesticides. Reducing the pesticide reliance of agricultural practices is a third main state policy on pesticides. Increased taxes imposed on pesticide imports and use discourages farmers from (over)reliance on pesticides (Pincus et al, 1997). Integrated pest management (IPM) or organic agriculture promotion programs also aim to reduce pesticide use in combination with a stabilization or increase of crop yields (Wilson and Tisdell, 2001). In the 1990s countries such as Sweden, Norway, Denmark, Netherlands and Guatemala have decreased their annual pesticide use by one third, without diminishing crop yields (Edland, 1997; Pettersson, 1997; Pimentel, 1997 cited in Wilson and Tisdell, 2001).

But it is not only developed states that have aimed to reduce the heavy dependence of agriculture on (toxic) pesticides. Developmental states (see Evans, 1995), such as Vietnam, have equally strived to reduce the reliance of agricultural production on toxic

pesticides. Although these developmental states are known for their 'strong state', the literature seems to suggest that this strong influence is more related to economic development as such, and less to the mitigation of environmental and health effect of economic development. Developmental states were often believed to have limited state capacities and capabilities in developing and enforcing adequate state policies on environmental protection. But recent developments in China (Mol and Carter, 2006) and other strong states (Evans, 2002) provide contrasting evidence. This article analyses the successes and failures of Vietnamese state authorities in regulating toxic pesticides for agricultural purposes, with a focus on the Red River delta region in northern Vietnam. How successful have Vietnamese state authorities been in regulating the environmental and health effects of agro-pesticides and what are the main causes behind any success or failure?

After outlining the main methodology, the paper discusses the history and current objectives of Vietnamese state pesticide regulation, and the main pesticide market developments. The main part of the paper is dedicated to an analysis of the successes and failures of state pesticides policies, and followed by an analysis of the role of private actors (especially farmers and retailers) in changing the pesticide market.

3.2 Methodology

This study uses three methodologies: a desk study of official and grey policy documents on state pesticide policies; surveys of pesticides retailers and farmers; and in-depth interviews with key informants on state pesticide policies. In total, 15 state officials from the ministerial and district levels (covering four provinces in the Red River delta: Hanoi, Hai Duong, Hung Yen, Nam Dinh) and four pesticide company owners have been interviewed, using semi-structured questionnaires. These interviews, combined with several surveys (i.e. on farmers, consumers and exporters that are mainly discussed elsewhere (see Hoi et al, 2009a;b;c), were conducted from July, 2006 to October, 2008).

To get a further and more quantitative insight into the implementation and enforcement of state pesticide policies at field level, two surveys were conducted in Hanoi, Hai

Duong and Hung Yen provinces. One survey covered 45 randomly selected pesticide retailers in vegetable production areas in Hanoi, Hung Yen and Hai Duong provinces. It consisted of open and closed multiple-choice questions and focused on understanding current pesticide retailing and the relations with the state administrative system and farmers. The second survey was carried out among farmers in Hanoi and Hai Duong provinces. In each province, two communities – one which the state had targeted for 'safe vegetable production'[10] and another without such policy which therefore can be called 'traditional vegetable production' – were selected. In each community between 30 and 33 farmers were randomly selected, resulting in a total survey of 125 farmers. These questionnaires focused on agricultural practices, pesticides' selection and use, and farmer's perception on changes in the pesticide market.

3.3 The history of Vietnam's pesticide policy

Pesticides were firstly imported and used in Vietnam in the mid-1950s. From this period until the beginning of the 1980s, agricultural inputs were centrally managed and agricultural production was collectively organized. This centralized management and collective production, however, turned out to be serious obstacles for Vietnam's economic as well as agricultural development. Privatization in agricultural production – and other economic sectors – was officially endorsed by the central government through its *Open door* policy of 1986. This also marked a shift to private pesticide imports, formulation, distribution and use in Vietnam.

Since 1986 the Ministry of Agriculture and Rural Development (MARD) annually issues a list of legal pesticides. From 1992 onward, this list has been specified into three categories: permitted pesticides, pesticides permitted with restricted use, and banned pesticides. Pesticides of the second category could only be used at specific locations, for specific crops, while using strict application methods. However, initially it was not detailed on what locations/crops/application methods pesticides of this category could be used. The list of pesticides is annually updated by new (registered) pesticides.

[10] The production follows a set of procedures regarding good soil and water condition, use of less toxic chemical inputs, clean seed/seedlings, and adoption of integrated pest management strategy.

Pesticides that are banned by regulation or are not re-registered after a given time period due to poor quality and market demand will automatically disappear from the updated list. The list serves as the legal basic for pesticide imports, formulation, distribution, and use, and is of key importance for state pesticide management at local level.

In 1993, in the Decree no. 92-CP (SRV, 1993), pesticide gained further state attention. This Decree formed the first comprehensively legal document on pesticides management and outlined the objectives of plant protection; the requirements for pesticide production, formulation, distribution, and use; the responsibility and rights of relevant state offices in monitoring and inspecting activities related to pesticides; and the establishment of a plant protection system from central to district level. The Plant Protection Department (PPD) of MARD was put forward as the key administrative authority in pesticides policy. Besides the main aim of pest and disease control, the Decree also emphasized pesticide safety for human health, animals and the environment. To foster plant protection activities, the Decree encouraged qualified organizations and individuals into pesticides business or services. Organizations belonging to the state agroforestry sector and individuals with specified – and regularly updated – technical training on plant protection met the required qualifications for pesticides business. Advertisement of pesticides of the second category was prohibited.

To tighten the registration, import, production, trade and use of “restricted use” pesticides, MARD stipulated in 1995 that no new registration of this category of pesticides was permitted (except those used in wood industry, for disinfection and in the health care system) (MARD, 1995). In parallel, all organizations and individuals using “restricted use” pesticides needed to be registered and certified (MOH, 1999). These efforts have contributed to a remarkable reduction of the import of “restricted use” pesticides, i.e., from roughly 40% of the total pesticide imports in 1991 to 5.0% in 1998 (Huan and Anh, 2001).

However, despite this achievement illegally imported pesticides remained widely available, including those of the forbidden category, as officially admitted in Directive no. 29/1998/CT-TTg (SRV, 1998). Challenged by this fact, pesticides became further

regulated by the government. At the turn of the millennium, pesticides are considered "a special good with strict limitations in trade". All activities related to pesticides such as registration, import, production, export, storage, transport, trade and use were put under state regulation (SRV, 2001). In addition, the Decree no. 92-CP was amended in 2002, when IPM-based pest and disease control was further emphasized (SRV, 2002b). Within agriculture, vegetables have received special state attention, due to high pesticide residues associated with intensive and improper pesticide uses. In 2005, MARD issued a specific list of pesticides for vegetables, containing 241 pesticide trade names out of the total 959 listed in that year (MARD, 2005a).

All new pesticides either imported or formulated in Vietnam legally require registration at MARD. Part of the registration procedure is a field trial, which aims to determine pesticide efficacy, and (possible) side-effects on plants, human health, animals and the environment. The field trial has to be carried out in the two main agricultural areas of Vietnam simultaneously, by two state Pesticide Control Centers (MARD, 1998a). For vegetables, fruit crops and tea, field trials also need to evaluate pre-harvest interval and the effects on food quality (MARD, 2003c). Biological pesticides have been given priority in research, investment, production, trade and use. To advance biological pesticides MARD stipulated in 2002 that biological pesticides do not have to follow the same registration regulations as for chemical pesticides (that is: no field trials; MARD, 2002c). However, following the fast and uncontrolled development of biological pesticide formulations, biological pesticides recently became also subjected to field-trial (be it on a smaller scale, requiring less time, and lower fees compared to chemical pesticides) (MARD, 2006a).

Pesticide users have to strictly follow guidelines of technical staff and of labels on pesticide packaging to ensure proper application regarding dosage, application timing, and crops. Users are responsible for their activities related to improper use of pesticides and the use of banned or unknown-origin pesticides. However, state officials see these requirements as warnings for farmers, in stead of rules that have to be enforced and sanctioned in case of violation.

3.4 Developments on the pesticide market

From the early 1990s onward, the pesticides market has changed dramatically in Vietnam. Many pesticide companies have been established, new retailers have come into business, and the market is overwhelmed by an annual increase of pesticide types. According to Vietnamese regulation, one pesticide applicant can only register one product under one pesticide trade name. However, pesticide companies obtain multiple types[11] of pesticides sold under the same trade name, simply by marginally changing the concentration or composition of the pesticide. Hence, the Vietnamese pesticide market now consists of a large number of pesticide types. For instance, between 1999 and 2008, the number of active ingredients (AI) has almost doubled; while the number of pesticide types has increased 3.6 times.[12] Pesticides of toxic category II, U and unknown (UK)[13] have especially increased, both in terms of AI and type. In AI terms, pesticides of toxic category II increased 1.3 times, category U 1.6 and category UK 3.7. In terms of type, pesticides of toxic category II increased 2.8 times, U category 3.3, and UK category 8.8 (see Figure 3.1). Many pesticides of category UK are newly formulated pesticides, which have not been updated in the 2004 WHO toxicity classification. A number of UK pesticides are relatively safe for both human health and environment, such as Abamectin, Acetamiprid, Indoxacarb[14] and biological substances such as Artemisinin, Azadirachtin, and Beauveria. The increased number of pesticide types does probably not only reflect the drive of by pesticide companies to supply more types, but also demand from other market actors such as retailers and farmers. The increasing number of pesticide types of category II is associated with an increasing use of category II pesticides by farmers. This is confirmed by farm monitoring data in Dong Anh district

[11] Technically, a type of pesticide is defined, in this paper, as a specific combination of a pesticide trade name, content of AI(s), and formulation. So different types may have the same trade name but differ with respect to the actual content of AI(s) and/or to the formulation method.

[12] These AIs and formulations include insecticides, fungicides and herbicides “permitted” and with “restricted use”.

[13] All active ingredients are searched for toxicity from (IPCS, 2004) and **PAN** Pesticides Database. Ia = extreme hazardous; Ib = highly hazardous; II = moderately hazardous; III = slightly hazardous; U = unlikely to present an acute hazard in normal use; and O = obsolete as pesticide, not classified. Pesticides not found in these data sources are defined as unknown (UK) pesticides.

[14] These three insecticides are increasingly used and belong to the 10 most used pesticides in our 2006 farm monitoring research (as reported more in detail in (Hoi et al, 2009c).

(Hanoi) between 2003 and 2007. Pesticide AI quantity of category II had increased from 18.4% to 40.6% (Hoi et al, 2009c).

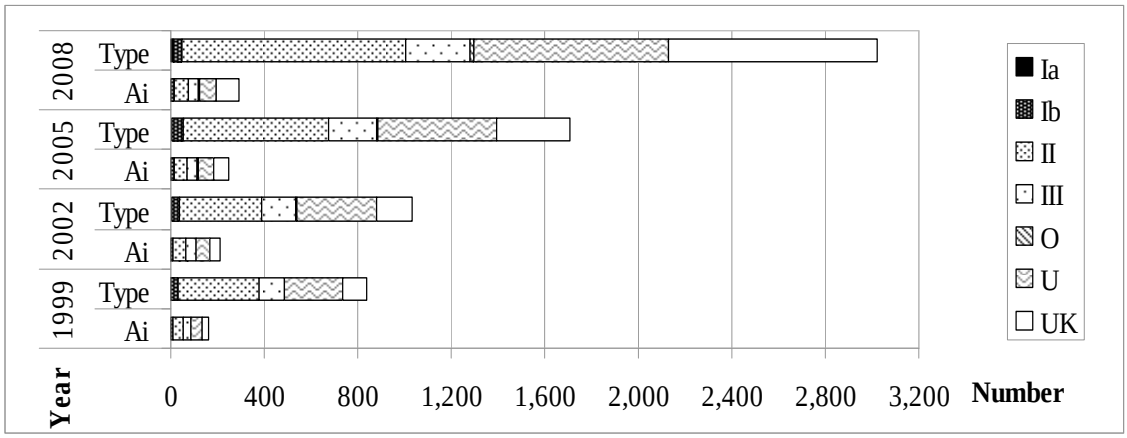

Figure 3.1 Number of pesticide AIs and type of pesticides in Vietnam, 1999-2008.[15]
Source: adapted from (MARD, 1999; 2002a; 2005b; 2008).

The increase in numbers of AIs and in pesticide types comes together with increased competition between and among pesticide companies and retailers. To cope with growing competition, most (Vietnamese) companies are relying on cheaper pesticides, mostly imported from China. For instance, in value terms, legal pesticides imports from China have increased remarkably, from US$22.5 millions in 2000 to US$200.3 millions in 2008 (and from 16% to 42% of the total pesticide import value). Besides their value also quantity of the legally imported pesticides grew exponentially, especially in the period of 2003 and 2007 (Figure 3.2).

In addition to the legally imported pesticides (as mentioned in Figure 3.2), the Ministry of Industry and Trade estimates that about 30-35% of the pesticides currently used in Vietnam is imported illegally (Lan, 2008). Aggregated pesticides imports and use are thus significantly higher than reported in official statistics. Among the illegally imported pesticides many are highly toxic and forbidden for use in Vietnam. In 2007, more than 21 tons illegal pesticides were confiscated by PPD inspection teams (Vinachem, 2008b). In 2007, 13 out of 83 inspected pesticides on the market violated

[15] In annual list of pesticides, MARD count types of active ingredients for both single and combined ones. However, for purpose of this paper with its focus on environment, single AIs are considered and counted. For combined AIs, the toxicity is determined by the most toxic AI presented in the combination.

labeling and quality regulations (Quyen, 2008). Of the 5,347 pesticide companies and retailers inspected, 12% were violating pesticide regulations such as selling illegal pesticides (Quyen, 2008). And 18% of 8,200 farmers monitored were violating regulations, such as improper use of pesticides and/or use of illegal pesticides (Thanh, 2009).

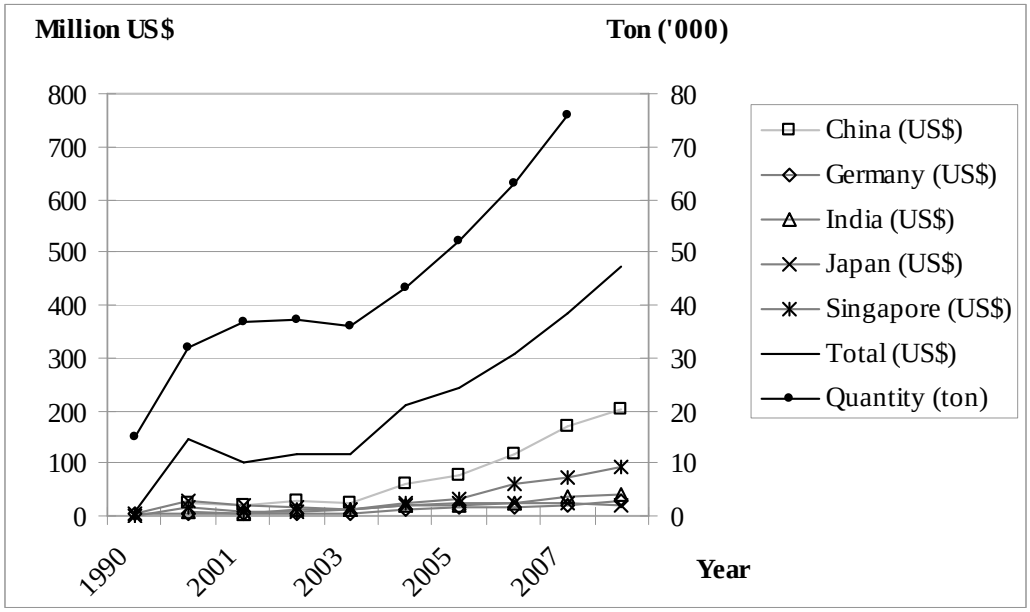

Figure 3.2 Pesticide import value and quantity (in finished form) from major countries of origin[16]

Source: (Anh, 2002); *personal interviews PPD and MARD in 2004*; (Oanh, 2005); (GSO, 2006b); (Vinachem, 2006; 2007; 2008a;b) (Vinachem, 2006; 2007; 2008a;b) (import quantity from 2004 to 2006 estimated due to unavailability of statistical data).

MARD has taken very limited actions to restrict or ban toxic pesticides. Over the period 1999 to 2008, Endosulfan was the only pesticide removed from the market (in 2006), and Methomyl was the only pesticide restricted in its use (in 2002). New safer pesticides have been simply added to the market, rather than replacing old and toxic ones. The removal of highly toxic pesticides (i.e., category Ia and Ib) and the reduction of category II pesticides remains highly urgent in Vietnam. Hence, despite the increase of rules and policies, regulation of the pesticide market has been a failure rather than a success, as officially revealed by a high-ranking official of PPD (MARD) recently (Cuong, 2008).

[16] These figures include small quantities of pesticides that Vietnam re-exports to other countries, such as Cambodia.

3.5 Weak environmental state institutions

The failure to regulate and reform the Vietnamese pesticide market can be explained to a major extent by the functioning of state authorities responsible for pesticide management.

Governance structure

Part of the problem lies in the strict hierarchical and isolated position of MARD officials in the capital Hanoi, vis-à-vis the local fieldworkers of the PPD in the provinces. To a large extent, high ranking officials of MARD are the sole decision makers for regulations related to pesticides, with little or even no inputs from external actors or even from local PPD staff. The local PPD staff interviewed revealed their 'surprise' over the many types of pesticides authorized by MARD and their lack of control on that process. Centralized policy making of MARD in Hanoi has not been embedded in the social, economic and policy networks of rural Vietnam. A head of a district PPD in Hung Yen said that over two recent years, he received the annual list of approved and 'restricted use' pesticides, as issued by MARD. None of the farmers and retailers interviewed was aware of the MARD lists of pesticides. Many regulations and registrations of MARD are thus added to the piles of documents, and not really enforced in practice.

This reflects on PPD staff who are motivated and committed to their work, as they face significant obstacles from their superiors and other state agencies in effective enforcement. For instance, in Hai Duong province the intervention of a ministerial official prevented that investigations in illegal pesticides were made public or legally addressed.[17] Faced by such challenges, pesticide management staffs often become less motivated. For instance, there is little cooperation between and among PPD and MARD officials from different district or provinces. If PPD officials discover that farmers within their jurisdiction use forbidden pesticides that are bought from a retailer in another district/province, PPD officials often take no further action, not even informing

[17] PPD official Hai Duong, personal interview in November, 2006.

their colleagues. These officials find no economic or political incentive to do so.[18] The head of Hanoi PPD revealed that when her team discovered a large volume of an expired pesticide, she requested the company to recollect and destroy it. However, the company did not respond to her request and she found it difficult to enforce this on the company, being afraid of violence.[19] And not without reason, as other examples show. In 2002 a provincial interdepartmental inspection team of Hung Yen province discovered large-scale smuggling of Chinese pesticide (Methamidophos). When attempts to bribe members of the team failed, the pesticides were dispersed in front of the inspection team by the illegal traders. The informed district police and communal authorities provided no cooperation to the local inspection team to solve this violence.[20] During their inspections, PPD officials are regularly attacked by retailers and their relatives, as for instance happened in Gia Xuyen district, Hai Duong province in 2004.

The rule of law and enforcement of pesticide regulations are thus systematically undermined in Vietnam. PPD staff members are responding rather to the wish of higher ranking officials, than to legally defined tasks and responsibilities. In other words, the administrative (and political) system of Vietnam is being operated on the basis of "who you know" and "who you depend on", in stead of on basis of the rule of law. For instance, when a scientist published his research on chemicals used for fruit storing in a newspaper, he was disciplined by his superior for "providing information to a newspaper without permission of the head" (Tintucvietnam, 2004). The strict 'guidance' of higher ranking officials is considered a financial and political safety-belt for the local staff, because the high-ranking officials decide on financial resources and protect the staff from interferences from other individuals/sectors with competing interests. For instance, in Van Giang district, Hung Yen province, a large-scale pesticide inspection in 2003 confiscated 173 kg illegal pesticides. However, since then no such inspection has been organized and financially approved by the District People's Committee. The allocated and approved – by the District People Committee – budget for 2003 inspections have not been transferred. Since then, the pesticide retailing system of the district experienced only two inspections annually conducted by the provincial PPD.

[18] Hai Duong PPD, personal interview in November, 2006.
[19] Hanoi PPD, personal interview in December, 2005.
[20] Hung Yen inspection team, personal interview in November, 2006.

These have proven hardly effective regarding inspection scale and confiscation of illegal pesticides.

Besides the poor vertical cooperation within the MARD management system, also horizontal cooperation between MARD and other ministries falls short. For instance, definitions, formulations and types of pesticides were specified in the 1993 MARD Ordinance, but the 1997 import/export tariffs of the Ministry of Finance introduced new and ambiguous definitions for pesticides (Huan and Anh, 2002). Similarly, the Ministry of Finance tried to impose a 5% tax on pesticides in the mid-1990s, but the decision met fierce opposition of the pesticide companies. As there had been no consultation with MARD and the Ministry of Science, Technology and Environment[21], there was little scientific justification for the tax system and the national and international companies were able to argue against its logic and the tax had to be cancelled (McCann, 2005).

Corruption

In these state failures, close connections between state officials and pesticide companies and resulting corruption in the pesticide registration processes and in control and enforcement play major roles. It is estimated that 5-10% of pesticide registrations fail, due to inadequate biological efficacy (as proven in field-trials conducted by PPD). According to regulation of the Ministry of Finance, the registration fee is roughly US$6,500 and US$1,500 for a new chemical and biological pesticide types, respectively. More than 90% of this fee is related to field-trial activities. Of the fee collected for field-trials, 80% is managed and used by MARD for field-trial arrangements, including extra staff time, and the remaining 20% goes to the state treasurer (MOF, 2003). The increase in new types of pesticide registered enhances the income for MARD staff. This negatively affects the objective and meticulous implementation of the pesticide registration process. For instance, the time to perform a field-trial for one chemical product is set at two years in the state regulations. However, as revealed by pesticide companies, depending on the product and on the applicants, it

[21] This was split in 2002 into the Ministry of Natural Resources and Environment and the Ministry of Science and Technology.

may be shortened to several months or extended to more than 2 years.[22] This 'flexibility' in pesticide registration time of MARD is related to the "temporal characteristic"[23] of pesticides and causes a race among pesticide companies to shorten registration time or even disobey the regulations, for instance by producing and distributing pesticides without legal registration. For this reason, pesticide companies often bribe officials, even though the documents to support official pesticide registration procedures are present. Thus, as revealed by pesticide companies, the total expense for registration of a new type of pesticide (without ICAMA) is roughly $12,000.[24] These practices also provide a major incentive for state officials to allow the growth to type of pesticides, as it increases state and personal incomes.

At lower governance level, PPD officials cooperate with pesticide companies to push retailers to use pesticides of "additional cost". Often retailers have to accept the "rules of the game", to prevent administrative difficulties from PPD staff (Tuong, 2008). In a more sophisticated way, PPD staff use their legitimacy as state experts to suggest pesticides to farmers from companies to which they have (economic) relations, rather than effective and (environmentally) safe pesticides. PPD officials even protect violating pesticide companies, for instance by refusing to disclose the names of violating companies (Trung, 2008).

But ineffective pesticide management also moves beyond the level of individual PPD and MARD registration staff and individual pesticide registrations. It has also emerged at a more systematic level of state failures. Given the ineffective state auditing system and the absence of public participation in policy making, policy makers have been able to issue regulations in favour of certain individuals or groups, and at the expense of public interest. For instance, the 'flexibilities' and shortcomings in MARD policies have

[22] For instance, field-trial staff could evoke various reasons for delay of the field-trial such as all trial fields are occupied, or no or less target pests (as registered for pesticides) appeared during the trial etc.,

[23] The rapid emergence of resistance against pesticides among crops is shortening the period of effectiveness for many [formulated] pesticides with old AIs (mainly originating from China). For these reasons, once a local Vietnamese company decides to market a new product, it will do this as quickly as possible to take advantage of the temporary opportunities (Hoi et al, 2009).

[24] Staff of pesticide companies, personal interviews July 14, 2006 and March 5, 2008.

been notified recently. According to the Ministry of Justice, out of the 800 policy documents issued by MARD in the period 2003-2008, 200 are not in line with the different laws (Khue, 2008). Thus, the 'flexibility' of MARD may allow some policy document to be contradictory to the regulations issued by MARD itself. For instance, several chemical pesticides were illegally privileged to have a fast track and cheaper registration procedure, similar to what is only allowed for biological pesticides. In 2001, formulations of Deltamethrin (WHO toxic category II), combinations of Dimethoate (category II) and Fenvalerate (category II), and formulations of Ethoprophos (category Ia) were allowed such a fast and cheap registration trajectory (MARD, 2001a). Formulations of Tricyclazole (category II) and Metaldehyde (category II) received the same registration privilege (MARD, 2002b; 2003b).

The close connection between certain MARD officials and pesticide companies is not limited to the registration process for individual companies, but also retards implementation and enforcement practices. Despite the fact that paraquat[25] is a notorious pesticide and has been banned in many countries, in Vietnam it was put in the category of 'restricted use' pesticides in 1999, but replaced into the first category (no restrictions) in the following years. This reversal of paraquat was mainly caused by a "diplomatic" arrangement between the company that registered most paraquat pesticides and MARD, as revealed by a staff member of that company. This retarded MARD officials from taking further effective action to control paraquat use after registration approval, and resulted in an increasing type of pesticides registered, distributed and used in Vietnam.

Information shortage

In all these policy processes information plays a major role but is not always available. At present, the state registration of pesticides mainly focuses on biological efficacy, and preharvest interval for a limited number of crops, such as vegetable and tea. Environmental impacts of pesticides are mainly judged based on (available) technical information (such as the Chinese ICAMA certificate), as provided by pesticide companies. However, as an official of the Advisory Committee for Pesticides (of

[25] In 2008, there were 24 types of pesticide containing paraquat.

MARD) indicates, ICAMA data are not always available for MARD to judge pesticide registration.[26] The unavailability of technical information on Chinese pesticides complicates the assessment of environmental impacts of newly imported pesticides.

Besides limited availability, information is also strategically (mis)used. As information is highly centralized and countervailing information is often missing or disregarded, the consequences can be large. For instance, international scientific evidence existed that pesticides were the cause of, rather than the solution to, the Brown planthopper problem on rice. To gain that insight, Indonesia has paid high costs in controlling Brown planthopper by applying pesticide (Pincus et al, 1997). However, more than 20 years later Vietnam seems to have learned little from the documented Indonesian experience. Responding to the recent massive infection of rice by the Brown planthopper in southern Vietnam, the central government decided to subsidize pesticides by 100% (SRV, 2006). No clear plan existed within MARD for (long-term) nonchemical-based Brown planthopper control (MARD, 2007a). As the Indonesian case shows, assigning the responsibility for pesticide policy to crop protection specialists does not automatically result in a rational set of policies (Pincus et al, 1997).

Apart from this, information is also often adjusted in accordance with political interests, without much independent control on the reliability of information. Hence, Vietnamese statistics are often not very reliable (see Mol, 2009). A communal PPD staff in Dong Anh district reported 8 pesticide retailers in her commune. However the district PPD only recorded 6. It proved that only 3 retailers (of the 8) obtained a certificate for their business, and the district PPD found it problematic to report 5 businesses without a legal certificate to higher officials. Similarly, information of pesticide retailing and use in so called “safe vegetable cooperatives” is often adjusted to provide a better outcome in the comparison with traditional vegetable production areas. Manipulation of information is sometimes quite advanced. Used pesticides packaging that farmers normally leave behind in agricultural fields are increasingly included in inspections into illegal

[26] Official Advisory Committee for Pesticides, personal interviews in December, 2005 and Feb, 2009. This is explained by one official of MARD, who declared that companies are, as a new rule, allowed to submit the ICAMA certificate later. In order to support the seasonal characteristics of pesticide business, MARD expects this new rule to shorten the time between import and distribution of pesticides (Hanoi PPD, personal interview July 2006).

pesticides. Nowadays, the packaging is often collected before (pre-)informed visits of district/provincial officials and inspection teams take place. The higher ranking officials and inspection teams remain *de facto* deprived from reality.

Weak jurisdiction

Vietnam's jurisdiction is also subjected to corruption and distortion, in favor of political and economic interests of the elites at the expense of the poor. To solve disputes Vietnamese firms and individuals rely on private negotiation or third party mediation, rather than on the legal court. For instance, from a survey among 6,500 firms conducted by the Vietnam Chamber of Commerce and Industry (VCCI), only 0.8 % saw courts as the best dispute resolution mechanism, 2.1% as second best, and 5.5% as third best. Most firms prefer informal mechanisms for dispute resolution (VCCI and VNCI, 2006), but this approach disfavors the deprived. In summer 2008 the entire rice harvest of a farmer in Long An province was destroyed by using out-of-date pesticides, causing a loss of US$11,000. The pesticide company did not reimburse the farmers; and challenged the farmer to proceed to the court if he disagreed (Sang, 2008). The disfunctioning juridical system of Vietnam disadvantages farmers, who lack power and knowledge to cope with powerful and rent-seeking pesticide companies and state officials.

3.6 Local signs of hope

Although the improvements in pesticide registration and use are generally poor at the national level, some local counter tendencies have been found. In contradiction to the information provided by the Ministry of Industry and Trade (Lan, 2008), 90% of the retailers we interviewed indicated that the increase of pesticides of Chinese origin goes together with a reduction in illegally imported Chinese pesticides. According to these retailers, before 2000 illegal Chinese pesticides[27] accounted for 50%-70% of their turnover, but presently (2008) they account for less than 10%. This reduction of illegal pesticides goes together with many new pesticides with higher biological efficacy,

[27] Pesticides that are illegally imported contain either AIs banned or permitted to use in Vietnam.

considerably improving the pesticide market according to 84% of the retailers and 72% of the farmers we interviewed (Table 3.1). Also in earlier research we found that in the perception of retailers and farmers the exponential growth of pesticide imports between 2003 and 2007 went together with a shift towards more expensive and safer pesticides used by farmers, although not with significant changes in the quantity of pesticides used per ha per cropping season (Hoi et al, 2009c). Anecdotal evidence seems to point in the same direction. The head of Gia Lam PPD estimated that in his district over the past 10-15 year the volume of active ingredients in pesticide reduced from about 500 kg to about 100 kg, due to lower concentrations of active ingredient.[28] The 12% of farmers that considered the current pesticide market worse than 10 years ago point to the large type of pesticides as well as to the low biological efficacy of pesticides.

Table 3.1 Perception of retailers and farmers on current pesticide market (n=45 for retailers; n=125 for farmers)

	% of retailers	% of farmers
Improved	84%	72%
No change	16%	16%
Worsen	-	12%

It is not so much the state and state policies that are driving these local improvements in pesticide markets and use. The positive shift in pesticide distribution and use in the research area should be explained mainly by changes in farmer's perception and knowledge regarding pesticide quality and health. Several examples can illustrate the mechanisms at work. A farmer in Dong Anh district bought a highly toxic pesticide (Methamidophos), but fear of cancer stopped her from using it.[29] And, a poor farmer in Gialam district insisted with her retailer to sell her a safe pesticide (Indoxacard) rather than a cheaper but highly toxic alternative.[30] Increased farmer knowledge on and demand for pesticides of better efficacy and safety forced retailers into more cooperative relations with farmers, and thus to promote more expensive pesticides with high efficacy and safety (and often lower profits; see Hoi et al, 2009c). Retailers sometimes proactively change farmer pesticide use. A retailer in Hung Yen said that in 2006 the provincial television and local PPD officials promoted pesticide Dihet 60WP (a combined active ingredient of Nereistoxin 58% and Imidacloprid 2%) to fight the rice

[28] Personal interview in August, 2008.
[29] Personal interview and observation in August, 2007.
[30] Personal observation in August, 2008.

borer. However, Nereistoxin is also the main AI in SatTrungDan 5H (also used for rice borer), which proved significantly less effective than the pesticide Padan 50SP (containing Cartap). The prices of Dihet 60WP and Padan 50SP were the same and he convinced his farmers not to use Dihet 60WP. Though Dihet 60WP was still distributed by other retailers, after one or two cropping season(s), Dihet 60WP was no longer used in this area. But such market-driven elimination of pesticides proceeds very slow

An explanation for the absence of improvements in pesticides use in nation-wide figures, while our survey in three red River Delta provinces shows modest improvements relates to the economic situation of farmers. In a nationwide survey conducted by International Food Policy Research Institute (IFPRI) and MARD in 2000, only 22% of farmers growing vegetables and roughly 35% of those growing major fruits (i.e., longan, litchi, rambutan) were reported to use pesticides (IFPRI and MARD, 2002). In addition, agricultural sown area has increased from 21.2 million ha in 2001 to 24.7 ha in 2006 (roughly 16.4%) (GSO, 2007c). The fast increase of pesticide imports in recent years is related to the increase in farmers being able to access pesticides for pest and disease control, and partly in increase of agricultural area. These newcomers in pesticide use mostly live in poorer areas and have less experience with pesticides. Hence, they use more cheap, low quality and toxic pesticides. This is even observed within the three provinces under study. For instance, our farmer's surveys identified two illegal Chinese pesticides used in the wealthy Gialam district (Hanoi), but seven in the poorer Giaxuyen district (Hai Duong province).

Though a positive shift in pesticide distribution and use can be observed in our study areas, considerable room remains for improving pesticide imports, formulation, distribution and use and private actors may continue to urge for better policy measures. The most important measure is the promotion of better quality pesticides and improved technical knowledge among farmers. Most farmers prioritize better quality of registered pesticides (biological efficacy and safety) and a more effective state management system (to reduce the type of pesticides, imitated pesticides, and low quality pesticides) (Table 3.2).

Table 3.2 Important improvements for future pesticide management in Vietnam (n=45 for retailers; n=125 for farmers)

Solution	Percentage retailers (%)	Percentage farmers (%)
Pesticides of better quality	32%	40%
More effective state management	23%	21%
Better technical knowledge retailers	19%	8%
Better technical knowledge farmers	26%	3%
No response	-	28%

In parallel with the wishes of retailers and farmers, there have been some signs that the Vietnamese state is trying to keep track on improving the pesticide market. In reaction to the ineffectiveness of current policies regarding production, distribution, and use of chemicals (including pesticides), MARD has taken some adjustments in her policies regarding pesticide registration as well as IPM promotion. Recently, MARD has designed a new regulation for a field-trial in combination with registration of biological pesticides (see MARD, 2006a). A stricter control over biological pesticides could partly help to reduce the large type of pesticides and of counterfeits, one of the key problems in current pesticide policies. Similarly, in IPM promotion, though thousands of farmers have been trained in IPM under the support of international organizations such as NORAD, DANIDA, FAO, CIDSE, and ACIAR, the amounts of pesticides used has not reduced significantly and pesticides applied on vegetables remain a serious problem. According to the Hung Yen provincial PPD official, IPM training courses selected participants from different villages and they were unable to disseminate their IPM knowledge to the numerous farmers in their village. In 2007 MARD redesigned its IPM training strategy; with more farmers trained (and inspired) at the same time in one village level, IPM adoption on vegetables is expected to increase. However, given tens of millions of farmers, low cooperation among farmers, poor regulation compliance by farmers, and a stunted state budget, IPM training will be a very expensive and time-consuming choice in Vietnam.

3.7 Conclusion

Despite advanced pesticide regulations oriented towards safer pesticides and reduced pesticide dependency, there has been a failure of Vietnam's pesticide policy, visible in

the exponential growth of both quantity and value of imported pesticides. Parallel with increasingly strict pesticide regulations, the Vietnamese state enlarged the access to pesticides for wider groups of farmers. This is the main explanation for the growth in imported pesticides. However, the growing import of newly formulated (and safer) pesticides did not replace the highly toxic and low quality ones. This pesticide market has contributed to unsustainable practices among vegetable growers: the adoption of high dosages, cocktails of pesticides, and the application of inadequate preharvest intervals taking place especially in poorer areas.

As our empirical data revealed, a slight shift towards more expensive and safer pesticides, a reduction of illegally imported pesticides from China, and some elimination of unnecessary pesticides from the market has largely been driven by farmers. In our study, farmers that are better-off and have more technical knowledge contributes to a more favorable pesticide performance. Unlike farmers in richer areas like Hanoi – who have been to a certain extent, active and reflexive in pesticide selection and use - those in poorer areas continue to suffer from low quality and imitation pesticides that are still widely available in Vietnam.

At the national level, there has been no consistent improvement observed in pesticide market so far. State authorities have significantly contributed to these pesticide policy failures. An inadequate governance structure, corruption, too close relations between authorities and pesticides producers, and absence of reliable information and a well functioning juridical system can explain this.

Restructuring the current pesticide market should thus be the first priority of Vietnam to eliminate unnecessary and toxic pesticides. Other government interventions, i.e. a more stringent and enforced pesticide registration process and promoting IPM-based pest control strategy can be suggested. These interventions, however will require strong political commitment and ethic, and a further public participation in decision making and implementation processed related to pesticides.

Chapter 4

Market governance for safe food in developing countries: the case of low-pesticide vegetables in Vietnam[31]

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Abstract

In many developed countries private arrangements have emerged in food governance. Following limited successes of state regulation, market actors and mechanisms are increasingly included in the environmental and safety governance of domestic and global food chains and networks. But do such private governance arrangements also work in domestic markets in developing countries? Pesticides use in vegetable supply is taken as a case to explore the role of market actors and dynamics in food safety governance in Vietnam. The so-called safe vegetable production system in the Red River Delta, introduced 10 years ago as a domestic alternative to conventional vegetable production, is analyzed through detailed monitoring of farmers, surveys of retailers and consumers, and in-depth interviews with state officials and vegetable traders. The paper finds limited successes of this low-pesticide vegetable production, distribution and consumption system. This private arrangement in food governance lacked trust from market actors (especially consumers), and was short of an active state that organized transparency and got market actors involved. As such, market governance in food safety needs to be strong.

Key words: food risks, agriculture, retailers, consumers, state, Red River Delta.

4.1 Introduction

Food risks, associated with a chemical-based agriculture and articulated and mediated by domestic and global food supply chains, have increasingly been paid attention to by nation-states and international organizations. Nation-states have taken various efforts to cope with this issue, for instance via more stringent regulations on food production, food industry and imports (Terragni, 2006 cited in Halkier et al, 2007; Martinez et al, 2007). In many developed countries, reducing pesticide-based agriculture has been achieved (OECD, 2008; Zilberman et al, 1991). At a higher advanced level, organic agriculture has been remarkably developed (Giannakas, 2001; Woese et al, 1997; Zhao et al, 2007). This nonchemical-based agriculture has not only been growing in developed countries whose food regulations are stringent and consumers are wealthy and willing to buy pro-healthy foods like in the US, Japan and other OECD countries, but also in developing countries. Recently, faced by serious “poisoned food”, “farmer deaths from pesticide poisoning”, “consumer deaths from consuming farm produce”, and “food export rejections”, China has adopted a “vigorous adjustment of agricultural

structure" that results in a fast development of organic agriculture (Paull, 2007). Less pesticide-based and organic agriculture is also reported in Thailand (Eisses and Chaikam, 2002), Tanzania (Bakewell-Stone et al, 2008), and Ethiopia (Devi et al, 2007). In parallel with efforts by nation-states in controlling food safety for their domestic citizens as well as for export, international initiatives on food safety have also increasingly been developed. Health risks associated with unsafe food have been even driven to the top of the political agenda in the 1990s and the global nature of the concerns in this area is enshrined in the Sanitary and Phytosanitary Agreement of the WTO and the activities of the Codex Alimentarius Commission (Atkins and Bowler, 2001).

Since Vietnam opened up to the outside world, in 1986, agriculture has been restructured: crop diversification, more cash crop production (including vegetables), more international trade of agricultural inputs and products, and increasing application of agrochemical inputs. Between 1991 and 2007 pesticides use in Vietnam increased from 15,000 to 76,000 tons (Anh, 2002; Vinachem, 2008b). The expenditures for pesticide imports even increased 9.8 times between 1991 and 2006 (GSO, 2008b; Oanh, 2005). Currently, pesticides use per hectare is highest in the production of vegetables (Anh, 2002). The consequence of all this is that consumers are increasingly concerned[32] and faced[33] with food risks associated with chemical residues.

Given the increasing scope and impacts of food poisonings, the Vietnamese government issued the Ordinance of Food Safety and Hygiene in 2003 (SRV, 2003) in which food business operators are legally responsible for the safety and hygiene of foods they produce and trade (Article 4). For "high-risk" foodstuffs, state certification of business conditions is required. The Ordinance also regulates the proclamation of food standards and the advertising and labeling of foodstuff (WorldBank, 2006). In parallel, the

[32] Pesticides take up a major place among the food safety concerns in Vietnam. For instance, 81% of consumers interviewed in Hanoi mentioned concerns about food risk associated with pesticide use on vegetables (Figuié, 2003).

[33] According to the Vietnam Food Administration, in 2005 there were 133 cases of food poisoning with more than 4,000 people injured (Thu, 2006). In 2007, the Ministry of Health reported 248 food poisoning cases with 7,329 people injured of which 55 died (Thang, 2008). Food poisoning cases have been reported throughout the country and from different sectors: factory workers (Thu, 2006), students (Duc, 2009), and individual consumers (Cau, 2008).

Vietnamese state regulated pesticide use in agriculture, with direct regulation of pesticides and their application as the core regulatory mode. As successes of this direct regulation have been modest at best (Hoi et al, 2009c), a policy was established to create a domestic market for food production that uses less-toxic pesticides: 'safe vegetable production'. Safe vegetable production has to follow specific conditions and procedures, which includes a strict adoption of integrated pest management practices in combination with the use of low-toxic pesticides (MARD, 1998c). To a certain extent, these policies represent a shift from a state "command and control" approach towards a stronger reliance on "self-regulatory" or "market-based" approaches, in which private food producers, operators and consumers become key agents in food safety and environmental protection. The functioning and success of this 'market governance' model in Vietnam's pesticides regulation is the subject of our paper.

So far, little is known on how and to what extent domestic markets, market actors and market networks/value chains articulate food safety and low-pesticide use in vegetables in Vietnam. Do domestic market actors and networks play a role successfully in the greening of vegetables and vegetable production? What constrains market actors in national food networks from being active in transforming 'pesticide-addicted' domestic vegetable production into more environmentally sound alternatives? In investigating these questions, this paper focuses on the domestic vegetable supply chain in the Red River Delta, arguably one of the most important locations for vegetable production in Vietnam. After introducing the theoretical background and research methodology, the paper analyses how and to what extent small vegetable producers, wholesalers, retailers, and Vietnamese consumers articulate (un)successfully their interest in less-toxic vegetables.

4.2 Market governance in food safety

State failure in environmental and food safety protection is not a typical Vietnamese phenomenon, but reported more widely. Two main reactions have been identified following state failures around the world. The first one relates to what is often called political modernization (in Europe: Tatenhove et al, 2000) or reinventing government

(in the US: Rosenbaum, 2000). The central idea is that state failure was caused by a particular model of state policy making and implementation, and hence, new ways of state intervention should be called for: less directive, top-down; more cooperative, negotiated, bottom-up. The second development counted on relegating tasks and responsibilities to institutions and actors beyond the state. Privatization, public-private partnerships, deregulation, and liberalization all refer to this. These two lines more or less come together in the literature on governance (e.g. Kooiman, 2003; Treib and Falkner, 2007).

Market (sometimes also called private: Chan and Pattberg, 2008) governance refers to the notion that private economic actors and institutions gain authority in governing areas which were conventionally ruled by states. Within the domain of green and safe food, market governance include more and active roles of consumers, producers and retailers, contributing to more safe and environmentally sound food (production) (Atkins and Bowler, 2001; Spaargaren and Van Vliet, 2000). Private mechanisms play an important role in the provision of higher quality, safe and green food. Retailer-driven assurance schemes (e.g. GLOBALGAP[34]; Martinez et al, 2007), private labeling and certification schemes (Boström and Klintman, 2008) and Community-Support Agriculture for organic farming (Thompson and Coskuner-Balli, 2007) are just a few of the arrangements at work in OECD countries.

Global commodity chain analysis (e.g. Gereffi and Korzeniewicz, 1994), the agro-food network and commodity complexes (Goodman and Watts, 1997; McMichael, 1996), and convention theory (Ponte and Gibbon, 2005) all focus on networks and chains and can be applied to understand how in contemporary production-consumption systems non-economic demands of environment and safety are included. At the centre of these studies and approaches lie the multiple linkages, relations, interdependencies of formally independent economic actors. These linkages are characterized by flows of material resources, finances, products, information and trust. Of key importance in these

[34] GlobalGAP (Global Good Agricultural Practices) is a private sector body, initiated by large European retailers, that sets voluntary standards for the certification of agricultural products around the globe (http://www.globalgap.org).

chain and network frameworks are questions of (de-)regulation and governance, and the relation between external state interventions that are imposed upon the networks and chains, and private internal network and chain coordination and governance. Who is able and willing – and how - to articulate and exercise (food safety and environmental) control by specifying what products need to be delivered, in what quantity and quality, how these should be produced and at what price (Ponte and Gibbon, 2005)? In the agri-food network literature two conclusions are drawn on the powerful actors in these networks that can introduce food safety and environmental conventions into such networks and chains. Major transnational food processing firms have often been analyzed as the key chain coordinators that 'determine' food quality standards and impose these on others (Gereffi and Korzeniewicz, 1994). More recently, with the consumerist turn in food studies, major retailers or even consumers and organizations that represent their interest, are seen as actors who are also able to impose food quality and safety conventions in food networks (Oosterveer, 2007; Spaargaren and Mol, 2008). In these private articulations of food quality, questions of verification, accountability and trust are crucial, strongly articulated in debates around private standards and labels (e.g. Boström and Klintman, 2008). If actors in the agri-food network articulate environmental and food safety interests, how is verification of these claims and trust in these labels organized? What roles do chain actors, and state and non-state actors (e.g. NGOs; private certification bodies) outside these chains play?

Most empirical studies on the private articulation of environmental and food safety conventions concentrate on and draw their conclusions from either western or global agri-food networks. Research, especially in Europe (Kjærnes et al, 2005; Knowles and McEachern, 2007), has made clear that food safety issues have become important drivers for the re-organisation of commodity chains and networks as well as related food safety policies. Especially Kjærnes et al (2005) concluded that countries may differ widely with regard to their institutional arrangement on food safety and there is not one correct policy arrangement. Nevertheless they conclude that there need to be a strong alignment between market provisioning and state regulation and in the absence of such high levels of distrust among food consumers may emerge.

The articulation of food quality and safety in domestic agri-food networks in developing countries has received little attention. Although, we find especially in these developing countries weak state institutions that fail in implementing, enforcing and constructing trust in environmental and safety conventions in food; as such these countries might 'profit' from such market governance arrangements. We will use an agri-food chain perspective to analyze whether, how and which (private) actors in the domestic vegetable production-consumption chain in Vietnam articulate food safety interests and thus complement the Vietnamese state in pesticides governance in vegetables (Figure 4.1). In such a chain analysis actors relations and resource interdependencies are of crucial importance, and full part of the analysis.

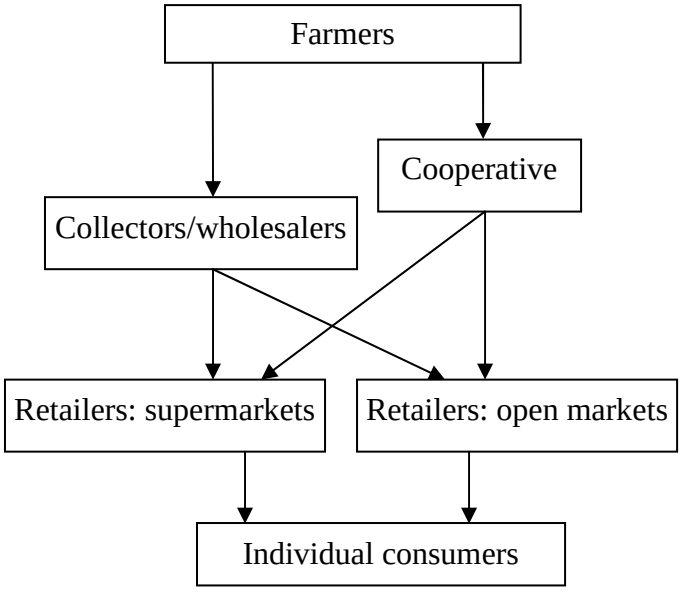

Figure 4.1 Fresh vegetables chain in Vietnam
(the arrows indicate product flows)

4.3 Methodology

In studying private governance of pesticides in food we use not only pesticides in vegetables (production) as a dependent variable, but also so-called 'safe vegetables' (as a proxy). Safe vegetables have been introduced by the Vietnamese government as a voluntary domestic label/brand. Safe vegetable production has to follow specific conditions and procedures, of which the most important are: (1) the production area is not affected by wastes from industrial and living activities; (2) only decomposed

manure, is used, not fresh manure; (3) clean groundwater and surface water is used for irrigation, not water polluted by industrial and domestic waste; (4) strict adoption of integrated pest management practices in combination with the use of low-toxic pesticides; and (5) safe vegetable products meet requirements on chemical and pathogen residues (in accordance with technical standards set by WHO/FAO in 1993/1994) (MARD, 1998c).[35] In stimulating and creating a market for safe vegetables, the Vietnamese state counts heavily on various market actors (farmers, distributors, retailers, consumers).

Hanoi has the most developed market with respect to safe vegetable production and consumption in Vietnam and was chosen as the site for our study. Since little information is available on pesticides use and pesticides residues in vegetable production and consumption networks in Vietnam, this research very much relied on primary data, collected for this research. A variety of quantitative and qualitative research methods were applied. Entry point of the investigation was the local (vegetable) markets. In total 22 markets were visited, 16 were selected for the research (as these had both conventional and safe vegetable retailers). Depending on the market scale, between 20 and 30 conventional, but only 1–4 safe vegetable retailers were observed in a market.[36]

A survey among retailers was conducted in March and April of 2008. In total, 56 and 31 retailers of conventional and safe vegetables, respectively, were interviewed by using a multiple-choice questionnaire. At each retailer, 2–4 vegetable consumers were interviewed, also by using the same style of questionnaire. In total 121 conventional and 104 safe vegetable consumers were interviewed.

The study also relies on a farmers' survey, which was conducted from September to November, 2006, in two provinces serving Hanoi markets: Hanoi and Hai Duong. In each province, two communities – one with predominantly safe vegetable production

[35] However, since 2004, the Hanoi Department of Commerce started to become involved into certifying safe vegetable trade in Hanoi (see below).

[36] By the end of 2007 in total 66 safe vegetable retailers were certified by Hanoi Department of Commerce (Nhi, 2007). Hence, with N=31 in our study we have a very representative sample of 45% of the safe vegetable retailers in this region.

and another with only 'conventional vegetable production'–were selected. In each community 30–33 farmers were randomly selected, resulting in a total survey of 125 farmers. These 125 farmers were interviewed using structured questionnaires to understand their present and past (5-7 years ago) vegetable farming activities, with a focus on pesticides use and the factors that influence decision-making on pesticides use, including marketing channels.

Additionally, 32 farmers in Dong Anh district, Hanoi, were monitored on a daily basis from August 2006 to March 2007 for their farming activities such as crops grown, type and quantity of inputs used, vegetable quantity harvested, and marketing channel and selling price. Similar monitoring data had been gathered from these same 32 farm households between August 2002 and March 2003 (in the previous VEGSYS Project[37]). This repetition allows a longitudinal comparison to track changes over time. The monitoring from August 2002 to March 2003 and from August 2006 to March 2007 will be labeled monitoring periods 1 and 2, respectively (hereafter MP1 and MP2).

Finally, some additional information was gathered from in-depth, semi-structured interviews with 8 state officials (in the agricultural and environmental departments), 7 conventional and 10 safe vegetable producers and distributors, and 2 distribution companies in Hanoi, Hai Duong, and Hung Yen province.

4.4 Vegetable producers

Vegetable farmers in Hanoi and Hai Duong provinces work on average a small area of 2,360m^2 per household, of which 61% is devoted to vegetable growing in the main vegetable season: winter. In Hanoi, the major vegetables are cauliflowers, choysum, kohlrabi, wax gourd, wrapped heart mustard, headed cabbage, and carrot. In Hai Duong, the types of vegetables grown are less diverse and the major vegetables are headed cabbage, wrapped heart mustard, cucumber, and kohlrabi. In summer, farmers in the two provinces grow rice and maize as major crops and some vegetables such as headed

[37] Sustainable Technologies for Pest and Disease Management and Soil Fertility Management in Smallholder Vegetable Production in Sichuan, China and Red River Delta, Vietnam (VEGSYS). Project contract No. ICA4-CT-2001-10054. See www.vegsys.nl.

cabbage, choysum, wax gourd, wrapped heart mustard, cucumber, and bitter melon. Major insects and diseases on vegetables are: flea beetle, imported cabbage webworm, diamond back moth, Rhizotonia, Xanthomonas, and Alternaria.

There is evidence that farmers are increasingly relying on external inputs for vegetable production. In terms of production costs, the share of external inputs such as chemical fertilizers, industrial compost, and pesticides has increased remarkably between MP1 and MP2. By contrast, that of locally available manure has reduced (Figure 4.2). This is partly explained by the increased market price of these external inputs (caused by increasing global fuel prices), but also by increased use of some of these inputs. For instance, comparing major inputs used in MP1 and MP2 (/ha/cropping season) by Independent Samples T-Test, there is a significant increase in the applied volume of pesticides (in formulation) for cauliflower (df=15, $p<0.05$); similarly, for wrapped heart mustard, composts and pesticides use (in active ingredient) increased (df=60, $p<0.05$ and df=71, $p<0.05$, respectively). However, there is no statistical difference for pesticides used on choysum and kohlrabi between MP1 and MP2.

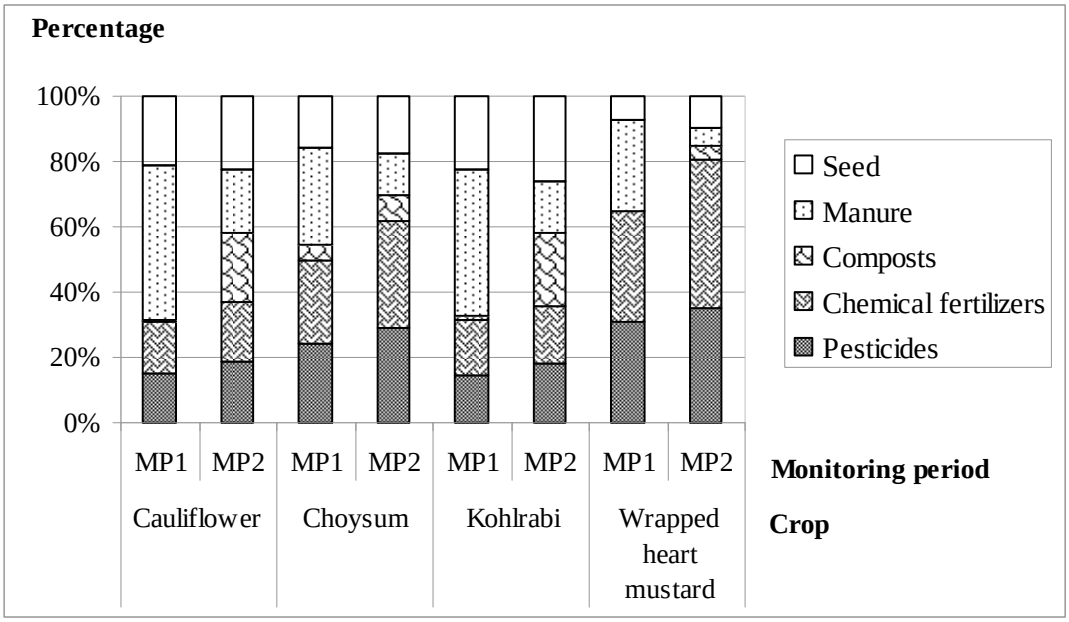

Figure 4.2 Percentage of input costs for four major vegetable crops for MP1 and MP2

A large percentage of the farmers interviewed and monitored has received technical training from state and non-state actors. Additionally, safe vegetable farmers also received material support from the state, such as the construction of a net house.

However, farming practices are strongly influenced by their longstanding routines and experience-based assessments on risks associated with climate conditions, on pest and disease population, on market prices, etc. For instance, our farmer's survey found that up to 72% of the farmers apply a higher pesticide dosage than technically recommended. Around 64% of the farmers cocktail (more than) two different types of pesticides in each spray. In addition, the suggested pre-harvest interval (hereafter PHI) for pesticides is often not strictly followed by farmers. According to farmers and even in the view of officials of Hanoi Department of Plant Protection (CPV, 2005), a general PHI of about 7 days for pesticides is acceptable to guarantee for vegetable safety. But many (toxic and applied) pesticides indicate on their packaging a PHI of 14 days, such as products of Chlorpyriphos, Dichlorvos, Methomyl, and Cypermethrin. Only 10% of the 125 interviewed farmers followed the suggested pesticide PHI in deciding on the vegetable harvesting time. However, the farm monitoring data showed a better result: of the total 707 harvests of the four major crops, 157 (22%) had a PHI of less than 7 days, 308 (44%) satisfied the PHI of more than 14 days, and the remaining harvests were with pesticide PHI in between. This could be explained by the relationship between vegetable price and vegetable harvesting practices adopted by farmers (and whether PHI indications are followed); that is: when vegetable prices are low, farmers tend to reduce the use of chemical inputs and harvest vegetables in smaller quantities and more frequently, waiting for a better price.[38] Therefore, although the percentage of farmers concerned with pesticide PHI is small, in practice a much larger percentage of marketed vegetables satisfy a PHI of more than 14 days.

For conventional vegetable marketing channels, vegetable price is considered by 54% of the farmers the most important factor in selecting their vegetable marketing channels. Although 32% of the interviewed farmers said they have no problem with vegetable marketing practices, 52% believed that only chemical inputs result in good appearance of the vegetables. According to them, good appearing vegetables are not only sold at higher prices, but also attract traders in hard times for marketing. Only 28% of the

[38] For instance, for pesticide pre-harvest intervals of more than 14 days, the average quantity of vegetable/harvesting time is 182 kg and the price VND1,652/kg. By contrast, for pesticide pre-harvest intervals of less than 8 days, the average quantity of vegetable/harvesting time is 255 kg and the price VND2,063/kg.

surveyed farmers considered a social relation with buyers of vital importance. In quantitative terms, the farm monitoring results reveal that the largest (and growing) percentage of vegetables was sold at the farm gate (to local collectors and/or wholesalers): 36% in MP1 and 55% in MP2. Local markets were the second (but decreasing) marketing channel, i.e., 33% in MP1 reduced to 25% in MP2. The same tendency was found in the Hanoi wholesale market, with 25% in MP1 and 15% in MP2. The safe vegetable marketing channel just accounts for a small but stable percentage (2%) of the market share. Besides, a small percentage of vegetables was sold in other provinces.

In contrast with conventional vegetable production, safe vegetable production is better organized, often under “cooperatives” (or groups of farmers) rather than by individual farmers. Many new safe vegetable cooperatives have thus been established in Hanoi after the Cooperative Law came into force in 1996 (Cuong and Tru, 2004). However, most of these cooperatives were formed among relatives. In the organization of their production, safe vegetable cooperatives often assign certain members responsibilities in monitoring chemical use on vegetables by all cooperative members, especially regarding pesticide PHI. Nevertheless, all cooperative managers admit that the quality of vegetables is largely dependent on individual members. There is no successful enforcement mechanism within the cooperatives to secure correct pesticides use. The main reason is that the cooperatives have not yet been able to significantly help their members in marketing their products via the safe vegetable channel. According to farmers of safe vegetable production cooperatives in Hanoi, just 10% of their harvest is marketed through the safe vegetable channel. The other 90% is sold to local collectors and wholesalers at the price of conventional vegetables.

4.5 Collectors/wholesalers

For conventional vegetable marketing channels, local vegetable collectors and wholesalers often do not have a formal contract with farmers. Although relations between farmers and buyers are sometimes close, all interviewed local vegetable collectors and wholesalers indicated that they select vegetables, and not vegetable

producers. When called by farmers, local vegetable collectors and wholesalers investigate their quality in the field, mostly in terms of vegetable appearance and pesticide smell. Hardly ever do they ask farmers questions regarding pre-harvest interval, as they do not trust farmers will give the correct information.

In Hanoi, most farmers harvest vegetables themselves and only then sell them to local collectors (or to other channels). Thus, these farmers may have several harvests during each crop cycle, depending on the maturity of the crop and on market signals/prices. In many areas in Hai Duong and Hung Yen provinces, farmers sell vegetables to local vegetable collectors and wholesalers 10 to 15 days before the harvest, whereby the price is negotiated. The buyers base their quantity and price on past years experience of vegetable demand from their clients. For farmers, pre-harvest transactions make them less dependent on unpredictable market prices and climate conditions for vegetables and allow them to plan their labour. In these pre-harvest vegetable transactions, the main objective of local buyers is not to control quality in terms of pesticide uses and fulfillment of PHI. Interviewed local collectors/wholesalers indicated that none of their partners asks about the safety of vegetables (in terms of chemical residue control), even not those coming from Hanoi who buy vegetables for the safe marketing channel.

By contrast, collectors of safe vegetables often make a contract with retailers to whom they sell their products, mainly regarding the collector's responsibility for the safety of vegetables. These collectors are often farmers who are members of safe vegetable cooperatives certified by the Hanoi Plant Protection Department. Only with such certificates these farmers can sign contracts for vegetable provision with safe vegetable retailers. Thus, establishing a safe vegetable cooperative is a necessary procedure for farmers to enter the safe vegetable market channel. Even then, vegetable providers are sometimes faced with "difficulties" raised by staff of supermarkets or factory kitchens to which they sell their safe vegetables (Vy, 2006).[39] Together with the inconsistent and inadequate surveillance and enforcement, and rent seeking behavior of inspectors (WorldBank, 2006), this contributed to non-compliance by other less powerful actors in

[39] A safe vegetable provider in Dong Anh district revealed that he was required to pay a bribe of roughly US$60/month to the staff of the factory kitchen which he had a contract with to provide vegetables (personal interview in December 2, 2006).

the chain. For instance, a safe vegetable collector collects vegetables not only from other members of his/her cooperative, but also from other farmers within his own network, or simply from the open market for products that he/she considers safe. For instance, a safe vegetable cooperative in Van Noi (Dong Anh, Hanoi) has 18 members, of which 14 are involved in vegetable collection and distribution, on a more or less continuous basis. Safe vegetables may thus regularly contain high pesticide residues (Lan and Long, 2007; Tuyen, 2008b).

Besides these individual collectors, there are two safe vegetable distribution companies in Hanoi: (1) Vietnam Joint-venture Company for Agroforestry Products with the vegetable brand name "Bao Ha"; and (2) Ha An Joint-venture Company for Safe Agricultural Products with the brand name "Ha An". The products of these two companies are bought by safe vegetable retailers. The Vietnam Joint-venture Company--established in 2004 with the financial support of Hanoi Plant Protection Department--currently has contracts with three safe vegetable cooperatives in Dong Anh and Soc Son district (Hanoi) for daily vegetable provision. The Company only sorts and packages vegetables, and has contracts with 12 vegetable shops for selling vegetables in Hanoi. The Company, however, has not yet been able to control the use of pesticides by farmers. By contrast, Ha An Joint-venture Company--established late 2007--is currently renting 5 ha in Gia Lam district (Hanoi) for vegetable production. With financial and staff support from Hanoi Plant Protection Department, Ha An is currently using less-toxic pesticides to control pests and diseases. However, as Hanoi Plant Protection Department will cease support in 2009, the capacity of the company to continue controlling vegetable quality can be questioned. The Company currently distributes to private safe vegetable retailers and directly to consumer households on request.

Given these differences between conventional and safe vegetables in terms of production and collection systems, it is interesting to investigate the different perceptions and levels of trust among retailers and end-consumers, regarding chemical residues in vegetables.

4.6 Retailers

There is a formal distinction between conventional and safe vegetable retailers. Registration procedures to become a safe vegetable retailer are mentioned in the Decision 130/2004-QD-UB, issued by Hanoi government in 2004 (HPC, 2004).[40] According to this Decision, a safe vegetable retailer needs to fulfill several criteria to be certified by Hanoi Department of Commerce: regarding the infrastructure of the sales location, the sourcing of safe vegetables, and information on quality and origin on the vegetables packaging. The Decision also regulates that retailers are legally responsible for the quality of the vegetables.

In the market, there is a clear difference between conventional and safe vegetable retailers. Among the conventional vegetable retailers, 93% is specialized in vegetable trade on a continuous basis. The others are farmers who sell their own vegetables, together with those collected from their neighbors. By contrast, only 42% of the safe vegetable retailers are specialized in vegetable trade on a continuous basis. Another 26% mixes safe vegetables trade with other "safe" foodstuffs, such as pork, beef, chicken and eggs. The remaining safe vegetable retailers are farmers coming from safe vegetable cooperatives in Hanoi (mainly from Van Noi commune). These farmers do not trade vegetables on a continuous basis, as they need to work on the farm as well. Some do not have a fixed place on the market. All put the "safe vegetable sign" on their selling place, but as revealed, they are hardly controlled by the Hanoi inspectors who are responsible for food safety.

For conventional vegetable retailers the sources from which vegetables are obtained have hardly changed over the years. The majority of the vegetables still comes from wholesalers and collectors. The remaining vegetables are bought from farmers or even from other retailers. None of the conventional vegetable retailers reported directly buying from safe vegetable cooperatives or vegetable distribution companies. By contrast, safe vegetable retailers increasingly obtain their vegetables from safe vegetable

[40] Before this Decision was issued, safe vegetable retailers in Hanoi were provisionally recognized legally as long as they source vegetables from safe vegetable cooperatives.

cooperatives, and less and less via wholesalers and collectors. There is also an increasing tendency of buying vegetables from vegetable distribution companies (Table 4.1).

Table 4.1 Vegetable sourcing of retailers (in % of quantity)

Source	Conventional vegetable retailers (n=56)		Safe vegetable retailers (n=31)	
	2003	2008	2003	2008
Collectors	21%	26%	26%	2%
Wholesalers	61%	54%	24%	1%
Producers	17%	19%	2%	1%
Other retailers	1%	1%		
Safe vegetable cooperatives			47%	85%
Vegetable distribution companies			1%	11%

Safe vegetable retailers seem to experience less economic difficulties recently than conventional vegetable retailers. Over one third of the conventional vegetable retailers are facing structural difficulties in their business. Their daily trade volume has reduced over the past five years, for some retailers as much as 50%. Only some 20% reported progress in their business. By contrast, safe vegetable retailers were much more positive regarding their business development over the past 5 years (Table 4.2). On average, the volume of vegetables traded daily by conventional vegetable retailers decreased from 153 kg to 127 kg over the last five years. The volume of vegetables traded by safe vegetable retailers increased from 96 kg in 2003 to 134 kg in 2008. Still, in 2008 the share of safe vegetable retailing in Hanoi is at best 5% of the total vegetables marketed. Thus, the difficulties among conventional vegetable retailers were not so much caused by the success of safe vegetable retailers, but rather by the increasing number of retailers[41] (indicated by 55% of the conventional vegetable retailers).

Irrespective of these differences in economic developments between the two groups, most conventional vegetable retailers surveyed saw no reason to switch to safe vegetables. Two main reasons were mentioned for this conservatism: consumers

[41] This could be caused by urbanization and industrialization, through which many farmers lose their land. For instance, according to the Ministry of Agriculture and Rural Development, roughly 336,000 ha of agricultural land were taken out of production in the period of 2001 – 2005, affecting about 2.5 million people. A number of these people are seeking alternative income sources, such as vegetable trade (Tuyen, 2007).

continue to buy conventional vegetables while these retailers do not trust safe vegetables, and they fear problems with the authorities if consumers fall ill from their safe vegetables as indicated in the Decision 130/2004-QD-UB. Of lesser importance were mentioned the higher price of safe vegetables and the existing relations of retailers with their vegetable providers (often related to control over quality) (Table 4.3).

Table 4.2 Developments in vegetable trade of retailers, 2003-2008 (n=87)

	Conventional vegetable retailers (n=56)	Safe vegetable retailers (n=31)
Increased	21%	49%
No change	41%	32%
Reduced	38%	19%
Average volume/retailer 2003 (in kg)	153	96
Average volume/retailer 2008 (in kg)	127	134
Growth in vegetable trade over 2003-08	-20%	28%

Table 4.3 Reasons mentioned by conventional vegetable retailers not to change to safe vegetable retailing (n=56)

Reason	Percentage
High price	36%
No trust in safe vegetables	48%
Relation with present vegetable providers	27%
Consumers keep buying conventional vegetables	68%
Other reasons	14%

Consequently, it is hard to find incentives for conventional vegetable retailers to switch to safe vegetables. A considerable percentage of conventional vegetable retailers, i.e., 23%, is willing to change to safe vegetable retailing if requested by their regular consumers. Another 11% is willing to move to safe vegetable retailing if their price is at an acceptable level. A somewhat similar percentage of conventional vegetable retailers considers either good vegetable sources or formal procedures for safe vegetable business important. However, up to 71% of the conventional vegetable retailers did not consider any of these incentives sufficient to decide to change to safe vegetables retailing.

The majority of the safe vegetable retailers fully trusts the quality and safety of their products. Table 4.4 indicates that this trust is to a major extent related to the commitment of vegetable providers. This trust is less caused by information about the

origin of vegetables, certificates issued by relevant authorities, or the name of the trading company; by relations with relatives/friends in the vegetable chain; or by absence of negative feedback from regular consumers. However, trust in vegetable producers and providers is often put at risk, for instance in the case of Van Noi (Dong Anh district). Van Noi has emerged as one of the most important areas of safe vegetable production and has become widely known among Hanoi consumers since 10 years. Many safe vegetable retailers in our survey were selling Van Noi vegetables. However, recently Van Noi experienced a reduction of its credibility, following lack of commitment towards the safety of the vegetables (Tuyen, 2008a).

Table 4.4 Reasons for safe vegetable retailers to trust the safety of vegetables (n=31)

Reason	Percentage
Vegetables with information on origin, certificates etc.,	42%
Commitment from vegetable providers	77%
Introduced by relatives/friends	10%
No negative feedback on food risks from consumers (after a period of time)	19%

Given the frequent reporting on food poisoning (including from vegetables) in Vietnamese media, it is remarkable how many retailers take no action, i.e. 39% of the conventional and 58% of the safe vegetable retailers. For safe vegetable retailers this can be explained by their trust in the quality and safety of their vegetables; conventional vegetable producers probably ignore the problem or simply think that the 'dirt' of vegetables could be removed by careful cleaning. Standard reactions from retailers on food safety scares are to give consumers advice on vegetable processing (washing; cooking) and/or demand suppliers to make a more careful selection of the vegetables. None of retailers ever thinks of looking for other providers.

4.7 Consumers: lack of trust

The large majority of the consumers consume only conventional vegetables purchased from conventional vegetable retailers. By contrast, contemporary 'safe vegetable consumers' (i.e. consumers who regularly buy safe vegetables) bought a major share of their vegetables from conventional vegetables retailers in the past, but have switched largely (73% of the bought quantity) to safe vegetables retailers during the last 5 years.

Currently, still some 20% of all vegetables bought by safe vegetable consumers comes from conventional vegetable retailers, for instance when consumers can not find specific vegetables at safe vegetable stores or when they have no time to visit safe vegetable retailers. Vegetables bought at supermarkets (often under a safe brand) seem to increase for both groups of consumers, but still make up a small quantity, i.e., 5% and 6% for conventional and safe vegetable consumers, respectively.

Table 4.5 indicates the main reasons for conventional vegetable consumers not to buy safe vegetables: lack of trust in the quality of safe vegetables. Obviously, the guarantees set by authorities and market parties through their branding and policies did not generate trust among vegetable consumers. This lack of trust comes together with a repression and blocking of information (see also Mol, 2009). When a scientist published his research on chemicals used for fruit storing in a newspaper, he was disciplined by his head for "providing information to a newspaper without permission of the head" (Tintucvietnam, 2004). In 2001, the Food Administration of HoChiMinh City detected carcinogenic 3-MCPD in soybeans. However, the information was only disclosed to the public in 2007 (Ha, 2007). In addition, consumers are confused by conflicting information regarding vegetable safety provided by different regulatory agencies, i.e., the Ministry of Agriculture and Rural Development and the Ministry of Health (Hang, 2006). The denial of risks, conflicting information, and information closure on risks by authorities do not contribute to trust in the safety of food among consumers. The absence of experiences with acute food poisoning is the second main reason why conventional vegetable consumers do not switch to safe vegetables. The higher prices of safe vegetables and trust in the application of cleaning detergents for conventional vegetables before eating further explain the low interest in safe vegetables. Very few consumers think that their relation with the present retailers is of any importance in sticking to conventional vegetables.

These ambivalences on trust in safe vegetables can also be found among safe vegetable consumers. Up to 86% of safe vegetable consumers switched to safe vegetables because of the claimed safety, while one third consumed these vegetables for reasons of convenience (a retailer close by). Although most safe vegetable consumers considered

safety the main reason for their preference, complete trust in the safe vegetables label could only be found among a small percentage, i.e. 13% of total safe vegetable consumers interviewed. In a scale between complete trust to no trust at all, 75% of the safe vegetable consumers indicated to have moderate trust, and the remaining consumers either have limited trust or no trust at all in the safety of safe vegetables.

Table 4.5 Reasons for not buying safe vegetables (n=121)

Reason	Percentage
Higher price	23%
No trust in the safety of safe vegetables	69%
Relation with present retailer	6%
Trust in cleaning detergents	12%
No acute food poisoning experienced so far	50%

Given the increasing mass media reporting on food poisoning, a widespread reaction by Vietnamese consumers (84% of the conventional and 81% of the safe vegetable consumers) is to clean vegetables with water, salt water or detergents (VEGY[42], ozone). This response seems to constitute a sense of being somewhat in control of the risks associated with chemical residues in vegetables, and at the same time reflects the limited trust consumers have in (safe and conventional) vegetables and the supply chain. Few consumers consider buying alternative kinds of vegetables or switching retailers, i.e., 12% and 9% for conventional and safe vegetable consumers, respectively. But many consumers in Hanoi also started to grow vegetables themselves on the top floor of their houses (in boxes), on land that has been designated but not yet converted into industrial zones, or even on strips of land along roads (Bac, 2008; Minh, 2008).

4.8 Conclusion

After more than 10 years of major efforts and investments by state authorities and market actors, the safe vegetable production and distribution system has not yet been able to take a significant share of the vegetable market and gain widespread consumer trust. Originally set up and designed by state authorities to provide a domestic alternative for the pesticides-addicted conventional agriculture and to involve market

[42] A ‘chemical removing’ detergent produced by GOODMAID Chemicals Corp. Malaysia

actors in governing the food system in more environmentally sound and safe directions, the safe vegetable system still operates at a marginal scale (even more so outside the urban centers). Through state support in technical training and infrastructural development, farmers in some localities have actively participated in safe vegetable production. However, their vegetable products have not successfully attracted consumers. Similar lessons were learnt in other cases of low-pesticide vegetables in Vietnam. Although the Sustainable Agricultural Products Company Ltd. achieved international certification issued by IFOAM, their products failed to penetrate into the market (ADB, 2006). And some private operators developed their own vegetable brand in Hanoi (i.e., Bao Ha and Ha An). But they have not yet been able to develop and implement internal product quality standards and rules that gained trust among consumers and proliferate their products in the market.

In the prevailing situation of non-compliance by Vietnamese food operators in delivering a level of safety required to satisfy public health goals, it is often suggested that stronger regulatory action is an appropriate response (Martinez et al, 2007). But the state regulatory system has demonstrated an inability in controlling food safety, especially vegetable collectors and retailers. Two main reasons are behind that. First there is a poor capacity of the state regulatory system on food safety and hygiene. For instance, the Vietnam Food Administration is the implementing agency under the Food Safety and Hygiene Ordinance, responsible for assuring the hygienic status of fresh and processed foods. However, its annual budget is about US$30,000, of which 80% goes to staff salary costs, leaving a limited resource for operational activities (WorldBank, 2006). Moreover, corruption levels are high, rent seeking behavior by food inspectors widespread and transparency is lacking. Collectors and retailers may trade conventional vegetables under the brand and for the price of safe vegetables, causing food poisoning among consumers and subsequently distrust in safe vegetables. Collectors and retailers may just pay for non-compliance to the ‘safe vegetable rules’ and continue business as usual. Thus, in the view of some vegetable retailers and consumers in Hanoi, “once the legal–administrative system is corrupt, there is little hope for safe vegetable production and distribution practices.”

Vietnam has thus been not able to get market actors in the vegetable supply chain and the relevant state authorities seriously committed to setting up a well-functioning, legitimate, transparent and accountable safe vegetable system. Although in our analysis we have come across many reasons for this still marginal and problematic functioning of safe vegetable production and consumption, two interdependent reasons stand out: the failure (of state authorities) to involve and support market actors in safe vegetable governance, and the absence of trust in safe vegetable production as better alternative to conventional vegetables (especially – but not only – among consumers).

The failure to activate market actors towards reduction of pesticide reliance in vegetable production and consumption (in line with what has become known in industrialized societies as food-risk/environmental governance), is thus as much related to the political system of Vietnam as to the economic status of a developing country. The deficiency of a post-material middle class that performs an effective demand for environmental quality and food safety does not seem to be the main reason for the failures in the safe vegetable production chain. We also cannot relate it simply back to a lack of interest or sheer conservatism in the various segments of the vegetables supply chain. Involving non-state actors in governing collective goods such as food safety and environmental protection does require not just (or even not primarily) economic resources, but rather functioning systems of legitimacy and accountability, information disclosure and transparency, and independent civil society actors that counter-balance and disclose failing state and market actors and institutions. The absence of all this in Vietnam limits and constrains effective market actor involvement in modern systems of vegetable production and distribution.

This all relates back to the theories which guided and inspired our research. Although, since the development towards a market-oriented economy, consumers are labeled ‘king’ by Vietnamese manufacturers and service providers, these ‘kings’ have limited power. However, this is not so much caused by powerful producers and retailers in the supply chain, or the lack of a consumerist turn in agri-food networks. It is strongly related to the political system. Hence, understanding market actors and private governance in agri-food networks also means ‘bringing the environmental and food

safety state back in' (e.g. Mol, 2007). By the same token, our study reflects back on the governance literature. Governance, that is the stronger involvement of non-state actors and a shift of state tasks and responsibilities to them, requires a both a "policy space" for them, as the design and safeguarding of favorable conditionalities by the state. With a still hierarchical, top-down and corrupted state management and without state-enhanced transparency, accountability, and enforcement governance is impossible, as our case of safe vegetables proved. There are very limited possibilities for participation, low commitment of private actors in implementing state strategies, and unwillingness of state authorities for transparency, information disclosure and being held accountable. If any of the OECD models of governance is to emerge in the Vietnamese food sector, a restructuring the current centralized state system towards transparency and democracy is a must.

Chapter 5

Pesticide governance in export supply chains: The case of vegetable and fruit production in Vietnam[43]

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Abstract

This paper analyzes the role of international agrofood supply chains in greening vegetable and fruit products and production in Vietnam. Mainly through contract-based procurement, the export-oriented vegetable and fruit supply chain is better structured and organized than the domestic supply chain. Exporters intervene to some degree in fruit and vegetable farming, to safeguard supply and improve product quality. Pesticide use is one of exporter's concerns, although pesticide application remains largely controlled by farmers. Despite some endogenous innovations to improve vegetable and fruit pesticide practices, farmers and exporters are especially responding to demands of importers. Relatively lax import regulations from the main export markets (China and Russia) are the main reason for limited achievements in less pesticide-dependent vegetable and fruit production in Vietnam. By the same token, these limited innovations constrain farmers and exporters from exporting to more challenging markets in the EU, the US and Japan. Hence, in Vietnam export markets have hardly induced reduction in the use of pesticides in agricultural vegetable and fruit production.

Key words: vegetable and fruit, contract farming, food processing, export, Red River Delta.

5.1 Vietnam's agro-food exports and the environment

With its subtropical climate and superfluous rural labour resources, Vietnam has favourable conditions for vegetable and fruit production. The area destined for growing vegetables and fruits increased remarkably, from 322,900 ha in 1990 to 642,600 ha in 2007 (FAOSTAT, 2009). And further expansion to 800,000 ha in 2010 is planned (MARD, 2004b). Parallel to the promotion of vegetable and fruit production for domestic consumption, the Vietnamese state aims to increase the vegetable and fruit exports, up to US$700 million in 2010 and US$1 billion in 2015 (VCCI, 2007). But while total agricultural export value achieved an average annual growth rate of 15% between 1986 and 2006 that of vegetable and fruit exports was only 6%. The monetary share of vegetable and fruit exports in total agricultural export value fluctuated strongly, and achieved roughly 5% in 2006 (Figure 5.1). Given the much larger world market for vegetables and fruit as compared with that for rice and coffee (FAO, 2005; 2006)[44] the

[44] For instance, the world export value of fruits and vegetables was US$90 billions in 2003 (FAO, 2005), while the world export value of rice and coffee was only US$8.9 billion and US$9.1 billion, respectively in 2004 (FAO, 2006).

vegetable and fruit exports of Vietnam fails to follow the general trend, especially given the higher value of vegetables and fruits as compared with rice.

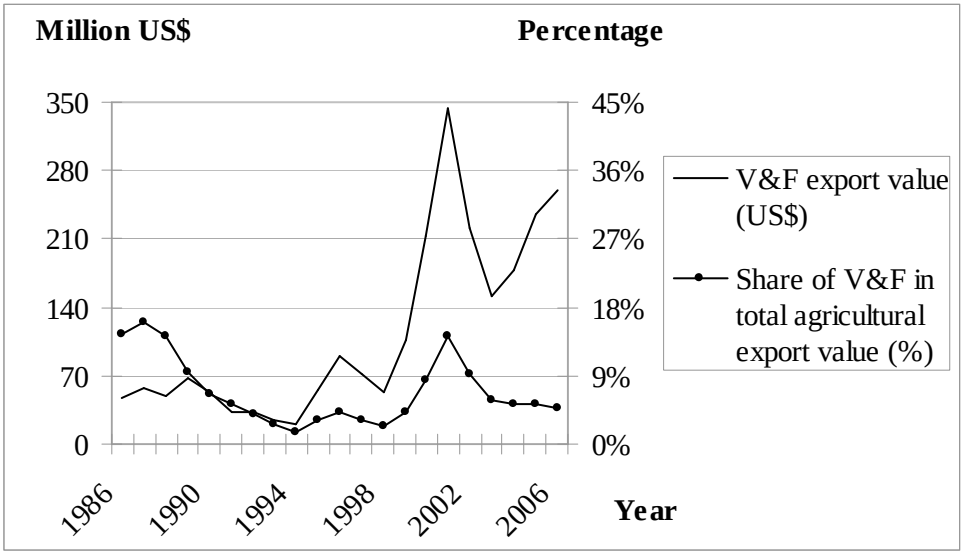

Figure 5.1 Vegetable and fruit exports of Vietnam

Source: (GSO, 2006b; 2008b)

The failure of Vietnam's vegetables and fruits in penetrating the global market is largely caused by the poor development of the vegetable and fruit processing sector, with respect to both scale and product quality. For instance, by 1999 there were only 12 companies and 48 processing units involved in vegetable and fruit processing in Vietnam, all poorly equipped and with a total processing capacity of 150,000 tons/year. Aware that the development of the agro-processing sector provides new outlets for agricultural production, absorbing rural labourers, increasing farmer incomes and providing a more stable outlet for agricultural production, the Vietnamese government has put a lot of effort into developing this sector. In 2003, an additional 12 companies were established with more advanced processing technologies, increasing total processing capacity of Vietnam to 290,000 tons/year (CPV, 2007). The expanding capacity of the food processing sector was taken in combination with efforts in promoting export-crop production (Vietnam News Service, 2002 cited in IFPRI and MARD, 2002). However, due to the poor production planning and coordination, actual capacity used was much lower than the potential capacity. For a representative example, a large-scale food-processing factory was constructed in Hai Phong province with a total investment of roughly US$3 million. Operating since 2001 and equipped with

advanced technology imported from Italy, the factory has produced far below its designed capacity, due to the shortage of inputs (Ha and Phu, 2006).

The Enterprise Law of Vietnam, passed in 1999, paved the way for the development of private agroindustrial enterprises as well as the transformation of state-owned enterprises into joint-stock ones. This also diversified export-crop production, from traditional export-crops such as rice and coffee to non-traditional ones such as various types of vegetables and fruits. In further promoting agricultural transformation from subsistence to commercial and export-oriented agriculture, the Vietnamese government passed Decision 80/2002/QD-TTg. This decision attempted to and did increase the adoption of contract farming to improve procurement, efficiency, and product quality via control of and investment in farming practices by agroindustries (SRV, 2002a).

Export production often requires further standardization in products and production methods, high quality of products, and regularity in output, which usually come together with large-scale, high capital input agriculture where chemical fertilizers and pesticides are widely used. But by the same token, export production is often related to high and strict product quality standards on pesticide residues and international standards and conventions on production methods and environment, articulated via international commodity chains. In many cases, the international commodity chains–-instead of or in addition to states–have strengthened agricultural restructuring and development of the agricultural network in developing countries, and thus govern the use of pesticides. In Chile, expansion of agricultural exports after economic liberalization have been associated with an unprecedented increase in the participation of the private sector in generating and transferring agricultural technology to the rural population (Jarvis, 1992 cited in Altieri and Rojas, 1999). Similarly, various studies have illustrated how international markets are pushing agricultural production in developing countries to become more environmentally friendly, even towards using organic production methods (Arbona, 1998; Boselie et al, 2003; Dolan and Humphrey, 2000). For instance, vegetable and fruit producers and exporters in Kenya and Zimbabwe have grabbed export opportunities, by integrating into global food chains in combination with restructuring vegetable and fruit production practices to meet social and environmental

standards of UK importers (Dolan and Humphrey, 2000). In Guatemala, agricultural practices with strongly reduced or eliminated pesticide use have been promoted after vegetable exports were banned on the international market (Arbona, 1998). Consumers, retailers and food importers from the U.S., the EU and Japan demand low presence of chemical substances on imported vegetables and fruits, often codified in national and international regulations, standards, labels and contracts. Thus, at a more systematic level, the promotion of agricultural exports has contributed to institutionalization of food-safety standards in developing countries that have been gradually harmonized with those adopted by developed countries (Essex, 2008). However, the potential of such pesticides governance through international commodity chains is largely dependent on the structure of and coordination mechanisms in these chains (see Gereffi, 1994; Ponte and Gibbon, 2005). Even so, together with the stringent regulations and possible assistance of foreign importers to other actors lower down in the food chains, governments of exporting countries should continue to play an important role in supporting involvement of domestic actors into the chains; for instance, to restructure the production chains as in the case of China (Wang and Song, 2008), or to support agroenterprises, especially small-scale ones with low human and financial capacity, in terms of financing, formation of industry networks, and marketing assistance as in the case of the US (Bagchi-Sen and Scully, 2007).

Little is known how and to what extent the vegetable and fruit supply chain in Vietnam witnessed a change in pesticide use to meet the quality standards of foreign importers after 1999. Nor is it clear whether increased contract farming – especially prevailing in export production chains – made any difference in lower pesticide use in fruit and vegetable production for export markets. This article aims to shed light on this missing information. The purpose of this paper is to empirically examine whether and how Vietnamese export commodity chains govern farmer's pesticide use in growing export crops. The focus is then on Vietnamese exporters, who relate Vietnamese farmers and agro-industries to foreign importers. After outlining the research methodology for this paper, we will characterize the Vietnamese vegetable and fruit exporting sector. Subsequently, we will analyze how Vietnamese food processors/exporters source their products from farmers and attempt to manage product quality (especially with respect to

pesticides). Finally, we will examine how exporters govern the supply chain, also in comparison with domestic traders.

5.2 Methodology

This study aims to investigate how and to what extent exports and exporters contribute to reduced pesticide use in vegetable and fruit production in Vietnam. The study was carried out in 8 provinces[45] in the north of Vietnam, from July to October of 2008. Thirty vegetable and fruit processing and exporting enterprises in these provinces were analyzed and interviewed. Both open and closed questionnaires were used to understand the exporter's characteristics, their sourcing of raw products, their processing and exporting activities, their participation in farming practices of contracted farmers, and the company's efforts in controlling vegetable and fruit production and quality. The main focus was on pesticide use in farming practices.

This study focused on vegetables and only those fruits that are used during meals as foodstuff (such as cucumbers, tomatoes, casaba melon, and chilli) and not as deserts. Other fruits, such as litchi, longan, dragon fruit, coconut, cashew, and jackfruit, were not included. Since most interviewed companies were involved in both processing and exporting vegetables and fruits, we use the terms "exporter" and/or "enterprise" to refer to both processors and exporters, distinguishing explicitly between the two only where needed.

Given the small scale of the farms in Vietnam, all exporters have to rely on local collectors – individuals or representatives of agricultural cooperatives (see more below) – for production planning, organising loans for farmers, and even production monitoring, i.e. pesticide use. These collectors are therefore important, not only for exporters themselves, but also for (eventually) pushing vegetable and fruit farming practices towards proper pesticide use. Four collectors – two in Hanoi, one in Nam Dinh and another one in Bac Giang province – were interviewed to better understand their

[45] The survey included the provinces of the Red River Delta, as well as other provinces in the northern and central region of Vietnam: Hanoi, Hai Duong, Hung Yen, Nam Dinh, Thai Binh, Ninh Binh, Bac Giang, and Thanh Hoa.

role regarding controlling farmers' pesticide use, and to complement exporter perspectives. Of these four collectors, the two in Hanoi are leaders of (volunteer-based) small farmer groups who are responsible for linking farmers to exporters, for instance by delivering seeds and credit offered by exporters to farmers; and by receiving harvests directly from the farmers and delivering payment to them. These collectors are also directly involved in vegetable and fruit production. They provide no services relating to pesticides and fertilizers, because farmers of their groups have excellent pesticide knowledge. By contrast, the two other collectors are agricultural cooperative leaders. Besides performing similar activities to the other two collectors, they also provide pesticide and fertilizer services to farmers. In addition, earlier research also included surveys among farmers, focusing on their use of pesticides in farming practices and their connections with pesticide companies and retailers (see Hoi et al, 2009b;c). Where necessary we draw on that information too.

5.3 Characterization of Vietnamese vegetable and fruit exporters

Following the 1999 Enterprise Law Vietnam witnessed a rapid development of private agro-enterprises and a transformation of state-owned enterprises. The increase of agro-enterprises went together with a diversification in the production of export crops, from traditional export crops (such as coffee) to new export crops including various types of vegetables and fruits. This came together with a diversification in the scale of processing and exporting, in the products exported, and in the export markets.

Of the 30 export enterprises interviewed, 60% is private-owned (which all started exporting after 2000) and 40% consists of joint-stock enterprises, most of them transformed from state-owned ones. This latter category started exporting usually before 2000. There is quite a difference in the operational scale, and in human and financial capacity, both between private-owned and transformed joint-stock enterprises as well as within the two categories of enterprises (Table 5.1). Overall, the enterprises are small-scale, with an average staff number of 14 and with 91 permanent workers. The enterprises strongly rely on seasonal workers, with on average 180 labourers. The average charter capital is about US$390,000/enterprise, although 70% of the enterprises

have a smaller capital. In 2007, average revenues per enterprise were about US$1,265,000. Two-third of the enterprises focused on exports of agricultural products only, the others are involved in exports of multiple products (more often among joint-stock enterprises). Agricultural exporting enterprises operate seasonally, related to the harvest of export crops. The second group of enterprises functions more or less year-round, depending on trade orders of foreign importers. This group also has a larger number of permanent staff compared to the first group.

Table 5.1 Major characteristics of thirty export enterprises

Basic information	Unit	Private enterprises (n=18)	Transformed enterprises (n=12)	All (n=30)
		Mean (SD)	Mean (SD)	Mean (SD)
Number of administrative staff	person	9 (9)	21 (23)	14 (17)
Number of permanent worker	person	41 (37)	167 (308)	91 (202)
Number of seasonal worker	person	170 (130)	194 (151)	180 (137)
Charter capital	US$'000	370 (380)	422 (406)	390 (384)
Total revenue in 2007	US$'000	830 (558)	1,918 (1,709)	1,265 (1,259)

Eighty per cent of all exporters are equipped with testers to measure the content of acid, salt, and sugar in processed products. But none of the 30 companies has equipment for chemical analysis of pesticide residues in fresh and processed products. One-third of the enterprises (most of them joint-stock owned) has acquired international certification on food safety/hygiene such as ISO 9001/2000; ISO 22000/2005; HACCP; and/or Intertek. In addition, eighty per cent of all enterprises have a simple system of settling tanks for wastewater treatment. Some enterprises add biochemical ingredients to the tanks for a better treatment, before releasing the treated wastewater in public waterways. These provisions for environmental and product quality management are related to the international orientation of the companies, as indicated by our interviews.

Twenty-five enterprises are directly involved in both processing and exporting. Three enterprises only export fresh products, and two enterprises only export already processed products. These five exporting enterprises are all private-owned. Major export products are cucumbers, chilli, casaba melon, tomatoes, and pineapple. Fresh products are mostly exported to China, whilst processed products, especially pickled ones, mainly go to Russia. Some products are also exported to countries such as Japan, the U.S, France and Germany, but in small and varying quantities.

Cucumbers, gherkin and tomatoes are to a high percentage exported indirectly, meaning that processors sell processed products to (Vietnamese) exporters rather than export these directly to (foreign) importers. In total, indirect exports account for 26% of the total exported quantity (Table 5.2). This phenomenon reflects an increase in demand by importers; due to their limited processing capacity, exporters need to rely on external sources for processed products to meet demand. Such a longer supply chain may affect product quality as well as exporters' revenues. Thus, some exporters refuse to work with other processors. For instance, one exporter in Hung Yen received an order for 200 containers of processed cucumbers and gherkin from importers from Russia and some former CIS[46] countries in the second half of 2008. However, he could only deliver 100 containers from his own company and refused to work with indirect exports. By the same token, processors who have not yet been able to find trustworthy foreign importers have to rely on indirect exports. When import demand reduces these companies are more vulnerable compared to those with direct connections with foreign importers. Though some information of exporters is mentioned on product labels (such as location of origin of the product), all products are exported under the brand name of the importers rather than of the exporters. For this reason, Vietnamese exporters have not yet been able to extend their armlength or influence beyond the border of the country. The operational strategies of exporters thus reflect the (brand) requirements of the specific importers and importing countries.

Most of Vietnam's vegetables and fruits are exported to countries whose domestic markets are not well organized and controlled, such as China (Bai et al, 2007), Russia (Berg et al, 2005), and even Taiwan (Jeng and Fang, 2003). The requirements on and/or control of (imported) food quality are low, also with respect to pesticides residues. Together with current high vegetable and fruit demands from these countries, this drives many Vietnamese exporters towards expanding processing facilities and export capacities, beyond small-scale and poorly equipped operations. Hence, investment capital is currently the most important constraint for 40% of the exporters. Sourcing raw products is considered a real constraint for 33% of the exporters. Besides, fluctuation of

[46] CIS, the Commonwealth of Independent States is an organization of countries that are former Soviet Republics.

import demand, mainly from Russia and China, is considered a major constraint by 23% of the exporters. Constraints regarding the Vietnamese state administrative system are less pressing (Table 5.3).

Table 5.2 Vegetable and fruit export quantity, value and destination from eight provinces in 2007

Products	Quantity (ton)	Value (US$'000)	Indirect exports (%)	Importing countries
Cucumbers, gherkin	36,377	18,229	36%	China, Germany, Japan, Mongo, Poland, Russia, Ukraine, Slovakia, US, Taiwan
Pineapple	10,100	6,053	19%	England, Germany, Gruzia, Mexico, Mongolia, Russia, Ukraine, US
Chilli	6,974	4,118	7%	China, Japan, Kazakhstan, Korea, Russia, Slovakia, Taiwan, Ukraine
Tomatoes	6,000	2,543	45%	Germany, Gruzia, Mongolia, Poland, Russia, Ukraine
Casaba melon	4,900	1,960	0%	Japan, Taiwan
Garlic	1,000	1,520	8%	Japan, Taiwan, Ukraine
Sweet corn	1,440	804	15%	France, Mongolia, Russia, Taiwan
Head cabbage	1,700	340	0%	Taiwan
Radish	1,110	231	0%	Taiwan
Others	2,423	2,040	30%	Czech Republic, Hungary, Germany, Japan, Korea, Mongolia, Russia, Taiwan, US
Total	72,024	37,837	26%	
Mean (Standard deviation)	2,401 (2,277)	1,261 (1,184)		

Table 5.3 Difficulties faced by Vietnamese exporters (n=30)

	The most important constraint
Export market demand	23%
Capital requirements	40%
Raw materials (quantity and quality)	33%
State policy and enforcement	3%

Despite increasing foreign demand for vegetables and fruits, 50% of the exporters expressed worries regarding their future business (data not shown). They fear competition on product quality with exporters from Thailand and India. Especially the increased stringency of product quality standards in CIS countries causes concerns. Another 37% of the exporters consider raw material (crop) quality and quantity an

important factor for safeguarding successful future exports. One exporter in Hung Yen said that he exported 200 tons of Casaba melon to Japan in 2002, but only 40 tons in 2007 owing to shortage of good quality products. At the same time the demand by Japan for imported vegetables and fruits is currently very high. The current shortage of high quality raw products, as faced by exporters, is caused by increased demand of importers, reduced interest of farmers in highly urbanized areas in export crop production (see below), and the reduced involvement of local authorities in agriculture. As one exporter reported "5-10 years ago, it was easy for us to arrange export-crop production in selected localities, and we were highly welcomed by farmers and local authorities. Farmers were enthusiastic, followed by direct participation of local officials who earned income by working together with farmers in the same fields. However, at present, officials have different means of income. For this, officials do no longer convince farmers to work in 'collective' form on a common crop, which is needed for high quality and high volume export-crop production."

5.4 Sourcing products and quality management

The procurement strategy of firms depends on the kind of crops, their conventions, and the form in which they are exported, i.e., fresh or processed. For instance, among the products that are most exported, cucumber, gherkin, chilli, and cherry tomatoes are largely sourced from contracted farmers. A noted example is that exporters tend to make contracts with farmers for the production of cherry tomatoes, but rarely for regular tomatoes. For instance, G.O.C Food Processing Joint Stock Company presently has 10 ha contracted for cherry tomato production in Bac Giang province, but none for regular tomatoes. This tendency is found also among other companies such as Viet Nga Limited Company (Bac Giang Province), Luveco Fruits and Vegetables Joint-stock Company, and Handicraft Joint-stock Company (Nam Dinh province). By contrast, traditional crops such as tomato and pineapple are more acquired from the open market. However, on average, 81% of raw product quantity is sourced via contracts exporters make with farmers (Table 5.4).

Table 5.4 Sources of exporters for buying products (in percentage of quantity)

Product	Number of exporters	Percentage of quantity sourced from open market	Percentage of quantity sourced from contracted farmers
Cucumbers, gherkin	25	11%	89%
Tomato	19	43%	57%
Chili	10	7%	93%
Pineapple	10	57%	43%
Casaba melon	3		100%
Garlic	2	20%	80%
Sweet corn	2		100%
Radish	2		100%
Head cabbage	1		100%
Average		19%	81%

Except two exporters who only export already processed products, the remaining 28 exporters are directly involved in sourcing raw products either from contract farmers or the open market or from both sources. Of these, only two exporters totally rely on open market for raw products. Compared with the situation several years ago that only 15% of processors relying on contract farming for raw materials (IFPRI and MARD, 2002), this reflects a tendency towards higher levels of vertical coordination and more contract farming within the vegetable export sector of Vietnam.

Given the small scale of most farms, i.e., of less than 0.4 ha/farm household (Huan and Anh, 2002), an exporter needs a large number of farmers for export-crop production, often in different locations. Hence exporters use local collectors – independents or representatives of agricultural cooperatives – to assist them in safeguarding sufficient and stable fresh product sources from farmers. There are exporters who contract more than 20 collectors. Together with staff of exporters, these collectors take part in organizing production, harvesting, grading the products collected from farmers, and monitoring production (i.e. chemical use by farmers). They are also involved in delivering seeds and organizing loans for farmers (usually provided by exporters). Since collecting and grading of crops is often done locally, before transporting to the processing plant, exporters are unable to trace the product origin back to individual farmers. Monitoring and directing farming practices is thus an important strategy for exporters to exert some control on quality of raw products, especially regarding

pesticide use and preharvest interval (see below). Collectors play an import role here, and importers often hold collectors responsible for poor quality. We came across an exporter of fresh vegetables and fruits to Germany and Slovakia who held his collectors responsible for any rejection of products by importers when it is related to product quality.

Contracts are made at the beginning of the cropping season, when the buying price is set. Given the increasing scarcity of high quality fresh products, exporters set buying prices at a reasonable level, to ensure farmers' commitment in delivering the harvest to exporters. For instance, in case of gherkin, exporters adjust the buying price so that farmers earn between US$2,500 and $3,300 per ha per season (after paying for inputs such as seeds, fertilizers, chemicals and machine rent). With this price, farmers earn roughly US$3 per working day. On average, of every US$1.00 worth of exported processed gherkin, farmers received about US$0.20 (hence 20%). However, this price is often adjusted in accordance with market prices at harvesting time, to sustain farmers' commitment in providing crops to exporters. Still, farmers are often blamed for selling products to other exporters than the ones with whom they have a contract. Usually this happens when higher prices are offered. Early in the harvest season, when harvests are still moderate, exporters often race for raw materials and thus offer higher prices. One exporter in Hai Duong said that he could procure about 60% of the harvest via contracted farmers at the early harvest season, but he often has to send his staff to the field to work with collectors in stopping farmers to sell products to other exporters. In this situation, contract farming causes higher transaction costs for exporters. Several exporters thus prefer to source raw materials from the open market at higher buying prices. We find a statistically significant difference between new private exporters and conventional state-owned exporters in sourcing products from contract farming (χ^2 value of 3.80, $p<0.1$ for "legal status of exporter" and "number of contracted crops). Hence, private exporters tend to source more products from contract farming, while state-owned and joint-stock enterprises source more raw products from the open market. An explanation could be that all private exporters are currently relying solely on exporting vegetables and fruits and they are also more mobile and active in professionalizing their business as compared to the transformed ones.

Collectors are paid by exporters by a commission based on the quantity of raw products exporters receive from the collector-production bound. However, different commission rates are adopted by exporters for collectors in different locations; it means that in some locations small quantities provided collectors still with a sufficient amount of money for adequately continuing his job. Exporters do inform farmers on the price they pay for the products, so that collectors will not take a share of the earnings from farmers. Some exporters also organize annual meetings with collectors and farmers for adjusting their procurement and product-quality improvement strategies. Since most export crops come with multiple harvests, price adjustments could take place several times per cropping season.

According to exporters, EU, Japanese and U.S. importers often require product samples for quality checking, before official export shipping. Besides, Japanese importers sent their technical staff directly to Vietnam for monitoring processing activities and checking product quality before shipment to Japan. By contrast, importers from China, Russia and former CIS countries – with lower product quality requirements – have exercised arms' length product procurement without direct control of processing activities/facilities. Nonetheless, exporters are well aware that products with inadequate sensory quality, pathogenic residues or high pesticide residues could induce a rejection by importers, and seriously affect exports. Among the interviewed exporters, two reported such experiences with export rejection by Japanese and Korean importers due to inadequate product quality. Additionally, one exporter in Hung Yen province received a warning from a Japanese importer for residues of the pesticide Rhidomil MZ 72WP (a combinant of Metalaxyl 8% and Mancozeb 64%) in his products. However, none of the exporters actively collect samples of products for chemical residue testing. Following requirements of importers from among others Japan, Korea and Germany, 7% of the exporters reported sending randomly collected vegetable and fruit samples to the Department of Plant Protection (Ministry of Agriculture) or SGS Vietnam[47] for pesticide residue analysis. In addition, 23% of the exporters sent crop samples of their first exports for analysis. The other 70% has never done any pesticide residue testing

[47] SGS is the world's leading company in inspection, verification, testing, and certification of products and processes in all sectors (http://www.sgs.com/).

until now, mainly because importers did not require them to do so. Pesticide analysis is not only costly for exporters, but – as revealed by some exporters – sometimes considered of limited value by importers due to a lack of trust in Vietnamese testing institutions. Besides, exporters are aware that chemical residues on vegetables and fruits are significantly reduced after processing, due to cleaning and salting. Processed products, especially pickled and salted ones, are thus less risky for consumers compared to fresh crops. In addition, exporters use their experience to detect potential export risks, including those related to chemical residues. An exporter in Nam Dinh province, for instance, was surprised by cropping yields and the sensory quality of gherkins produced by several contracted cooperatives. By sending his staff to the production fields for several days, he discovered that farmers used an unknown chemical stimulus in crop production. Though scientific data on the effects of this chemical substance were not available, the exporter worried about product safety and ended his contracts with these cooperatives.

Being aware of the possible rejections in international trades, exporters pay more attention to product safety than domestic traders. The domestic market is characterized by the very limited attention traders pay to consumer's health. Quality control of vegetables and fruits especially regarding pesticide uses and preharvest interval, is almost absent (Hoi et al, 2009b). In contrast, exporters (have to) behave more accountable to the importers. Two exporters in Hai Duong province reported that they refused the requests of Taiwanese and Korean importers for fresh vegetables and fruits, because they were not confident on the safety of these products given their unsuccessful control of chemical use by farmers, even though they could earn more from exports of fresh products compared to exports of processed ones. Several exporters indicated that they have not yet tried to find EU or U.S importers, fearing that they cannot yet meet their high requirements on product quality.

5.5 Vegetable and fruit supply chain governance

As mentioned in the previous section, raw materials are mainly sourced via contracts with producers. This section will focus on the relationship between exporters and primary producers involved in contracts.

Different from domestic vegetable and fruit supply chains with rather loose chain relations, exporters are more closely connected to farmers, especially via product contracts on major export crops such as cucumber, gherkin, chilli, casaba melon, and baby tomato. These close connections guarantee exporters enough quantity and basic quality of the raw products for processing and exports. But these connections involve more than just buying crops. For instance, up to 77% of the exporters provide (and pay for) technical training to farmers, often carried out by technical staff of the export enterprises and not by state extension service staff because experiences with the latter are not always positive. An exporter revealed that in the 2008 summer season, he contracted farmers to grow 10 ha of onion in Hai Phong province. Fifteen to twenty days after planting, the onion plants were infected with diseases. He brought a sample to the Provincial Department of Extension for assistance and advice, but the extension service did not help him, although he was willing to pay for the services. He estimated that 80% of the harvest was lost, worth about US$20,000. In parallel with technical training, around 73% of the exporters provide seeds to farmers, and about half of them provide production loans. Especially in the new areas for vegetable and fruit growing, exporters also provide fertilizers and pesticides to farmers (Table 5.5). By introducing technical packages to farmers, the exporters expect good product quantities and quality, especially with respect to sensory quality, uniform size, low or free chemical residues, and in line with required preharvest intervals. However, few exporters continue providing chemical inputs to farmers over lengthy periods of time. Our survey found that only 3 exporters provided pesticides to farmers. However, it is noted that most agricultural cooperatives are providing services on pesticides to farmers as well.

Table 5.5 Services offered by exporters to farmers (n=30)

Services offered	Percentage of exporters
Production loans	50%
Technical training	77%
Seeds	73%
Fertilizers	13%
Pesticides	10%

When pesticides are provided by exporters and agricultural cooperatives, farmers of export crop production are restrained from using illegal and undesired pesticides, which are often imported. For instance, the Ministry of Industry and Trade estimates that about

30-35% of the pesticides currently used in Vietnam is illegally imported (Lan, 2008). These illegal pesticides are often claimed to be of Chinese origin and highly toxic. They are also used improperly by farmers, as technical information attached to the pesticides is in Chinese. Besides, cooperatives are also trying to direct farmers towards proper pesticide use. A head of an agricultural cooperative in Bac Giang said that besides providing technical knowledge to farmers, the cooperative focuses its services on providing pesticides in small sachets and/or bottles in order to control farmers from overdosage applications. Though individual collectors do not provides pesticides to contracted farmers, they revealed that they often monitor pesticide use of farmers especially regarding pesticide preharvest interval, to be sure that harvested vegetables and fruits are safe, mainly for surviving their business. However, none of the exporters or collectors adopts a specific list of pesticides which contractors have to follow, i.e. a list of low-toxic pesticides extracted from the general list of pesticides given by Ministry of Agriculture and Rural Development.

However, half of the exporters found it impossible to fully control pesticide use by farmers, especially for those located far away. These exporters transferred monitoring and controlling farmer's pesticide use to locally contracted collectors. Over 40% of the importers exercised some control on farmer pesticide use, especially regarding the pesticide pre-harvest interval. Before harvesting, these exporters send their staff to the field to monitor pesticide use by farmers, and to guarantee a long-enough pre-harvest interval. Only two of the 30 interviewed exporters reported thorough control of pesticide use by farmers. These exporters sent technical staff to the field at regular times during the entire cropping season to assist farmers in various matters, including the kinds and amounts of pesticides farmers use when pests and diseases are detected. However, none of the exporters was directly involved in pesticide handling practices in the field.

Farmers are mainly motivated by economic returns and thus high cropping yields, which usually involve higher instead of lower pesticide use. They are less motivated and rewarded by product quality (low chemical residues) and environmental performance. However, in their effort to gain higher economic returns, some techniques for reduced

pesticide use have been developed and applied. For instance, in Nam Dinh province some farmers grow gherkin under contract with exporters. At the early growing stage when the plant has only 2-3 leaves the plant is vulnerable to leaf miner. The conventional pesticide spraying method turns out to be not very successful. In recent years, instead of spraying pesticides farmers inject pesticides directly into the pedicels of plant leaves. This not only helps farmers to successfully control leaf miner, but also reduces pesticide use (in finished form) up to 60% compared to conventional spraying methods (Hoi et al, 2009c). Another innovation concerns seed quality and nursery production to which vegetable and fruit farmers traditionally pay little attention (Everaarts et al, 2006). Currently in Nam Dinh, Ha Nam and Bac Giang provinces, farmers widely germinate gherkin and sweet corn in peat blocks before transplantation. Gherkin peat-block germination was firstly introduced by cucumber farmers in Ha Nam province, and quickly expanded to other production areas in several provinces via technical training given by exporters. For instance, it was mentioned by GOC export company that within her contracted production area of 60 ha of cucumber and gherkin in Lang Giang district (Bac Giang province), peat-block germination techniques are being applied by 70% of the contracted farmers in winter season and roughly 100% in spring season. Similarly, on 200 ha of cucumbers and gherkin contracted by Luveco Company in Nam Dinh province in 2007, about 95% of the farmers relied on peat-block germination techniques. This germination method does not only help farmers to diversify their cropping pattern, which is still dominated by two rice-crops/year, but also provides more uniform transplants that improve crop health and product consistency. The production system based on peat block-germination thus requires less pesticide than the traditional one. These examples of reduced pesticide use are either endogenous developments by farmers or triggered by assistance from exporters and hardly involve state institutions and foreign importers.

Besides, exporters have initiated some experiments to promote less pesticide dependent vegetable and fruit production, but these have not yet proven successful. An exporter in Nam Dinh province initiated a trial of about 7,000m^2 of low pesticide cucumber production in 2007. However, at the time of research the exporter and farmers had not yet been able to set a final agreement regarding compensation if crop failure occurred.

Similarly, several exporters in Hung Yen and Hai Duong have tried to motivate contracted farmers to use better agricultural practices, which, in their view, are badly needed to secure the competitiveness of Vietnam's vegetable and fruit exports and the long-term welfare of those involved. However, the absence of coordination among exporters and farmers prevented the implementation of such good agricultural practices. According to exporters, coordination of farmers is a precondition for better control of exporters over production processes, especially regarding chemical use. However, most exporters are confused on how to achieve such coordination. Several exporters explained that if they force farmers to strictly follow their requirements, farmers will end the contract. To motivate farmers via higher prices is financially limited for individual exporters, given the fierce competition between them, and difficult to coordinate among exporters. In Hung Yen province, an initiative for cooperation among exporters started in 2007, but disagreement among exporters on higher prices resulted in a failure. Among the 13 exporters in the province, only two accepted to pay farmers 10% higher prices; the others continued paying farmers the market price. Renting land from farmers for direct production would be a possible strategy for some exporters to better control product quality and minimize pesticide use, but this is currently impossible for farmers (due to a shortage of off-farm jobs) and exporters (due to a shortage of capital, experience, and human resources). Some exporters argue that local authorities should take responsibility for such arrangements and coordinate production, because they have financial resources and state power which exporters do not have. But in recent years the role of local authorities in agricultural production is reducing rather than expanding.

The closer connection between exporters and agricultural producers compared to domestic traders and farmers, does not necessarily last long. In contracting with exporters, farmers have two basic needs: a reliable contract and a reasonable profit margin. However, though receiving initial support from exporters for crop production (such as seeds, chemical inputs and credit), the product price paid by exporters does not provide farmers a higher profit margin compared to alternative crop/buyer combinations. Farmers in peri-urban areas with good access to open markets for less-labour-intensive vegetable crops or with available off-farm jobs are thus gradually

getting rid of contracts with labour intensive export-crops. For instance, an exporter in Hai Duong province reported that in 2001, when his enterprise was established, 80% of the total quantity of cucumber and gherkin exported was sourced within the province, but at present only 20%. Many farmers broke their contracts, mainly because – with improved connections to the open markets for vegetables and fruits – they moved to non-export vegetables and fruits, with more production freedom and similar or higher incomes following increasing urban demand. An exporter of salted gherkin to Japan in Hung Yen said that even though he accepted to pay a 60% higher price in 2008 than in 2007, many farmers in Hung Yen refused to extent their production contract with him. Exporters in Hung Yen and Hai Duong are thus entering the traditional rice-growing provinces, like Nam Dinh, Ha Nam, Thai Binh and Vinh Phuc, for sourcing enough raw products, because Hung Yen province could provide only 50% of their total demand on cucumbers, and even less for tomatoes. These distances increase transportation costs and limit possibilities for quality monitoring by exporters. But this change involves also advantages. In these new areas, rice production is rotated with export-crop production, helping to impede pests and diseases. Compared to vegetable farmers, rice farmers usually have less connection with open markets and are thus more reliable and committed to export(ers') requirements. Income from vegetable and fruit production is also higher than from rice. And finally, their higher receptiveness for technical training by exporters increases the likelihood of proper chemical and pesticide use.

5.6 Conclusion

Vietnam is a country of late-entrance into the global market and the global penetration of its agro-food sector lags behind that of neighboring China and Thailand, who are the world leading exporters of several fresh products (FAO, 2004; Mei, et al, 2006 cited in Paull, 2007). Vietnam's agricultural and agro-industrial exports– including the sub-sector of vegetable and fruit exports – is expanding, but remains underdeveloped. Exporters in Vietnam are currently focusing on processed products, which generally show a downward trend in value added (FAO, 2004). One of the main reasons is the easier achievable product quality requirements of processed products compared to fresh

products. Our analysis has shown that the structure of the supply chain is one of the main causes behind low product qualities, also with respect to pesticide residues.

Vietnam's agriculture is characterised by small-scale production, especially in densely populated areas such as the Red River Delta and in rural areas with high unemployment rates (GSO, 2006a). Small farmers will probably not massively move out of agriculture on the short term, so the development of large scale farming is unlikely. Hence, future export growth will depend on better coordination between farmers, but the differences among them in interests, cropping practices, resource availability, and commitment towards product quality do not facilitate such coordination.

Most exporters are small-scale, in terms of human resources, capital and export quantity. Exporters fall short in resources to adequately control pesticide use of the large number of farmers from which they source products. And farmers are marginally committed to product safety and chemical use. Limited concerted efforts of and coordination among supply chain actors make Vietnam one of the nations whose agricultural products are subjected to high rejection rates in international trades (Aksoy and Beghin, 2005). Constrained by more stringent control of importers from developed countries, Vietnamese exporters currently focus their exports on processed products and on countries with less stringent import regulations, such as China and Russia. This has been an important reason for the retard of substantial export-induced changes towards less pesticide-dependent vegetable and fruit production schemes. Though exporters have been increasingly relied on contract farmers for procurement of raw products, devoting more resources to field monitoring, directly managing pesticide provision and application by exporters, and/or standard pesticide residue sampling are not business as usual yet at Vietnamese exporters.

Nevertheless, following the requirements of importers for product quantity, product quality and related environmental conditionality, export-oriented vegetable and fruit supply chains are better structured and organized than domestic ones. With respect to vegetables and fruits, exporters intervene to some degree in farming processes and pay attention to pesticide use by farmers. This results in a reduction in (illegal and toxic)

pesticide use among farmers (Hoi et al, 2009c). The tendency that exporters increasingly contract farmers in peripheral locations, who include rice in their cropping pattern, helps to impede pest and disease development and reduces pesticide use, compared with intensive vegetable and fruit farmers close to urban centres. However, Vietnamese exporters have not yet been able to vertically penetrate themselves further into global agricultural supply chains. By not being able to penetrate into markets of developed countries, Vietnamese exporters do not only miss a lucrative and highly potential market, but also an incentive to renovate themselves towards higher standardization and professionalization. Perhaps the Vietnamese state has to play a stronger role in the agro-food sector and chain to overcome the low reputation of "Made in Vietnam" among foreign agro-food importers. This paper proved that farmers, processors and exporters have been unable to do it alone.

Chapter 6

Conclusions

6.1 Introduction

In recent decades the economic structure of Vietnam has changed dramatically. The share of agriculture in total national GDP reduced remarkably, whilst those of the service and industrial sectors increased. In addition, the population has also transformed and become increasingly urban and non-farm. This all comes together with a major restructuring of agriculture, with more cash crops production (including vegetables) to meet the growing demand of the domestic and export markets. At the national level, the area sown of vegetable production has almost doubled between the 1990 and 2007. As vegetable crops are more vulnerable to pests and diseases under intensive farming systems, increased reliance on pesticides in vegetable production contributed to the growing import and use of pesticides in Vietnam. This, together with improper use of pesticides by vegetable farmers, has caused severe health problems for farmers and vegetable consumers, a loss of vegetable export opportunities due to high pesticide residue levels, and considerable environmental pollution.

The Red River Delta (RRD) is one of the seven ecological regions of Vietnam. It is the most densely populated region in the country. Roughly 75% of the Red River Delta population is living and seeking livelihood in rural areas but the unemployment rate remains relatively high, at 6%. The Red River Delta is currently the largest vegetable producing region of Vietnam. The average farm size is very small, less than 0.4 ha per farm household. Many kinds of vegetables are grown as part of a rice-based farming system. The vegetables sown area increased at roughly 4% per year and productivity increased at more than 6% per year in the period from 1999 to 2005 (Rauhoaquavn, 2007). Similar to the Red River Delta, an expansion of vegetable production area has also been observed in all other ecological regions of Vietnam recently (Rauhoaquavn, 2007). And similar tendencies of intensifying pesticide use on vegetables have been reported in these other ecological regions as well (Anh, 2002; IFPRI and MARD, 2002). This makes the Red River Delta not just an interesting area to study pesticide use on vegetable production, but also an exemplary region for trends occurring in other areas in Vietnam as well. There is one notable difference, however: Red River Delta farmers have produced a larger surplus of vegetables for the rest of the country and for exports,

compared with other regions in Vietnam. Therefore this region is often given special attention by the Vietnamese state and non-state actors when governing pesticide use in vegetable production.

Unlike rice production, where reduced pesticide use has been observed recently in the RRD (Linh, 2001), there is solid evidence that vegetable farmers are increasingly relying on pesticides for pest and disease control, at the expense of consumer and farmer health, and the environment. This increasing reliance on pesticides has weakened the agro-ecosystem, which has in turn made vegetable production even more vulnerable to pest and disease attacks. The main motive behind the increasing reliance of Vietnamese farmers on pesticides is (short-term) economic interest: to prevent crops from pest and disease attacks, and to maintain good appearance of the vegetables on the market (see Chapter 2 & 4). The main question underlying this thesis was, whether other than short term economic interest are beginning to work towards more careful pesticide practices in Vietnam. Are emerging drivers such as stricter state pesticide policies, state support for safe vegetable production, increasing consumers' demand for vegetable safety, and the pressure from foreign importers on the quality of exported vegetables gradually orienting interests and practices to less (toxic) pesticide use and the protection of consumer health and the environment?

More specifically, the study aimed to answer the following three research questions: (i) to what extent are agricultural and environmental authorities complemented by non-state actors in greening agricultural production and products in the RRD of Vietnam? (ii) how strong and successful are actors in (inter)national food networks and domestic consumers triggering lower pesticide use? and (iii) do we witness similar developments towards multi-actor governance on agro-environmental practices and food quality in developing countries as have been identified in OECD countries? The theoretical background of these questions is to be found in Ecological Modernization Theory, a theory that has been developed to understand and analyze environment-induced transformations in OECD countries. So the more theoretical question underlying this research has been whether similar environment-induced transformation processes can be witnessed in developing and transitional countries such as Vietnam. Does the Ecological

Modernization Theory help us in understanding the role of the Vietnamese state and the non-state actors in agro-food networks (farmers, agricultural input service providers, consumers and exporters) in the greening of agricultural production and food products in Vietnam? In investigating these empirical and theoretical questions the study adopted both quantitative and qualitative methodologies, focusing on various actors from different sectors: farmers, pesticide retailers/companies, vegetable consumers/exporter, and government officials.

This final chapter summarizes the major research results, draws conclusions, and proposes measures to promote more public-private cooperation for effectively greening vegetable production in the Red River Delta of Vietnam. The chapter starts with a section on the current tendencies in pesticide use by farmers in vegetable production. Subsequently, dysfunctional pesticide and vegetable markets and market networks are analyzed as a major factor retarding the restructuring of vegetable production practices towards lower pesticide reliance by farmers. This is followed by a section on the poor role played by the centralized Vietnamese state in controlling and motivating farmers and other market actors towards reduced pesticide use in vegetable production. The chapter concludes with observations on the value of Ecological Modernization Theory and recommendations for the future environmental protection strategy in agricultural Vietnam.

6.2 Pesticide use on vegetables

Since the initial import and use of pesticides in the middle of the 1950s, Vietnamese farmers have increasingly considered pesticides as the most important solution to protect vegetable crops from pest and disease attacks. All farmers within our surveys and farm monitoring schemes showed a major interest in reliance on pesticides for controlling pests and diseases. Though there has been no evidence that the quantity of pesticide use per vegetable production unit in a cropping season has increased within the time span of the two farm monitoring periods used for this study (see Chapter 2), over a longer time span it is certain that their use has increased. The tendency of increasing pesticide reliance has been reported in other areas of Vietnam, for instance

HoChiMinh city (Jansen et al, 1996), as well as in poorer regions of Vietnam (see Chapter 3). In this respect, Vietnam is different from many OECD countries where pesticide use per crop output has reduced over the last decade (OECD, 2008; Wilson and Tisdell, 2001). In parallel with growing pesticide reliance in agriculture in Vietnam, there is also a tendency towards increasing cropping index in densely populated peri-urban areas.[48] This means that the pesticide load on the environment has been increasing. In our detailed farm monitoring on pesticide use, pesticide costs ranged between 18% and 35% of the total material input costs for the four major vegetable crops (see Chapter 4). These figures reveal that currently pesticides are being misused in vegetable production.[49] The current pesticides practices of farmers can be largely explained by the increasing access to pesticides, lack of technical know-how, the wide availability of low quality and counterfeit pesticides due to a poorly regulated pesticide market, and a poorly regulated and controlled vegetable market.

Although a large percentage of farmers interviewed and monitored has received technical training from state and non-state actors, their farming practices are strongly influenced by long standing routines and experience-based assessments on risks associated with climate conditions, on pest and disease populations, and on vegetable market prices.[50] For instance, our farmer survey found that a large percentage of farmers applies a higher pesticide dosage than technically recommended (on pesticide packages and by experts). Most of the farmers combine two or more different types of pesticides in each spray. In addition, the suggested pre-harvest interval (hereafter PHI) for pesticides is often not strictly followed by farmers. However, we could not relate these problems simply or only to conservatism of the farmers or their poor perception of the negative effects of their pesticide use. For instance, some farmers refuse to sell their vegetables to collectors for collective kitchens being afraid of legal punishment if a number of workers are poisoned from unsafe vegetables (see Chapter 4). Moreover, the

[48] For instance in Dong Anh district, Hanoi, the cropping index increased from 1.41 in MP1 to 1.74 in MP2.

[49] According to Ashburner and Friedrich (2001) and Blackie and Gibbon (2003), pesticide costs of over 10% of total production costs is considered indicative of problematic pest control tactics, while costs of over 25% is considered unsustainable in developing countries (cited in Williamson et al, 2008).

[50] Similar lesson is also learnt from other areas, for instance vegetable farmers in HoChiMinh city (Dung et al, 1997).

approach and quality of the training courses delivered to farmers are also contributing to such pesticide practices. In Vietnam, the responsible staff for training facilities prefer the achievement of training quota, above the (cost-)effectiveness of the training courses (McCann, 2005). Training schemes are often rather bureaucratic, unpractical, and fail to attract farmer's interest, resulting in low levels of application. As analyzed in Chapter 2, farmers still face numerous constraints in the selection and use of pesticides, for instance, the inability to determine pesticide toxicity, problems around over-dosage and cocktailing, cost-related evaluation of pesticide quality, and assessing adequate pre-harvest intervals.

The present farming condition of farmers partly explains their pesticide practices. With high population density, farm households are characterized by very small and fragmented landholdings. Tens of millions of farmers with often very limited cooperation find adoption of IPM or reduction of pesticide use difficult, if their neighbors fail to follow the same line. Since most vegetable pests are sourcing their foods over a range of vegetable crops, the diversity of the household-based cropping system in combination with inherent differences among households in technical know-how, financial resources, and interests are a real challenge for Vietnamese farmers in successfully controlling pests and diseases via IPM in a collective manner. Hence, farmers find it easier to continue relying on the large-scale use of toxic pesticides to save their crops.

Unlike previous studies which found that market liberalization in Vietnam only resulted in a tendency towards the application of cheaper and more hazardous pesticides (see Quyen et al, 1995), our study found some improvements of pesticide use by vegetable farmers (see Chapter 2 and 5). Together with more attention being paid to pesticide pre-harvest intervals by safe vegetable farmers, techniques for reduced pesticide use have been developed and applied by some export-oriented farmers, such as injecting pesticides directly into the pedicels of plant leaves to control leaf miner on cucumbers or increasing the application of peat-block germination techniques for cucumber and gherkin production. Thanks to technical training given by exporters, these techniques have been expanded somewhat through farmer communities that focus on export crops.

By the same token, as revealed by our farm monitoring results, there is a tendency towards the use of more expensive and safer pesticides (see Chapter 2), although farmer's reliance on pesticides for controlling pests and diseases on vegetables remains statistically unchanged between the two monitoring periods. This is explained by the higher biological effectiveness of these pesticides and–to a lesser extent–by a growing concern among farmers about the safety of vegetables for consumers and the environment. Together with some successes in pesticide policy, this has resulted in the elimination of a number of unnecessary pesticides from the market (see Chapter 3). This tendency seems to be positive and continuous. However, it will take quite a lot of time until a substantial percentage of farmers will decide to fully get rid of all unnecessary pesticides.

6.3 Dysfunctional markets

The pesticides market

The pesticides market in Vietnam has shown an increase in the numbers of pesticide companies and pesticides retailers in recent decades. Different from foreign companies, most Vietnamese pesticide companies are small in scale and generally focusing on a 'quick-yielding' and short-term strategy. By relying on their retailing network, these companies have been able to push their pesticides into farmers' pesticide purchases and use. Many pesticides are marketed with confusing technical information on packages/bottles, and they often contain inadequate or wrong information on the types of targeted pests and diseases, the recommended pre-harvest interval, and even the active ingredients content. Under a poor state regulation and enforcement, many pesticide companies even "multiply" types of pesticides, which in turn have raised further complications for farmers to select and use correct or adequate pesticides. It has also complicated the work of local officials in managing pesticide markets, especially in the inspection of counterfeit and expired pesticides (see Chapter 2 & 3). For instance, compared to the US with 500,000 tons of 600 different types of pesticides used annually (Altieri and Rojas, 1999), Vietnam has a much lower volume of pesticides being used (roughly 76,000 tons in 2007), but significantly more pesticide types registered and used (more than 3,000) (see Chapter 3). Such a poorly or even unregulated market also

explains the existence of so-called parasitic pesticides. Not only pesticides companies but also their retailers are aware of the low biological effectiveness of these parasitic pesticides. However, both largely ignore farmers' interests and pursue their quick-yielding business. The existence of parasitic pesticides again partly explains the improper pesticide applications made by farmers, i.e. pesticide cocktailing (see Chapter 2).

After more than 20 years of economic liberalization, Vietnam has not been able to develop its own pesticide industry. Most of pesticides are imported and the share of pesticides originating from China has increased astonishingly, i.e. from 16% of the total pesticides import value in 2000 to 42% in 2008. It can be concluded that Vietnamese companies have not paid adequate attention to long-term investments such as research and development on pesticides. The increasing import of pesticides from China is a threat to the environment in Vietnam because most of the Chinese pesticides are highly toxic due to the low environmental commitment of the Chinese chemical industry (Tremblay, 2006). Most, if not all, forbidden and highly toxic pesticides smuggled into Vietnam originate from China. Given this situation, MARD recently urged firms to cut down on pesticide imports, and instead to invest in modern technologies for biological pesticide manufacturing domestically (Vietnamnews, 2009).

The vegetable market

As much as the pesticide market, the current vegetable market is also poorly organized and structured. Though private food producers, operators and consumers are seen as key agents in food safety and environmental protection in recent state policies (see Chapter 4), there has been a poor cooperation among those actors to improve vegetable production and vegetable safety, i.e., via proper pesticide application and/or reduction of pesticide use. A modern vegetable retailing chain is emerging, with supermarkets and safe vegetable shops, but this still accounts for a very small market share (5% at the present) (see Chapter 4). The traditional vegetable supply chain is characterized by wet markets and hawkers and still plays a dominant role in delivering vegetables to consumers, even in cities and towns. Unregulated vegetable transactions are dominant in these vegetable marketing channels. These markets have not been able to provide

consumers with vegetables of good quality, even not to those who are willing to pay more for safe vegetables.

But also the safe vegetable market is not without problems. Current safe vegetable production is not adequately monitored and controlled by market actors, for instance, cooperative members who are assigned to monitor pesticide use, supermarkets, and other safe vegetable collectors. Safe vegetable farmers are also not (financially) motivated for their self-discipline and commitment towards stringent production procedures, especially regarding pesticide use. It is not just that prices for safe vegetables are hardly higher than those of conventional vegetables. Also, to sell safe vegetables to supermarkets or collective kitchens, farmers are sometimes requested to pay a bribe to staff of the supermarkets/kitchens (see Chapter 4). Following poor (state and market) regulation of safe vegetables, numerous lessons of food poisoning suffered by consumers of safe vegetables have challenged consumers' trust in these safe vegetable marketing channels as well as discouraged them to seek and pay a premium price for safe vegetables. Distrust among consumers in the Vietnamese state management system regarding vegetable markets (see below) also results in consumer reluctance to buy safe vegetables certified by state authorities (see Chapter 4). All this has discouraged farmers in moving to safe vegetable production, because they find no financial incentive to commit themselves towards the more stringent production requirements for safe vegetables. It also discourages retailers to move to trading safe vegetables. Thus, while market actors in OECD countries have been able to develop farming and retailing mechanisms such as GlobalGAP and CSA, which govern farm management practices towards better social and environmental standards, Vietnamese non-state actors have not yet been able to do so.

This also extends to the vegetable export sector. Unlike in various other developing countries, where market actors are successfully transforming agro-food sectors into more environmentally sound directions, even towards organic vegetable production methods (Arbona, 1998; Boselie et al, 2003; Dolan and Humphrey, 2000), little evidence of that could be found in the vegetable production sector in Vietnam. This is partly caused by less stringent requirements that importers (mainly from Russia and

China) impose upon Vietnamese exporters but it is also related to the poor capacity of Vietnamese exporters in controlling vegetable quality which would create access to more high-quality export markets. Besides, not unlike farmers and domestic market actors, Vietnamese exporters are also plagued by corruption, even though they have better legal knowledge and socioeconomic networks (see Chapter 5).[51]

6.4 An anti-developmental state

The classical literature on market failures in the provision of collective goods, such as environmental quality and common health, points to a strong state to look after such provisions. In the literature on developing countries such strong states are also referred to as developmental states (see Evans, 1995), where states have a strong and relative autonomous power vis-à-vis the market.

As analyzed throughout Chapters 2 and 3, Vietnamese pesticide policy has increasingly integrated aspects of environmental protection within its agricultural production orientation, for instance in prioritizing biological pesticides, by setting stricter pesticide registration requirements, by regulating pesticide use at farm level, by promoting IPM-based pest and disease control via providing technical training to farmers, and by launching a safe vegetable production and promotion program. The environmental goals set in pesticide policy still remain quite limited, though. And the implementation of this pesticide policy remains heavily focused on (short-term) economic interest, for instance via promoting pesticide access to and use by farmers, by subsidizing pesticides for farmers in areas where crops are under heavy pest and disease attacks, and by limiting resources for control and enforcement of regulations for pesticides' imports and use.

Even with its limited environmental intentions and objectives, Vietnamese state pesticide policy has largely failed to achieve their goals. The poor policy enforcement has failed to filter pesticides in the market as well as in directing pesticide distribution

[51] Similarly, a recent survey conducted by Ernst&Young and VCCI revealed that 48% of Vietnamese enterprises said that they failed to have business contracts with partners because they did not bribe persons who have the power to influence the success of the contract (Vinh, 2009).

and use towards compliance with the (environmental) intentions of the policy. Except for a few toxic pesticides which were successfully forbidden recently, stricter state policy on chemical pesticides – especially those of the second category – has largely failed given the continuous increase of these pesticides (see Chapter 3). Together with the fast increase of parasitic pesticides, this has resulted in pesticide policy failures in directing farmers towards better pesticide practices. The root cause of this policy failure is very much related to the current centralized state system. Such a system enhances power among specific individuals and groups, facilitates the expansion of corruption, and limits state performance. Policy making is done by top officials without input from lower ranking officials, from officials from other sectors, and/or from the general public. For instance, local pesticide inspectors will not try their best because their performance is heavily depending on the leaders. PPD officials at district levels blame that they are too much depending on the budget approved from upper levels for leaving their office to monitor pesticide retailing and pesticide application practices in their localities. Given this dependence, the mandate of lower-ranking officials seems mainly to support their leaders, and not to provide independent reviews or to carefully fulfill their legally assigned duties. For their own interests, leaders often tend to choose their servants on the basis of their loyalty and not their professional performance (Rama, 2008).

Pesticide state officials may also have a stake in pesticide business (see Chapter 3). The economic relation between state officials and pesticide business agencies does not only give the later more market power but also promote their rent-seeking behavior at the expense of the enforcement of state pesticide regulations, of monitoring pesticide users, and of protecting vegetable consumers and the environment. Local pesticide management officials may not want to uncover violating pesticide agents, being afraid that violating agents may be protected by higher ranking officials. In such situations, officials chose to limit their assigned activities within a boundary that they think safe for them, rather than actively fighting violators in favor of the public interests or carry out their legally assigned duties. A pesticide official may also not inform his/her colleagues on a pesticide violator within the colleague's territory, because it is not his/her own (economic/political) interest. We observed a reluctance of local officials in enforcing

regulations. As a provincial PPD of Hung Yen revealed, tests on pesticide residues on vegetables are not only costly, but the testing results do not empower them to further enforce regulations.[52] When performing their daily task, committed staff may face brutal pressures from high-ranking officials of other state agencies to refrain from enforcing regulations. In addition, corruption and cronyism may also contribute to the disobedience of local officials towards the orders of higher ranking officials, as observed in the failure of provincial pesticide inspection teams (see Chapter 3). The bureaucratic and corrupt state system and its "blocked" officials are a main cause for the long lasting failure of pesticide policy enforcement in Vietnam.

Given the poor performance of policy enforcement, newly formulated policies or regulations are largely only adding to the pile of policy documents, further increasing the difficulties for local policy implementers and confusing the regulated. A number of newly issued regulations also strongly overlaps with the old, failed ones. For instance, in 1998 MARD detailed requirements for the pesticides registration process, including the specific pests/diseases and crops targeted by the pesticide (MARD, 1998a). This means that after legally approved, pesticides will be produced and marketed in accordance with their registered pests/diseases and crops. However, in 2005 MARD issued a specific list of pesticides for vegetables (MARD, 2005a). Besides, the continuous issuing of new regulations has to a certain extent served the self-interest of regulation bodies or other influential groups, who could continuously benefit from corruption associated with these new regulations and their distorted policy enforcement. Besides, hundreds of regulation issued by MARD recently proved not to be in line with the different laws (see Chapter 3).

However, it needs to be noted that MARD is not the principal state regulatory body for pesticide management and food safety. These tasks fall also to other state institutions, such as the Ministry of Resource and Environment, and the Ministry of Health. Thus, ineffective pesticide management moves beyond the level of individual PPD and MARD officials/staff. It has emerged at a more systemic level of state failures. We observed a poor cross-sectoral cooperation between and among state agencies, for

[52] Hung Yen Department of Plant Protection, personal interview on July 17, 2007.

instance between agricultural, environmental, market, and health agencies/officials. This has contributed to the failure of policy enforcement and even of policy formulation on for instance pesticides imports (Anh, 2002) and pesticides taxes (McCann, 2005).

The current state system largely explains the disorder in the pesticide and vegetable markets. All actors have been strongly guided towards (short-term) economic interest without adequate consideration of their responsibility towards law, welfare of other people and the environment. The bureaucratic state system, information closure and secrecy, and corruption have all contributed to ineffective responses from the state to these emerging market problems. In other words, the current centralized Vietnamese state has largely failed to pursue a structural political change, which would enhance her performance in economic and social liberalization. In that sense, the current bureaucratic state is functioning as an anti-developmental state

6.5 Ecological modernization and the future

Following the findings listed above, we have to conclude that the ecological modernization framework is not very helpful in describing the current (lack of) improvements in pesticides practices related to vegetable production, trade and consumption in contemporary Vietnam. For one, we hardly detected significant improvements towards less and less toxic pesticide use in Vietnam. Currently, there does not seem to be a process of ecological modernization taking place in Vietnam's agro-food sector in general, and in the country's pesticide practices in particular. Secondly, we also found no major role for non-state actors (both domestic and foreign ones) in triggering environmental innovations in pesticides practices. The market should still be seen in its traditional sense: as an institution that fails to take the provision of collective goods into account. No major market incentives nor significant market actors are currently moving Vietnam's pesticide practices into more environmentally sound directions. And thirdly, the state in Vietnam is still very much a traditional state, with a strongly hierarchical structure, a dominance of command-and-control regulation, very limited formal involvement of non-state actors in pesticide policy making and implementation (although we did find considerable informal involvement of non-state

actors in the form of bribing and corruption), and few foreign-directed improvements. We can hardly witness the processes of political modernization, so characteristic for ecological modernization in OECD countries. All in all, ecological modernization as an analytical-descriptive model has little relevance for understanding current developments in Vietnam's pesticide policies and practices.

Political modernization: a motive for public-private cooperation in Vietnam

Given the centralized decision making system in Vietnam the state will remain the key player in the restructuration of the pesticide and vegetable markets. State actors hold important control over the pesticide market and use and influence pesticide management, mass media and extension services which provide information to the public regarding technical aspects and the negative effects of pesticides. For instance, the state, with its regulatory tools could restructure the present pesticide market, focusing on eliminating unnecessary and toxic pesticides as has been the case in Nicaragua in the early 1980s (Thrupp, 1988). State management of the pesticide market should not only contain administrative procedures such as issuing regulations and certificates for pesticide retailers or safe vegetable producers and retailers, but should also cover monitoring arrangements and incentives to force and motivate certified retailers to follow regulations and to integrate social and environmental considerations in their daily activities. The Vietnamese state could also indirectly change pesticide use via regulating the domestic market of vegetable products as well as the way vegetable exports are arranged.

However, so far the Vietnamese state has failed to monitor and control transactions in the pesticide and vegetable markets. Under the economic liberalization initiated in 1986, economic activities have become much more diversified and the number of involved stakeholders has exploded. Also on the pesticide and vegetable markets, the number of stakeholders has increased enormously and they should play a role in reducing the impact of pesticide use. Pesticide and vegetable retailers as well as farmers are aware of the risks of pesticide toxicity to consumer's health and environment and even of the low biological effects of using cheap pesticides. However, due to poor cooperation between these actors, concerted efforts toward reduction of pesticide reliance, at least in terms of

getting rid of parasitic pesticide trade and use and better governing vegetable quality, have not been taken (except in some very limited instances). Therefore, although the engagement of non-state actors in regulating markets has been somewhat legitimized recently no formal and informal institutions that could adequately govern activities of involved actors towards a balance between, among others, economic, social and environmental interests, have been yet successfully developed.

Public opinion can also contribute to the necessary political modernization. Also in Vietnam the public constitutes a huge source of information regarding the performance of officials and, for instance, corruption has been mainly discovered by the public, i.e., mass media, rather than by state anti-corruption authorities (Uyen, 2009). Ironically, it is alleged by the Vietnamese government that anti-corruption interventions have to be combined with political stability (Quang, 2009), and therefore mass media have been put under stricter control by the government. However, reduced information disclosure would deepen the "gap" between the state and civil society and further reduce cooperation or even induce resistance from the civil society on the enforcement of state policies. This choice by the Vietnamese state could also be threatened by the economic and/or environmental crises that seem to generate more tensions recently. For instance, local people have increasingly used legal proceedings to demand authorities to solve environmental pollution problems, only second to land-use right conflicts in Vietnam (Van, 2009). There are therefore few indications at the moment that public information disclosure will form an important contribution to improving pesticide policies and practices in Vietnam, although it could play a useful role in such a political modernization process.

A state governed by laws to which all public and civil actors adhere to is thus a necessary pre-condition for a more positive future in Vietnam's pesticide use for vegetable production. Realizing this objective requires a wider transformation of the existing state structure, i.e., from top-down, command-and-control and hierarchical policies towards more consensual, participative, market-oriented, and network-based steering. An effective and consensual state is able to intervene in pesticide and vegetable markets and impose stricter environmental and human health protection

measures. This transformation can only be achieved with the help of an empowered civil society by rebalancing the activities and influence of specific groups or individuals and increasing the weight and attention given to public interest. The civil society can only take up this role if there is access to information about pesticide practices in vegetable production, impacts and alternatives. The most important precondition for alternatives of pesticide-intensive agriculture of Vietnam is thus information disclosure. As the Indonesian case shows, a successful IPM policy can be attributed to alternative policy mechanisms which include a decentralized and participatory form of information generation and dissemination (Thiers, 1997). Rapidly building on this example is urgent for Vietnam in order to reduce the environmental and human health impacts of pesticide use in vegetable production.

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Appendix 1

Questionnaire for farmers' survey

A. Personal Information

Date: . . . . . .Place: . . . . . .
Name of interviewee: . . . . . .
Gender: . . . . . .Age: . . . . . .
Educational attainment: . . . . . .

B. Present farming practices

1. What is size of your farm?: . . . . . .

2. What are the crops in major growing seasons?

Winter/Spring	Summer/Autumn
. . . . .	. . . . .
. . . . .	. . . . .
. . . . .	. . . . .
. . . . .	. . . . .

3. What is the area for growing vegetables in the main vegetable season:. . . . .(m^2)?

4. What are the major insect pests and diseases on vegetable crops?

Vegetable	Insect	Disease
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .

5. What are the major controlling methods for these insect pests and diseases?

Vegetable	Insect pest/disease	Controlling method
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .
. . . . .	. . . . .	. . . . .

6. How many types of pesticide (trading names) do you use for controlling pests and diseases?
   ( ) 1 – 5 ( ) 6 – 10 ( ) more than 10

7. What are the major 5 types of pesticides you use most?
   . . . . . .
   . . . . . .
   . . . . . .
   . . . . . .

8. What are the main reasons of using these 5 pesticides? (*Ranking if more than 1 item is selected, 1 = most important, 5 = least important)*

( )	Biological efficacy
( )	Acceptable price
( )	Safe for your own health and consumers
( )	Safe for environment
( )	Others, specify: . . . . .

C. Past farming practices

9. What were the major vegetables you grew 5 to 7 years ago?
   . . . . . .
   . . . . . .
10. What were the major insect pests and diseases on these vegetables?
   . . . . . .
   . . . . . .
11. What is your observation on the effect of pests and diseases on vegetables compared to 5 to 7 years ago?

( )	Less serious
( )	No change
( )	More serious

12. Could you explain why there has been a change in seriousness of pests and diseases in recent years (if applicable)?
   . . . . . .
   . . . . . .
13. What has been the major change in controlling methods for pests and diseases?

( )	Relying more on biological pesticides
( )	No change
( )	Relying more on chemical pesticides

14. Could you name 5 types of pesticides you used 5 to 7 years ago?
   . . . . . .
   . . . . . .
15. What were main reasons of using these 5 pesticides? (*Ranking if more than 1 item is selected, 1 = most important, 5 = least important)*

( )	Biological efficacy
( )	Acceptable price
( )	Safe for your own health and consumers
( )	Safe for environment
( )	Others, specify: . . . . .

D. Vegetable market

16. What are the marketing channels via which you sell your vegetables? Specify for the major vegetables:
   . . . . . .
   . . . . . .

17. What are the "terms and conditions" you need to fulfill to get access to the marketing channels? Specify for each type of vegetable
    . . . . . .
    . . . . . .
18. Do you think these market "terms and conditions" have influenced your decision on pesticide selection and use on vegetables? Explain why?

( )	Very important
( )	Important
( )	Not important
( )	Others, specify: . . . . .

19. What have been the changes in marketing channels via which you sold your vegetables 5 – 7 years ago? Specify advantages/constraints
    . . . . . .
    . . . . . .

E. Pesticide knowledge

20. Have you ever attended a technical training course? If yes, plz. specify training content and organizer and time.

Content	Organizer/date (month/year)
. . . . .	. . . . .
. . . . .	. . . . .

21. Can you distinguish a pesticide as toxic or less toxic?
    ( ) Yes ( ) No

22. If yes, among the pesticides you have used, for how many pesticides could you determine their toxicity?

( )	All
( )	Most
( )	Several

23. From whom have you learnt the pesticide toxicity? *(Ranking if more than 1 item is selected, 1 = most important, 4 = least important).*

( )	Agricultural officials/extension officers
( )	Pesticide retailers
( )	Neighbors
( )	Mass media

24. Do you often try to know the toxicity of pesticides when you buy them for use?
    ( ) Often ( ) Sometimes ( ) Not at all

25. What is your opinion about the toxicity of pesticides used in your locality when compared with 5 to 7 years ago?

( )	More "safer" pesticides
( )	No change
( )	More "toxic" pesticides

F. Pesticide selection and uses

26. What sources of information on pesticides are important to your pesticide selection and use?

( )	Own experience
( )	Advise by neighbors
( )	Advise by pesticide retailers
( )	Advise by agricultural officials / extensioners
( )	Others, specify: . . . . .

27. What is the pesticide dosage you often apply?

( )	Follow dosage as recommended (on pesticide label)
( )	Reduce dosage compared with recommendation (on pesticide label)
( )	Increase dosage compared with recommendation (on pesticide label)

28. How often do you cocktail different pesticides for single applications?

( )	Never	( )	Most sprays
( )	Sometimes	( )	All sprays

29. What are the reasons that you cocktail different pesticides? *(Ranking if more than 1 item is selected, 1 = most important, 4 = least important).*

( )	For controlling several types of pest/disease at one times (to save labour)
( )	To be sure that if certain pesticide(s) has no effect on the target pest/disease then (an)other pesticides will take effect
( )	To increase the total biological effect of the pesticide application
( )	Others, specify: . . . . .

30. What information sources do you rely on for cocktailing pesticides? (*Ranking if more than 1 items are selected; 1 = most important, 4 = least important).*

( )	Own experience	( )	Pesticide retailers
( )	Neighbor	( )	Agricultural officials/extensioners

G. Pesticide market

31. Have you seen the number of pesticide retailing shops in your locality over the last 5 or 7 years?
    ( ) Reduced ( ) No change ( ) Increased

32. Have you seen the types of pesticides which have been marketed over the last 5 or 7 years?
    ( ) Less diverse ( ) No change ( ) More diverse

33. What difficulties have you faced in selecting and using pesticides?
    . . . . . .
    . . . . . .
34. Do pesticide retailers guarantee for pesticide quality they sell to you?
    . . . . . .
    . . . . . .
35. What improvement in the pesticide market do you wish for in the future?

Appendix 2

Questionnaire for pesticide retailers

Date: . . . . . .
Place of interview: . . . . . .
Name of interviewee (optional) . . . . . .
Age:. . . . . Sex. . . . . .

1. When did you start your vegetable business: . . . . . .

2. How has your pesticide retail been going on?

	Unit	At present	5 years ago
Number of pesticide types sold in a year			
Quantity of pesticides sold in a year			
Revenue in a year			

3. What are the factors that influence your decisions on sources of pesticide purchases (*if there are more than one answers, ranking as 1 = most important, 5 = least important)*?

( )	Biological efficacy
( )	Safer pesticides (i.e., biological substances)
( )	Brand name of pesticide companies
( )	Higher financial benefit
( )	Relation with pesticide companies

4. To what extent could you determine the toxicity of the pesticides you trade?

( )	All types of pesticide
( )	Many types of pesticides
( )	Several types of pesticides
( )	Not at all

5. What has changed in the pesticide market in recent years?

( )	More biological pesticides with better biological efficacy
( )	More chemical pesticides with better biological efficacy
( )	No change
( )	Worsen (more pesticides of low biological efficacy, counterfeit pesticides…)

6. What is your observation on the distribution of illegal pesticides in your locality in recent years?

		Remarks
( )	Increased	
( )	No change	
( )	Reduced	

7. Do you have experience with the state pesticide inspectors?

	0 = not at all; 1 = sometimes; 2 = many times
How often your shop is inspected:	
Inspected violations :	
Reminded by inspectors	
Punished by inspectors	

Specify for violations inspected especially those punished by inspectors:
. . . . . .
. . . . . .

8. What is the degree of farmer's dependence technically on pesticide retailers for pesticide selection uses?

	% farmers (at the present)	% of farmers (5 years ago)
Not relying on pesticide retailers for technical information		
Relying on pesticide retailers for technical information only for new pesticides or those for uncommon pests/diseases		
Relying on pesticide retailers for technical information for all pesticides when purchased		

9. For a better (and safer) pesticide use on vegetables, what do you think is needed (*if there are more than one answer, rank them as 1 = most important, 4 = least important)*?

( )	Pesticide companies should produce more biological pesticides with high biological efficacy.
( )	More effective state pesticide management
( )	Improving technical knowledge among pesticide retailers
( )	Improving technical knowledge among farmers

Appendix 3

Farm monitoring form[53]

Farm code: . . . . Date:	Researcher:. . . . .

1a. General Farm Data

Name of household head:	. . . . .
Persons interviewed:	. . . . .

2. Household member

Member name	Sex	Age	Relation to household head	Occupation	Educational level

5a. Farm Section Units (FSU)

FSU number	Description of farm section (i.e., location, local name, land ownership etc.,)	Area (m^2)

Definition Farm Section Unit (FSU): Part of the farm considered to be homogeneous for soil, slope, flooding and ownership characteristics

[53] For the purpose of the study that focused on pesticide use on vegetable production,, this farm monitoring form was extracted from the farm monitoring form that was used for Vegsys Project in Vietnam and China (see: http://www.vegsys.nl). The topics for gathering information in the monitoring form are assigned ordinal numbers in compatible with NUTMON software (see more at: http://www.nutmon.org/).

10a. Primary Production Units (PPU)

PPU number	Crop components (including share of grown area in %)			Area (m^2)	Located in FSU
	1st crop	2nd crop	3rd crop		

110. External Inputs in Primary Production Units: crop management

Date	From	To: PPU	Description of inflow				Remarks
			Type	Quantity	Unit	Unit price	

Checklist: • Seeds • Fertilizers • Manures (only from outside) • Manual traction	• Animal traction (hired only!) • Mechanical traction • Hired labour • Pesticides.

Form 120. Output from Primary Production Units (harvesting and residue management)

Date	From PPU	To:	Description of outflow				
			Type	Quantity	Unit	Unit Price	Remarks

Market:	*Checklist:*	*Remarks:*
. . . . .	• Harvested product • Vegetable seedling • Crop residue • Cattle feeding • Stocking • Burning material • Manure	• All outputs from PPUs to both INTERNAL and EXTERNAL. • A single flow can have more than one destination. • In case of burning / green manure: estimate the quantity

Form 520b: Family labour (specific per unit)

Period (from….to….)	PPU	Number of working hours

Appendix 4

Checklist for vegetable farmers

1. **Production and production cost**
   Specify for traditional and safe vegetables:
   - Major vegetable crops
   - Cropping patterns
   - Pests and diseases problems and control methods
   - Agricultural input uses and relevant services: advantages and constraints.
   - Cooperation with other farmers: knowledge/information exchange, collective efforts such as IMP practices
   - Changes in vegetable production in the locality in recent years: cropping patterns, varieties, yield, pests and diseases and their control methods.

2. **Harvest and postharvest**
   S*pecify for traditional and safe vegetables:*
   - Cleaning practices
   - Packaging / processing
   - Storing
   - Transportation

3. **Marketing**
   S*pecify for traditional and safe vegetables:*
   - Places of sale (farm-gate/open market/supermarket/safe vegetable shops/vegetable processors/exporters) and their relative importance
   - Buyer's requirements and their measures to control over vegetable quality
   - Selling arrangements and negotiation process
   - Type of vegetable buyers and possible services provided by buyers (market information/loan/technical assistance/contracts).
   - Advantages and constraints of different types of buyers
   - Major changes in marketing vegetables in recent years

4. **Access to agricultural input and extension services**
   S*pecify for traditional and safe vegetables:*
   - Input availability
   - Technical know-how on production/post-harvest
   - Market information
   - Major changes in access to agricultural input and extension services in recent years

Appendix 5

Checklist for pesticide retailers/companies

1. **Background information**
   - Starting year of pesticide business
   - Year of obtaining a certificate for pesticide technical know-how
   - Year of obtaining a certificate for pesticide business

2. **Vegetable production and pest and disease problems**
   - Major vegetable crops in the locality
   - Pest and disease problems and most important control methods
   - Changes in pest and disease problems on vegetable crops in recent years and major causes.

3. **Pesticide services**
   - Types and quantity of pesticides traded (seasonally/yearly)
   - Pesticide suppliers
   - Measures to control quality of pesticides
   - Buying arrangements/conditions for pesticides
   - Technical information and other benefits provided to farmers
   - Differences in services between safe vegetable production area and traditional vegetable production area
   - Changes in pesticide trade (pesticide import, production, distribution for companies; pesticide suppliers, pesticide quantity and quality, retail competition for retailers) in recent years.

4. **State policies**
   - State regulations for pesticide companies/retailers
   - State support (tax, loans, technical know-how, information)
   - Pesticide quality control (including illegal and counterfeit pesticides)
   - Advantages and constraints in terms of state policies related to pesticide business (import, formulation, distribution, retailing)
   - Changes in state regulations on pesticide business, and relevant advantages and constraints.

Appendix 6

Checklist for staff from government agencies

1. Role/function of the institution related to:
    - Pesticide management
    - Vegetable production
    - Trade and processing
    - Certification/management of food safety.
    - Environmental protection

2. Current situation of the area of intervention of the institution in the locality?
   Changes of the field(s) in recent years.

3. Cooperation of the institution with other state agencies, vertically and horizontally, in implementing/improving the management field(s) of the institution in the locality?
   Advantages/constraints faced in the cooperation? Examples of success and failure.

4. Cooperation of the institution with private actors in promoting/improving the management field(s) of the institution, such as:
    - Agricultural input providers
    - Vegetable farmers/cooperatives
    - Vegetable collectors/wholesalers
    - Vegetable processors/exporters

   Advantages/constraints faced in the cooperation? Examples of success and failure.

5. Pesticide distribution/use in the locality. Changes in recent years

6. Safe vegetable production in locality. Changes in recent years

7. State policies and their implementation on:
    - Pesticide distribution and uses
    - Vegetable production
    - Vegetable trade and processing
    - Certification/monitoring of vegetable safety.

8. View of the roles played by market actors in pesticides use by vegetable farmers.

9. Solutions for better pesticide management and use; vegetable production and vegetable quality control in the future?

Appendix 7

Questionnaire for safe vegetable retailers

Date: . . . . . .
Place of interview: . . . . . .
Name of interviewee (optional) . . . . . .
Age:. . . . . Sex. . . . .

10. When did you start your vegetable trade: . . . . . .

11. When did you start safe vegetable trade: . . . . . .

12. Where do you source your vegetables?

( )	Delivery person(s)	**. . . . . %**	5 yrs ago*:* . . . . . *%*
( )	Night wholesale market	**. . . . . %**	. . . . . *%*
( )	Safe vegetable cooperatives	**. . . . . %**	. . . . . *%*
( )	Safe vegetable traders	**. . . . . %**	. . . . . *%*

13. Could you tell me why you change the sources of vegetables (*if there is more than one answer, rank them as 1 = most important, 4 = least important)*?

( )	Diversity of vegetables
( )	Good price
( )	Safer vegetables
( )	Relation with current vegetable delivery actor

14. To what extent do you believe that vegetables you are trading are safe?

( )	All
( )	Most
( )	Some
( )	None

15. Reasons for believing certain source(s) of vegetables (*if there is more than one answer, rank them as 1 = most important, 4 = least important)*?

( )	Good looking vegetables with information on production area
( )	Commitment of your partner
( )	Third party involvement (i.e., relatives)
( )	Long-time trading vegetables without any poisoning problem

16. If you trust certain vegetable source(s), will you (*if there is more than one answer, rank them as 1 = most important, 4 = least important)*?

( )	Always rely on these sources
( )	Share information with your friends and encourage them to buy vegetables from these sources
( )	Share information with your friends when asked
( )	Not share information

17. What is your response to information on food poisoning presented in television/newspapers (*if there is more than one answer, rank them as 1 = most important, 4 = least important)*?

( )	Request person(s) who deliver vegetables to you to be more careful
( )	Looking for other sources of safer (and more trustworthy) vegetables
( )	Advise consumers be more careful in processing vegetables
( )	No response (because there has been no poisoning among your consumers till now)

18. What is your business progress since you move from normal to safe vegetable trade?

( )	Increased . . . . . %
( )	Increased after poisoning information delivered on mass media
( )	No change
( )	Reduced . . . . . %

Appendix 8

Questionnaire for traditional vegetable retailers

Date: . . . . .Place of interview: . . . . . .
Name of interviewee (optional) . . . . . Age:. . . . . Sex. . . . . .

1. When did you start your vegetable business: . . . . . .

2. Where do you source vegetables?

( )	Delivery person(s)	**. . . . . %**	In the past 5 yrs*:* . . . . . *%*
( )	Night wholesale market	**. . . . . %**	. . . . . *%*
( )	Other vegetable retailers	**. . . . . %**	. . . . . *%*

3. Why don't you source vegetables from safe vegetable production cooperatives (*if there is more than one answer, rank them as 1 = most important, 5 = least important)*?

( )	High price
( )	No trust in vegetables as really safe
( )	Relation with the current vegetable delivery actors
( )	Consumers keep buying vegetables
( )	Time-consuming state procedures required for safe vegetable trade

4. What factors could motivate you to move to safe vegetable trade (*if there is more than one answer, rank them as 1 = most important, 5 = least important)*?

( )	Acceptable price (as at . .% higher as compared with traditional vegetables)
( )	Trustful sources of safe vegetable provision
( )	Simple procedures for safe vegetable retailing
( )	Increasing demand of consumers on safe vegetables
( )	Others, specify: . . . . .

5. What is your response to information on food poisoning presented in television/newspapers (*if there is more than one answer, rank them as 1 = most important, 4 = least important)*?

( )	Request person(s) who deliver vegetables to you be more careful
( )	Looking for other sources of safer (and more trustful) vegetables
( )	Advise consumers be more careful in processing vegetables
( )	No response (because there have been no poison for your consumers till now)

6. What is your business progress since you move from normal to safe vegetable trade?

( )	Increased . . . . . %
( )	Increased after poisoning information delivered on mass media
( )	No change
( )	Reduced . . . . . %

Appendix 9

Questionnaire for safe vegetable consumers

Date: . . . . . Place of interview: . . . . . .
Name of interviewee (optional) . . . . . Age:. . . . . Sex. . . . . .

1. Where do you buy vegetables?

( )	Vendors	**. . . . . .%**	5 years ago*: . . . . . .%*
( )	Wet market	**. . . . . .%**	*. . . . . %*
( )	Safe vegetable shops	**. . . . . .%**	*. . . . . %*
( )	Supermarket	**. . . . . .%**	*. . . . . ..%*

2. Reasons for changing sources of vegetables? (*if there is more than one answer, rank them as 1 = most important, 5 = least important).*

( )	Convenience
( )	Clearly stated-selling price
( )	Safer vegetables
( )	Have relation with retailers
( )	Others, specify: . . . . .

3. To what extent do you believe that safe vegetables are safe?

( )	All
( )	Most (meaning you still have to be scared of possible poisoning)
( )	Some (meaning vegetables are safe or not is beyond the control of sellers)
( )	None

4. What makes you trust that the source(s) of vegetables as safe? (*if there is more than one answer, rank them as 1 = most important, 5 = least important)*

( )	Good looking vegetables with information on the production area
( )	Certificate given by authority for safe vegetable
( )	Advertisement on television/newspapers or relatives/friends
( )	You have no experience on food poisoning after long time of vegetable consumption
( )	Others, specify: . . . . .

5. What is your response to information on food poisoning presented in television/newspapers? (*if there is more than one answer, rank them as 1 = most important, 5 = least important).*

( )	Remind your regular retailer(s) be more careful
( )	Looking for other sources of safer vegetables (supermarkets, safe shops…)
( )	Wash vegetables more often before cooking (maybe with salt water, Ozone, VEGY detergent).
( )	No response (because you have no experience on food poisoning)
( )	Others, specify: . . . . .

Appendix 10

Questionnaire for traditional vegetable consumers

Date: . . . . . Place of interview: . . . . . .
Name of interviewee (optional) . . . . . Age:. . . . . Sex. . . . . .

1. Where do you buy vegetables?

( )	Vendors	**. . . . . .%**	5 years ago*: . . . . . .%*
( )	Wet markets	**. . . . . .%**	*. . . . . %*
( )	Safe vegetable shops	**. . . . . .%**	*. . . . . %*
( )	Supermarkets	**. . . . . .%**	*. . . . . ..%*

2. Why don't you buy (more) safe vegetables? (*if there is more than one answer, rank them as 1 = most important, 5 = least important).*

( )	High price
( )	Do not trust in vegetable safety
( )	Having personal relation with current vegetable retailer
( )	Believe that vegetables will be safe after cleaning by salt water, ozone or VEGY detergent
( )	No poisoning experience from consuming normal vegetables

3. What premium price of safe vegetables, as compared with that of normal vegetables, will you be willing to pay for?

( )	10 – 20%
( )	20 – 30%
( )	30 – 40%
( )	40 – 50%
( )	Others, specify: . . . . .

4. What makes you trust that the source(s) of vegetables as safe (*if there is more than one answer, rank them as 1 = most important, 4 = least important)?*

( )	Good looking vegetables with information on the production area
( )	Certificate given by authority for safe vegetable
( )	Advertisement on mass media or relatives/friends
( )	Others, specify: . . . . .

5. What is your response to information on food poisoning presented in television/newspapers (*if there is more than one answer, rank them as 1 = most important, 5 = least important)?*

( )	Remind your regular retailer(s) be more careful
( )	Looking for other sources of safer vegetables (supermarket, safe shops…)
( )	Wash vegetables more often before cooking (maybe with salt water, ozone VEGY detergent).
( )	No response (because you have no experience on food poisoning)
( )	Others, specify: . . . . .

Appendix 11

Questionnaire for vegetable processors/exporters

Name of company: . . . . . Type: . . . . . .
Name of interviewee: . . . . . Age:. . . . . Sex: .. . . . .
Date: . . . . . Place of interview: . . . . . .

A. Organization and export activities

1. What is starting year of your company: . . . and starting year of vegetable export: .

2. What is the scale of your company business:

Characteristic	Unit	Quantity
Human resource	head	
Administrative staff	head	
Permanent workers	head	
Seasonal workers	head	
Charter capital	million VND	
Revenue from vegetable export (in 2007)	million VND	
Investment for research and development (technical trainings for farmers, variety trials…)	million VND	

3. What kinds of products do you currently export?
. . . . . .
. . . . . .

4. At your company, do you have:

( )	Technicians for controlling product quality . . . . .
( )	Equipment for controlling product quality . . . . .
( )	Technicians for environmental issues .. . . . .
( )	Equipment for waste treatments . . . . .

5. Do you own any international certificate(s) for product quality (and year of issue)?
. . . . . .
. . . . . .

6. What was your export in 2007 *(for product brand name: own company=1, importer=2)*?

Product	Quantity (ton)	Price (million VND/ton)	Importer(s)* / import countries	Product brand name

**Importer(s) include other Vietnamese exporters. Products sold to other Vietnamese exporters before export are subjected to indirect export.*

7. What was your export 5 year ago [(+) = increased; (-) = reduced, as *compared with the 2007 export]?*

Product	Quantity (%)	Price/unit of export (%)	Major importers / import countries

8. How did you find your trade partners (*if there is more than one answer, rank them as 1 = most important, 4 = least important)?*

		Remark
( )	You did it yourself	
( )	The partners found you	
( )	With help of state –support agencies	
( )	With help of a third party	

9. How do you control pesticide residues in your products?

	Taken by your company	Taken by your partner
Tests on pesticide residues for all exports		
Tests on pesticide residues for random exports		
Tests on pesticide residues for some first exports		
No test on pesticide residues (or do not know)		

If tests on pesticide residues were taken by your company, what were the testing agencies you sent your samples of vegetables to?

. . . . . .
. . . . . .

10. Have you had any experience of rejection import caused by pesticide residues in your products? ( ) yes ( ) no

    If yes, then in what year, with what partner, and what were your solutions:

    . . . . . .
    . . . . . .

11. What are your current export difficulties (*if there is more than one answer, rank them as 1 = most important, 5 = least important)?*

( )	Shortage of import markets
( )	Shortage of capital
( )	Quantity and quality of raw products
( )	State administrative system (time-consuming, land-use certificates, tax, custom services…)
( )	Others, specify: . . . . .

12. 12. What is the business strategy of your company in the future?

Product	Importer(s) / import countries	Priority (1 = high; 3 = low)

B. State (support-) policy

13. What are the roles played by the authorities in your business?

		Remark
( )	Very important	
( )	Important	
( )	Not important	

14. If authorities play an important role in your business, can you rank and explain the activities taken by authorities in supporting your business? (1 = most important; 4 = least important):

		Example
( )	Support in administrative issues	
( )	Legal support in contracts made by exporters and their contract farmers and emerging issues.	
( )	Legal support in disputes with importers / import countries	
( )	Other support (loans, technical training, processing techniques, equipment…)	

15. Has the state export administration supported your business*? (tax system, land-use certificate, business certificate, custom services…)*

		Example
( )	Better	
( )	No change	
( )	Worsen	

C. Relations with farmers / agricultural input providers

16. Can you detail the sources of raw products on which your company relies?

Product	Source (1 = agricultural cooperatives; 2 = collectors; 3 = open market)	Production contract (1 = yes; 0 = no)	Share in the total amount of raw product bought by the company (in %)

17. What are your investments for contract farmers?

		Remark
( )	Technical training	
( )	Seed / seedling provision	
( )	Fertilizer provision	
( )	Pesticide provision	
( )	Production-management support (providing field technical staff)	

18. To what extent do you control the pesticide use by contract farmers?

		Remark
( )	Good	
( )	Not as good as expected	
( )	Under farmer’s control	

19. If you control the pesticides use by farmers well, what is your strategy?

		Remark
( )	Farmers are required to follow a specific list of pesticides made by the exporter	
( )	Full-time field-monitoring staff	
( )	Test of pesticide residues for random vegetable samples after harvest.	

20. If you do not provide contract farmers with fertilizers/pesticides, do you have any cooperation with local input providers via whom you may have some control over fertilizer/pesticide use of contract farmers?

		Remark
( )	Yes (effective cooperation)	
( )	Yes (not effective)	
( )	No	

21. What is your purchasing price as compared with that of open market?

		%	Remark
( )	Higher		
( )	Equal		
( )	Following set price when making contract		

22. What is farmers' commitment towards production contracts?

		Remark
( )	Good	
( )	Acceptable	
( )	Not good	

23. What factors influence the future of your business (*if there is more than one answer, rank them as 1 = most important, 4 = least important)*?

		Remark
( )	Import market	
( )	State support policy	
( )	Quantity of raw products	
( )	Quality of raw products	

24. What is your view on the future export of vegetables and fruits from Vietnam?

. . . . . .

. . . . . .

Appendix 12

Checklist for vegetable collectors

1. **Background information**
   - Starting years of vegetable collection for processors/exporters
   - Seasonality in vegetable collection
   - Number of worker and facilities (if applicable)
   - Number of farmers and vegetable growing area under farming contract (if any)
   - Number of processors/exports under contract

2. **Vegetable sourcing and quality control**
   - Main types of vegetable collected
   - Sources of vegetables collected (seasonally: from open market or contract farmers).
   - Purchasing and selling prices for vegetables (seasonally: from open market or contract farmers)
   - Payment procedures and negotiation process (to suppliers and to processors/exporters)
   - Definition of vegetable quality
   - Measures to obtain vegetables of expected quality (specify measures for products sources from open market and those from contract farmers).
   - Vegetable post-harvest practices (cleaning, sorting, packaging).
   - Changes in vegetable collection (sourcing areas, vegetable quantity/quality, post-harvest practices, financial return) in recent years

3. **Relation with contract farmers**
   - Contract farmers: terms and conditions
   - Services / supports provided to contract farmers (seed, other inputs, loan, market information, technical training)
   - Risks and risk sharing
   - Changes in recent years

4. **Relation with contract processors/exporters**
   - Contract processors/exporters: terms and conditions
   - Services / supports provided by contract processors/exporters (seed, other inputs, loan, market information)
   - Risks and risk sharing
   - Changes in recent years

5. **Key constraints and opportunities**
   - Key opportunities to develop vegetable production for exports
   - Factors to achieve these opportunities
   - Key constraints to the development of the vegetables for exports
   - Possible solutions to these problems

Summary

The economic liberalization in Vietnam, initiated in the middle of the 1980s, contributed to the further intensification and expansion of private actor-engagement in agriculture and food-supply. Vietnamese farmers, who already considered applying pesticides the most effective manner to protect their vegetable crops from pests and disease attacks, started using more pesticides. Pesticide use in agriculture has, therefore, increased astonishingly in recent decades which causes increasing anxiety among Vietnamese consumers. Every year, thousands of Vietnamese consumers are poisoned through contaminated foods while millions of farmers are exposed to chronic poisoning resulting from the use of pesticides. Besides threatening human health, pesticide use endangers water quality and ecosystems in the fertile river deltas of northern and southern Vietnam. In addition, intensive use of pesticides is threatening export opportunities for vegetables and fruits from Vietnam. Although Vietnamese governments have devoted many efforts to control pesticide industry and use as well as food quality, so far they have largely failed in getting the relevant practices in line with these policy goals.

This study applied–and thus assessed the value of–Ecological Modernization Theory perspectives in analyzing the greening of food production in Vietnam with a focus on the roles played by the Vietnamese state and the different societal actors in pesticide-related food production practices: farmers, pesticide retailers/companies, vegetable exporters, and consumers. The study made use of both quantitative and qualitative research methods to assess current pesticide policies and practices and to formulate recommendations for the further ‘greening’ of vegetable production.

Unlike previous studies which reported that market liberalization in Vietnam led to increased application of cheaper, more hazardous pesticides, our study found some improvements in the pesticide use of vegetable farmers. Together with more respect paid to the pesticide pre-harvest interval by safe vegetable farmers, several techniques for reduced pesticide use were developed and applied especially by export farmers, for instance direct pesticide injection, and application of peat-block germination techniques.

Similarly, our detailed farming monitoring showed that farmers in Hanoi tend to use more expensive and safer pesticides than farmers in more remote areas. Although improved biochemical effectiveness of these pesticides and related techniques are the main explaining factors, to a small extent these farmers' concerns about vegetable consumers' health and safety and about environmental impacts also contribute to this shift. This tendency seems to be positively correlated with the improvement of farmers' technical knowledge and their experience with pesticides. The changes in pesticide use by farmers can also partly explain the (small) changes that took place on the pesticide market in Vietnam recently, notably the elimination of unnecessary pesticides. However, this improvement is still marginal and especially relevant among safe vegetable and export-oriented farmers and it will probably take considerable time until a substantial percentage of the vegetable farmers will decide to get rid of unnecessary pesticides completely.

At the moment, the situation among vegetable growing farmers is characterized by improper pesticide use and inadequate attention given to the pesticide pre-harvest interval. These dangerous practices are still widely spread in Vietnam and despite the technical training that a large percentage of the farmers have received from state and non-state actors, their practices remain strongly influenced by their traditional routines and experience-based assessments of risks. These conventional practices rely on their experiences with climate conditions, pest and disease populations, market prices of vegetables, etc. During their daily activities, farmers, nevertheless, face numerous constraints in selecting and using pesticides, as, for instance, they are unable to determine the toxicity of pesticides. In reaction they have developed a number of risky routines as they apply pesticides in overdose, use pesticides in cocktails, evaluate the quality of a pesticide on the costs rather than on its technical attributes, while many pay inadequate attention to the pre-harvest interval. These dangerous practices are responsible for the misuse of pesticides that in turn causes the presence of inadmissible residues on vegetable products and leads to environmental pollution.

Farmers on their own cannot change the current situation regarding the use of pesticides in Vietnamese vegetable production. Transformations in different other practices in the

vegetable supply chain are also necessary. In particular, the distorted system for the distribution of agricultural inputs needs to change. In the absence of effective enforcement from the relevant governmental policies and of consumer pressure to respect environmental and human health interests, Vietnamese vegetable supply-chain actors are mostly oriented towards quick profit-yielding activities. As the pesticide market is poorly regulated, many pesticides are obtainable on the market with a rather low use-value in vegetable protection but a high load of active ingredients with large environmental impacts.

Although the pesticide market in Vietnam is changing in recent years and particularly the import of new and safer compounds is growing (both in terms of quantity and value), the situation remains dominated by rather toxic pesticides (i.e., WHO toxic category II). The search for short-term profit dominates the business strategy of most pesticide companies and leads to the continuous increase in types of pesticides. This proliferation of pesticide names makes it even more difficult for farmers to make a good selection and is contributing to the misuse of pesticides in vegetable production.

Comparable to the situation on the pesticides market, the vegetable market is also poorly organized, although with the exception of the safe vegetable production and export sectors which are structured somewhat better. Even though private food producers, operators and consumers are partly legitimized by recent government policies as key agents in protecting food safety and environmental impacts, they are poorly cooperating towards improving vegetable production. A modern vegetable retailing chain (supermarkets) with higher concerns for food safety and environmental health is emerging, but still accounts for only a very small share of the market. The traditional channels of retailing vegetables, such as wet markets and hawkers, are dominating vegetable supply to consumers even in urban areas. This poorly regulated chain has not been able to provide vegetables of good quality and safety to consumers, not even to those who are willing to pay extra for safe produce. Thus, while in OECD countries non-state actors have been able to develop farming and retailing mechanisms such as GlobalGAP and CSA, which shift the farm management practices towards

improved environmental performance, in Vietnam non-state actors have not yet been able to do so.

The current governmental system in Vietnam largely explains the disorder in the pesticide and vegetable markets in combination with the particular behavior of the actors involved. The centralized Vietnamese governmental system, characterized by bureaucracy, information closure and corruption, has contributed to the ineffective responses to the problems on the emerging markets because laws are not sufficiently enforced. Pesticides regulations are repeatedly violated by private actors in Vietnam as nearly all actors seem more oriented towards (short-term) economic profits than to adequate consideration of their responsibilities towards the law, other people's welfare and the environment. A state governed by laws to which all public and civil actors adhere to is therefore a necessary pre-condition for a more positive future in Vietnam's pesticide use in vegetable production. This will definitely require a transformation of the existing governmental structure, i.e. from top-down, command-and-control and hierarchical policy-oriented towards more consensual, participative, network and market-oriented, as proposed by Ecological Modernisation Theorists.

Samenvatting

De economische liberalisering in Vietnam sinds het midden van de jaren 80 van de vorige eeuw heeft bijgedragen aan de toenemende betrokkenheid van private actoren bij de voedselvoorziening en tevens aan de verdergaande intensivering van de landbouw. De Vietnamese boeren, die het gebruik van pesticiden altijd al beschouwden als de meest effectieve manier om hun gewassen te beschermen tegen ziekten en plagen, begonnen daarmee meer pesticiden te gebruiken. Het pesticidengebruik in de landbouw is dan ook enorm toegenomen gedurende de laatste decennia en dit resulteert in toenemende bezorgdheid onder de Vietnamese consumenten. Elk jaar worden duizenden Vietnamese consumenten vergiftigd door besmet voedsel, terwijl miljoenen boeren blootstaan aan de gevaren van chronische vergiftiging als gevolg van het gebruik van pesticiden. Naast de gevaren voor de menselijke gezondheid, bedreigt pesticidengebruik ook de waterkwaliteit en de ecosystemen in de vruchtbare rivierdelta's van noordelijk en zuidelijk Vietnam. Daarenboven betekent het intensieve pesticidengebruik een bedreiging voor de exportmogelijkheden van groenten en fruit vanuit Vietnam. Hoewel de Vietnamese overheid zich grote inspanningen heeft getroost om de pesticidenindustrie en het pesticidengebruik te controleren en de kwaliteit en veiligheid van het voedsel te verzekeren, is zij er tot nu toe nauwelijks in geslaagd de relevant praktijken aan te passen aan deze beleidsdoelstellingen.

Deze studie is gebaseerd op–en daarmee tevens de bruikbaarheid evaluerend van–de perspectieven van de theorie van Ecologische Modernisering in het 'vergroenen van de voedselproductie in Vietnam' met een focus op de rollen die daarbij worden gespeeld door de Vietnamese overheid en de verschillende relevante maatschappelijke actoren: boeren, pesticide handelaren/producenten, exporteurs van groenten en consumenten. In het onderzoek is gebruik gemaakt van zowel kwantitatieve als van kwalitatieve onderzoeksmethodes om het huidige pesticidenbeleid en de gerelateerde praktijken te evalueren en om aanbevelingen te formuleren voor de verdere 'vergroening' van de groenteproductie.

In tegenstelling tot eerdere studies die rapporteerden dat de liberalisering van de markt in Vietnam slechts heeft geleid tot het toenemend gebruik van goedkoper en gevaarlijker pesticiden, vonden wij in ons onderzoek enkele verbeteringen in het pesticidengebruik door groenteproducenten. Boeren, vooral degenen die veilige groenten produceerden, respecteerden de noodzakelijke periode voor de oogst waarbij geen pesticiden meer mogen worden toegepast en ontwikkelden verschillende technieken voor verminderd pesticidengebruik, zoals rechtstreekse injectie van pesticiden en de toepassing van gecontroleerde technieken voor ontkieming via turfmolm. Tevens vond ons onderzoek dat boeren in Hanoi duurder en veiliger pesticiden gebruiken dan boeren in meer afgelegen gebieden. Hoewel de toepassing van deze pesticiden en de alternatieve technieken vooral kunnen worden verklaard vanuit hun grotere biochemische effectiviteit, dragen de zorgen onder deze boeren over de gezondheid en veiligheid van de consument en over de impact op het milieu ook bij aan deze verschuiving. Deze trend lijkt positief te zijn gecorreleerd met de toename in technische kennis bij de boeren en met hun ervaring in het gebruik van pesticiden.

Deze veranderingen in het pesticidengebruik bij producenten kunnen eveneens gedeeltelijk de (geringe) wijzigingen verklaren die recentelijk hebben plaatsgevonden op de pesticidenmarkt in Vietnam, met name het verdwijnen van nutteloze pesticiden. Deze verbeteringen zijn echter nog steeds marginaal en vinden vooral plaats bij boeren die produceren voor de export, zodat het waarschijnlijk nog geruime tijd zal duren voor een substantieel gedeelte van alle groenteproducenten zal hebben besloten om volledig af te zien van nutteloze pesticiden.

Op dit moment wordt de situatie bij de groenteproducenten gekarakteriseerd door verkeerd gebruik van pesticiden en inadequate aandacht voor de noodzakelijke periode voor de oogst waarbij geen pesticiden meer mogen worden toegepast. Deze gevaarlijk praktijken zijn nog steeds wijd verspreid en ondanks dat een groot gedeelte van de onderzochte boeren technische training heeft ontvangen van de overheid en andere instanties, blijven hun praktijken nog steeds sterk beïnvloed door hun routines en door risicobeoordeling gebaseerd op ervaringen. Deze conventionele praktijken maken gebruik van de weersgesteldheid, plagen en ziekten populaties, marktprijzen van

groenten, etc. In hun dagelijkse werkelijkheid worden boeren desalniettemin geconfronteerd met talloze beperkingen bij het selecteren en gebruiken van pesticiden. Zo zijn boeren, bijvoorbeeld, niet in staat om de toxiciteit van pesticiden te bepalen. Als gevolg hiervan hebben zij riskante routines ontwikkeld door pesticiden in te hoge doses te gebruiken, verschillende pesticiden te mengen in cocktails, de effectiviteit van een pesticide te baseren op de kostprijs in plaats van op de technische kwalificaties, terwijl veel producenten evenmin veel aandacht besteden aan de noodzakelijke periode voor de oogst waarbij geen pesticiden meer mogen worden toegepast. Deze gevaarlijk activiteiten zijn verantwoordelijk voor het misbruik van pesticiden die vervolgens leidt tot de aanwezigheid van ontoelaatbare hoeveelheden residuen op groenten en tot milieuvervuiling.

Boeren kunnen de huidige situatie in het pesticidengebruik bij groenteproductie niet veranderen zonder de medewerking van andere maatschappelijke actoren. Veranderingen in verschillende andere praktijken zijn noodzakelijk en in het bijzonder dient het verstoorde systeem voor de distributie van inputs voor de landbouwproductie te worden gewijzigd. In afwezigheid van een effectieve handhaving van het relevante overheidsbeleid en van druk vanuit consumenten om de belangen van het milieu en de menselijke gezondheid te respecteren, zijn de actoren in de groenteproductieketen in Vietnam vooral gericht op activiteiten die op korte termijn profijt opleveren. Omdat de pesticidenmarkt slecht is gereguleerd, zijn er veel pesticiden beschikbaar op de markt die een vrij lage gebruikswaarde hebben in de bescherming van groentegewassen maar een hoog gehalte aan actieve ingrediënten met een grote impact op het milieu.

Hoewel de pesticidenmarkt in Vietnam de laatste jaren is veranderd en vooral de import van nieuwe en veiliger bestanddelen toeneemt (zowel in hoeveelheid als in waarde), wordt deze markt nog gedomineerd door vrij gevaarlijke pesticiden (i.e. WHO categorie II). Het streven naar korte termijn profijt beheerst de zakelijke strategie van de meeste pesticidenbedrijven en leidt tot de voortdurende toename in het aantal handelsnamen voor pesticiden. Deze proliferatie maakt het voor boeren nog gecompliceerder om een goede keuze te maken en draagt bij aan het misbruik van pesticiden in de groenteproductie.

Vergelijkbaar met de situatie op de markt voor pesticiden is de groetenmarkt eveneens slecht georganiseerd, met uitzondering van de veilige groenteproductie en de exportsector, die wat beter zijn georganiseerd. Hoewel de private voedselproducenten, handelaren en consumenten deels gelegitimeerd zijn door recente overheidsbeslissingen als sleutel actoren in het beschermen van de voedselveiligheid en het milieu, werken zij slecht samen in het verbeteren van de voedselproductie. Er is een modern distributiekanaal (supermarkten) in opkomst met meer aandacht voor voedselveiligheid en milieu, maar dit beslaat nog slechts een heel klein deel van de markt. De traditionele distributiekanalen, de open markten en de straathandelaren, domineren nog steeds de voedselvoorziening voor de consument, zelfs in de stedelijke gebieden. Deze slecht gereguleerde keten is niet in staat geweest consumenten te voorzien van groenten van goede kwaliteit en veiligheid, zelfs niet die consumenten die bereid zijn meer te betalen voor veilig voedsel. Terwijl in OESO-landen de private actoren actief hebben bijgedragen in de ontwikkeling van productie en distributiemechanismes, zoals GlobalGAP en CSA, die de productiepraktijken verschuift naar meer duurzaamheid, zijn de private actoren in Vietnam daar (nog) niet in geslaagd.

Het huidige overheidssysteem in Vietnam verklaart, in combinatie met het specifieke gedrag van de betrokken actoren, grotendeels de wanorde in de markten voor pesticiden en voor groenten. Het gecentraliseerde overheidssysteem, gekarakteriseerd door bureaucratie, het verbergen van informatie en door corruptie, heeft bijgedragen tot het gebrek aan effectieve reacties op de problemen van de opkomende markten, omdat wetten en regels onvoldoende worden gehandhaafd. Voorschriften voor het gebruik van pesticiden worden regelmatig overtreden door private actoren in Vietnam terwijl vrijwel alle actoren meer gericht lijken op (korte termijn) economisch profijt dan op adequate inachtneming van de eigen verantwoordelijkheden jegens de wet, het welzijn van andere mensen, en het milieu. Een staat die wordt geregeerd door wetten die door alle publieke en private actoren wordt gerespecteerd is daarom een noodzakelijke voorwaarde voor een meer positieve toekomst in het gebruik van pesticiden in de groenteproductie in Vietnam. Dit vereist een transformatie in de huidige overheidsstructuur, van een topdown, dirigistische en hiërarchische wijze van beleid maken, in een meer op

consensusgerichte, participatieve, netwerk en markt georiënteerde wijze, zoals voorgesteld door de ecologische modernisering's theoretici.

Tóm tắt

Kinh tế thị trường ở Việt Nam, khởi xướng vào giữa thập kỷ 1980, đã góp phần tăng cường thâm canh nông nghiệp và sự phát triển của các thành phần tư nhân tham gia vào sản xuất nông nghiệp và chuỗi cung ứng lương thực, thực phẩm. Nông dân Việt Nam ngày càng dựa vào thuốc bảo vệ thực vật để kiểm soát các loài sâu bệnh hại trong sản xuất nông nghiệp. Thuốc bảo vệ thực vật nhập khẩu vào Việt Nam bởi vậy, tăng lên một cách khủng khiếp trong những thập niên gần đây, dẫn đến sự lo ngại ngày càng tăng của người tiêu dùng (về an toàn thực phẩm). Mỗi năm, hàng ngàn người tiêu dùng Việt Nam đã bị ngộ độc thực phẩm trong khi hàng triệu nông dân cũng bị đầu độc do tiếp xúc trực tiếp với thuốc bảo vệ thực vật. Ngoài những đe doạ trực tiếp đến sức khoẻ con người, thuốc bảo vệ thực vật còn làm ô nhiễm nguồn nước và đầu độc các hệ sinh thái ở các khu đồng bằng vốn phì nhiêu phía bắc và nam Việt Nam. Thêm vào đó, việc tăng cường sử dụng thuốc bảo vệ thực vật đã làm giảm cơ hội xuất khẩu rau/quả của Việt Nam. Mặc dù chính phủ Việt Nam đã cố gắng kiểm soát ngành công nghiệp thuốc bảo vệ thực vật và hoạt động sử dụng thuốc trong sản xuất nông nghiệp, tuy nhiên những gì diễn ra ngoài thực tế (liên quan đến sản xuất, phân phối và sử dụng thuốc bảo vệ thực vật) dường như xa rời các mục tiêu chính sách đề ra.

Nghiên cứu này áp dụng và góp phần đánh giá Thuyết Hiện đại hoá Sinh thái (Ecological Modernisation Theory), thông qua việc phân tích những thay đổi trong sản xuất rau quả của Việt Nam, tập trung vào phân tích vai trò của chính phủ và các tổ chức xã hội trong các hoạt động sản xuất rau/quả và sử dụng thuốc bảo vệ thực vật: nông dân, công ty/người bán lẻ thuốc bảo vệ thực vật, doanh nghiệp xuất khẩu rau/quả, và người tiêu dùng. Nghiên cứu sử dụng cả phương pháp nghiên cứ định lượng và định tính nhằm đánh giá các chính sách quản lý thuốc bảo vệ thực vật của nhà nước Việt Nam, từ đó đưa ra một số đề xuất nhằm tăng cường sản xuất rau an toàn ở Việt Nam.

Khác với các nghiên cứu trước đây đưa ra kết luận rằng nền kinh tế thị trường ở Việt Nam đã dẫn đến việc tăng cường sử dụng các loại thuốc bảo vệ thực vật rẻ tiền và độc hại hơn, nghiên cứu của chúng tôi đã chỉ ra một số cải thiện trong hoạt động sử dụng thuốc của người dân trồng rau. Cùng với việc quan tâm nhiều hơn đến thời gian cách ly

bởi những người dân sản xuất rau an toàn, một số biện pháp kỹ thuật nhằm cắt giảm việc sử dụng thuốc bảo vệ thực vật đã được phát triển và ứng dụng bởi người dân trồng rau/quả xuất khẩu, ví dụ tiêm trực tiếp thuốc bảo vệ thực vật vào thân hoặc cuống lá dưa bị sâu đục thân hoặc vẽ bùa, áp dụng biện pháp ươm hạt rau trong bầu. Tương tự, kết quả điều tra chi tiết các hoạt động của hộ gia đình ở Đông Anh (Hà Nội) cho thấy người dân có huynh hướng sử dụng các thuốc bảo vệ thực vật đắt tiền và an toàn hơn (so với dân các vùng sâu, vùng xa hơn). Mặc dù hiệu quả sinh học của các thuốc này là yếu tố giải thích chính; ở mức độ nào đó, sự quan tâm của người dân đến sức khoẻ người tiêu dùng và môi trường sống cũng góp phần giải thích cho sự thay đổi này. Ngoài ra, những cải thiện về kiến thức và kinh nghiệm của người nông dân trong sử dụng thuốc bảo vệ thực vật cũng có những ảnh hưởng tích cực đối với sự thay đổi đó. Sự thay đổi từ phía người dân đã góp phần dẫn đến những điều chỉnh của thị trường thuốc bảo vệ thực vật ở Việt Nam thời gian gần đây, ví dụ sự loại bỏ nhiều loại thuốc bảo vệ thực vật hiệu quả thấp. Tuy nhiên, sự thay đổi tích cực này còn rất hạn chế, chủ yếu trong nhóm người dân sản xuất rau an toàn và xuất khẩu, và bởi vậy sẽ cần một thời gian dài cho đến khi một bộ phận lớn nông dân quyết định tảy chay các loại thuốc bảo vệ thực vật hiệu quả thấp.

Hiện tại, hầu hết người dân trồng rau còn sử dụng bất hợp lý thuốc bảo vệ thực vật và chưa chú ý đến thời gian cách ly. Các động thái “nguy hiểm” này vẫn còn phổ biến. Mặc dù một bộ phận nông dân đã được tập huấn kỹ thuật (sản xuất rau/quả thâm canh và sử dụng hợp lý thuốc bảo vệ thực vật) thông qua các chương trình khuyến nông của nhà nước và các tổ chức tư nhân, hoạt động sử dụng thuốc của người dân vẫn phần nhiều bị chi phối bởi thói quen và đánh giá rủi do sâu bệnh hại theo kinh nghiệm. Việc đánh giá rủi do sâu bệnh hại của người dân thường được đặt trong mối tương quan với điều kiện thời tiết, mật độ sâu/bệnh hại, giá rau ngoài thị trường v.v. Trong các hoạt động sản xuất, người dân vẫn đối mặt với hàng loạt những khó khăn trong lựa chọn và sử dụng thuốc bảo vệ thực vật, ví dụ họ không xác định được độ độc của thuốc. Bởi vậy việc sử dụng thuốc của người dân vẫn còn hàm chứa rất nhiều “bất hợp lý” như dùng thuốc quá nồng độ khuyến cáo, cộng thuốc, đánh giá chất lượng thuốc trên cơ sở chi phí thuốc thay vì các đặc tính kỹ thuật của thuốc, và nhiều người dân chưa chú ý đến thời gian cách ly. Các hoạt động sử dụng thuốc chưa hợp lý này của người dân là nguyên

nhân khiến dư lượng thuốc trong sản phẩm rau/quả cao (ảnh hưởng đến sức khoẻ người tiêu dùng), và là nguyên nhân gây ô nhiễm môi trường.

Tự người nông dân sẽ không thể thay đổi được tình trạng sử dụng thuốc bảo vệ trong sản xuất rau/quả hiện tại ở Việt Nam. Những thay đổi trong các công đoạn khác trong chuỗi cung ứng rau/quả là cần thiết. Cụ thể, hệ thống cung cấp nguyên vật liệu đầu vào cho sản xuất (bị xuyên tạc) cần phải thay đổi. Trong điều kiện thiếu vắng sự thực thi chính sách nhà nước có hiệu quả và sức ép của người tiêu dùng (đối với người sản xuất và hệ thống dịch vụ sản phẩm) nhằm tăng cường các lợi ích về sức khoẻ người tiêu dùng và môi trường, các tác nhân trong chuỗi dịch vụ rau/quả hiện tại ở Việt Nam dường như đang bị định hướng và hấp dẫn bởi các hoạt động tạo lợi nhuận ngắn hạn. Với sự yếu kém của nhà nước trong quản lý thị trường thuốc bảo vệ thực vật, nhiều loại thuốc rẻ tiền, hiệu quả sinh học thấp đang được sử dụng đã bổ sung một lượng lớn hoạt chất độc hại vào môi trường.

Mặc dù thị trường thuốc bảo vệ thực vật ở Việt Nam trải qua những thay đổi trong thời gian gần đây, ví dụ lượng hoạt chất mới và an toàn hơn được nhập khẩu nhiều hơn (cả về mặt lượng và giá trị), tuy nhiên thị trường vẫn phổ biến với các thuốc có độ độc tương đối cao (ví dụ độ độc II theo phân hạng độc tố của WHO). Mong muốn tạo lợi nhuận ngắn hạn của hầu hết các công ty thuốc đã dẫn tới sự tăng vọt số tên thuốc thương phẩm trên thị trường. Số tên thuốc thương phẩm tăng quá nhiều khiến người dân gặp khó khăn trong lựa chọn và sử dụng thuốc hợp lý.

Tương tự như đối với thị trường thuốc bảo vệ thực vật, thị trường rau/quả hiện tại cũng bị xuyên tạc (mặc dù thị trường rau an toàn và kênh xuất khẩu được tổ chức có phần tốt hơn so với rau thường). Trong những năm gần đây, vai trò của các tác nhân như người sản xuất, người phân phối và người tiêu dùng rau quả đã được hợp pháp hoá một phần trong các chính sách của chính phủ như là đối tượng chính góp phần bảo vệ chất lượng thực phẩm và môi trường sống, tuy nhiên các tác nhân này dường như chưa hợp tác với nhau nhằm cải thiện tình hình sản xuất rau/quả hiện tại. Mặc dù kênh bán lẻ rau an toàn hiện đại (siêu thị) với những quan tâm về chất lượng nông sản và môi trường nhiều hơn (so với kênh tiêu thụ truyền thống) ngày càng được mở rộng ở Việt Nam, tuy nhiên hiện

tại kênh này vẫn chỉ chiếm một phân khúc thị trường rất hạn chế. Các kênh phân phối rau/quả truyền thống như chợ mở và bán dong sẽ vẫn chiếm lĩnh phần lớn thị trường phân phối rau/quả ở các khu vực đô thị. Các kênh phân phối này--với đặc điểm tổ chức lỏng lẻo, không chuyên nghiệp--đã và sẽ không thể đảm bảo chất lượng rau quả cung cấp cho người tiêu dùng, bao gồm cả những đối tượng sẵn lòng chi trả cao hơn cho sản phẩm an toàn. Bởi vậy, trong khi các cá nhân/tổ chức tư nhân ở các nước thuộc khối OECD đã phát triển và ứng dụng các biện pháp sản xuất và hệ thống bán lẻ như GlobalGAP và CSA, góp phần thúc đẩy sản xuất theo hướng thân thiện với môi trường, các cá nhân/tổ chức tư nhân ở Việt Nam chưa làm được như thế.

Hệ thống quản lý hành chính quan liêu hiện tại của Việt Nam là nguyên nhân chính dẫn đến những bất cập trong quản lý thị trường thuốc bảo vệ thực vật và rau/quả, cũng như hành vi của các tác nhân tham gia trong các thị trường này. Hệ thống quản lý hành chính tập trung, quan liêu, và tham nhũng là nguyên nhân kìm hãm những phản ứng có hiệu quả đối với các vấn đề mới nảy sinh trong nền kinh tế thị trường. Các qui định quản lý thuốc bảo vệ thực vật thường bị các cá nhân/tổ chức sản xuất, kinh doanh, và người dân lờ đi hoặc vi phạm khi mà những tác nhân này chú trọng chủ yếu đến lợi ích trước mắt cho chính họ, thay vì quan tâm đến trách nhiệm của họ trước luật pháp, phúc lợi xã hội, và môi trường sống. Một nhà nước pháp quyền ở đó tất cả các cá nhân/tổ chức phải tuân thủ theo luật là điều kiện tiên quyết cho những thay đổi tích cực trong sử dụng thuốc bảo vệ thực vật trong tương lai sản xuất rau quả của Việt Nam. Điều này sẽ đòi hỏi một số chuyển dịch trong cấu trúc tổ chức nhà nước Việt Nam, từ hình thức quản lý tập trung và quan liêu chuyển sang hình thức quản lý dân chủ và cởi mở hơn, như đề xuất bởi các học giả Thuyết Hiện đại hoá Sinh thái.

Completed Training and Supervision Plan

Name: Pham Van Hoi

Period of PhD study: September 2005-February 2010

PhD student, Mansholt Graduate School of Social Sciences (MG3S)

Description	Institute / Department	Year	ECTS*
Courses:			**23.8**
Mansholt Introduction course	Mansholt Graduate School of Social Sciences (MG3S)	2005	1
Project and Time Management	Wageningen Graduate Schools (WGS)	2006	1.5
Techniques for Writing and Presenting Scientific Papers	WGS	2009	1.2
Getting Articles Published	Environmental Policy Group (WUR)	2008	0.6
Quantitative Research Methods	MG3S	2005	4
Social Theory and the Environment: An Introduction Into Ecological Modernization Theory	MG3S/WIMEK	2005	6
Policy Evaluation Methodology	MG3S/WIMEK	2006	4
Socio-Cultural Field Research Methods	MG3S	2006	4
Scaling and Governance	PE&RC, MG3S, WIMEK and WIAS	2009	1.5
Presentations at conferences and workshops:			**6.3**
Mansholt Multidisciplinary seminar		2009	1
Conference on “The Greening of Agro-Industries and Networks in Asia: Challenges and Opportunities”, Chulalongkorn University, Thailand		2006	1
The Seventh Asian Inter-University Seminars, Hanoi, Vietnam		2006	1
Environmental Policy Group Research Colloquium, Wageningen		2006	1
Environmental Policy Group Research Colloquium, Wageningen		2007	1
Conference on “Southeast Asia Today: Development Paradigms, Reflexive Engagements”, Manila, Phillipines		2008	1
WOTRO Research Day		2009	0.3
Total (minimum 30 ECTS)			**30.1**

*One ECTS on average is equivalent to 28 hours of course work.

About the author

Pham Van Hoi was born on February 22, 1973 in Nam Dinh province, Vietnam. He obtained his Bachelor of Plant Protection from Hanoi University of Agriculture (Vietnam) in 1996, and MSc of Science in Social Development from Ateneo de Manila University (the Philippines) in 2001. In 1997, he was recruited as lecturer by Hanoi University of Agriculture and remained there till today. His research interests and publications are related to sustainable development and environmental protection in agricultural sector. In September 2005, he started his PhD Program in Wageningen University, the Netherlands.

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