



State governance of pesticide use and trade in Vietnam



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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 where farmers have to largely rely on cheap but often old and more toxic pesticides. 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 (i.e., centralized decision making), large corruption, information distortion and a failing legal system. To some extent, and in some more wealthy areas, farmers 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.

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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 million/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 [1]. These numbers exclude “silent” casualties by pesticides [2]. 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 [3]). The annual costs of pesticide-related domestic human health and of lost export opportunities for vegetables and fruits in Vietnam is estimated at US\$700 millions [4]. This equals the total estimated export income of vegetables and fruits in 2010 [5]. 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 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 [6,7]. Firstly, state authorities are involved in banning certain highly toxic pesticides like persistent organic pollutants (POPs, following the Stockholm Convention), or the US “Big Green” [8]. 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 [9]. 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 [10]. In the 1990s countries such as Sweden, Norway, Denmark, Netherlands and Guatemala have decreased their annual

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pesticide use by one third, without diminishing crop yields (Edland 1997, Pettersson 1997, Pimentel 1997 cited in [10]).

But it is not only developed states that have aimed to reduce the heavy dependence of agriculture on pesticides. Developmental states (cf. [11]), such as Vietnam, have equally strived to reduce the reliance of agricultural production on highly toxic pesticides. Although such developmental states are known for their “strong arms” – in a sense of authoritarian power which leads and directs the developments, 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 [7] and other states [12] provide contrasting evidence. This article analyses the successes and failures of Vietnamese state authorities in regulating 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 pesticide policies, and followed by an analysis of the role of private actors (especially farmers and retailers) in changing the pesticide market.

2. Methodology

This study uses three methodologies: a desk study of official and grey policy documents on state pesticide policies; surveys of pesticide 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 [13–15]), 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 agricultural 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 agricultural communities 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 (largely, but not solely focused on the vegetable subsector), pesticide selection and use, and farmer’s perception on changes in the pesticide market.

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. 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 [16], pesticides gained further state attention. This Decree formed the first comprehensively legal document on pesticide 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 pesticide 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 pesticide 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 pesticide 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) [17]. In parallel, all organizations and individuals using “restricted use” pesticides needed to be registered and certified [18]. 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 [19].

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 [20]. 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 [21]. In addition, the Decree no. 92-CP was amended in 2002, when IPM-based pest and disease control was further emphasized [22]. 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 [23].

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,

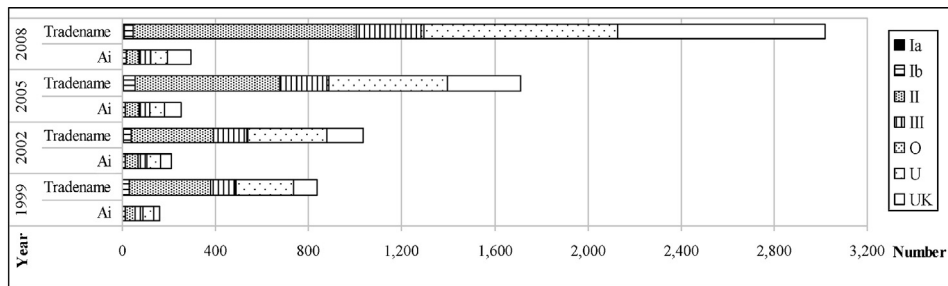


Figure 1. Number of pesticide Ais and formulated pesticides in Vietnam, 1999 till 2008¹⁰.

Note: Ai = Active ingredient

Source: adapted from [29–32].

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 [24]. For vegetables, fruit crops and tea, field trials also need to evaluate pre-harvest interval and the effects on food quality [25]. 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 [26]). 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) [27].

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, instead of rules that have to be enforced and sanctioned in case of violation.

4. Developments on the pesticide market

From the early 1990s onward, the pesticide 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 trade names. According to Vietnamese regulation, one pesticide applicant can only register one product under one pesticide trade name. However, pesticide companies obtain multiple trade names for the same product, simply by marginally changing the formulation of the pesticides. Hence, the Vietnamese pesticide market now consists of a large number of pesticide trade names. For instance, between 1999 and 2008, the number of active ingredients (Ai) has almost doubled; while the number of trade names has increased 3.6 times¹ (see Figure 1). Pesticides of toxic category II, U and unknown (UK)² have especially increased, both in terms of Ai and trade names. In Ai terms, pesticides of toxic category II increased 1.3 times, category U 1.6 and category UK 3.7. In trade name terms, pesticides of toxic

category II increased 2.8 times, U category 3.3, and UK category 8.8 (Figure 2). 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, Indoxacarb³ and biological substances such as Emamectin benzoate and Matrine. The increase of pesticide trade names does probably not only reflect the drive of by pesticide companies to supply more trade names, but also demand from other market actors such as retailers and farmers. The increasing number of pesticide trade names 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 (Hanoi) between 2003 and 2007. Pesticide Ai quantity of category II had increased from 18.4% to 40.6% [15].

The increase in number of Ais and trade names 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 pesticide 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 2).

In addition to the legally imported pesticides (as mentioned in Figure 2), the Ministry of Industry and Trade estimates that about 30–35% of the pesticides currently used in Vietnam is imported illegally [39]. Aggregated pesticide 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 [38]. In 2007, 13 out of 83 inspected pesticides on the market violated labeling and quality regulations [40]. Of the 5,347 pesticide companies and retailers inspected, 12% were violating pesticide regulations such as selling illegal pesticides [40]. And 18% of 8,200 farmers monitored were violating regulations, such as improper use of pesticides and/or use of illegal pesticides [41].

MARD has taken very limited actions to restrict or ban highly 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 highly toxic ones. The removal of highly toxic pesticides

¹ These Ais and formulations include insecticides, fungicides and herbicides “permitted” and with “restricted use”.

² All active ingredients are searched for toxicity from [28] 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.

³ 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 [15]).

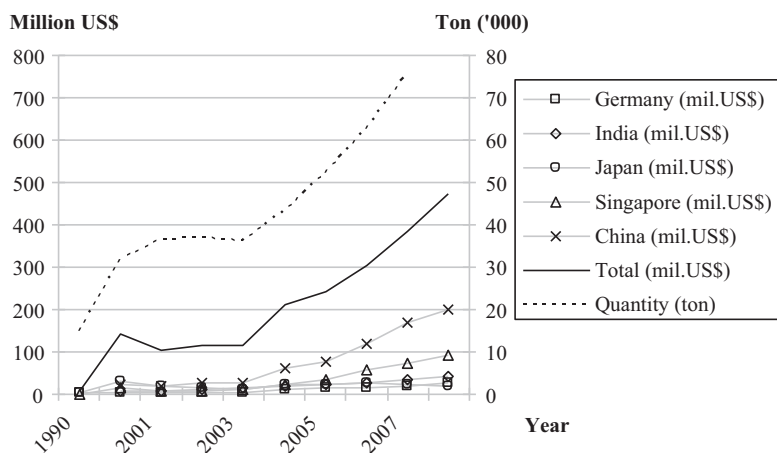


Figure 2. Pesticide import value and quantity (in finished form) from major countries of origin¹¹.

Source: [33]; Anh 2004; personal interviews PPD and MARD in 2004; [3]; [34]; [35–38] [35–38] (import quantity from 2004 to 2006 estimated due to unavailability of statistical data).

(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 [42].

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.

5.1. 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 pesticide trade names 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 were 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 (PPD official Hai Duong, personal interview in November, 2006). 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 their colleagues. These officials find no economic or political incentive to do so (Hai Duong PPD, personal interview, November, 2006). The head of Hanoi PPD

revealed that when her team discovered a large volume of expired pesticides, 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 (Hanoi PPD, personal interview in December, 2005). 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 (Hung Yen inspection team, personal interview in November 2006). 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” [43]. 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. 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 [44]. 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 Environment⁴, 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 [45].

5.2. 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 trade name, 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 [46]. The increase in new pesticide trade name registration 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 may be shortened to several months or extended to more than 2 years.⁵ This “flexibility” in pesticide registration time of MARD is related to the “temporal characteristic”⁶ 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 pesticide trade name (without ICAMA) is roughly \$12,000 (*staff of pesticide companies, personal interviews July 14, 2006 and March 5, 2008*). These practices also provide a major incentive for state officials to allow the growth to trade names, 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 [47]. 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 [48].

But ineffective pesticide management also moves beyond the level of individual PPD and MARD registration staff and individual

trade name 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 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 [49]. 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 [50]. Formulations of Tricyclazole (category II) and Metaldehyde (category II) received the same registration privilege [51,52].

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 Paraquat⁷ 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 trade names 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 number of pesticide trade names registered, distributed and used in Vietnam.

5.3. 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 MARD) indicates, ICAMA data are not always available for MARD to judge pesticide registration⁸ (*official Advisory Committee for Pesticides, personal interviews Dec, 2005 and Feb, 2009*). 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 pesticides [9]. However, more than 20 years later

⁴ This was split in 2002 into the Ministry of Natural Resources and Environment and the Ministry of Science and Technology.

⁵ 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.

⁶ 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 [15].

⁷ In 2008, there were 24 pesticide trade names containing Paraquat.

⁸ 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*).

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% [53]. No clear plan existed within MARD for (long-term) nonchemical-based Brown planthopper control [54]. 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 [9].

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 (cf. [55]). 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 normal vegetable production areas. Manipulation of information is sometimes quite advanced. Used-pesticide packages that farmers normally leave behind in agricultural fields are increasingly included in inspections into illegal 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.

5.4. 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 [56], 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 [57]. 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.

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 (cf. [39]), 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 pesticides⁹ 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

⁹ Pesticides that are illegally imported contain either Ais banned or permitted to use in Vietnam.

Table 1
Perception of retailers and farmers on current pesticide market.

	% of retailers (n=45)	% of farmers (n=125)
Improved	84%	72%
No change	16%	16%
Worse	0%	12%

with higher biological efficacy, considerably improving the pesticide market according to 84% of the retailers and 72% of the farmers we interviewed (cf. Table 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 [15]. 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 pesticide Ais reduced from about 500 kg to about 100 kg, due to lower concentrations of active ingredient (*personal interview in August, 2008*). The 12% of farmers that considered the current pesticide market worse than 10 years ago point to the large number of pesticide trade names as well as to the low biological efficacy of pesticides.

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 (*personal observation in August, 2007*). 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 (*personal observation in August, 2008*). 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; cf. [15]). 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 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 low quality pesticides proceeds very slow.

An explanation for the absence of improvements in pesticide 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

¹⁰ 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. Similarly, MARD counts pesticide formulation based on registered (common) trade names other than on content of other materials mixed with Ais for final products (trade names), which are counted in this paper with much larger figures.

¹¹ These figures include small quantities of pesticides that Vietnam re-exports to other countries, such as Cambodia.

Table 2
Important improvements for future pesticide management in Vietnam.

Solution	% of retailers (n = 45)	% of farmers (n = 125)
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	0%	28% ¹²

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 [58]. In addition, agricultural sown area has increased from 21.2 million ha in 2001 to 24.7 ha in 2006 (roughly 16.4%) [59]. 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 highly 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 number of pesticide trade names, imitated pesticides, and low quality pesticides) (Table 2).

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 (cf. [27]). A stricter control over biological pesticides could partly help to reduce the large number of pesticide trade names 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.

¹² The high percentage of farmers without response on pesticides improvements could be explained by their distrust in state pesticide regulation enforcement as well as in pesticide market actors to bring about improvements.

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 takes 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 pesticide 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 highly 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 processes related to pesticides.

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