

A ten-year research on the usage of pesticides in Vietnamese vegetable cultivation

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1. Introduction

When the centralised government encouraged the use of pesticides in the collectivised production that dominated agricultural policies and practices between 1959 and the early 1980s, pesticides were first imported and employed in Vietnamese agriculture in the late 1950s (Xuan, 1995). Vietnam began to shift its economy and agriculture toward a market-based system by the middle of the 1980s, allowing private business owners to take part in the import, manufacture, distribution, and use of pesticides for the agricultural industry. The annual usage of pesticides rose from 100 tonnes in the 1950s (Anh, 2002) to 35,000 tonnes in 2002 and over 105,000 tonnes in 2012 (ILS, 2013). In 2012, the entire cost of

importing pesticides increased to US\$744 million. The 2005–2007 rice brown planthopper bloom was linked to the sharp rise in pesticide imports in 2008 (Hoang et al., 2011; Vietnam Academy of Agricultural Sciences, 2007). But in 2008, the planthopper bloom was somewhat milder, and as a consequence, significant imported pesticide stockpiles persisted in the years that followed. As a result, imports of pesticides decreased in 2009 and 2010. Pesticide imports into Vietnam have generally risen over the last several decades; between 2005 and 2012, the average growth rate of pesticide imports was 18.8% annually in terms of value and 10.6% annually in terms of quantity (see Figure 1).

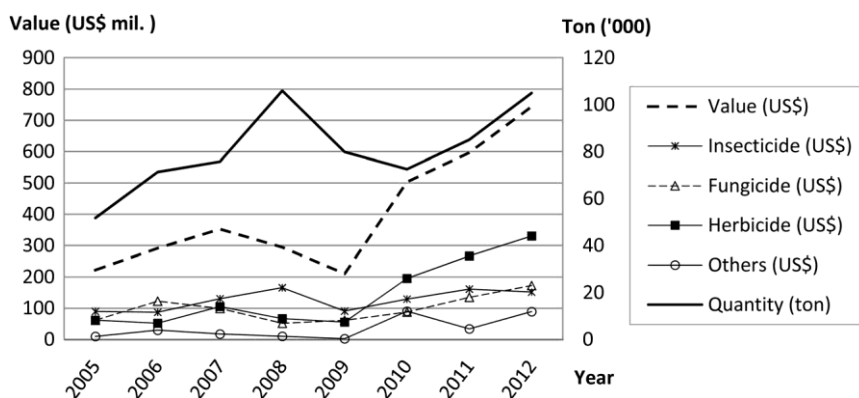


Figure 1. Vietnam's pesticide imports from 2005 to 2012 (in million US\$ and million kg).
Source: ILS (2013).

Vietnam's growing dependence on pesticides

has led to exorbitant expenditures; in 2012,

the country spent US\$829 million on imported pesticides, almost equivalent to its export earnings from fruits and vegetables (Tan, 2013). There have also been indirect costs, such as uncertain agricultural output linked to a contaminated agro-ecosystem, export prospects lost owing to excessive pesticide residues on goods, and social and environmental costs connected with pesticide usage.

In order to save the environment and public health, several industrialised countries have implemented policies to reduce the use of pesticides and encourage more environmentally friendly farming practices throughout the last 20 years. Examples include the US "Big Green" organic farming promotion campaign (Zilberman, Schmitz, Casterline, Lichtenberg, & Siebert, 1991) and the 1990s decline in pesticide use in Sweden, Norway, Denmark, and the Netherlands (Edland, 1997; Pettersson, 1997; Pimentel, 1997 cited in Wilson & Tisdell, 2001). The EU enacted Directive 91/414/EEC in 2010 with the goal of removing more than 60% of pesticide active ingredients (AIs) from the European market in an attempt to further limit the usage of pesticides. New Sustainable Use of Pesticides and Water Framework and Tighter Maximum Residue Limits Law The remaining pesticides' usage in EU nations will be further restricted by directives (Birch, Begg, & Squire, 2011).

Many developing nations have also made an effort to lessen the use of hazardous pesticides in their agricultural production. In the 1980s, for example, Nicaragua and Indonesia attempted to do so (Matteson, 2000; Thrupp, 1988; quoted in McCann, 2005), and China, the world's biggest pesticide user, has established a goal to reduce pesticide usage by 20% by 2016 (CRI, 2011). However, many developing nations have not been able to successfully reduce the use of pesticides in agriculture. This is primarily due to their limited state

capacities and capabilities for creating and enforcing appropriate policies on limiting the distribution and use of pesticides, as well as a lack of knowledge about farming practices related to pesticide use. As a result, governments in countries like India, Iran, and Colombia (Hashemi, Peshin, & Feola, 2014), Ethiopia (Mengistie, Mol, Oosterveer, & Simane, 2015), Thailand (Panuwet et al., 2012), Bangladesh (Rahman, 2013), Sri Lanka (Jaya-singhe & Silva, 2003), and the Caribbean (Pereira, Boysielal, & Chang, 2007) have adopted ineffective ways to address pesticide use at the farm level. In order to encourage appropriate pesticide usage in agriculture, this study examines Vietnam's pesticide policy and its effects on the distribution and use of agricultural pesticides in Vietnam. The study examines changes in the quantity of pesticides (AIs and formulated pesticides) that have been registered, imported, and distributed in Vietnam during the last 15 years after outlining the methodology. A thorough examination of changes in agriculture pesticide usage comes next. degree from 2002 to 2013. An examination of the achievements and shortcomings of Vietnamese pesticide policy rounds off this essay.

2. Methodology

In order to examine quantitative changes in pesticide use, this study employed two primary methods: longitudinal primary data collection of actual farm-level pesticide use in a vegetable production district (Dong Anh District, Hanoi) and existing national data sets of registered pesticides authorised for agricultural use.

The Ministry of Agriculture and Rural Development (MARD) produced annual lists of registered (and hence authorised) pesticides from 1999 to 2013, which were gathered and examined. Pesticide kinds were discovered, analysed, and synthesised in terms of both AIs and formulated pesticides.2 The WHO Classification of

Pesticides 2009 (IPCS, 2009) was used to define the toxicity classifications of pesticides.³

The Donganh District of Hanoi, which has historically been a significant vegetable-producing area for the Hanoi market, was the site of the major data collection on farm-level pesticide usage (see Figure 2). Thirty farmers in this district self-monitored their pesticide usage practices on vegetables every day for eight months, from August 2013 to March 2014, after being instructed to utilise self-recording techniques for daily agricultural operations. Similar monitoring data had previously been collected from essentially the same set of farmers using a similar approach, namely from 32 farm families between August 2002 and March 2003 and from 32 farm households between

August 2006 and March 2007. These follow-up evaluations provide a longitudinal comparison to monitor changes in pesticide usage over time. Monitoring periods 1, 2, and 3 (henceforth referred to as MP1, MP2, and MP3) are the monitoring campaigns that ran from August 2002 to March 2003, August 2006 to March 2007, and August 2013 to March 2014. In MP1, a total of 199 primary production units⁶ with a sown area of 7.55 ha and 225 primary production units with a sown area of 8.17 ha were under observation. The comparable numbers for MP3 are 11.69 ha and 301 ha, respectively. Farmers prefer to vary their vegetable crops to some degree. But during the course of the three monitoring periods, Choysum, Kohl-rabi, and wrapped heart mustard continued to be the predominant vegetable crops (see Table 1).



Figure 2. Location of the research site.

3. Pesticides policies

Vietnam used a centralised agricultural management system before to the mid-1980s. State authorities at various governmental levels imported, distributed, and directed the use of pesticides. However, the pesticide industry became increasingly privatised as Vietnam moved toward a market-based economy, beginning with the Renovation Policy enacted in 1986. This was particularly true with regard to pesticide imports, production/formulation, and distribution (retail). Pesticide

manufacturing and trading firms and private retailers, who also advise and educate smallholder farmers on the use of pesticides for vegetable production, mirrored agricultural extension services that counsel farmers on agricultural output. Every year, starting in 1986, MARD publishes a list of pesticides that are authorised for import, manufacturing/formulation, distribution, and usage in Vietnam in order to provide private players involved in pesticide imports, production, packaging, and

distribution a legal foundation. This list has been divided into three groups since 1992: pesticides that are approved, pesticides that are allowed for limited use, and pesticides that are prohibited. Second-category pesticides must be applied strictly and may only be used in certain areas for certain crops. Every year, newly registered pesticides and those that have been classed as restricted or prohibited are added to the list of pesticides. For state pesticide management agencies at all levels to carry out the national strategy, the list is crucial. For private players involved in the import, manufacture, and distribution of pesticides, it is also essential.

The first comprehensive legal document on pesticide management in Vietnam was Ordinance No. 8-L/CTN (Nguyen, 2014), which was issued in 1993. It outlined the goals of plant protection, the requirements for pesticide production, formulation, distribution, and use, the rights and responsibilities of pertinent state authorities in monitoring and inspecting activities related to pesticide import, production,

distribution, and use, and the establishment of a plant protection system from central to district level. In order to further emphasise the use of Integrated Pest Management (IPM)-based pest and disease management in the Vietnamese agriculture sector, Ordinance No. 8-L/CTN was modified in 2001 (Socialist Republic of Vietnam, 2002).

In Vietnam, the pesticide trade has been very profitable. Over the last several decades, there has been a notable rise in the number of players in this industry, all of whom utilise various tactics to encourage the use of pesticides on farms (Hoi, Mol, Oosterveer, & van den Brink, 2009). The Department of Plant Protection (a division of MARD) issued Document No. 310/BVTV-TTr in 2012 to strengthen its oversight of the unrestrained promotion of pesticide use by pesticide companies among farmers, who, for example, claimed that pesticides had beneficial side effects like boosting crop growth and fruiting success (Plant Protection Department, 2012).

Table 1. General overview of vegetable production in Dong Anh, 2002–2013.

Vegetable crop	Total sown area (in % area and ha)		
	MP1 2002–2003 (N ¼ 32)	MP2 2006–2007 (N ¼ 32)	MP3 2013–2014 (N ¼ 30)
Kohlrabi (% area)	48.4	46.2	26.2
Wrapped heart mustard (% area)	12.1	22.1	29.2
Choy sum (% area)	3.8	7.4	7.4
Cabbage (% area)	4.4	1.5	7.0
Tomato (% area)	9.1	1.6	3.4
Wax gourd (% area)	3.3	3.7	3.3
Others (%)	18.9	17.5	23.4
Total vegetable crops (in numbers)	21	19	29
Total sown area (in ha)	7.55	8.17	11.69

The Vietnamese government has worked hard over the last ten years to promote and carry out a number of pesticide reduction initiatives, including "3 Reductions, 3 Gains," "1 Must, and 5 Reductions," and "4 Rights," which target all crops. The 2013 Law on Plant Protection and Quarantine formally established the "4 Rights" movement. This law, which primarily regulates pesticide registration, addresses the same topic as the amended Ordinance No. 8-L/CTN of 2002. However, the focus on bio-efficacy as the primary criteria for pesticide registration has shifted. It is anticipated that the Law will have a stronger administrative impact on pesticides as more human and financial resources are allocated for the enforcement of pesticide registration policy and pesticide campaigns, even though (negative) effects of pesticides on health and the environment remain the responsibility of pesticide companies through the technical pesticide registration documents they provide to MARD (Lan, Le, & Phong, 2014).

4. National usage of pesticides

Pesticide imports and usage in Vietnam have expanded in terms of quantity and kinds (both as formulation and AI) despite Vietnamese pesticide regulations. Between 2002 and 2013, there was a 1.8-fold rise in AIs and a 5.7-fold increase in formulated insecticides (a 17% annual growth rate). Ten The number of pesticides belonging to hazardous categories II and UK has increased (2- and 3.4-fold, respectively) in relation to AIs. The number of pesticides

belonging to hazardous categories II, III, and UK11 exhibited the most rise in terms of formulations (7.4-, 5.9-, and 9.1-fold, respectively). The number of AIs for pesticides of toxicity Ib seems to have decreased somewhat between 2002 (12 AIs) and 2013 (10 AIs), however the number of formulated pesticides of this very hazardous category has significantly grown, from 34 in 2002 to 149 in 2013 (see Figure 3). Twelve

The combination of newly registered AIs and freshly blended AI compounds is the reason for the sharp rise in AI types; only few AIs have been taken from Vietnam's list of permitted pesticides. For example, the number of pesticide AI types rose from 210 to 386 between 2002 and 2013, although only three AIs were outlawed at that time: dichlorvos and dicofol in 2013, and deltamethrin in 2012. No AI has been transferred from the "permitted" to the "restricted use" category. Both improper pesticide usage on farms and biological causes (such as growing production areas of fruit and vegetable crops, greater pesticide resistance of pests and illnesses) are responsible for the rising need for pesticides, particularly insecticides. Experts claim that up to 80% of pesticides used in Vietnamese agriculture are applied improperly (i.e., in violation of the "4 Rights"), which results in low bio-efficacy, higher production costs, and a higher hazardous burden on the environment (Nguyen, 2014). An investigation in the Thai Binh

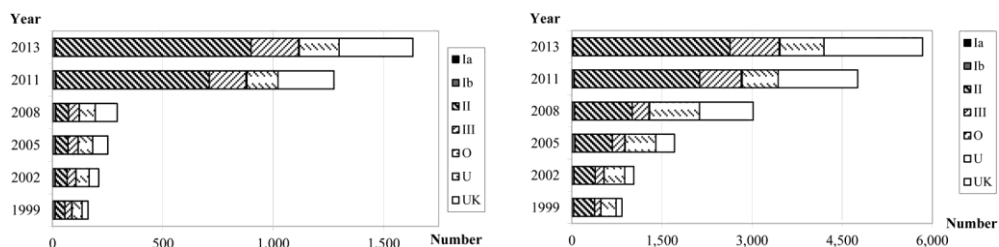


Figure 3. Number of pesticides: AI (left) and formulation (right) in Vietnam, 1999–2013. Sources: IPCS (2009), Ministry of Agriculture and Rural Development (2002, 2005, 2008, 2013).

province in 2014 discovered that 70% of farmers disregarded the advised preharvest interval (PHI) and 80% of farmers broke the "4 Rights" guidelines for pesticide usage (Lan et al., 2014). Ineffective state control of pesticides is the primary source of the persistent availability of subpar and fake pesticides on the market, which is another significant issue. These compounds make up around 10% of all pesticides marketed and utilised in Vietnam, according to official figures (ILS, 2013). Since official figures do not include illicit pesticides, these pesticides may really have an even greater market share. The lengthy list of subpar pesticides is known to wholesalers and retailers, who have questioned how many of these pesticides may be effectively registered and supplied in Vietnam (Anh, 2013).

Farmers that abuse pesticides or employ pesticide combinations do so in part because of low-quality pesticides (Hoi, Mol, Oosterveer, & van den Brink, 2009). Additionally, farmers are confused by the excessive number of pesticide names available on the market and are forced to depend on pesticide sellers for information on effectiveness and use. Ironically, a significant portion of current pesticide dealers are either current or former farmers with inadequate pesticide technical expertise. 52% of Hanoi's 1324 pesticide shops were reportedly operating without a technical pesticide certificate in 2013 (HanoiDARD, 2013). Pesticide dealers have tricked farmers who are perplexed by the Table 2. Trend of pesticide use in monitoring periods.

abundance of pesticides. Retailers advise farmers to use counterfeit pesticides, often in conjunction with high-quality ones, since sophisticated pesticides sometimes have smaller retail profit margins than inexpensive, low-quality, or counterfeit ones (Anh, 2013). (Hoi, Mol, Oosterveer, & van den Brink, 2009).

5. Pesticide use at farm level

Between 2002 and 2013, the Dong Anh area had an increase in pesticide usage at the farm level in all categories, including frequency of use, amount of AI, and quantity of formulated pesticides. The majority of these increases are linked to pesticide market dynamics and agricultural production circumstances, such as more (and more pesticide-resistant) pests and illnesses, however some may be linked to an increasing cropping index. As a result, farmers are using more pesticides and more dangerous ones (such those with toxicity class Ib). Insecticides continued to account for the majority of farmers' pesticide usage during the course of the three monitoring periods, while herbicides saw a minor rise (see Table 2).

The overall amount of pesticides applied rose 1.9 times for formulated pesticides and 2.5 times for AIs between MP1 and MP3. Compared to the cropping index between MP1 and MP3 (1.3 times), this increase is much greater. In MP1, MP2, and MP3, the amount of formulated pesticides used per ha/crop-ping season rose from 11.20 to 13.09 kg and 13.99 kg, respectively.

Types		MP1 (%)	MP2 (%)	MP3 (%)
Formulation	Insecticide	55.2	69.1	54.2
	Fungicide	34.1	20.1	35.1
	Herbicide	3.0	9.6	9.1
	UK	7.7	1.2	1.6
AI	Insecticide	52.8	64.5	49.0
	Fungicide	43.6	22.1	38.0
	Herbicide	3.6	13.4	13.0

Pesticide quantity/ha/cropping season rose from 5.61 to 5.37 kg and 9.11 kg in MP1, MP2, and MP3, respectively, in terms of AIs (not include certain unknown AIs). Thus, there has been a substantial correlation between the usage of pesticides on farms and their market availability (Figure 2). Although there has been a noticeable decline in the use of pesticides of toxicity class Ib, MP2 and MP3 saw increases in the usage of pesticides of toxicity class II. Additionally, the variety of pesticides used by farmers is today dominated by novel biological insecticides like acetamiprid, avermectin, and abamectin. In MP3, the usage of chemical pesticides like fenobucarb, indoxacarb, nereistonxin, and permethrin significantly declined. Nevertheless, two chemical pesticides of hazard class II—cypermethrin and chlorpyrifos—were used more often. There has also been a surge in the use of pesticides of toxicity class U, particularly validamycin and mancozeb. While thiophanate-methyl was used more often in MP3 and rose to the top of the ten most used pesticides during this monitoring period, copper hydroxide was used less frequently in MP2 and MP3. Compared to MP1, zineb consumption declined in MP2 before rising once again in MP3 (see Tables 3 and 4). Between MP1 and MP3, there were much fewer illegally imported pesticides with no information on AIs. For example, in MP1, pesticides of unknown AI were found in 9.1 and 7.7% of pesticide flows and formulation quantities, respectively; in MP3, these numbers were only 2.0 and 1.6% (see Table 3).

Pesticide cocktailing was less common in MP3,15 than in MP2 because single pesticides were used for the majority of applications (see Table 5).

Our research region exhibits trends in the kinds of pesticides used that are comparable to those seen in the yearly registration lists (Figure 2), with increases in AIs and formulated pesticides of 1.7 and 2.0 times, respectively. In terms of toxicity classes, over the most recent monitoring period, pesticides of toxicity class UK have become the most common in terms of formulation, followed by those of toxicity class II and

class III (see Table 6).

6. Pesticide policy enforcement

Regarding the predominance of prohibited pesticides (i.e., very hazardous and/or illegal ones), it is probable that state regulation has affected the types of pesticides utilised at Dong Anh farms as well as the pesticides that are accessible on the market. Throughout our farm monitoring periods, the use of illegal pesticides (i.e., those with unknown AI) and pesticides of toxicity class Ib has steadily declined, whereas new biological pesticides are being imported, distributed, and used more often.

Farmers continue to focus more on the effectiveness of available pesticides than on state pesticide laws like the "4 Rights," despite the impact of state control on the market availability of pesticides. For example, vegetable producers have continued to use pesticides that are barred by state policy on a regular basis: methomyl and del-tamethrin, which were outlawed in early 2013, were found 46 times in a total of 2294 pesticide flows in MP3. Furthermore, a broad list of pesticides used by MP3 farmers—including Ansuco 5WG, Conphai 15WP, Goltoc 250EC, Marshal 200SC, PeRan 50 E, Regent 800 WP, Topsin M 70 WP, and Vitashield 40E—were not licensed for use on vegetables. The suggested PHI will not be sufficient for usage on vegetables since these pesticides are registered for crops other than vegetables. Therefore, consumer safety of the veggies is still in doubt when these pesticides are applied, even if farmers follow producer and state guidelines for pesticide PHI (which they often do not). This implies that farmers will seldom take into account a pesticide's toxicity or legal status once they have access to it. When choosing and applying pesticides, farmers sometimes lack access to the yearly list of authorised pesticides and are unaware of its hundreds of formulations. As a result, governmental initiatives to advance and codify the "4 Rights" have mostly failed.

Table 3. Quantities and toxicity of pesticides used in the three monitoring periods.

AI toxicity	MP1 (%) (N ¼ 32)			MP2 (%) (N ¼ 32)			MP3 (%) (N ¼ 30)		
	Flows ^a	Quantity of formulation	Quantity of AI	Flows	Quantity of formulation	Quantity of AI	Flows	Quantity of formulation	Quantity of AI
Ib	1.6	2.0	1.6	0.9	1.1	1.1	0.1	0.4	0.4
II	27.1	24.6	18.4	31.8	41.0	40.6	29.6	40.9	40.4
III	4.7	11.1	8.7	3.8	3.1	3.7	7.9	8.7	12.9
U	25.6	32.4	39.9	22.8	27.6	31.3	24.2	30.4	34.4
UK (known AI)	31.9	22.3	31.4	39.6	26.0	23.3	36.3	18.0	11.9
UK (unknown AI)	9.1	7.7	–	1.1	1.2	–	2.0	1.6	–
Total (in number of flows and kg for formulation & AI)	1,697	84.8	42.5	2,209	106.7	43.8	2,294	163.6	106.5

^aA flow means a single recorded pesticide used by farmers.

Table 4. The 10 most used pesticides in the three monitoring periods.

Active ingredients	WHO classification	MP1 (N ¼ 32)		MP2 (N ¼ 32)		MP3 (N ¼ 30)	
		Quantity of formulation (kg)	AI quantity (kg)	Quantity of formulation (kg)	AI quantity (kg)	Quantity of formulation (kg)	AI quantity (kg)
<i>Insecticides</i>							
Avermectin	UK	–	–	–	–	20.58	10.27
Abamectin	UK	4.42	0.11	4.26	0.05	7.58	0.04
Acetamiprid	UK	–	–	1.43	0.29	6.35	1.26
Chlorpyrifos (-Ethyl)	II	–	–	5.4	2.09	22.39	13.09
(Alpha-) Cypermethrin	II	5.83	1.22	3.65	0.23	15.26	11.35
Endosulfan	II	5.68	1.99	–	–	–	–
Fenobucarb	II	2.1	0.96	24.89	9.12	–	–
Indoxacarb	II	–	–	1.66	0.25	–	–
Nereistoxin	UK	9.77	9.14	15.09	8.11	–	–
Permethrin	II	–	–	1.81	0.91	–	–
<i>Fungicides</i>							
Copper hydroxide	III	4.37	2.19	–	–	–	–
Mancozeb	U	4.33	3.11	–	–	8.46	5.41
Validamycin	U	3.13	0.15	8.39	0.4	9.29	3.25
Zineb	U	13.97	11.14	–	–	11.26	8.96
Thiophanate-methyl	U	–	–	–	–	11.52	10.34
<i>Herbicides</i>							
Butachlor	III	2.2	1.32	7.81	4.68	10.72	9.97

Table 5. Pesticide application: cocktailing practices.

Pesticide application practices	MP2	MP3
Single pesticide application	43.6	72.7
2 pesticides-mixed application	41.0	19.2
3 pesticides-mixed application	13.2	7.5
4 pesticides-mixed application	2.1	0.5
5 pesticides-mixed application	0.2	0.1
Total application (in numbers)	1267	2294

Table 6. Number of pesticide types used in monitoring periods.

Toxicity	MP1		MP2		MP3	
	AI	Formulation	AI	Formulation	AI	Formulation
Ib	2	2	2	4	1	1
II	18	31	26	47	28	69
III	7	11	8	14	12	16
U	13	34	10	21	15	38
UK	6	28	10	28	22	92
Total	46	106	56	114	78	216

Since the Vietnamese agriculture industry employs roughly 24 million farmers, with an average of less than 1.0 hectares per family (GSO, 2014), it is obviously difficult for the state sector to monitor and regulate pesticide usage practices at the farm level on its own. Although there have been certain types of contract vegetable farming where private contractors have some influence over the choice and use of pesticides (Hoi, Mol, & Oosterveer, 2009a; Hoi, Mol, & Oosterveer, 2009b), this represents a very tiny percentage of farmers. Therefore, governmental regulation of the pesticide market and increasing farmers' and vegetable consumers' knowledge and awareness of pesticides throughout the domestic and global value chains are crucial to the success of pesticide policy.

7. Conclusions

Pesticide usage in Vietnam's agricultural industry is continually rising, even though government rules on pesticide management have expanded during the last ten years. A growing variety of pesticide kinds are being registered and supplied at the macro level, both in terms of AIs and formulated

pesticides. The reduction of high-toxicity pesticides (Ib), unknown AI pesticides, and cocktail applications at the farm level has been countered by an increase in the types and quantities of AIs and formulations used per production unit/cropping season, particularly with regard to toxicity class II pesticides. Vietnam's pesticide policy is failing, especially with relation to the latter. There is no clear plan or strategy to reduce pesticide reliance in vegetable cultivation, despite successful attempts to outlaw certain harmful pesticides and encourage the import and usage of biological pesticides. The "4 Rights" concepts and other policies pertaining to the appropriate use of pesticides have had very little effectiveness. Despite persistent environmental pollution and degradation (Hoai, Sebesvari, Minh, Viet, & Renaud, 2011; Lamers, Anyusheva, La, Nguyen, & Streck, 2011; Vietnam Environment Administration, 2013), and growing consumer demand and willingness to pay for safe vegetables (Hanh, 2014), only modest progress has been made in Vietnam's 20 years of state promotion of safe vegetable production and marketing.

A more efficient pesticide market regulation will not be enough to address all of Vietnam's pesticide issues due to the widespread overuse of pesticides on farms. However, this is a first, practical, and affordable approach for the Vietnamese government to begin addressing these issues. MARD now publishes a lengthy list of pesticides every year, which confuses local state officials tasked with monitoring and enforcing pesticide regulations. Additionally, retailers are able to deceive farmers by selling low-quality or counterfeit pesticides at higher profit rates, leaving farmers reliant on retailers for the selection and application of pesticides. There would be less confusion among state authorities and farmers if the list of pesticides was substantially narrower, with inexpensive but subpar pesticides prohibited from the market and the remaining pesticides properly chosen and tested in Vietnamese agricultural circumstances. A condensed list of pesticides authorised for use and distribution would make it easier for farmers to choose how to use pesticides and allow local state authorities better monitor the pesticide trade and local retailers to comply with state requirements. However, even with a smaller list of allowed pesticides, more government initiatives are still necessary to effectively monitor residues on vegetables, limit pesticide sales and retail, and expand the recognised market for safe veggies. These initiatives will help Vietnam get closer to agricultural production plans that use "fewer pesticide types" and/or "produced with less pesticides."

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