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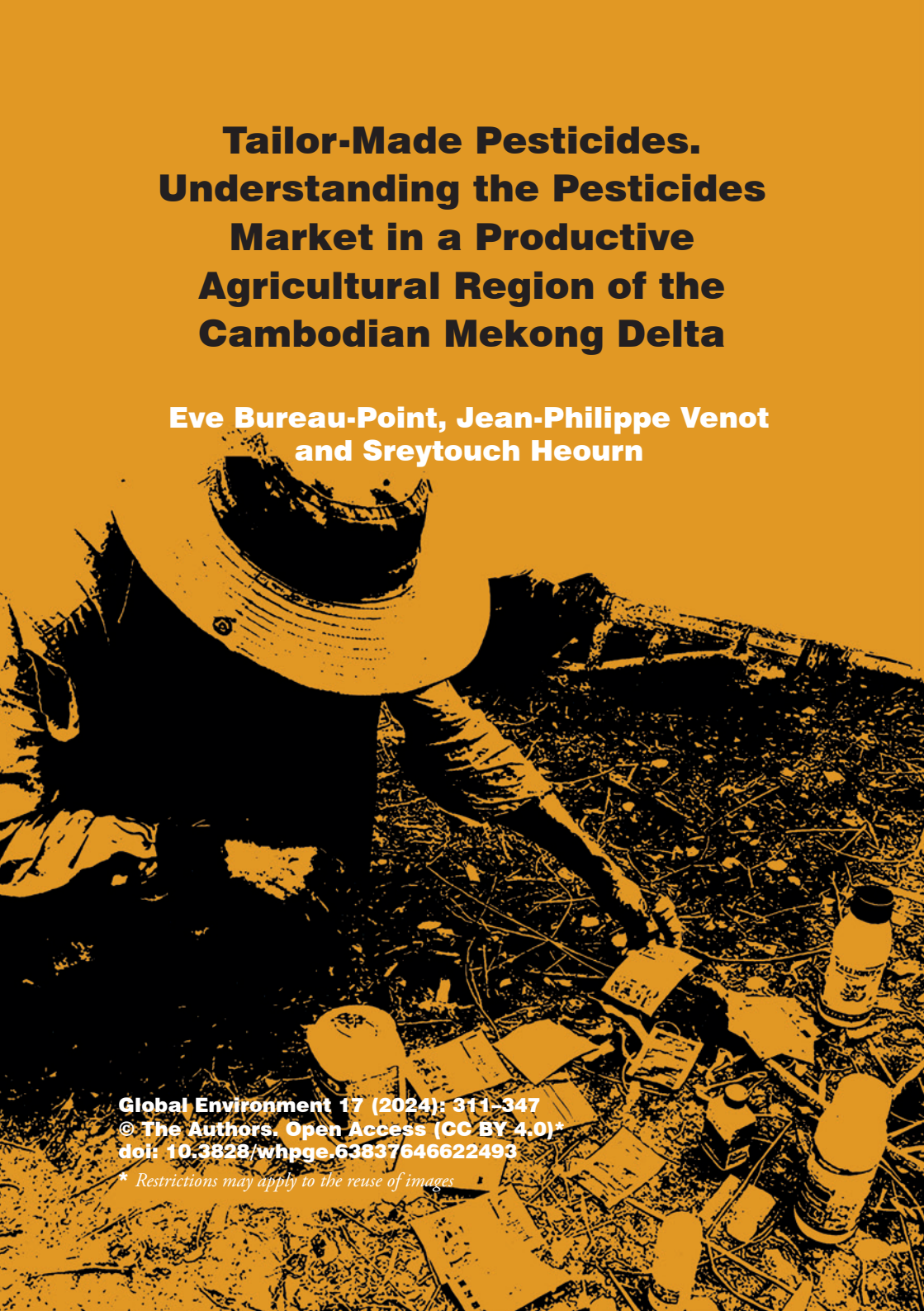
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# Tailor-Made Pesticides. Understanding the Pesticides Market in a Productive Agricultural Region of the Cambodian Mekong Delta

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and Sreytouch Heurn

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This article draws on approaches in the anthropology of things and the anthropology of capitalism. It brings to light fragments of the supply chains of pesticides in one of the most productive agricultural regions in Cambodia. Based on an ethnographic study conducted from November 2021 to December 2022 with farmers, petty retailers and marketing agents enrolled in the pesticides sector, this article shows how a study of local interactions between pesticides and these actors brings out multi-level data, ranging from the local marketing strategies to transnational manufacturing of pesticides. It highlights various stages that are taking place between small-scale farmers and industrial players to redefine tailor-made pesticides and fuel the local market.

**keywords:** *pesticides, intensive agriculture, market, capitalism, anthropology, Cambodia*

## I ntroduction

The market in pesticides started and developed in the Global North after the Second World War. Until the 1970s, the consumption of pesticides was concentrated in Europe, the United-States and Japan.<sup>1</sup> Since then, the technical ‘modernisation’ of agriculture based on the uses of pesticides, fertilisers, irrigation, mechanisation and the selection of high yield varieties has begun its globalisation process. Pesticides have become pillars of a worldwide agricultural system that promises secure and better yields, and economic growth. However, as alerts about the negative effects of pesticides were rising, and given the tightening up of regulation in Europe and United States since the 2000s,<sup>2</sup> the growth of pesticide use is slowing down in these regions. Growth in the market for pesticides is now

<sup>1</sup> G. Assouline, ‘L’évolution technologique de l’industrie des phytosanitaires: quelles interactions avec l’agriculture?’ *Économie rurale* 192–193 (1989): 42–48.

<sup>2</sup> BASIC, *Analyse de la création de valeur et des coûts cachés des pesticides de synthèse* (2021), [https://lebasic.com/wp-content/uploads/2021/11/BASIC\\_Etude-Creation-de-Valeur-et-Couts-Societaux-Pesticides\\_20211125.pdf](https://lebasic.com/wp-content/uploads/2021/11/BASIC_Etude-Creation-de-Valeur-et-Couts-Societaux-Pesticides_20211125.pdf) (2021).

occurring in the Global South,<sup>3</sup> in countries where people are more vulnerable to pesticides: market and uses are sparsely controlled; regulations authorise pesticides produced by companies based in the Global North but banned there; the number of people working in the agricultural sector is higher; Personal Protective Equipment (PPE) is not suitable or even not available; and infrastructures for managing empty pesticide packaging rarely exist.

This makes research on pesticides in the Global South essential. On the one hand, it is urgent to limit the health and environmental impacts of pesticides in this part of the world. On the other hand, health and environmental problems are ineluctably transnational and the result of power relations stemming from the history of colonialism, capitalism and modernity. Hence getting a broad view of the circulation of these substances in countries such as Cambodia is an ethical duty, so as to grasp the plurality of the globalised effects of these inventions of Western industrial societies.

There is little research investigating pesticides in the Global South from a social science perspective, though this is an expanding field.<sup>4</sup> On the specific topic of the market in pesticides in the Global South, little work has been conducted except for studies on the global pesticides complex that describe some global and local market dynamics in the Global South. Annie Shattuck, for instance, has analysed the re-structuration of the global market from a historic 'North to South' to a 'South to South' trade.<sup>5</sup> With other colleagues, she also highlighted the limits of FAOSTAT related to pesticide use across most countries and proposed another method to figure out the pesticide market flows.<sup>6</sup>

<sup>3</sup> A. Shattuck, 'Generic, growing, green?: The changing political economy of the global pesticide complex', *The Journal of Peasant Studies* 48 (2) (2021).

<sup>4</sup> E. Bureau-Point, 'La "vie avec" les pesticides au Cambodge'. *Lettre INSHS* 73 (2021)

<sup>4</sup> Ibid., 12.

<sup>5</sup> A. Shattuck, M. Werner, F. Mempel, Z. Dunivin and R. Galt, 'Global pesticide use and trade database (GloPUT): New estimates show pesticide use trends in low-income countries substantially underestimated', *Global Environmental Change* 81 (2023).

Ryan E. Galt<sup>7</sup> studied the political economy of pesticide residues in export-oriented fresh vegetables in Costa Rica and the political control of the circulation of illegal residues in exports. Others have analysed the issue of unregistered pesticides in Mali.<sup>8</sup> Hanna Andrea Rother studied the street selling of pesticides<sup>9</sup> and pesticide vendors in the informal sector in South Africa.<sup>10</sup> Aniket Aga studied the transactions between farmers and transnational agribusinesses at the village-level in India.<sup>11</sup> Despite such research, the dynamics of the pesticide market in the Global South are still poorly documented.

We contribute to this nascent field of enquiry and apply the theoretical and methodological framework of the anthropology of things<sup>12</sup> and the anthropology of pharmaceuticals<sup>13</sup> to the study of pesticides. We consider pesticides as objects that have a social life throughout a spatial and temporal trajectory during which they are made and remade. In line with the anthropology of pharmaceuticals, the life cycle of pesticides can be divided in five different phases: production, market, regulation, uses, waste and residue management.<sup>14</sup>

<sup>6</sup> R.E. Galt, *Food Systems in an Unequal World: Pesticides, Vegetables, and Agrarian Capitalism in Costa Rica* (Tucson, AZ: University of Arizona Press, 2014).

<sup>7</sup> S. Haggblade, N. Keita, A. Traoré, P. Traoré, A. Diarra and V. Thériault, 'Unregistered pesticides: Prevalence, risks, and responses in Mali', *Agricultural Economics* (2023): 1–15.

<sup>8</sup> H.A Rother, 'Falling through the regulatory cracks: street selling of pesticides and poisoning among urban youth in South Africa', *International Journal of Occupational and Environmental Health* **16** (2010): 202–13.

<sup>9</sup> H.A. Rother, 'Pesticide vendors in the informal Sector: Trading health for income', *New Solutions: A Journal of Environmental and Occupational Health Policy* **26** (2) (2016): 241–52.

<sup>11</sup> A. Aga, 'Merchants of knowledge: Petty retail and differentiation without consolidation among farmers in Maharashtra, India', *Journal of Agrarian Change* **18** (2018): 658–76; A. Aga, 'The marketing of corporate agrichemicals in Western India: theorizing graded informality', *Journal of Peasant Studies* **46** (7) (2019): 1456–76.

<sup>12</sup> A. Appadurai, *The Social Life of Things: Commodities in Cultural Perspective* (London-New-York: Cambridge University Press, 1986).

<sup>13</sup> R.S Whyte, S. Van der Geest and A. Hardon, *Social Lives of Medicines* (New York: Cambridge University Press, 2002).

<sup>14</sup> E. Bureau-Point, "'C'est comme mourir pendant que nous sommes en vie'".

As contextual relations and retroactions occur throughout pesticide biographies and influence to varying degrees their circulation and their effects on the living world, we assume that pesticides are not stable and universal but modifiable, transformable and dependent on circumstances. They are subject to translation processes through which their materiality, meaning and value are redesigned to facilitate their circulation. As defined by Anna Tsing, translation is not only related to language issues, but refers to operations by which the process of a world under construction is drawn into another.<sup>15</sup> It is therefore necessary to follow objects, as closely as possible, in the continuum of their sinuous course in order to understand how they are being defined, transformed and experienced at the different phases of their social lives.

While only the biography of pesticides can reveal their complexity, one study cannot apprehend exhaustively the totality of the complex assemblages produced in the long trajectory of pesticides. Our study focuses on a specific phase of their ‘biography’: the market. However, as we will see, each phase is not a closed entity. In order to document the market, we look at other phases such as regulation, uses and production. Looking at the market leads us also to the field of anthropology of capitalism. We bring to light the local expression of capitalism and describe how operations of translation make the market flourish and contribute to pesticide use.<sup>16</sup> This paper will also highlight how studying local market dynamics can bring to light multi-level data, ranging from the local marketing strategies to the transnational manufacturing of tailored-made pesticides. We will highlight the development of multiple links of inter-dependence between actors that make commercial exchange possible. After a brief presentation of the history of the pesticides market in Cambodia,

Le problème des pesticides dans le quotidien des agriculteurs au Cambodge’, *Emulations* (Forthcoming 2024).

<sup>15</sup> A.L. Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton: Princeton University Press, 2015), p. 106.

<sup>16</sup> Z.A. Goldberg, ‘Development through commodification: exploring apple commodity production as pesticides promotion in the High Atlas’, *Agriculture and Human Values* **39** (2021): 663–82.

we describe three specific webs of relations with pesticides which configure and fuel the pesticides market from local to transnational: the relations at farmer level, at petty retailer level and at the level of field promoters working for pesticide companies.

The study was conducted between November 2021 and December 2022 in a specific district of the Upper Mekong delta considered as one of the most productive agricultural regions in Cambodia. The study area is about 25 square kilometres and is located fifty kilometres from Phnom Penh and about fifteen from the Vietnam border. It stands at a strategic location for selling fresh cultivated products to the capital city as well as accessing pesticides and other cultivation technological packages from the neighbouring country.<sup>17</sup> This area forms a mosaic landscape, crisscrossed by *prek*. These are earthen channels that are perpendicular to the main river and bring water and sediments to the floodplain.<sup>18</sup> In these fertile lands, farmers can grow several crops cycles per year (vegetable, corn, rice, fruit trees, etc.). They own on average less than two hectares. The fieldwork involved interviews and participant-observation with 25 farmers. In order to characterise the pesticide applications, we conducted a detailed follow-up of pesticides used by twelve of these farmers. Every month, one of the authors (Sreytouch Heourn) visited the farmers and recorded the pesticide packages we asked them to keep after they used them. More specifically, we registered the following information: commercial name of the product, name and concentration of active ingredients, manufacturer, distributor, place of supply, price, quantity used, method and reason of application. This process was essential as it is nearly impossible to have an accurate vision of farmers' practices through interviews. Eight petty retailers who supplied farmers in the case study area were interviewed and we listed all the pesticides sold by five of them (taking pictures of all the pesticides

<sup>17</sup> To protect the subjects' and companies' privacy and confidentiality, the name of the district is not disclosed. We use the name 'District 1' to refer to our study area.

<sup>18</sup> J.P. Venot and C.B. Jensen, 'A multiplicity of *prek(s)*: Enacting a socio-natural mosaic in the Cambodian upper Mekong delta'. *Environment and Planning E: Nature and Space* 5 (3) (2021): 1446–65.

stored in their shops). Interviews with marketing agents of companies<sup>19</sup> working in the study area were also conducted.<sup>20</sup> Data was collected in the framework of an interdisciplinary project<sup>21</sup> bringing together social science, environmental science, and health science to understand the relationships between hydrological dynamics of the deltaic floodplain and health risks associated to contaminants (bacteria and pesticides) and vectors (mosquitoes). Complementary anthropological data collected earlier (2018–2020) in another project entitled ‘Living with Pesticides in Cambodia’<sup>22</sup> is also used in the analysis.

## **History of the Pesticides Market in Cambodia**

In Cambodia, chemical pesticides spread first during the French protectorate (1863–1953) in cotton and rubber plantations. Until the mid-1980s, pesticides were used in small amounts and specific locations. Khmer peasants ensured their subsistence with small farms, focused on rice cultivation, without resorting to chemistry. The Khmer Rouge regime (1975–1979), based on an agrarian utopia, pushed this ancestral organisation to the extreme by transforming the country into a gigantic labour camp centred on working the land. Humans were seen as the main tools for working the land. With this forced collectivization, a quarter of the population died of exhaustion, famine, disease, mass executions or torture. The end of the Khmer Rouge regime gave way to a Vietnamese-led government (1979–1989) marked by a collectivist farming system. It was not until the Paris Agreements, signed in 1991, that a peace process was

<sup>19</sup> To protect their anonymity, the names of the companies have been changed.

<sup>20</sup> Eve Bureau-Point and Jean-Philippe Venot developed the methodology of the study. EBP together with Sreytouch Heourn conducted interviews with industry actors, petty retailers as well as farmers and SH conducted most of the data collection regarding the detailed follow-up of pesticides uses.

<sup>21</sup> Wat-Health project (Fond de Solidarité Pour les projets Innovants, June 2021- December 2022).

<sup>22</sup> Eve Bureau-Point (Fondation de France-2018-2020).



truly established. The country received massive international aid for reconstruction. The planned economy was abandoned in favour of a market economy and the country gradually opened up to international trade and liberalism.

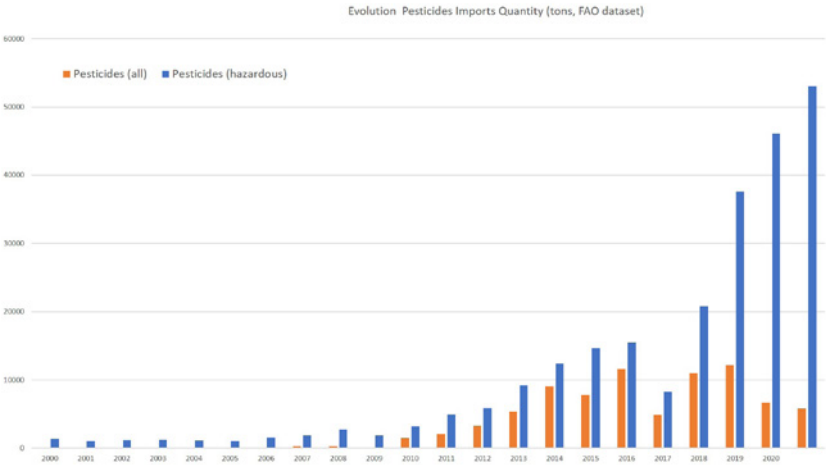
With the opening of the market, the principles of the ‘green revolution’ (high-yielding seed varieties, irrigation, mechanisation, chemical inputs) took hold in the country and Cambodia embraced agricultural intensification policies, producing staple crops such as rice, cassava and maize as well as high value crops such as pepper, fresh mango and raw palm oil to export to neighbouring countries and beyond. Free trade agreements pushed the production of high-yielding and export-oriented crop varieties. The Cambodian agriculture sector became embedded in a global political economy, with subsistence farming losing importance. Gradually, many farmers went from one rice crop to two or three per year. As soils were left fallow less frequently, fertilisers became necessary to counterbalance loss in fertility. With this intensification process, plant diseases, weeds, populations of rodents and insects increased, as did the need for chemical inputs. More and more retailers opened in the country, even in the most remote provinces. Pesticides became easy to access. Cambodian farmers value their immediate effects – they can produce more with less labour. They became increasingly dependent on pesticides. Despite their limitation,<sup>23</sup> FAO statistics on pesticides imports show this increase (Figures 1 and 2).

Cambodia does not produce synthetic pesticides. Vietnam, Thailand and China are the largest suppliers of pesticides in the country.<sup>24</sup> ‘South–South’ trade networks are booming, especially for the production of pesticides that are no longer protected by patents. More and more Chinese firms produce the active ingredients themselves, while others are sourcing them from large agrochemical groups and repackaging them.

23 Shattuck et al., ‘Global pesticide use and trade database’.

24 S. Thong, ‘The Need of Law and Regulations on Pesticides Management Guideline to Farmers and Businessmen for Harmonizing Agriculture in Cambodia’, Master’s thesis in public policy (Korea, Yeungnam University, 2017).

**Figure 1. Evolution of pesticide imports in Cambodia (2000–2021)**



Source: The authors, based on FAOstat.

**Figure 2. Increase of pesticide companies and registered pesticides between 2008 and 2020**

	2008	2013	2018	2019	2020
Number of registered companies	12	28	87	92	140
Number of registered pesticides (Commercial products)	114	422	2440	2679	2648

Source: data collected at DAL office.

Even though these substances are toxic, their market in Cambodia developed before regulatory mechanisms were put in place by the state and its international partners. Until 1999, there was no regulation for pesticides. The registration of pesticides started in 2002, in accordance with Sub-Decree 69 (enacted in 1999) on the standards and management of agricultural products. This Sub-Decree was the first legal mechanism for pesticide control (registration, import, sale, labelling, packaging, quality, storage and disposal market). It banned the use and trade of pesticides classified by WHO as ‘very or highly dangerous to human health.’<sup>25</sup> However, the law was poorly enforced and there were virtually no regulatory constraints on the pesticide market. In 2012, the law on the Management of Pesticide and Fertilizer was adopted as a legal instrument to control the use and trade of pesticides in the Kingdom of Cambodia. The Ministry of Agriculture, Forestry and Fisheries (MAFF) is responsible for the management of pesticides in the country, through the Department of Agricultural Legislation (DAL). Until 2023, this department has been responsible for the registration of pesticides, legislation, labelling, and monitoring products in circulation and updating a list of banned and restricted products.<sup>26</sup> Since 2013, their regulatory efforts have been guided by the ASEAN Pesticide Regulation Practice Guide aimed at harmonising practices in the region. Under MAFF, there are other initiatives that relate to pesticides. The General Directorate of Agriculture (GDA) has implemented Integrated Pest Management programmes since 1993 with the support of FAO.<sup>27</sup> These programmes are notably to raise awareness and codes of ‘good practice’ for pesticide use. However, Cambodia faces many issues relating to pesticide management and law implementation (such as illegal imports from the neighbouring countries). The pesticides market is not closely monitored, nor it is really controlled, and the

<sup>25</sup> Ibid.

<sup>26</sup> In 2019, 171 active ingredients were banned, 51 were restricted (DAL).

<sup>27</sup> Information on methods of controlling insects, diseases and fungi using synthetic chemistry, according to a so-called ‘reasoned’ use that would cause minimal disturbance to ecosystems.

increase in use comes together with burgeoning health and environmental issues that are poorly documented. The analysis of interdependent relations between farmers, petty retailers and companies in relation to the sale of pesticides that we discuss in the following sections contributes to shedding light on these issues.

## **Farmers' Relations to Pesticides: From Translation Processes to Singular Practices**

The farmers surveyed during the research cultivate between one and six plots in which they grow one to five different crops in rotation (rice, maize, mung bean, vegetables,<sup>28</sup> fruit-trees). Those who grow vegetables use the highest number of products (up to eighteen products for a single crop cycle on a given plot) while rice and maize, and fruit-tree farmers tend to use fewer products (between six and nine on average per crop cycle). On average, farmers apply pesticides three to six times per cultivation season if they cultivate rice or maize and fruit-trees. Farmers spray vegetable crops ten to twenty times per season (that is, twice a week or every two days). In each application, farmers mix different products (most notably several types of fungicides and insecticides). These mixtures are made of three to five products on average when applied to rice or maize and fruit-trees while vegetable farmers mix about ten products on average in each application (and sometimes up to eighteen). Farmers can apply three types of herbicides in the same application. Others sometimes mix the same active ingredients (resulting in overdosing), or pesticides that are meant to have the same effect on the target.

These intensive uses result from a spatial and temporal process of familiarisation with pesticides. Farmers all remember the first retailers who opened their shops in the area at the beginning of the 1980s, and promoted products with labels written in a foreign language (in this area, Vietnamese). At the time, farmers accessed these obscure objects through one or two petty retailers. A vernacular way

<sup>28</sup> Chili, tomato, eggplant, long bean, cucumber, bitter and winter melon.

of naming and classifying pesticides, distant from regulatory knowledge, then, developed in the local community.

The term 'pesticide' has been translated into the Khmer language as *thnam gimi* (*thnam* for medicine, *gimi* for chemistry) or *thnam kaksikam* (*thnam* for medicine, *kaksikam* for agriculture). The translation by the term 'medicine' is meaningful since it emphasises the care (of plants) rather than the toxic action of pesticides (on living organisms). In this way, it contributed to the positive image of these techno-chemical objects and to the expansion of a chemical agricultural model. If we look at the other naming and classifying processes, the term *thnam* is used as a general prefix for differentiating different types of pesticides. The term 'insecticides' is translated by *thnam satlaat* (medicine - insect), herbicides by *thnam smaow* (medicine - grass), fungicides by *thnam chomgueue* (medicine - disease), molluscicide by *thnam kjourng* (medicine - snails), etc. Other terms, less common, have emerged, such as *thnam av pleing* (medicine - raincoat) which refers to products used for protecting crops from the rain. Farmers also classify pesticides according to their strength or weakness (*thnam klang* - strong medicine/*thnam khsaaoy* - weak medicine), their price<sup>29</sup> (*tlai*-expensive or *ot tlai*-not expensive), the odour they give off (*thnam klen* - odour medicine/*thnam ort klen* - odourless medicine), or the material form in which they come (*thnam kan chop* - package medicine; *thnam teuk* - medicine water; *thnam msaow* - medicine powder).

Since some farmers feel that products bought in Cambodia have been, at times, of poorer quality than those sold in neighbouring countries (Thailand, Vietnam), they sometimes ask products from a specific country. In the vast universe of circulating pesticides, when farmers want a particular product, they often describe a characteristic of the packaging (a number, an illustration, a trade name), which has sometimes become a popular product name such as '*thnam 48*' (for glyphosate), '*Kbal Tao*' (Lion-Head for abamectin), '*Nominee*' (for bysphyribac), or they ask directly some active ingredient which

<sup>29</sup> While the same active ingredient may be marketed in around fifty different formulations (e.g. glyphosate), quality and price can vary considerably.

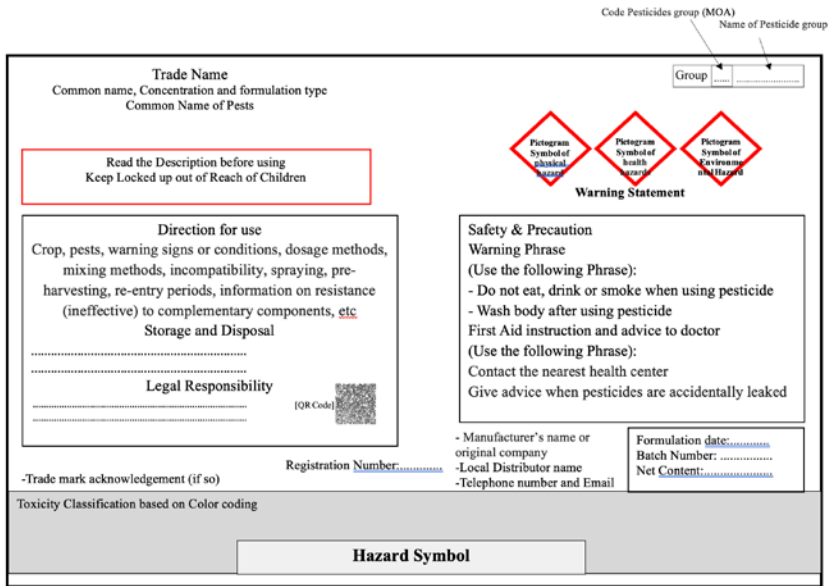
has become popular, such as *Décadé* (for 24D).<sup>30</sup> However, those cases are not frequent. When in need of pesticides, farmers commonly explain to petty retailers the problem they face by naming the insect, disease or weed that affects their crops, the state of development of the plant and how it is affected (spots, holes, etc.). Sellers then generally choose a specific product, among many others, for the farmers, and control the market.

Farmers always change their crop rotation according to the crop market price, which fluctuates. They tend to cultivate the crop that fetches the highest price, but it is not rare that, by the time of harvest, the price has dropped. They alternate between successful seasons and seasons in which they lose money. Climate change is also making working conditions unstable and affecting their crops. Since the intensification of agriculture, they face the loss of soil fertility, and the resistance of living organisms to pesticides (insects, bacteria, weeds...). One farmer we interviewed said: 'For the herbicide, before, we never used as much as 5 litres, 1 litre was more than enough, but now everyone is using 5 litres of herbicides.' Since in our study area living organisms acquire resistance to the products used after a few years, it is widely accepted by the interviewees that changing products is an effective way of preventing attacks. After increasing the quantity of pesticides they apply, farmers generally change the products they use. To adapt to these fast changes, farmers are then in close and constant interaction with pesticide sellers in order to access pesticides. The latter give advice related to application methods, mixing products, quantity to apply, etc. As the number of commercial products on the market increases year by year,<sup>31</sup> we can easily understand why farmers do not acquire all the regulatory knowledge related to each specific product. In these constantly shifting farming conditions, farmers need great technical expertise, not only focused

<sup>30</sup> 24D is the common name of 2,4-dichlorophénoxyacétique acid. It is used in the composition of herbicides.

<sup>31</sup> In 2020, 2,648 commercial products were registered in Cambodia which contained 336 different active ingredients (i.e. many commercial products contain the same active ingredients).

**Figure 3. Government norms for pesticide labelling.**



Source: *Prakas*<sup>31</sup> on guidelines for labeling and the model of pesticide information, Ministry of Agriculture, Forestry and Fisheries, 2018.

on pesticides, which they find in interaction with sellers. One farmer said: ‘The petty retailer not only provides the knowledge or technique of using pesticides but also explains how to choose the variety for cultivation.’







We also have to keep in mind that if farmers acquire knowledge only through the labels of registered products, they would hardly be in a position to put the knowledge highlighted into practice (warning statement, mode of application...) (Figure 3).

For example, when mixing between two and eighteen products, how can farmers follow the diverse safety rules written on the differ-

<sup>32</sup> *Prakas* is an official term in khmer for ‘official declaration’.

**Figure 4. Pictograms and warning hazard symbols.**

**a. Pictograms and Warning Hazard symbols**

	<b>Corrosive</b>		<b>Environmental Hazard</b>
	<b>Irritant</b>		<b>Acute Health Hazard</b>
	<b>Acutely Toxic</b>		<b>Chronic Health Hazard</b>

Source: *Prakas* on guidelines for labeling and the model of pesticide information, Ministry of Agriculture, Forestry and Fisheries, 2018.

ent labels? Some products may be irritant, others constitute major health risks, others are hazardous for the environment, others again are dangerous for animals (Figure 4).


That farmers do not know all existing products and their effects is not due to a lack of capacity, but rather to the fact that such knowledge cannot be valued and followed, given application frequencies, the common mixing practices observed, and also the rapid transformation of the products found on the market.

Moreover, we can observe North/South asymmetries, which raises an ethical question when looking at the PPE recommended for farmers in Cambodia. For instance, if we compare the PPE recommended for the use of the same active ingredient in France and



**Figure 5. Private company selling PPE in France.**

**Gamme AEGIS**



**Certifiée EN ISO 27065 niveau C2**  
 EPI REUTILISABLES DE CATEGORIE III DEDIES A LA PROTECTION VIS A VIS DES PRODUITS PHYTOPHARMACEUTIQUES ET CONFORMES AU REGLEMENT 2016/425/CEE  
 Examen CE de type et contrôle annuel de la production selon le Règlement réalisé par : CTC (Organisme Notifié n° 0075), 4 rue Hermann Frankel 69367 LYON Cedex 07 - France  
 PROTECTION POUR LES TRAVAILLEURS ET OPERATEURS PENDANT 1 CAMPAGNE  
 Nombre de cycles d'entretien (lavage + séchage) : 30  
 60% coton - 40% polyester

Ces EPI vestimentaires sont dédiés principalement à la protection du corps des opérateurs / travailleurs du monde agricole exposés à de faibles quantités de produits phytopharmaceutiques et peuvent être utilisés sur les phases de travail suivantes :

Pour la phase d'application :

- > Tracteur avec cabine fermée, pressurisée et filtrée
- > Tracteur sans cabine avec une pulvérisation vers le bas
- > Avec une lance pour les cultures basses, sans contact intense avec la végétation

Cambi-AEGIS		VIERA AEGIS		PARTAIN AEGIS	
taille	taille	taille	taille	taille	taille
ENX	S	MS	S	PRO	S
ENM	M	MSM	M	PROM	M
ENL	L	MSL	L	PROL	L
ENXL	XL	MSXL	XL	PROXL	XL
ENXXL	XXL	MSXXL	XXL	PROXXL	XXL

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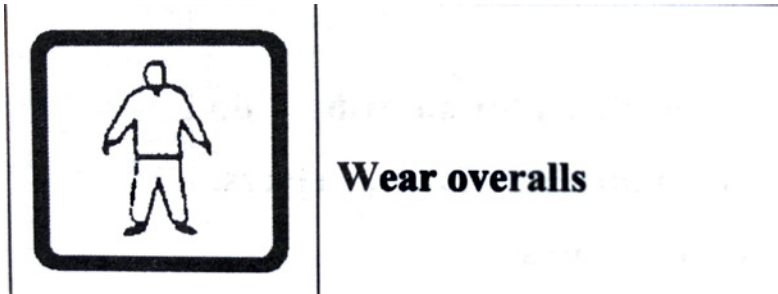
Cambodia, standards of application are significantly different. The standard of use for Byspiribac is a case in point. In France, users have to wear ISO norms clothes such as those shown in Figure 5 (from the website of Bayer.fr).

In Cambodia, for the same active ingredient, the standard is to ‘wear overalls’ such as illustrated by the following pictogram (Figure 6).

In practice, when they apply pesticides, Cambodian farmers commonly wear long and thick normal clothes, but never the full chemical protection suits recommended in Europe.<sup>33</sup> Also, some

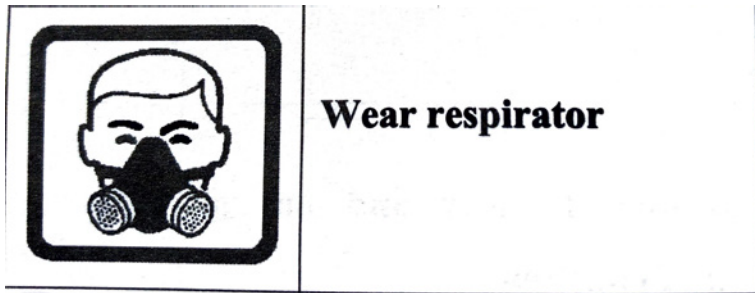
<sup>33</sup> Comparison with regional countries will be done in further research. We choose to compare with European standards because Europe stand as the his-

**Figure 6. Pictogram indicating the use of overalls when applying pesticides.**



Source: *Prakas* on guidelines for labeling and the model of pesticide information, Ministry of Agriculture, Forestry and Fisheries, 2018.

**Figure 7. Pictogram with masks with filter cartridges**



Source: *Prakas* on guidelines for labeling and the model of pesticide information, Ministry of Agriculture, Forestry and Fisheries, 2018

safety standards that can be found on labels of products sold in Cambodia are very hard to comply with. For example, masks with

torical producer of pesticides and the holder of stricter regulations influencing international norms.

filter cartridges illustrated in Figure 7 are required for the use of many products but they are simply not accessible on the market.

Some sellers tried to sell these masks but farmers had difficulties using them; they quickly disappeared from the market. Moreover, while in many European countries users have access to regulated channels to recycle empty pesticide packages,<sup>34</sup> in Cambodia such a channel doesn't yet exist.<sup>35</sup>

This section on farmers' relations with pesticides has highlighted the translation processes (naming processes, mixing practices, minimisation of safety information and equipment, uneven regulations) which have contributed to make pesticides more fluid in the Cambodian context. Paying particular attention to local names and classifications of the industrial object reminds us that an ethnoscience approach is central to accessing local understandings of pesticides, and also to the local language of market interactions. It sheds light on underlying power dynamics driving the market. Even if farmers accumulate knowledge on pesticides, pesticide sellers keep control over pesticide circulation and farmers remain reliant on the sellers. Even if some risks related to the use of pesticides have become obvious to farmers through their everyday experience, pesticides are considered unavoidable to sustain their livelihoods. As Aniket Aga illustrated in India, petty retailers stand not only as merchants of pesticides but also 'merchants of knowledge'.<sup>36</sup> In this context of fast changing farming situations, pesticides are changing quickly, and farmers stand at the end of a supply chain along which the techno-chemical knowledge associated with each product is changing constantly and emerges only partially, especially in relation to the question of toxicity.

<sup>34</sup> According to colleagues working on this, efficiency of European recycling systems remains limited too (Nathalie Jas and Giovanni Prete).

<sup>35</sup> Farmers burn the pesticide waste in their field or throw it into rivers and/or canals.

<sup>36</sup> Aga, 'Merchants of knowledge'.

## Petty Retailers: From Running a Business to Knowledge Control

All farmers interviewed purchased most of their products from a single petty retailer located less than three kilometres from their home.<sup>37</sup> Farmers buy pesticides as and when needed, just before use, close to their home. They consider storing pesticides at home to be risky. They only store the products they have not used fully, generally hanging them up high in a plastic bag.

*We can observe big activity in the 'depot'<sup>38</sup> located along the main road. Farmers are moving in, others are moving out. This is the peak of the dry season, insects and disease threaten the development of their crops. Farmers are coming regularly to their neighbourhood shop to buy fertiliser, insecticides, fungicides, herbicides, molluscicide, rodenticide, growth accelerator, stimulant or micronutrients. The depot is an overhang of sheet metal adjoining the house of the input seller. Cardboard boxes are stacked everywhere, some are opened, from which sellers take out some pesticides for clients. Other products are stored in dedicated shelves. The seller refills his stock on a need basis, informing the companies when his stock runs low. Pesticides are then delivered to the shop. Large posters promoting particular products are hung on the big walls. A calendar given by a pesticides company is hung near the boss' desk. One staff member is helping the boss in selling pesticides. While the latter is collecting payments, the seller listens to the demand of the farmers and prepare assortments of products. One of the children of the boss is playing on his phone while the other one is climbing the bags of fertiliser. Many chemical smells are mixed together. Odours become stronger or weaker depending on where you stand in the shop. A famous trinket cat (Maneki-neko) moving its arm is placed on the desk to bring luck to the business owner.*

Excerpt from the ethnographic diary, 20 July 2021.

To open a pesticide shop, one needs to have capital, we were told by a petty retailer who opened a shop in 2017. In his particular case, he had three sources of capital: his own savings, money he borrowed from his parents in law, and a loan from a Micro Finance Institution

<sup>37</sup> We also identified purchases in other retailer shops, or other means of supply such as direct sale in the village by companies (at farm gate, or at a villager's or village chief's house), internet purchases (Facebook), and illegal purchases across the border, but these are less common.

<sup>38</sup> In the local vernacular, petty retailers are called 'Depot' (French word).

(MFI). For two other long-established petty retailers who opened pesticide shops in the area at the beginning of the pesticides market in the 1980s, social capital proved to be more important than financial. A well-known success-story concerned one of them: he was a moto-taxi driver, opened a pesticide shop and became a rich man with a big villa. The skills described were: speaking Vietnamese, having business acumen and developing commercial activity with pesticide companies in Vietnam. One of these long-established petty retailers said:

In the beginning, in 1986 when I opened the shop, I knew nothing about pesticides, also I did not have any specific skill relevant to agriculture and I did not attend any training. I could recognise the active ingredients by learning and following what companies in Vietnam told me. I learned a lot from Vietnam because every company from which I ordered products invited me to join training every year in Vietnam, for 3 to 4 days. I obtained knowledge related to new pesticides or active ingredients, and about appropriate use of pesticides on crop problems. The main aim of the workshops organised by those companies was to introduce their new products to their distributors. Only 2 hours sitting in the training, then we had a visit tour programme that brought all the participants to visit the vegetable or crop farms in Vietnam.

This interview excerpt highlights the closed ties petty retailers have developed with Vietnamese pesticide sellers. Such ties still exist today, but with the increase in companies operating in Cambodia, they have become more diverse and reach out to other countries too (Thailand, Korea, China).

Like in the case of farmers we discussed in the previous section, this interview excerpt points out that selling pesticides is directly linked with accessing to knowledge. One petty retailer mentioned: 'the reason why my clients still buy the pesticides from my shop is to get not only the quality products, but good advice and new techniques from me'. This knowledge construction process involves different sources. Petty retailers are all embedded in a different web of relation and influence, they have different strategies to learn about pesticides, such as watching video on YouTube or searching for information on Internet. Some have undertaken occasional training

from NGOs related to agricultural practices (marketing, choice of varieties, insects and diseases, techniques of using fertiliser and pesticides, ...), while others have read scientific articles written by chemists, and yet others have relatives who graduated in agriculture in Cambodia and/or Vietnam and from whom they learn. Petty retailers also mentioned that they followed a three- to five-day training programme at the district department of Agriculture. Since 2014, this training has been mandatory to get a licence certificate for their business (valid for three years). However, they explained that they didn't get a lot of information during this training. For one petty retailer interviewed this is 'because the trainer just talks in general and very fast so it is hard to catch up with the lesson'. Another explained that, in his view, this training is not important because it focuses on business law and what input sellers have to pay to continue their business (a tax of 37,000 riels<sup>39</sup> a month) but it still matters to fill the licence application forms, which they need to get signed by the commune and village chief before they can officially operate their business. Since five inspectors are dedicated to pesticide control in the province, even though it is considered a mere formality, they follow the process.

The knowledge they value is that acquired through an entangled process from farmers and field promoters working for pesticide companies visiting their shops. Like farmers, the petty retailers are aware that the objective of field promoters is to sell their products. However, the information circulating – as biased as it may be – remains crucial to run their business. Petty retailers need to follow closely the fast-changing farming activities of their clients, the cultivation problems they face at any moment in time and the pesticides they have applied. They have to acquire the capacity and skills to choose the products promoted by commercial agents that are adapted to their clients' situation (in relation to price, formulation, efficacy, packaging). Some select products according to brand reputation,

<sup>39</sup> The riel is the official currency of Cambodia. Due to its weak value (4000r = USD 1, depending on the market rate), United States dollars have been in widespread use since the 1980.

provenance of the pesticides, or the packaging of the product. Once the products have been selected, they need to try them with their clients. One input seller explained:

we need to promote and study the quality as well. Sometimes I experiment on my farm, sometimes on others' farms – with the farmers who are close to us. When a farmer comes to buy from us, we add that pesticide for him, without him actually knowing about it and then we try to follow up with him, asking for information after he used it.

When petty retailers sell new products, they regularly ask for farmers' feedback in order to see if the product has met their expectations. Farmers' experience brings them specific knowledge about the adequacy of the product for the problems faced locally. Some of the petty retailers also have family farms of their own where they test the pesticides and observe their effects in the plots. The offer of pesticides depends also on the discourses and promise of field promoters (discount programmes, type of gifts...). Pesticide knowledge is then constructed socially in these day-to-day and back-and-forth processes, linking farmers, petty retailers and field promoters promoting their products.

As the competition between petty retailers has become tough (at the time of the study, 46 retailers had shops in the district), running such a business requires developing a general knowledge about the competitors and setting oneself apart, offering what others don't. Proposing a selection of pesticides to their clients, as described above, is such a strategy, to keep customers and encourage their loyalty. The following excerpt illustrates the strong competition:

Before, I had 70% of clients from N village, but it has decreased to 20% now. It is because of the increasing number of shops selling pesticides and because I did not allow my clients to buy on credit, then farmers irregularly come to my shop, they change to a shop that allows them to pay on credit. A few shops stopped soon after opening because of low capital, low knowledge, no precise goal, and a lot of customers buying on credit.

Developing friendly relationships is described as part of the skill-set needed for selling pesticides. As is generally the case, the motto

‘the customer is king’ appears as a basic principle in the business of selling pesticides. A female petty retailer said: ‘when the farmers come, I always welcome them very well. I sometimes even have lunch at 3 pm or 4 pm, because I need to talk to my farmers first. Each farmer is like our sibling. We need to talk to them for hours.’ Another key strategy to keep clients is to supply pesticides on credit, as illustrated in the following excerpt:

Mostly, the customers that owe me are the villagers here, or the people living near my house. I know their origin well. For example, I know that the persons that owe me, they have their own land, they have their house; however, it takes them times to pay us back, but we also don’t know what to do because farmers always face the problems, so I just try to facilitate it with them. It’s kind of sharing and pitying them as they cannot get any yields, so I just let them owe me so that they can get some pesticides to continue doing their farm works. Most farmers are good, whenever they have money, they will pay us. Farmers have to tell us when they have problems or if they need to buy something else. Example, some want to buy ko-yun,<sup>40</sup> so they keep that money to buy ko-yun, but at the end, they still pay back to us. But there is one case, he has 15 hectares, he never fails in planting rice, but maybe because he loves his money so much, he doesn’t pay us. And that time, the debt was \$1500.

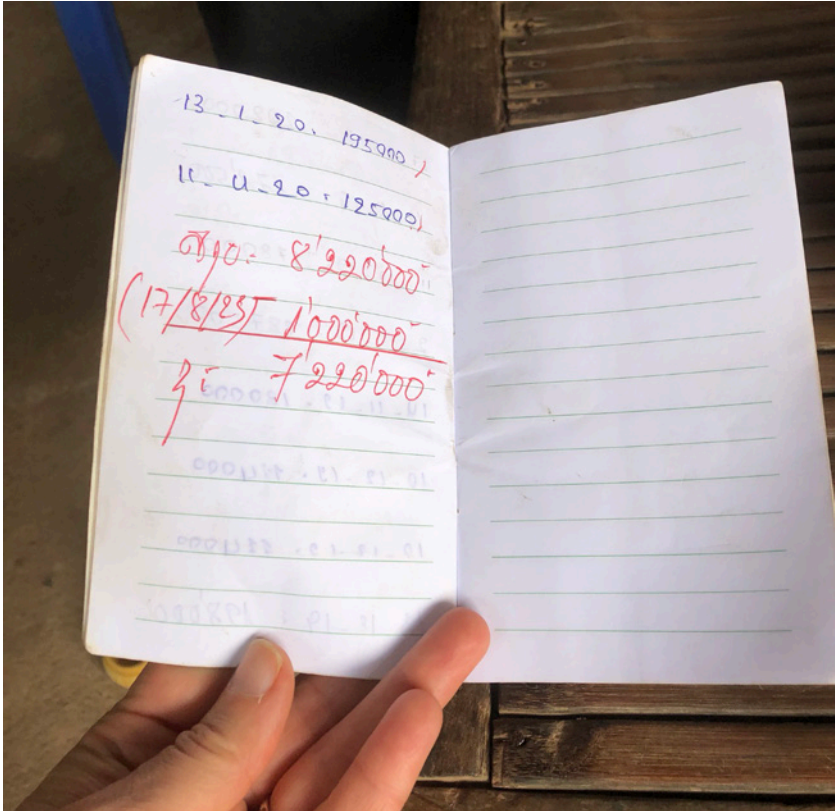
Some allow farmers to pay back the pesticides after one month, after the harvest or even after one year, or more, according to their financial capacity, the quantity of product bought and the decision of the petty retailer. ‘90% of my customers buy on credit and pay back after harvesting, and the price is 10% higher’, said one of the petty retailers. Petty retailers provide each farmer with a small booklet in which they note what s/he bought on credit and when (Figure 8).

Selling pesticides is not solely about selling an object, it is also about updating one’s knowledge of day-to-day farming practices. Like farmers, petty retailers do not necessarily acquire the regulatory knowledge associated with each specific product. The safety measures established by the industry and regulatory authorities operate only partially in this space of interactions. The priority is to sell and find products adapted to the financial resources, packag-

<sup>40</sup> Tractor-driven carts.



**Figure 8: Model of booklet used by petty retailers**



Source: Author, 2023.

ing preferences and crop problems of the clients. One petty seller for instance said: 'being a petty retailer is harmful, as much as for farmers, because we also touch the pesticide bottles. However, we are always careful by wearing masks, and clearing hands after touching'. General knowledge circulating regarding occupational toxicity recalls the idea widely spread that if pesticide users and sellers apply all the technical recommendations made by companies and regulatory authorities, they will be adequately protected. The wife of a

petty retailer we interviewed said: 'I also worry about my husband. However, he is being careful when he is touching and even stocking pesticides. He is also careful to control their smell, and the pesticide packages are better than before'. Like farmers, input sellers develop their own prevention strategies to protect themselves: 'Some substances can be kept in the open space. But for the substances that have smell, we keep them at the back of the house. When farmers come and they need it, then we go to take it for them. For the pesticides that have no smell, it's no problem if we put it near us. But yes, it is still poison, just a little'. Another staff member of a petty retailer explained: 'Some Depot have knowledge about that so they use the skin of the orange, coal, or pineapple to reduce the smell of pesticides.' 'Good practices' in the use of products are locally defined, not with the representatives of the chemical industries and the regulatory agencies. We can see how the safety data attached to each product reinforce the myth of their controlled use rather than providing effective protection. Though it is crucial, official safety data disappear behind other priorities determined by the local context.

This section has shown how petty retailers are reliant on commercial agents and farmers to run their business. On the one hand, they need close interactions with farmers to follow their fast-changing farming situations and try out the products, on the other hand they depend on commercial agents promoting pesticides in their shops. These intertwined processes have the effect of tailoring the pesticide market to the local situation. To fuel the sale and consumption of pesticides, petty retailers search for local efficiency of the product, packaging adapted to farmers practices, etc. They sell pesticides in their own ways to satisfy their clients and differentiate themselves from competitors. They also use diverse strategies that make farmers reliant on them (such as selling by credit, maintaining a guardian of knowledge role...).

## The Field Promoters: Intermediaries between Farmers and the Transnational Market

*Phirum, graduated with a bachelor degree in agronomy, has worked as a field promoter for Magma<sup>41</sup> since 2020. He has been trained by the marketing manager of the company two to three times per year about how to recognise the products of the company, how to promote them in the field, and about pesticide uses. He also learns by doing research by himself on YouTube and from other staff. He is in charge of 3 districts and he usually goes to the field two to three days per week to promote the products at key moments of crop cultivation. For example, before planting, he goes to promote herbicides. After, and until pre-harvesting, he promotes insecticides and fungicides. In district 1 (our case study), he goes to the field every week because the farmers are farming all the time. During promotion at depots, he provides information about the list of chemical products sold by the company and introduces discount programmes. He also reports about farmers' problems and about the market price of pesticides because the price can change three times per year according to the increase and/or decline of the raw material prices on the global market. He is also in charge of taking orders from the depots. He received a salary of 250\$ during the probation period and now 320\$, plus medical insurance of 200\$ per year. The biggest depots order three times per month on average (around 3000\$ per month), a minimum of fifty boxes and a maximum of 150 (Figure 9).<sup>42</sup> The smaller depots order ten to twenty boxes. For delivery, the company asks for the phone number of a taxi that the depot fully trusts, then send the products through those taxis and the taxi's fee is paid by the company. During promotion with farmers, he organises meeting and also visits farmers directly in their fields and asks about the cultivation problems, and does experimentations. For example, he proposes to mix a selection of pesticides adapted to the farmers' crop situation, and he comes back three days after to inspect the results. He also explains about protective equipment such as wearing mask, gloves and boots. He says that the increase in number of companies in Cambodia has caused a lot of competition. It is too much for the demand. To stay competitive, he works closely and ethically to attract both local input sellers and final users. To let them know and believe in the company's products, he says they develop a clear marketing strategy such as: update the new label, propose discount programmes for customers, promote directly in the field, propose good pesticides packages which are not torn or leaking, even smelling when they are in the users' hands. The problem is that many other companies sell the same active ingredients.*

Excerpt from the ethnographic diary, January 2019.

<sup>41</sup> Names of companies have been changed in order to protect anonymity.

<sup>42</sup> A box can contain between 10 to 30 bottles, or between 20 to 300 sachets.

This excerpt highlights how field promoters working for pesticide companies are also playing a key role in the construction of a tailor-made market in pesticides adapted to the situation of local farmers. These intermediaries are embedded in a tight web of relations involving farmers, petty retailers and companies based in Cambodia and abroad.

The main office of the company of this field promoter is located in Phnom Penh, close to the company's pesticide warehouse. The company opened in 2001 and has an importation and distribution license in Cambodia. The company imports products from a parent company based in Thailand. In Thailand, the parent company itself imports raw materials from different countries (China, Japan and Germany) and manufactures final products. Transportation is done

**Figure 9. Boxes of pesticides**



Source: Author, 2022, 2023.

**Figure 10. Field promotion**



Source: Author, 2019.

**Figure 11. Pesticide promotion on rickshaw**



Source: Author, 2023.

by ship. It takes from one to three months, depending on checks and control difficulties encountered. In Cambodia, the company has around fifty staff (such as chief officer, sale manager, sale manager assistant, administrative staff, accountant, logistic manager and assistant, marketing manager, field promoters). Among them are seventeen field promoters working in the provinces. The company recruits people with a background in agriculture as staff to work closely with depots and farmers. All the field promoters we met graduated from state agricultural universities, as observed by Aga<sup>43</sup> in India. They were unsure of where the raw materials came from. 'It may be originally produced in China or also imported from the

<sup>43</sup> Aga, 'Merchants of knowledge'.

**Figure 12. Field advertisement**



Source: Author, 2019.

other countries’, said one of them. Field promoters are in charge of promoting their company brand and products. All kinds of promotion activities are organised from small towns to remote villages. In small towns, products are sometimes advertised on rickshaws for a small fee (10\$ for three months, for example: Figure 11).

They also stick advertisements along the paths crossing farmers’ fields, as shown in Figure 12.

Field promoters generally wear t-shirts with the logo of the company. They also distribute some of these to farmers so the latter become de-facto promoters of the products in their daily living. They distribute calendars to petty retailers and farmers, as well as booklets with the list of the company’s products and related explanations (Figure 13). Signs of such aggressive advertisement campaigns are everywhere in the Cambodian countryside.

### Figure 13. Field advertisement



Source: Author, 2023.

To test and promote products directly in farmers' fields, they have different strategies. For instance, 'first, we contact the seller at the shop, then the shop chooses the farmer for us. We try to find who might have influence on other farmers so we test, then the farmers around this field can see, and then they can follow to use this product too. That's the marketing strategy.' Depending on its financial means, the company can cover all the expenses or ask farmers to pay half the price of the products: 'if the rice field is 1 ha, the company pays for 0.5 ha, and the rice farmers needs to pay for another 0.5 ha. They want to test their products. That's how the company advertises its products'. They reassure the farmers: 'It's already used in Taiwan. It's new in Cambodia. So, we test it so that we can show the farmers the result after using the fertiliser'. Sometimes, when they start working in a new area, they ask farmers where they buy their pesticides in order to choose the depot where they can best promote their products. When different farmers mention the same petty retailer, then they go and promote their products there. Selling strategies are diverse and unlimited. Field promoters, along with marketing agents, always need to invent new strategies, so that their company remains competitive. One challenge often mentioned by field promoters is the competition from Vietnamese products that circulate in the informal sector and are easy to buy on the other side of the

border. Products from Vietnam are notorious for being cheaper or being of good quality. One petty retailer said: 'It is also the reason why some depots dare to take risks to import the products from Vietnam even though they know those products have no registration, but because they can earn a higher income.'

In order to increase their sales, some companies hire marketing staff (generally with an agricultural degree) and post them at some strategic depots; these staff also visit other small depots and farms in the vicinity. These strategies illustrate how, through local staff, transnational companies develop close relationships with petty retailers and farmers. They have other powerful strategies to attract and secure the loyalty of clients such as discount programmes for depots. They fix targets and propose some valued rewards in exchange, as shown in the following excerpts from interactions between field promoters and input sellers:

'If you [petty retailers] buy 800 sacks, you will get a refrigerator, and if you get 1,200 sacks, you will get a 59-inch TV, 1,800 sacks, you'll get a latest iPhone, 3,200 sacks, you'll get the latest version of the Honda Dream Motorbike'.

'If you [petty retailers] buy \$10,000, then we add more products for you so that you can get the profits from those additional bottles.'

'Buy fertiliser, get noodles! Buy one sack get two packs of noodle. They [field promoters] do it for one month or two months, and they give us [petty retailers] ten boxes of noodles to give to the farmers. It's just their advertisement.'

### Other companies organise lotteries:

For company B, no matter how much you can sell, they invite all the sellers to a lottery in Phnom Penh. You can win gold, starting from 1 ji (the measurement for gold) and even diamonds. There is a lady who attended ten lotteries, but she didn't win anything. While others who sell only a small amount [of products] win. That's why some sellers get upset. This is unfair for the sellers who sell large amounts [of products].

To attract customers and decrease the price of pesticides, field promoters also propose specific contracts to input sellers. If the latter



**Figure 14. Shapes of product packaging**



Source: Authors 2022, 2023.

purchase large quantities of products, they can benefit from a discount allowing them to then sell these products cheaper than their competitors. Field promoters sometimes give exclusivity to some depots for selling some of their products in specific areas (three to four surrounding districts). As some input sellers provide credit facilities to farmers, some companies provide credit facilities to input sellers. Some companies allow their customers to pay in cash up to a month after they receive the products, but they also grant those who pay immediately a discount of one or two per cent ('commission').

Among these marketing strategies aiming at keeping clients, we have also those for tailoring pesticides to make them attractive locally. The packaging of the product includes the choice of the shape

**Figure 15. Design of the products**



Source: Authors 2022, 2023.

(bottle, sachet, capsule)<sup>44</sup> and the size of the container (bottles of one to five litres, sachets of 10 to 100 grams) (Figure 14).

To fit farmers' expectations and common practices, companies distributing pesticides in Cambodia generally present them in individual sachets or small bottles that correspond to a single application dose that farmers mix directly with water in the spraying equipment, in their field. These adaptations are practical. It facilitates calculating dosages. Packages of pesticides can be carried easily to the plot, by moto, without being too heavy. Moreover, it helps limit the storage of pesticides in a farmer's home. Packaging includes also the design

<sup>44</sup> To catch the attention of the farmers, some companies sell some products in the shape of medical pills.

of the label: the choice of a logo for the company that is easy for farmers to identify, commercial names that are attractive (underlining strength, wealth...), illustrations that underline the target of the product or the action of the pest (Figure 15).

In this country deeply marked by the war, where the names of bombs have become popular, some companies have chosen to give their pesticides the fictive name of a bomb (B99), or to use the image of a Western superhero (Superman) or mythical animals symbolising power, such as the snake, to draw attention to the power of their products. These illustrations on labels seem to have been effective as some illustrations became popular names used for pesticides by farmers.

In order to increase the efficiency of their products, some companies market ready-made 'cocktails' that mix different active ingredients. In addition to these marketing strategies, some companies also propose designing a special label with the name of a specific depot on it to attract clients. Also, in this context of increased resistance by living organisms to pesticides, users are attracted by new products so companies change label designs regularly to attract users. This marketing strategy consists in preparing a new label, with new colours, a new picture, a new commercial name, and/or new signs on the packages that shows precisely what the product is for, often with a picture illustrating the updated type of insect or disease common at the particular time of sale. The companies generally have a group of people responsible for designing packaging in Cambodia, though labels are printed and placed on the products by the parent company abroad. This practice of changing the packaging has several effects and interpretations. It increases farmers' dependency on input sellers, and the latter's dependency on companies. Farmers and input sellers never get used to the products and remain dependent on their supplier who often presents novelties. It also reinforces the difficulty of accessing knowledge that relates to a specific product. Some farmers feel lost, wondering if it is the label or the product inside that has changed, or both. They don't know if the emergence of a new product is related to the fact that an old product is not working anymore because of pest resistance or if it is a tactic for selling expired pesticides, or for reactivating the sale of the same products by giving

a sense of novelty. Moreover, it is well known by pesticide users and sellers that some companies sometimes illegally repack pesticides by changing the recipe and reducing the quantity of the active ingredient, or by adding other products than those stated on the label. Consequently, a lack of confidence in labels emerges. One input seller said: 'for some companies, they just put the label Fipronil on their bottles, but the inside, we don't know what is it because when we spray on worms, it's like pouring the water on the head of the duck, it depends whether the products that the company made are really pure and effective.'

These processes of singularisation of the market are constantly re-defined through close interactions between farmers, field promoters, petty retailers and the transnational companies abroad manufacturing pesticides. At the village level, field promoters observe preferences, constraints and vernacular language of farmers, as well as those of petty retailers. They also observe practices of other companies. Field promoters' feedback is then taken into account by representatives at an upper level (national, transnational) who can skilfully design the products according to the evolution of practices, preferences situations of their clients. This back and forth between local farmers, field promoters and transnational companies constitutes a cornerstone of the sale of pesticides.

## **Conclusion**

This paper highlights how the hundreds of synthetic chemicals used in the thousands of commercial pesticide products in circulation in Cambodia are tailor-made by the market through a social life which is far from the regulatory premise of controlled use. Pesticides go through operations of translation that shape the techno-chemical object to population. Regulatory knowledge related to each specific commercial product is far-reaching, and cannot be transposed 'as is' from one place to another. Pesticides are redefined locally through vernacular naming processes, selection of knowledge and power relations that make and remake them.

Pyramidal interactions between farmers, petty retailers, field promoters and the transnational manufacturers shape the pesticide market. If all these actors are interdependent (farmers are reliant on input sellers, input sellers are reliant on farmers and companies, companies are reliant on input sellers and farmers), the dynamics described in the paper highlight how this web of interactions serves the transnational manufacturers, who cannot sell without the feedback that comes from interactions between multiple local players. This structure maintains and fuels the market.

To penetrate the world of small-scale farmers in Cambodia, transnational manufacturers need to get marketing approval from the national authorities for each commercial product but, as shown in this paper, they also need multiple intermediaries at village level, to deploy aggressive promotion campaigns and translate the obscure technological objects into objects that are useable locally, over time. The vernacular language produced through multi-layered interactions appears as a key tool to select knowledge, simplify communication, maintain power relations over customers and thus facilitate the local market. It accounts for fast changes in the context where it develops and it influences the way pesticides are understood by its users. Through such processes, pesticide sellers become valued as 'merchants of knowledge' by farmers. The generalised practice of selling pesticides through credit maintains the dependency too. But credit is one among many ways in which marketing agents attempt to control clients. Tailoring pesticides to customers (choice of brand, packaging, advices, 'cocktails') in a context of growing competition is one of the other ways. The packaging of the products is always changing, recommendations for use provided by petty retailers evolve as pests become resistant to products, and new 'cocktails' are proposed accordingly.

These market dynamics illustrate how pesticides are not universal objects but objects in constant redefinition, tailored for their context of circulation. They create short term satisfaction to sustain agricultural business, but shape a politics of resignation<sup>45</sup> in which

<sup>45</sup> P. Benson and S. Kirsch, 'Capitalism and the politics of resignation', *Current Anthropology* 51 (4) (2010).

everyone accepts and undergoes harm as an inevitable condition of modernity. In fine, pesticides' negative effects is accepted by farmers and sellers to sustain business and livelihoods. This involves a process of under-evaluating pesticides' toxicity. In this web of interactions, the selection of knowledge is related to use convenience, prices and crop efficiency but more rarely in relation to toxicity. In terms of human health, instructions related to proper clothing circulate everywhere, but give an illusion of possible protection more than real effectiveness. Safety measures are mentioned on the packages in the local language. However, given fast-changing farming situations and local uses of pesticides (and notably the common practice of mixing products), these measures cannot be followed. Such narratives place excessive responsibility on farmers and overlook the role played by the multiple actors who drift pesticides from their originally intended path.

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