Assessing The Current Situation And Proposing Solutions To Manage Waste Containing Plant Protection Chemicals In Tea Cultivation In Thai Nguyen Province

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Abstract: This paper assesses the status of waste management containing plant protection chemicals in tea cultivation in Thai Nguyen province, Vietnam and proposes solutions to manage and collect them. The results shown that there are many types of pesticides that are used in agricultural cultivation, especially tea cultivation, but they are on the list of plant protection chemicals allowed for use in agricultural cultivation according to the regulations of the Ministry of Agriculture and Rural Development of Vietnam. The issue of environmental protection from waste containing pesticides is being paid attention and controlling them is very necessary. The management and treatment of waste containing pesticides in Thai Nguyen has been concerned but there is a lack of finance and equipment as well as an organization that can handle it. To improve the efficiency of waste management containing pesticides, it is necessary to synchronize some solutions.

Keywords: tea cultivation, Thai Nguyen, pesticide, waste

1. Introduction
Agricultural production in Thai Nguyen province plays an important role in the proportion in the economic structure of Thai Nguyen province, Vietnam. The agricultural production area plays over 95% in the province's natural area and over 70% of the province's total population. Tea production is moving in a positive direction. The productivity and quality of tea are improved. In 2016, the tea area was 21,361 ha, producing was 211,244 tons; new seed tea area reached 14,409 ha, accounting for 67.5% of the total tea area. Many new tea varieties with high productivity and quality are planted; many places have been VietGAP certified. Although there are advantages and potentials for tea production development, in reality, tea cultivation areas in Thai Nguyen province in general and Phu Tho district in particular are having many environmental problems. In particular, the problem of potential environmental pollution due to solid waste from the use of plant protection chemicals in tea cultivation. In the process of expanding tea plantation area, intensive farming has broken the biological balance, increased pests and diseases, and the level of harm is growing. The use of pesticides in tea cultivation involves the generation of bottles, jars, plastic bags containing plant protection chemicals, which are potentially toxic to the ecosystem, need to be treated proper way. However, up to now in some tea-growing areas in Thai Nguyen province, there are no strict management methods to this hazardous waste. So, this research is done with the goals:
- Assessing the status of waste management containing plant protection chemicals in tea cultivation in Thai Nguyen province, Vietnam.
- Proposing solutions to manage and collect wastes containing plant protection chemicals in tea cultivation in Thai Nguyen province, Vietnam.

2. Objects and methods
Waste contains plant protection chemicals that has used in tea-growing areas of Thai Nguyen province, Vietnam; Surveying and collecting data on natural, economic and social conditions, management of waste collection and containment of pesticides in the study area through reports of management agencies of Thai Nguyen province. Households are surveyed and interviewed by questionnaires. The subjects of questionnaires include communes, village managers, plant protection chemicals business households and farmer directly planting tea. The content of the questionnaires is using plant protection chemicals in tea cultivation; waste treatment containing plant protection chemicals; situation of managing and collecting plant protection chemicals-containing waste in the locality...

3. Results and discussion
3.1. Situation of management and use of plant protection chemicals in Thai Nguyen province
There are many different crops such as tea, rice, vegetables and other plants, the plant protection chemicals types are used in Thai Nguyen province are very diverse. They include:
- Plant protection chemicals are commonly used for rice and vegetables: Actara 25WG, Admire 050EC, Bulty 400EC, Bassa 50EC, Victory 585EC, Sairifos 585EC; Samole 700WP, Pazol 700WP, Ossal 700WP; Fuji One 40EC, Kabim 30WP, Fila 525SE; Validacin 3L, Cavil 50SC, Vida 3SC, Vanicide 15WP, Rill 800WG, Penalti Gold 52EC, Wapotoc 858 FC, Kamux 2EN, Virtaco 40WG, Neda 95FP, Cowbol 600WB, Drogon 585EC, Paran 95SP, ...
- Plant protection chemicals are commonly used for tea plants: Tilt Super 300ND, 20WP Starsuper, Copper oxychloride, Sulphate Cu, Applaud10WP, Butyl10WP, Admixe050EC, Sutin5EC, Scopion36, Actamec40EC, Catex306EC, Dygan5.4EC, Ortuss55C, Dylan2EC ...

Almost of them are on the list of plant protection chemicals allowed for use in agricultural cultivation according to the
According to Thai Nguyen Plant Protection Department, the amount of plant protection chemicals in agricultural production varies depending on the type of crop such as rice is about 2.5 kg/ha/year, tea is about 3 - 3.5 kg/ha/year, corn is about 2 kg / ha / year, and the average for all crops is 3.0 kg/ha/year. The total amount of plant protection chemicals is estimated over 298 tons/year. Estimating at 33% of excess chemical pesticides and chemical fertilizers will be absorbed into surface water.

3.1.2. Status of pesticide waste management in Thai Nguyen province

a. Evaluating the amount of waste containing generated pesticides

Every year in Thai Nguyen province, the large amount of plant protection chemicals have been used by farmers. Packaging containing pesticides is mainly plastic bottles and plastic bags. They are very sustainable materials in the environment. According to the study of the Vietnam Institute of Agricultural Environment (2012), the amount of chemicals attached to packaging covers about 1.85% of the total volume of chemicals. Currently, in Thai Nguyen province, there are no official statistics and surveys on the volume of waste containing pesticides. However, according to some published research results, the volume of ordinary packaging accounts for about 12-15% of the total volume of products (for drugs packed in plastic bottles) and accounts for 3-5 % of products (for drugs packed in plastic bags). According to a study by the Ministry of Natural Resources and Environment Vietnam (www.monre.gov.vn), the volume of drugs contained in plastic bottles accounts for 70-80%, contained in packages and others accounted for 20-30% of the total volume of drug consumed in the market. Therefore, the volume of waste containing plant protection chemicals generated in Thai Nguyen province is very important to monitor.

b. Current status pesticide waste management at Thai Nguyen province

- Collecting pesticide waste

Pesticide waste management has just been mostly: installing reservoirs in fields where concentrated pesticides or agricultural cultivation areas are concentrated; organizing propaganda and mobilizing farmers to collect wastes containing pesticides into storage tanks as prescribed. In some localities, agricultural production has been applied according to VietGap standards such as: Tea production at communes in Thainguyen city, Phuluong district, Donghy district, Daihu district where secondary collection points have been formed. Households have voluntarily collected waste containing pesticides immediately after using, concentrating in storage tanks in the family's agricultural production area; Periodically the women's union will carry out the collection, then concentrate on the storage house containing waste containing pesticides for storage. Due to lack of funding and sanctions, implementation is fragmented and difficult, for example: lack of storage tanks, lack of garbage storage, lack of specialized collection vehicles, etc. On the other hand, awareness of farmers are still limited, leading to the disposal of domestic waste into tanks containing pesticides. Therefore, it generates a large amount of waste that need to be treated.

- Current status of waste treatment containing pesticides

Currently, there are 4 companies which are licensed to treat pesticides waste in Thai Nguyen province. However, due to lack of financial mechanism, lack of responsibilities of units, organizations and individuals involved in the management and treatment of waste containing pesticides so hiring these units to dispose of waste containing pesticides has not been done.

- Resources to collect waste containing pesticides

+ Human resources: Currently in Thai Nguyen province, the collection of waste containing pesticides is mainly done by farmers. Some localities have formed self-managed teams to mobilize community participation (through socio-political organizations) to organize the collection. However, the treatment of waste after collection is still difficult due to lack of specialized agencies and lack of specific technical guidance.

+ Finance: In recent years, because of implementing the new rural construction program, Thai Nguyen province has been supported initially for the collection of pesticide waste. For example, investing in the installation of collection tanks at the fields. In some cases transporting to storage houses. The funding is taken from the source of socialization. However, people contribute money in a voluntary way. Currently, in Thai Nguyen province, there are no specific and unified regulations. Currently the districts also allocate funds for the disposal of waste containing pesticides after being collected.

- General assessment

Although pesticide wastes management in Thai Nguyen province has been paid attention, it is incomplete. Most communes are not yet active in collecting and managing solid waste in general and waste containing pesticides in particular. Some communes are typical in the construction of new rural areas, because there is not yet solution to collect wastes containing pesticides, so they have not completed the environmental criteria No. 17, thus delaying the construction of new rural areas. According to Decision No. 1282/QD-UBND dated May 25, 2011 of Thai Nguyen Provincial People's Committee. Due to the impact of small, fragmented production systems and lack of centralized management, there is still a large amount of unmanaged drug packaging that is mostly left in the fields, falling into water ditches. This will cause environmental pollution and indirectly affect the quality of agricultural products in production areas and may affect human health. Currently, there is a solid waste collection organization, but there is no organization to collect and treat waste containing pesticides. Collection and treatment of waste containing plant protection chemicals are spontaneous activities, without the attention of authorities at all levels, lack of plans, lack of investment capital, no suitable technical solutions according to regulations. While the demand for pesticide waste treatment is increasing and urgent Lack of funding for construction of storage tanks, storage areas and equipment for collection, transportation
and maintenance of activities in the collection and treatment of waste packaging containing pesticides. There is not yet a mechanism to implement socialization to encourage people's participation in collection and thorough treatment. There is not yet a mechanism to force the recall of packaging containing chemical pesticides, in which the management role of the state is main stream, the participation of the people is decisive. There is not yet clarified the responsibilities of organizations and individuals in collecting. No typical organizational model has been built on the basis of the participation of authorities and people. Organizations/individuals perform the collection and issuance of regulations to clearly define the rights and responsibilities of each participant. There are not yet comprehensive programs on propaganda, training, guiding people to use pesticides and raising people's awareness in the collection of waste containing pesticides, contributing to environmental protection. There are not yet specific policies to support localities to apply cleaner production models, train human resources with sufficient qualifications and management capacity. There is still no coordination among sectors in strategic planning and issuance of legal documents on waste management containing pesticides. Due to the lack of technology to clean and dispose of packaging after collection, most of the collected packaging is buried or burned with domestic waste that has not been cleaned. Until now, Thai Nguyen province has not yet developed and issued specific guidelines and regulations on activities to support the management of pesticide waste; there are no criteria to manage and treat pesticide waste, so the districts are still very confused, there is no specific orientation for collection and treatment of pesticide waste in rural areas.

3.2. Some solutions for pesticide waste management, collection and treatment

3.2.1. Building models to collect waste containing pesticides
Due to the particularity of most of the rural communes in mountainous areas, in order to well manage the collection of waste containing pesticides, it is necessary to set up the collection teams from the tanks to storage house. Teams were established under the socialization model. Members are political organizations and farmers. The establishment and maintenance of its activities are assigned to the Commune Farmers' Union. On that basis, the Commune Farmers' Union advised the commune authorities to implement and mobilize finance, coordinate with mass political organizations, agencies and units in the commune, villages to propagandize and mobilize farmers to participate.

3.2.2. Build a pesticide waste collection network
Wastes containing pesticides are collected by farmers and stored in tanks. After that, the collection team periodically transports waste to the commune's garbage transfer point (garbage storage house) before hiring a reputable company to transport and handle according to Vietnamese law (Figure 3.1).

![Diagram of pesticide waste collection](Image)

The network construction of collection points is based on the following principles:
- Before constructing or placing reservoirs, households are allowed to discuss and select suitable locations, based on the commune's planning.
- The construction or installation of reservoirs must be convenient for transportation, reasonably distributed to farmers in collecting, away from water sources, away from residential areas, not affecting the surrounding environment.
- Waste from the reservoirs on the fields is periodically collected to the concentrated waste storage site of the commune that has been built as planned.

3.2.3. Education, propaganda, training to raise awareness about pesticide waste management and collection
- Organize a conference to disseminate community awareness about pesticide waste management.
- Training to improve professional capacity for commune-level management officials, equipping more facilities and skills in collecting information on pesticide waste management.
- Develop community education programs to raise awareness for commune officials, heads of villages, hamlets, mass organizations, pesticide waste collection and management workers, people.

3.2.4. Issue guidelines on pesticide waste collection, transportation and treatment
Currently, there is no guidance in Thai Nguyen province on collection, transportation and treatment of waste containing pesticides according to Joint Circular No. 05/2016/TTLT-BNNPTNT-BTNMT dated May 16, 2016, guide the collection, transportation and handling of containers containing pesticides after use. Therefore, the specialized agency should soon advise the Provincial People's Committee to study, develop and promulgate guidelines for localities to implement and meet the requirements of collecting and treating wastes containing pesticides. Guidance on collection, transportation and treatment of waste containing pesticides in Thai Nguyen province should clearly identify the following main contents:

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Specific guidance on the list of pesticides after collection; Technical requirements for storage tanks, storage areas, localities that have built storage houses but have not ensured the regulations to renovate or must take measures to protect to ensure no objective conditions, foreign the scene affects the release of waste into the environment; The collection, transportation and treatment of wastes containing pesticides must comply with the regulations of the Ministry of Natural Resources and Environment, do not arbitrarily treat waste containing pesticides such as burning, washing, using chemical detergents, burying ...

- Specifying the specific responsibilities of each unit and organization from provincial, district, commune and community levels in collecting pesticide waste in the area; guide and propagate to organizations and individuals in the use of plant protection drugs and collecting wastes containing pesticides after use; guide the transportation and treatment of wastes containing pesticides used in the area; guide the collection, transportation and disposal of waste containing pesticides after use.

- Develop a mechanism for funding to collect and combine budget from the mobilization of community contributions to pesticide waste management. Ensure that pesticide waste collectors also enjoy the same benefits as other workers in the management of waste containing pesticides.

4. Conclusion
Currently there are many types of pesticides that are being used in Thainguyen for agricultural cultivation, especially tea cultivation, and they are on the list of plant protection chemicals allowed for use in agricultural cultivation according to the regulations of the Ministry of Agriculture and Rural Development of Vietnam. The issue of environmental protection from waste containing pesticides is being paid attention. In Thainguyen province, there is no exact study on the amount of waste containing pesticides. However, there have been many studies that showed the percentage of this waste compared to the total amount of pesticides consumed, so controlling this type of waste is very necessary. Although the management and treatment of waste containing pesticides in Thainguyen have been concerned, but there is a lack of finance and equipment as well as an organization that can handle it. In order to improve the efficiency of waste management containing pesticides, it is necessary to synchronize some solutions such as: Establishing collection teams at each hamlet or inter-hamlet; education, propaganda and training to raise awareness about the management and collection of waste containing pesticides for managers, as well as farmer households; It is necessary to soon promulgate specific guidelines for localities to implement, meeting the requirements for waste collection and treatment containing pesticides in the study area.

5. References