



TECHNICAL GUIDELINE

Reference

MANAGEMENT AND USE OF CHEMICALS AND WASTE

HA NOI - 2022

Preface

This guideline was developed with the financial support of the Technical Cooperation Project for Enhanced Sustainable Natural Resource Management (SNRM2) funded by the Japan International Cooperation Agency (JICA) and implemented by the Ministry of Agriculture and Rural Development from 2021 to 2025.

This document provides detailed guidance on the management and use of chemicals and wastes in the implementation of Sustainable Forest Management under the Vietnam Forest Certification System (VFCS).

1 Scope and objects of application

This standard applies to forest owners whose activities related to the management and use of chemicals and waste in the business and forest management processes to meet the requirements of sustainable forest management (SFM) under VFCS.

Applicable objects are forest owners, certification bodies and stakeholders in the implementation of sustainable forest management under the Vietnam Forest Certification System (VFCS).

2 References

Ministry of Industry and Trade, 2010. Circular No. 28/2010/TT-BCT dated 28/6/2010 stipulating a number of articles of the chemical law

Ministry of Industry and Trade, 2012. Circular No. 04/2012/TT-BCT dated February 13, 2012 of the Ministry of Industry and Trade regulating classification and labeling of chemicals.

Ministry of Agriculture and Rural Development, 2018. Circular No. 28/2018/TT-BNNPTNT dated 16/11/2018 Regulations on sustainable forest management.

Ministry of Agriculture and Rural Development, 2021. Circular No. 19/2021/TT-BNNPTN dated December 28, 2021 on promulgating the list of pesticides allowed and banned from use in Vietnam.

Ministry of Agriculture and Rural Development, 2015. Circular No. 21/2015/TT-BNNPTNT dated June 8, 2015 on management of plant protection drugs.

Government of the Socialist Republic of Vietnam, 2015. Decree No. 38/2015/ND-CP dated April 24, 2015 of the Government on waste and scrap management.

Government of the Socialist Republic of Vietnam, 2008. Decree No. 108/2008/ND-CP dated October 7, 2008 detailing and guiding the implementation of a number of articles of the chemical law.

National Assembly of the Socialist Republic of Vietnam, 2013. 41/2013/QH13 Law on Plant Protection and Quarantine.

National Assembly of the Socialist Republic of Vietnam, 2020. Law No. 72/2020/QH14 Law on Environmental Protection.

TCVN 5507:2002 Hazardous chemicals - Code of practice for safety in production, commerce, use, handing and transportation.

QCVN 07:2009/BTNMT- National Technical Regulation on Hazardous Waste Thresholds.

3 Terminology and definitions

In this project standard the following terms and definitions are used

3.1. Waste: things and substances that the user no longer wants to use and dispose of, however in some contexts it may be meaningless to one person but beneficial to another, waste is also known as garbage. In life, waste is envisioned as substances that are no longer used along with the toxins released from them.

3.2. Green organic waste: Plant material discarded as waste including cut and trimmed parts of trees and shrubs, clipped grass, leaves, garden waste , wood waste of natural origin (untreated) and weeds (harmful or otherwise).

3.3. Hazardous waste: Waste containing substances or compounds that have one of the characteristics of direct danger (flammable, explosive, toxic, corrosive, easy to pollute the

environment and other hazardous properties) or interacts with other substances harmful to the environment, flora and fauna and human health.

3.4. Solid waste: is waste in solid or viscous form (also known as sludge) discharged from production, business, service, daily life or other activities.

3.5. Industrial solid waste: Solid waste arising from production, business and service activities.

3.6. Living solid waste: solid waste arising from daily activities of people

3.7. Common waste: Waste that is not on the list of hazardous wastes or on the list of hazardous wastes but has hazardous elements below the hazardous waste threshold.

3.8. Agro-forestry waste: Wastes generated from agro-forestry activities such as chemical residues, plastic and glass pesticide bottles, pesticides, bags, etc. discarded in contravention of regulations, causing adverse effects on human health and the environment

3.9. Chemicals: A single substance, compound, or mixture of substances exploited or created by humans from natural or artificial sources.

3.10. Hazardous chemicals: Chemicals in the process of production, trading, use, preservation, transportation and disposal that can cause fire, explosion, corrosion, and difficult to decompose in the environment, toxic to humans, animals and the environment.

3.11. Fix the waste: The process of distinguishing a substance as waste or non-waste, hazardous waste or ordinary waste, and determining that the waste belongs to a class or group of substances for the purpose of actual classification and management.

3.12 Classify the waste: The actual separation of waste (fixed) in order to divide it into categories or groups of waste for different management processes.

3.13 Transport the waste: The process of transporting waste from the place of generation to the place of treatment, possibly accompanied by temporary collection, storage (or gathering) activities, transshipment and preliminary processing of waste at collection points or transfer stations.

3.14 Recycle waste: Reusing waste directly or after preliminary treatment without changing the properties of waste.

3.15 Preliminary treatment of waste: It is the use of mechanical and physical engineering measures to change physical properties such as size, moisture, and temperature to create favorable conditions for waste classify, storage, transportation, reuse, recycling, co-treatment, treatment to mix or separate components of waste to suit different management processes.

3.16 Event of chemical hazards: Unusual events related to chemicals that cause fire, explosion, toxic, corrosive or environmental pollution.

3.17 Withdraw energy from waste: The process of recovering energy from waste conversion.

3.18 Treat waste: The process of using technological and technical solutions (different from preliminary treatment) to reduce, eliminate, isolate, incinerate, destroy, and bury waste and harmful elements in waste.

3.19 Biological pesticide: Plant protection drug with effective ingredients being live microorganisms or substances derived from microorganisms, plants or animals.

3.20 Chemical pesticide: Plant protection drug whose active ingredients are synthetic organic or inorganic chemicals.

4. Management and use of chemicals

4.1 Transporting chemicals

4.1.1 Organizations and individuals, when transporting dangerous goods and chemicals, need to implement

Before transporting dangerous goods and chemicals, organizations and individuals must have a chemical safety sheet, which is a document established by the manufacturer or importer, printed in Vietnamese with full information as followed: Chemical identification; Identification of hazardous properties of chemicals; Information on the composition of substances; Physical and chemical properties of chemicals; Chemical stability and reactivity; Information on toxicity; Ecological information; Medical first aid measures; Measures to handle in case of fire; Measures to prevent and respond to incidents; Storage requirements; Effects on people and requirements for personal protective equipment; Requirements for disposal; Requirements in transport; Technical and legal regulations that must be complied.

4.1.2 Safety requirements and necessary documents when transporting chemicals

- a) The transportation of chemicals must comply with the schedule stated in the contract or other relevant documents on chemical transportation between the vehicle owner and the goods owner.
- b) The transportation of chemicals must ensure safety for people, livestock and the environment. Do not stop the vehicle in crowded places, near schools, hospitals, markets, domestic water sources.
- c) Chemicals can only be transported when they have been packed, labeled and licensed by a competent authority to transport pesticides as prescribed in Article 54 of Circular No. 21/2015/TT-BNNPTNT dated June 8, 2015 of the Ministry of Agriculture and Rural Development on the management of plant protection drugs.
- d) Chemicals that can react with each other must not be carried in the same vehicle.
- đ) Chemicals are not allowed to be transported on the same vehicle for passenger, livestock, food, inflammable and explosive substances and other goods, except fertilizers.

4.1.3 Requirements for drivers of vehicles transporting chemicals

Vehicle drivers and chemical transport escorts must:

- a) Understand the dangerous nature of chemicals such as: toxic, flammable, explosive, corrosive and must know how to handle preliminary when an incident occurs during the transportation of chemicals in accordance with the provisions of legislation on the transportation of dangerous goods;
- b) Drivers of vehicles transporting chemicals by road motorized vehicles, in addition to the certificates of vehicle control according to current regulations of the State, must also have a certificate of training in occupational safety in transporting and preserving chemicals; Persons escorting chemical goods must be trained in occupational safety in transporting and preserving chemicals.

4.1.4 Requirements for vehicles transporting chemicals

4.1.4.1. Packaging, bin or containers containing chemicals during transport

- a) Must be made of tough, durable, less absorbent materials;
- b) A warning chart with a black skull and crossbones image on a white background must be pasted in an offset square and warning pictures corresponding to the properties of the chemicals being transported according to the prescribed form. The size of the warning graphic

posted on each chemical bin is 100 x 100 millimeters (mm) and on the container is 250 x 250 mm;

c) There must be a rectangular, yellow-orange danger sign with the United Nations (UN) code in the middle, the size of the sign is 300 x 500 mm according to the prescribed form, located at the bottom of the warning graph. For drug packaging and bins, the signs must be smaller in size in accordance with the proportions of the packaging and containers, but must ensure visibility.

4.1.4.2. Means of transporting chemicals

a) Ordinary means of transport permitted for circulation by competent authorities to transport goods may carry chemicals.

b) Means of transporting chemicals must satisfy the following technical conditions:

- Having fire prevention and fighting tools and equipment suitable for chemicals when transporting;

- Covered with a roof and canvas, ensuring that the entire cargo compartment is waterproof during transportation;

- Do not use trailers to transport chemicals

c) Means of transporting chemicals are placed last of ferry if the ferry terminal does not have a ferry dedicated to dangerous goods.

d) Vehicles transporting chemical containers must be affixed with warning pictures of the type of cargo being transported. The size of the warning graphics posted on the vehicle is 500 x 500 mm, located on the sides and rear of the vehicle.

4.2 Incident handling

In case of incidents causing chemical leakage or dispersion during transportation, vehicle drivers, goods owners and vehicle owners are responsible for applying necessary measures to limit and overcome the consequences of incidents, and at the same time notify the People's Committees of communes where the incidents occur for further monitoring and measures to warn and prevent consequences. Violators must bear all remedial costs

4.3. Chemical storage

4.3.1 Regulations on chemical storage

The storage of chemicals must comply with the manufacturer's instructions on storage stated on the label and package; ensure safety for people, animals and the environment

4.3.2 Chemical storage requirements

a) Chemical warehouses must meet the requirements of TCVN 5507:2002 Hazardous chemicals - Code of practice for safety in production, commerce, use, handling and transportation.

b) It must be bright enough to identify goods. Lighting equipment must ensure safety in terms of fire and explosion prevention;

c) Goods are placed on shelves at least 10 centimeters (cm) high, at least 20 cm from the wall; must be stored in sealed packages, limiting the spread of odors to the surroundings;

d) The arrangement of goods must ensure that they do not cause breakage or leakage, have an entrance wide enough for at least one person, and separate each type;

- d) Having fire prevention and fighting regulations and equipment at the request of the fire prevention and fighting agency in a convenient place and ready to use when necessary;
- e) Having personal protective equipment such as gloves, masks, clean water, soap;
- g) Having materials and tools to promptly handle incidents.

4.4. Chemical usage

4.4.1 Regulations on the use of chemicals

Chemical usage must comply with the 4 “right” principle: right drug, right time, right dose and concentration, right way; compliance with the isolation period; ensure efficiency, safety for people, food, minimize environmental pollution, protect the ecosystem.

Only drugs on the list of chemicals permitted for use in Vietnam may be used (Appendix A).

4.4.2 Requirements for chemical users

Chemical users must be trained and guided on the use of pesticides according to the content of the drug labels.

4.4.3 Responsibilities and obligations of chemical users

When an incident or chemical is discovered that causes bad consequences for humans and the environment during use, the user of a plant protection drug is responsible for applying necessary measures to limit the consequences and immediately report to the Commune People's Committee where the incident occurs for remedial measures.

Drugs must be preserved, and chemical packages must be collected after use in the right places.

5. Waste management

5.1. Hazardous waste management

5.1.1 Hazardous waste management regulations

The fixation of hazardous waste is done according to the code, list and threshold of hazardous waste (QCVN 07:2009/BTNMT- National regulation on hazardous waste threshold).

5.1.2 Regulations on classification of hazardous waste

a) Hazardous wastes must be classified according to hazardous waste codes to be stored in suitable containers or storage devices. It is permitted to use the same packaging or storage equipment for hazardous waste codes of the same nature, inability to react and interact with each other and capable of being treated by the same method.

b) Hazardous waste must be classified starting from the time it is stored or transferred for treatment.

5.1.3 Regulations on hazardous waste transportation and collection

a) The collection and transportation of hazardous waste is only permitted by organizations and individuals that have a license to handle hazardous waste.

b) Hazardous waste collection and transportation means and equipment must meet technical requirements and management processes as prescribed. Means of transporting hazardous waste must be recorded in the License for hazardous waste treatment.

c) The use of special means of transport such as containers, railway vehicles, inland waterways, seaways or other means of transport not specified in the Hazardous Waste Disposal License must meet the technical requirements, management process as prescribed by the

Ministry of Natural Resources and Environment and approved by the Ministry of Natural Resources and Environment.

d) Transporting hazardous waste must follow the optimal route in terms of route, distance, time, ensure traffic safety and prevent and respond to incidents, in accordance with regulations of competent agencies on traffic flow.

5.2. Living waste management

5.2.1 Classification and storage of living solid waste

Living solid waste is classified at source suitable for management and treatment purposes into the following groups:

- a) Degradable organic group (leftovers, leaves, vegetables, tubers, fruits, animal carcasses);
- b) Reuse and recycling group (paper, plastic, metal, rubber, nylon, glass);
- c) The other groups.

- Living solid waste, after being classified, is stored in suitable packages or storage devices.

- The classification of living solid waste must be managed, supervised, propagated and mobilized organizations, individuals and households to comply with regulations, ensuring convenient requirements for collection, transportation and handling.

5.2.2 Collection and transportation of living solid waste

a) Living solid waste must be collected along routes to be transported to gathering points, transfer stations and solid waste treatment facilities according to the planning approved by competent authorities.

b) On main streets, commercial areas, parks, squares, population gathering points, traffic hubs and other public areas, appropriate storage devices must be arranged and living solid waste collection point.

c) Living solid waste storage devices must have sizes suitable for the storage time. Storage devices in public areas must ensure aesthetics,

d) In the process of transporting living solid waste, it must be ensured that no waste is scattered, causing dust, odor and water leakage.

5.2.3 Living solid waste treatment

5.2.3.1 Technology for treatment of living solid waste includes:

- a) Organic fertilizer processing technology;
- b) Combustion technology;
- c) Hygienic burial technology;
- d) Technologies for recycling, energy recovery, and production of products from useful components in living solid waste;
- đ) Other environmentally friendly technologies.

5.2.3.2 Selection of living solid waste treatment technology according to the following criteria:

a) Regarding technology:

The ability to receive all kinds of living solid waste, the ability to be flexible, suitable in terms of scale, expand the treatment capacity;

Degree of automation and localization of equipment lines; rate of treatment, reuse, recycling and burial of living solid waste;

Prioritize technologies that have been assessed and appraised by competent agencies to meet environmental technical standards and regulations and are suitable to Vietnam's conditions;

Manage, operate and maintain in accordance with the qualifications and capacity of local human resources.

b) Regarding the environment and society:

Ensure environmental standards and technical regulations;

Saving land use area;

Energy saving, ability to recover energy during processing;

Training and using local human resources.

c) Regarding the economy:

The treatment costs are in line with the local ability to pay or do not exceed the treatment costs announced by the competent authority;

The ability to consume products from the treatment and recycling of living solid waste.

5.2.4 Environmental protection requirements for living solid waste treatment facilities

a) Having an environmental impact assessment report approved by a competent authority for the investment project of a waste treatment facility.

b) Having systems and equipment for treatment (including preliminary processing, recycling, co-processing, energy recovery), and temporary storage areas that must meet technical requirements and management procedures as prescribed.

c) Having environmental protection works at the waste treatment facility meeting the technical requirements and management process as prescribed.

d) Having an environmental management and monitoring program.

đ) Living solid waste treatment facilities must be certified by a competent authority to meet environmental protection requirements before officially operating living solid waste treatment.

e) Before carrying out the trial operation, the living solid waste treater must report to the competent agency for certification of meeting environmental protection requirements for the living solid waste treatment facility on the trial operation plan. The duration of trial operation of living solid waste treatment shall not exceed 06 (six) months.

5.3. Ordinary industrial waste management

5.3.1 Fixation, classification and storage of ordinary industrial solid waste

a) Ordinary industrial solid waste must be fixed and classified separately from hazardous waste. In case it cannot be classified, it must be managed according to regulations on hazardous waste.

b) The fixation, classification and storage of ordinary industrial solid waste must meet the technical requirements and management process as prescribed.

5.3.2 Collection and transportation of ordinary industrial solid waste

a) The ordinary industrial solid waste collection, transportation and transshipment must not drop, cause dust, odor or water leakage and meet technical requirements and management procedures according to regulations.

b) Hazardous waste treaters who have been granted hazardous waste treatment permits are allowed to collect and transport ordinary industrial solid wastes.

c) Organizations and individuals that collect and transport ordinary industrial solid waste are responsible for transferring wastes to ordinary industrial solid waste treatment facilities that are permitted to operate in accordance with law.

5.3.3 Environmental protection requirements for ordinary industrial solid waste treatment facilities

a) Means of transport, storage equipment, and temporary storage area for ordinary industrial solid waste must satisfy the corresponding technical requirements and management processes specified at Points A and B, Appendix III issued together with Decree No. 38/2015/ND-CP issued on April 24, 2015 on waste and scrap management.

b) Storage devices must meet the following requirements:

- Ensure safe storage, not damaged, torn.

- Soft packaging is tightly sealed and hard packaging has a tight lid to ensure that waste is not leaked or released into the environment.

- Hard structure to withstand impact, not damaged, deformed, torn by the weight of waste during use.

c) Transshipment stations and storage areas (if any) are not required to be built in the form of warehouses but must meet the following regulations: Having a ground level to ensure that there is no flooding; The floor must be sealed, not cracked, not penetrated and to avoid rainwater from outside. There is a roof to cover the sun and rain for the entire storage area. Temporary storage warehouses or transfer stations in the form of warehouses must meet construction standards and regulations as prescribed.

d) The outdoor ordinary industrial solid waste storage area must meet the following requirements:

- Having a system to collect and treat overflowing rainwater and wastewater generated during the storage of ordinary industrial solid waste to ensure compliance with environmental technical regulations.

- Having a high ground level to ensure that it is not flooded; The foundation must be sealed, not cracked, not permeable, durable enough to withstand the load of the means of transport and the amount of ordinary industrial solid waste stored.

- Taking measures to minimize dust generated from the ordinary industrial solid waste storage yard (for the type of waste that generates dust).

đ) Ordinary industrial solid waste treatment systems, facilities and equipment (including preliminary treatment, reuse, recycling, co-treatment, treatment and energy recovery from industrial solid wastes, hereinafter referred to as ordinary industrial solid waste treatment) to ensure the satisfaction of technical requirements and management processes specified at point C, Appendix III, Section III of the Appendix issued together with this Decree. No. 38/2015/ND-CP issued on April 24, 2015 on waste and scrap management.

- The works or equipment for ordinary industrial solid waste treatment must meet the following general requirements:

Having a treatment technology suitable for chemical, physical and biological characteristics; has a capacity suitable for the volume of solid waste to be treated.

Ordinary industrial solid waste should be classified, checked and put through an ordinary industrial solid waste pre-processing system or device (if necessary) to ensure the appropriate size and physical state before being put into treatment.

After the final treatment of ordinary industrial solid waste and the waste generated from the treatment process, it must comply with the National Technical Regulation QCVN on the environment or have appropriate management measures as prescribed.

- Specific requirements for some ordinary industrial solid waste processing systems or equipment:

The ordinary industrial solid waste incinerators comply with the provisions of the National Technical Regulations on industrial waste incinerators.

The ordinary industrial solid waste landfill is built and operated to meet technical standards and regulations and must be consistent with the contents of the environmental impact assessment report and the decision approving the environmental impact assessment report.

- The installation area of ordinary industrial solid waste treatment systems or equipment must have:

Fire protection equipment according to regulations.

First aid box.

Communication equipment (landline telephone).

Alarm devices (such as horns, gongs, speakers).

The exit diagram, the sign indicating the exit is placed at the focal point of the path.

e) In case hazardous waste is generated from an ordinary industrial solid waste treatment facility, the responsibility of the hazardous waste generator must be fulfilled as prescribed.

g) Having an environmental impact assessment report approved by a competent authority for the investment project of a waste treatment facility

h) Treatment systems and equipment (including preliminary treatment, recycling, co-treatment, energy recovery), packaging, storage equipment, temporary storage areas or transfer stations, transportation vehicles (if any) must meet technical requirements and management processes as prescribed.

i) Having environmental protection works at the waste treatment facility that meet the technical requirements and management process as prescribed.

k) Having an environmental management and monitoring program.

l) Ordinary industrial solid waste treatment facilities must be certified by a competent authority to meet environmental protection requirements before officially operating ordinary industrial solid waste treatment.

m) Before conducting trial operation, the ordinary industrial solid waste treater must report to the competent authority to certify the satisfaction of environmental protection requirements for the industrial solid waste treatment facility. routine on test operation plan. The duration of trial operation of ordinary industrial solid waste treatment is not more than 06 (six) months.

5.4. Agro-forestry waste management

5.4.1 Classification of agro-forestry waste

Agricultural waste is divided into 4 main groups:

- a) Cultivation waste: All types of waste generated in the process of human cultivation. They come from all stages of agricultural production such as planting, cultivating, harvesting, etc..
- b) Livestock waste: Comes from human livestock activities, i.e. raising livestock, poultry, seafood, etc.
- c) Ordinary waste: Waste generated from agro-forestry production activities but does not contain ingredients that are dangerous to humans and other animals and plants (if any, these effects will not be too dangerous). Typically, post-cultivation residues, dead plants, stalks after harvest, straw, fertilizer bags, etc. In livestock, they can be the food of the livestock, poultry, dead animal carcasses, wastewater from slaughtering, animal processing, etc.
- d) Toxic waste: this group includes toxic chemicals that can cause poisoning, infection, etc. They are found in pesticides, preservatives, etc. After being used for agricultural activities, residues of these substances will seep into the environment and directly harm living organisms.

5.4.2 Regulations on treatment of agricultural waste

Regulations on the treatment of agro-forestry waste are specified in Decree No. 38/2015/ND-CP specifically: packaging and products containing hazardous chemicals that have been used in agricultural activities must be collected, stored, transported and disposed of in accordance with the provisions of hazardous waste disposal. For packages containing plant protection substances that have been cleaned of all hazardous components, they can be treated as ordinary waste.

5.4.3 Requirements on collection and treatment of agricultural waste

Ministries and sectors have the responsibility and duty to coordinate with each other to guide, direct the implementation and supervise the collection, treatment and management of agricultural waste.

5.4.4 Agricultural waste treatment process

The agricultural waste treatment process includes the following 5 steps:

- a) Step 1: classify
- b) Step 2: save
- c) Step 3: gather
- d) Step 4: transshipment
- d) Step 5: handling

5.4.5 Some methods of treating agro-forestry waste

5.4.5.1 Treatment of agricultural waste by biogas

Biogas is the most widely applied agricultural waste treatment method today. This method is easy to implement with extremely cheap and simple operating methods and costs. Wastewater after being treated in the biogas cellar can also be used as fuel to serve the daily needs of people such as cooking, lighting, etc.

5.4.5.2 Treatment of agricultural waste by biological pads

This method is applied in the livestock production. People will cover livestock and poultry cages with materials that are able to treat pollutants in livestock waste and reduce unpleasant odors. Typically: straw, rice straw, coir, rice husk, etc. This method is favored by its ease of use and high efficiency in livestock production.

5.4.5.3 Treatment of agricultural waste by living organism

The living organism mentioned here are earthworms and black flies. These organisms have the ability to turn polluting agricultural waste into nutrients that feed them. These organisms can then be used as pet food to provide an abundant and cost-effective source of nutrients. It's useful to be able to process agricultural waste and generate economic profits.

5.4.5.3 Treatment of agricultural waste by high-temperature composting

This technology uses a non-woven fabric (also known as toptex) to push the incubation temperature to 60 -70 degrees Celsius and still allow air to easily circulate in and out of the incubation tube. Then, aerobic organisms will proceed to decompose harmful organic waste and prevent NH₄ gas from escaping. This is a simple method that can be performed on-site without the investment of cumbersome equipment.

5.4.5.4 Treatment of agricultural waste by crop rotation method

This method is considered very effective and environmentally friendly. Trees will help protect the nutrients of the soil and increase the plant's resistance to pests and diseases. Thereby helping plants grow well without the need to use chemicals as well as pesticides. In addition, trees also help create cool air, significantly improving the environmental landscape.

5.4.5.5 Green organic waste treatment

Green organic waste is often made into compost, but the process is expensive and very unlikely to be sold at a price sufficient to cover the cost. At the same time, recycling compost as a mulch for the soil is also likely to cause harm to the environment because pathogenic microorganisms, insects, and parasitic fungi can proliferate rapidly in the decomposed compost, in addition, plant growth and survival may be inhibited. In Vietnam, a wastewater treatment process has been proposed to process and produce growth mixtures or soil substitutes, which can kill pathogenic microorganisms, insects, fungi and weed seeds to obtain can be used as mulch in different areas without spreading diseases and weeds.

Appendix A

(Reference)

List of pesticides banned from use in Vietnam

(Issued together with Circular No. 19/2021/TT-BNNPTNT dated December 18, 2021 of the Minister of Agriculture and Rural Development).

No	common name	(trade name)
Pesticides, forest product preservatives.		
1	Aldrin	Aldrex, Aldrite...
2	BHC, Lindane	Beta - BHC, Gamma - HCH, Gamatox 15EC, 20EC, Lindafor, Carbadan 4/4G, Sevidol 4/4G
3	Cadmium compound (Cd)	Cadmium compound (Cd)
4	Carbofuran	Kosfuran 3GR, Vifuran 3GR, Sugadan 30GR, Furadan 3GR
5	Chlordane	Chlorotox, Octachlor, Pentichlor...
6	Chlordimeform	Pesticides containing isobenzene Chlordimeform
7	DDT	Neocid, Pentachlorin, Chlorophenothane...
8	Dieldrin	Dieldrex, Dieldrite, Octalox...
9	Endosulfan	Cyclodan 35EC, Endosol 35EC, Tigiodan 35ND, Thasodant 35EC, Thiodol 35ND
10	Endrin	Hexadrin...
11	Heptachlor	Drimex, Heptamul, Heptox...
12	Isobenzen	Pesticides containing isobenzene
13	Isodrin	Pesticides containing Isodrin
14	Lead (Pb)	Pesticides containing Lead (Pb)
15	Methamidophos	Dynamite 50 SC, Filitox 70 SC, Master 50 EC, 70 SC, Monitor 50EC, 60SC, Isometha 50 DD, 60 DD, Isosuper 70 DD, Tamaron 50 EC...
16	Methyl Parathion	Danacap M 25, M 40; Folidol - M 50 EC; Isomethyl 50 ND; Metaphos 40 EC, 50EC; (Methyl Parathion) 20 EC, 40 EC, 50 EC; Milion 50 EC; Proteon 50 EC; Romethyl 50ND; Wofatox 50 EC ...
17	Monocrotophos	Apadrin 50SL, Magic 50SL, Nuvacron 40 SCW/DD, 50 SCW/DD, Thunder 515DD...
18	Parathion Ethyl	Alkexon, Orthophos, Thiopphos ...
19	Sodium Pentachlorophenate monohydrate	Copas NAP 90 G, PMD4 90 powder, PBB 100 powder
20	Pentachlorophenol	CMM 7 liquid oil
21	Phosphamidon	Dimecron 50 SCW/ DD...
22	Polychlorocamphene	Toxaphene, Camphechlor, Strobane
23	Trichlorfon (Chlorophos)	Biminy 40EC, 90SP; Dich Bach Trung 90SP; Dilexson 90WP; Dip 80SP; Diptecide 90WP; Terex 50EC, 90SP; Medophos 50EC, 750EC; Ofatox 400EC, 400WP; Batcasa 700EC; Cylux 500EC; Cobitox 5GR
Medicines for disease.		
1	Arsenic (As)	Arsenic organic compounds (liquid) Arsenic organic compounds (others)
2	Captan	Captane 75WP, Merpan 75WP...
3	Captafol	Difolatal 80WP, Folcid 80WP (aerosol)

		Difolatal 80WP, Folcid 80WP... (other)
4	Hexachlorobenzene	Anticarin, HCB... (aerosol)
		Anticarin, HCB... (other)
5	Mercury (Hg)	Mercury compounds (aerosol)
		Mercury compounds (other)
6	Selenium (Se)	Compounds of Selenium
Mouse poison		
1		(Thallium compound (Tl))
Herbicide		
1	2.4.5 T	Broctox, Decamine, Veon ... (aerosol)
		Broctox, Decamine, Veon... (other)

Appendix B. WHO's list 1A and 1B on hazardous plant protection drugs
(Reference)

N.	Active	International conventions	Acute toxicity	Chronic toxicity			
				Carcinogenic	Causing mutations	Reproductive poison	Endocrine Disruptors
1	<i>Acephate</i>						
2	Acrolein		x				
3	<i>Alachlor</i>	x					x
4	<i>Aldicarb</i>	x	x				x
5	Alpha-BHC; Alpha-HCH	x					
6	Alpha-chlorohydrin		x				
7	<i>Amitraz</i>						
8	Anthracene oil			x			
9	Arsenic and its compounds (see Appendix 1)			x			
10	<i>Atrazine</i>						x
11	Azafenidin					x	
12	Azinphos-ethyl		x				
13	Azinphos-methyl	x	x				
14	Benomyl	x			x	x	
15	Beta-cyfluthrin; Cyfluthrin		x				
16	Beta-HCH; Beta-BCH	x					x
17	Blasticidin-S		x				
18	Borax; disodium tetraborate decahydrate (only in case of pesticide use)					x	
19	Boric acid (only in case of use as a pesticide)					x	x
20	Brodifacoum		x				
21	Bromadiolone		x				
22	Bromethalin		x				
23	<i>Bromoxynil butyrate</i>						
24	Butoxycarboxim		x				
25	<i>Cadusafos</i>		x				
26	<i>Captafol</i>	x	x	x			
27	<i>Carbaryl</i>						x
28	<i>Carbofuran</i>	x	x				
29	<i>Carbosulfan</i>		x				
30	<i>Chlordane</i>	x					x
31	Chlorethoxyphos		x				
32	<i>Chlorfenapyr</i>						
33	Chlorfenvinphos		x				
34	Chlormephos		x				
35	Chlorophacinone		x				
36	Chlorotoluron						x
37	<i>Chlozolinate</i>						
38	Coumaphos		x				
39	Coumatetralyl		x				
40	Creosote			x			

41	<i>Cyhalothrin</i>						
42	<i>Daminozide</i>						
43	<i>DDT</i>	x					x
44	Demeton-S-methyl		x				
45	Dichlorvos; DDVP		x				
46	<i>Dicofol</i>						
47	Dicrotophos		x				
48	Difenacoum		x				
49	Difethialone		x				
50	<i>Dimethenamid</i>						
51	Dimoxystrobin						X
52	Dinocap					x	
53	<i>Dinoterb</i>		x			x	
54	Diphacinone		x				
55	Disulfoton		x				
56	<i>DNOC and salt of DNOC (see annex 1)</i>	x	x				
57	Edifenphos		x				
58	Endosulfan	x	x				
59	E-Phosphamidon		x				
60	Epichlorohydrin			x			x
61	<i>EPN</i>		x				
62	Ethiofencarb		x				
63	Ethoprophos; Ethoprop		x				
64	<i>Ethylene oxide</i>	x		x	x		
65	Ethylene thiourea					x	x
66	Famphur		x				
67	Fenamiphos		x				
68	Fenchlorazole-ethyl			x			
69	<i>Fenthion</i>						
70	Fentin acetate; Triphenyltinacetate		x				x
71	Fentin hydroxide; Triphenyltinhydroxide		x				x
72	<i>Fenvalerate</i>						
73	<i>Ferbam</i>						
74	Flocoumafen		x				
75	Fluazifop-butyl					x	
76	Flucythrinate		x				
77	Flumioxazin					x	
78	Fluoroacetamide	x	x				
79	Flusilazole					x	
80	<i>Formaldehyde</i>						
81	Formetanate		x				
82	Furathiocarb		x				
83	<i>Haloxypop-R</i>						
84	Heptenophos		x				
85	<i>Hexachlorobenzene</i>	x	x	x			x
86	<i>Hexchlorocyclohexane; isomer compounds BHC</i>	x					X
87	Isoxathion		x				
88	<i>Lindane</i>	x					x
89	Linuron					x	x
90	<i>Maleic hydrazide</i>						
91	Mecarbam		x				
92	<i>Mercury and its compounds (see annex</i>	x	x				

	1)						
93	<i>Methamidophos</i>	x	x				
94	<i>Methidathion</i>		x				
95	<i>Methiocarb</i>		x				
96	<i>Methomyl</i>		x				
97	<i>Methyl bromide</i>	x					
98	<i>Mevinphos</i>		x				
99	<i>Molinate</i>						x
100	<i>Monocrotophos</i>	x	x				
101	<i>Monolinuron</i>						
102	<i>Nicotine</i>		x				
103	<i>Nitrobenzene</i>					x	x
104	<i>Nonylphenol ethoxylates (see annex 1)</i>						
105	<i>Omethoate</i>		x				x
106	<i>Oxamyl</i>		x				
107	<i>Oxydemeton-methyl</i>		x				
108	<i>Paraffin oil; Mineral oil</i>			x			
109	<i>Paraquat dichloride</i>		x				
110	<i>Parathion</i>	x	x				
111	<i>Parathion-methyl</i>	x	x				
112	<i>PCP; Pentachlorophenol</i>	x	x				x
113	<i>Pentachlorobenzene</i>						
114	<i>Permethrin</i>						
115	<i>Phorate</i>		x				
116	<i>Phosalone</i>						
117	<i>Phosphamidon</i>	x	x				
118	<i>Profoxydim</i>						x
119	<i>Propetamphos</i>		x				
120	<i>Propham</i>						
121	<i>Propylene oxide, Oxirane</i>			x	x		
122	<i>Pyrazophos</i>						
123	<i>Pyriminil</i>						
124	<i>Quintozene</i>						
125	<i>Silafluofen</i>					x	
126	<i>Simazine</i>						
127	<i>Sodium fluoroacetate (1080)</i>		x				
128	<i>Strychnine</i>		x				
129	<i>Sulfotep</i>		x				
130	<i>Tebupirimifos</i>		x				
131	<i>Technazene</i>						
132	<i>Tefluthrin</i>		x				
133	<i>Tepraloxymid</i>						x
134	<i>Terbufos</i>		x				
135	<i>Thiodicarb</i>						
136	<i>Thiofanox</i>		x				
137	<i>Thiometon</i>		x				
138	<i>Thiourea</i>						x
139	<i>Thiram with benomyl and carbofuran</i>	x					x
140	<i>Triazamate</i>						
141	<i>Triazophos</i>		x				
142	<i>Tributyltin compounds; triorganostannic</i>						x

	<i>compounds</i>						
143	<i>Trichlorfon</i>						x
144	Tridemorph					x	
145	Vamidothion		x				
146	Vinclozolin					x	x
147	Warfarin		x			x	
148	Zeta-Cypermethrin		x				
149	Zinc Phosphate		x				
150	<i>Zineb</i>						x
151	Z-Phosphamidon		x				

Appendix B1: Active ingredients in the group mentioned in Appendix B

Active		number
Arsenic and its compounds		
1	<i>Arsenic pentoxide</i>	1303-28-2
2	<i>Axit cacodylic; axit dimethylarsinic</i>	75-60-5
3	<i>MSMA</i>	2163-80-6
4	<i>Natri arsenate/ Sodium arsenate</i>	13464-38-5
5	<i>Cacolydates; sodium dimethylarsinate</i>	124-65-2
6	<i>Chromium arsenate copper; CCA</i>	75-60-5
7	<i>Arsenic trioxide</i>	1327-53-3
8	<i>Calcium arsenate</i>	7778-44-1
9	<i>Arsenate coin</i>	10103-61-4
10	<i>Lead arsenate</i>	7784-40-9
11	<i>Sodium arsenate</i>	7784-46-5
DNOC and salt of DNOC		
1	<i>DNOC, ammonium salt</i>	2980-64-5
2	<i>DNOC, salt of potassium</i>	5787-96-2
3	<i>DNOC, salt of sodium</i>	2312-76-7
4	<i>DNOC</i>	534-52-1
Mercury and its compounds		
1	<i>Mercury chloride</i>	7487-94-7
2	<i>Mercury oxide</i>	21908-53-2
3	<i>Chloromethoxypropylmercuric acetate; CPMA</i>	1319-86-4
4	<i>Diphenylmercurydodecenylsuccinate; PMDS</i>	27236-65-3
5	<i>Phenylmercuric oleate; PMO</i>	104-68-9
6	<i>Phenylmercury acetate; PMA</i>	62-38-4

Active		number
Tributyltin compounds		
1	<i>Tributyltin oxide</i>	56-35-9
2	<i>Tributyltin fluoride</i>	4-10-1983
3	<i>Tributyltin methacrylate</i>	2155-70-6
4	<i>Tributyltin benzoate</i>	4342-36-3
5	<i>Tributyltin chloride</i>	1461-22-9
6	<i>Tributyltin linoleate</i>	24124-25-2
7	<i>Tributyltin naphthenate</i>	85409-17-2
Tributyltin triorganostannic no tributyltin		
1	<i>Fenbutatin-ôxit</i>	13356-08-6
2	<i>Cyhexatin</i>	13121-70-5
Nonylphenol ethoxylates		
1	<i>Nonylphenol ethoxylate</i>	68412-54-4
2	<i>Nonylphenol ethoxylate</i>	26027-38-3
3	<i>Nonylphenol ethoxylate</i>	37205-87-1
4	<i>Nonylphenol ethoxylate</i>	127087-87-0
5	<i>Nonylphenol ethoxylate</i>	9016-45-9
Paraffin Oil; Mineral oil		
1	<i>Paraffin oil</i>	64741-88-4
2	<i>Paraffin oil</i>	64741-89-5
3	<i>Paraffin oil</i>	64741-97-5
4	<i>Paraffin oil</i>	64742-46-7
5	<i>Paraffin oil</i>	64742-54-7
6	<i>Paraffin oil</i>	64742-55-8
7	<i>Paraffin oil</i>	64742-65-0
8	<i>Paraffin oil</i>	72623-86-0
9	<i>Paraffin oil</i>	97862-82-3

Appendix C

(Reference)

List of hazardous wastes

B.1 List of hazardous wastes

List of hazardous wastes (quoted from Decision No. 23/2006/QĐ-BTNMT dated December 26, 2006 of the Ministry of Natural Resources and Environment on the issuance of the List of hazardous waste)

Hazardous waste code	Waste name	EC code	Basel code (A/B)	Basel code (y)	Main hazardous properties	State of existence	Hazard threshold
...	...						
09	Waste from the wood processing industry, the manufacture of wood products, paper and pulp						
0901	Waste from the production of wood, and wood products	03 01					
090101	Sawdust, shavings, specimen heads, waste wood, chipboard and plywood contain hazardous ingredients	03 01 94		Y5	ET, T, F	Snake	*
0902	Waste from wood preservation	03 02					
090201	Organic wood preservatives that do not contain waste halogen compounds	03 02 01	A4040	Y5 Y39 Y42	ET, T	Liquid	**
09 02 02	Wood	03 02	A4040	Y5	ET, T	Liquid	**

	preservatives contain waste organochlorine compounds	02		Y39 Y41			
09 02 03	Wood preservatives containing waste organometallic compounds	03 02 03	A4040	Y5 Y19	ET, T	Liquid	**
09 02 04	Waste inorganic wood preservatives	03 02 04	A4040	Y5 Y21 Y24 Y29	ET, T	Liquid	**
09 02 05	Other types of waste wood preservatives that contain hazardous ingredients	03 02 05	A4040	Y39	ET, T	Liquid	*
...	...	...					
14	WASTE FROM AGRICULTURE, FORESTRY AND FISH PRODUCTS						
14 01	Waste from the use of plant protection substances						
14 01 01	Waste containing residues of pesticides	02 01 08	A4030	Y4	ET, T	Solid/liquid/mud	*
14 01 02	Waste containing residues of herbicides	02 01 08	A4030	Y4	ET, T	Solid/liquid/mud	*
14 01 03	Waste contains residues of fungicides	02 01 08	A4030	Y4	ET, T	Solid/liquid/mud	*
14 01 04	Retained or expired plant protection chemicals	02 01 08	A4030	Y4	ET, T	Solid/liquid	**
14 01 05	Packaging of waste plant protection	02 01 08	A4030 A4130	Y4	ET, T	Solid	*

	chemicals						
14 01 06	Other types of waste containing hazardous ingredients				ET, T	Solid/liquid/mud	*

Abbreviations

ET Ecologically toxic

F Flammable

T Toxic

Appendix D

(Reference)

Classification of waste in agro- forestry production

No	Waste group	Main waste components	Generation sources
1	Cultivation waste	Potting bags, packaging for manure, household waste (plastic bags, cigarette packs, food wrappers, green organic matter, wood from branches left behind after exploitation, sawdust, shavings, wood chips.	Activities of afforestation, tending and nurturing of forests, exploitation and processing of wood, making forestry roads, etc.
2	Livestock waste	Leftover food, manure, livestock wastewater, waste after slaughter, etc.	Animal husbandry, slaughter, etc.
3	Ordinary waste		
4	Toxic waste	Packaging for pesticides, wood preservatives, pesticide residues, wood preservatives, batteries, lubricants, etc.	Forest plant protection activities, wood processing and preservation, road construction, mechanized soil preparation, etc.

Reference

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