

# Current Use of Pesticides in the Agricultural Products of Cambodia

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## ABSTRACT

*Pesticide Management is still a complicated task with cross mandatory responsibility from various departments. At the Ministry of Agriculture Forestry and Fisheries (MAFF) in Cambodia, there are three departments working namely: 1) the Department of Agriculture Legislation as regulatory authority in charge of pesticide registration, licensing, inspection; 2) PPSPS Department of the General Directorate of Agriculture (GDA), playing a role as technical adviser in field evaluation of pesticides and efficacy field testing for registration; and 3) the National Agricultural Laboratory of GDA, which has a role in the analysis pesticides. Lack of law enforcement to farmers especially those who greatly depend on using pesticides created a big challenge for pesticide management in Cambodia; banned and restricted pesticides are widely available in the local markets. Counterfeit and illegal pesticide products are often found in unregistered pesticide shops/retailers. To fight against these challenges Cambodia shall take priority actions: improve border inspection on circulation of pesticides, and strengthening pesticide management law.*

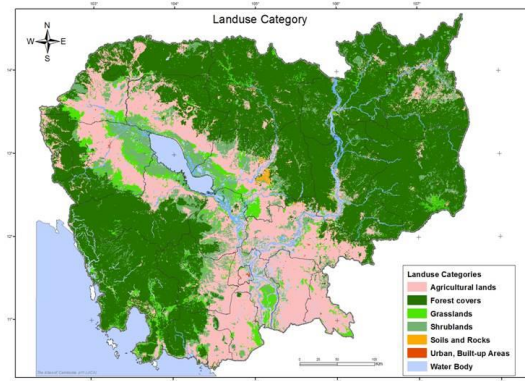
Keywords: Pesticide law enforcement, counterfeit pesticides, banned products, restricted, and permitted pesticides, border control, quality testing and residue analysis.

## INTRODUCTION

Cambodia is located at 102° to 108°E and 10° to 15°N. This country is influenced by the Monsoon climate, which consists of two seasons: dry season (November – April) and wet season (May – October). The rainfall is varied from 1250 to 2500 mm annually; the lowest is in January and the highest is in October with humidity range from 69% to 80%, the lowest of which occurs in March and the highest is in September. The day length is from 11 hours to 13 hours. The shortest day length is in December and longest is in June. The temperature varies from 23 to 33°C, the lowest occurs in December and highest is in April; with an evaporation of 2230mm per year. The lowest and highest evaporation occurs between September and March. The natural resources of Cambodia are officially under the protection of the State, as expressed in Article 59 of the constitution: “The state shall protect the environment and balance of abundant natural resources and establish a precise plan of management of land, water, air, wind, geology, ecology, ecologic system, mines, energy, petrol and gas, rocks and sand, germs, forests and forest products, wildlife, fish and aquatic resources”. The land use is divided by main groups such as Agricultural land (24%), forest cover (56%), grassland (6%), shrub land 10%), soil-Rock (0.2%), urban (0.1%) and water (3%).

Three departments under Cambodia’s Ministry of Agriculture, Forestry and Fisheries (MAFF) are responsible for plant protection and pesticide management: (1) the Department of Agriculture Legislation (DAL) as regulatory

authority in charge of pesticide registration, licensing, and inspection, 2) Department of Plant Protection Sanitary and Phytosanitary (DPPSPS) under the General Directorate of Agriculture (GDA), playing a role as technical adviser, provide training on pest management, pest control technology, pest monitoring, pest forecasting, pest outbreak warning, invasive species control and general pesticide advisory. It also conducts researches and developments on various pests to strengthen the implementation, managing pesticides including pesticide registration (providing efficacy field testing), and development of recommendation on pesticide use, and (3) the National Agricultural Laboratory (DAL) of the General Directorate of Agriculture, which has a role in the analysis of pesticides



### **Pesticide use:**

Cambodia is rich in bio-diversity and accordingly, agricultural crops are diversified. With the introduction of modern agriculture in the early '60s, traditional crop varieties were replaced by modern crop varieties (MCVs). These high inputs which are responsive to MCVs brought a significant change in Cambodia's agriculture. In due course, pest dynamics has also changed and a number of pest outbreaks occurred frequently. To overcome these problems, use of chemical pesticides also became frequent.

Cambodia's agriculture policy has emphasized eco-friendly production system, organic farming and IPM practice for sustainable agricultural development and food safety. Considering all these issues, the Pesticide Registration and Management Department has also emphasized the registration of bio-pesticide pesticides, which gradually reduce highly hazardous pesticides.

The Plan and policies of Cambodia also encouraged eco-friendly measures of agricultural production, IPM practice and organic farming which directly or indirectly support the concept of pesticide risk reduction in food safety. The preparation of pesticide policy and bio pesticide promotion directives is under way which encourages for the production, registration and use of bio-pesticides pesticides and bio-agent. The Royal Government of Cambodia (RGC) is regularly organizing training and awareness program on the safe use of pesticides to stakeholders and users of the pesticides.

Cambodia has also signed and ratified the Stockholm Convention (POP), Montreal Protocol (Ozone Depletion Materials) and Basel conventions with full developed action plans for implementation of the first two conventions with focal points placed in the Ministry of Environment. Whereas MAFF / DAL is the focal point for the Rotterdam Convention which had been acceded by Cambodia since May2013.

Cambodia's pesticide market has continued to expand over the last decade, which is basically a result of the liberalization of Cambodia's economy. Cambodia has no pesticide manufacturing capacity of its own, and most available pesticides are imported officially and illegally from neighboring countries such as Thailand and Vietnam. Some of the most popular pesticides, such as the organophosphates methyl parathion and Mevinphos are extremely

hazardous and are banned according to Cambodian law. The Environmental Justice Foundation (EJF) reported that inappropriate pesticide use in agriculture is widespread and that products are used by untrained and often illiterate farmers, who incur serious health consequences.

In recent years, MAFF has made strong efforts in pesticide management in Cambodia. The Government has issued an order to all relevant units to strengthen pesticide management and quality control including across border trade, distribution, sale and use of agrochemicals in the country. The Government has enforced pesticide labeling regulations, including development of labels in local Khmer language in line with the FAO Code of Conduct on the Distribution and the Use of Pesticides. In addition, MAFF is reviewing and updating the pesticide list including banned, restricted and permitted products through Ministerial proclamation No. 484 MAFF dated 26 November 2012 (Table 1).

Table1- List of Banned/Deregistered Pesticides in Cambodia					
S.N	Name of pesticides	Year of banned	S.N	Name of pesticides	Year of banned
1	Azinphos Methyl	2012	50	Demeton-s	2012
2	Aldicarb	2012	51	Demeton-S-methyl	2012
3	Aldoxycarb	2012	52	Diamidafos	2012
4	Aldrin	2012	53	Dichlorophene/Antiphen	2012
5	Aminocarb	2012	54	Dieldrin	2012
6	Amitraz	2012	55	Difenacoum	2012
7	Amitrol	2012	56	Difenthialone	2012
8	Antu	2012	57	Dimefox	2012
9	Aramite	2012	58	Dimethilan	2012
10	Arsenic compound	2012	59	Dinoseb	2012
11	Beta-HCH	2012	60	Dinoterb	2012
12	Benomyl	2012	61	Dioxathion	2012
13	Binapacryl	2012	62	Edifenphose	2012
14	Bromethalin	2012	63	Elemental phosphorous	2012
15	Bromophos	2012	64	Endosulfan	2012
16	Butoxycarboxim	2012	65	Endothion	2012
17	Cadmium compound	2012	66	Endrin/ Nendrin	2012
18	Cadusafos	2012	67	EPN	2012
19	Calcium arsenate	2012	68	Ethoprop(Ethoprophos)	2012
20	Calcium cyanide	2012	69	Ethylene dichloride(EDC)	2012
21	Camphechlor	2012	70	Ethylene oxide	2012
22	Captafol	2012	71	Famphur(Famophos)	2012
23	Captan	2012	72	Fenamiphos	2012
24	Carbon tetrachloride	2012	73	Fenbutatin oxide	2012
25	Carbophenothion	2012	74	Fensulfothion	2012
26	Chlordane	2012	75	Fentin hydroxide	2012
27	Chlordecone	2012	76	Fluoroacetamide	2012
28	Chlordimeform	2102	77	Fonofos	2012
29	Chlorethoxyfos	2012	78	Fosthietan	2012
30	Chlorfenvinphos	2012	79	Furathiocarb	2012
31	Chlorophenols	2012	80	HCH(Insecticide)	2012
32	Chlormephos	2012	81	Heptachlor	2012
33	Chlorbenzilate	2012	82	Hexachlorobenzene(HCB)	2012
34	Chlorophacinone	2012	83	Isobenzan	2012
35	Chlorthiophos	2012	84	Isodrin(Isomer of Aldrin)	2012
36	Copper arsenate	2012	85	Isoxathion	2012
37	Coumaphos	2012	86	Leptophos	2012
38	Crimidine	2012	87	Lindane(Gamma-HCH)	2012
39	Crotoxyphos	2012	88	Medinoterb acetate	2012
40	Cupric acetoarsenite	2012	89	Mephospholan	2012
41	Cyanthoate	2012	90	Mercaptofostion	2012
42	Cycloheximide	2012	91	Methiocarb	2012
43	Cyhexatin	2012	92	Methomyl	2012
44	Daminozide	2012	93	Mevinphos	2012
45	DBCP(Dibromochloropane)	2012	94	Mexacarbate	2012
46	DDT	2012	95	Methamidophos	2012
47	Demephion-o	2012	96	Monocrotophos	2012
48	Demephion-s	2012	97	Oxamyl	2012
49	Demeton-o	2012	98	Parathion-methyl	2012

In the context of chemical management, the Ministry of Environment is starting to introduce the GHS (Global Harmonization System) for pesticide labeling. Japan International Cooperation Agency (JICA) has provided assistance for staff capacity building and facilities for strengthening pesticide analysis laboratory. Frequent inspecting to the pesticides retailers, dealers, formulators and others users are done in order to check whether they follow the code of conduct related to pesticide use as regulated by the RGC. Pesticide laboratory has been established and brought into operation especially on formulation and quality testing. With regards to pesticide management, there are many challenges which remain unresolved, such as insufficient enforcement of rules and regulations, uncontrolled importation, and broad availability of undesirable pesticides, misuse and over use, limited data on health and environmental effects and high pesticide residues in food. However, on a positive note, there has been a broad recognition throughout the Government, NGOs and private sector with regards to current pesticide issues and their negative implications for production, health, environment and trade. However, testing for residues in fruits and vegetables is the first priority for the upcoming action plan.

Through Policy Component of project GCP/RAS/229/SWE of the Swedish-supported Pesticide Risk Reduction Program activities were carried out to address the issue of highly hazardous pesticides through capacity building for chemicals management in general. Cambodia focused on initial steps to develop adequate regulatory framework including legal documents and functional mechanism for the control of pesticides and capacity building for staff members in national and provincial levels on pesticide management including training for retailers and inspectors, pesticide quality control and inspection, and registration and data base development. In addition, Cambodia participated in an FAO Regional High-Level Workshop on Licensing and Inspection of Pesticide Sellers, which was organized in Hanoi on 10-11 November 2008. The workshop facilitated the exchange of information and experiences, and to discuss common issues/questions related to the establishment and operation of a functional licensing and inspection schemes for pesticide importers and sellers in compliance with legal obligations.

Farmers and pesticide traders' survey took part to determine the perceptions and practices of pesticide use among farmers that incorporated agrochemicals into their farming strategy. Survey results in nine provinces, identified to be potentially at elevated risk from pesticide use, were surveyed. In Cambodia, specialist traders are found in larger towns that sell pesticides, together with seeds and chemical fertilizers. In smaller towns general stores sell pesticides typically alongside other products, including groceries and cosmetics. Of the 109 pesticide retailers interviewed, 10 were owners of specialized stores and 99 were general store owners. Farmers are more willing to trust the quality of pesticides purchased from specialized stores. It is often suspected that general stores dilute their stocks and due to low turnover, some pesticides turn out to be older stocks. However, sometimes distance prohibits farmers from travelling to major towns to buy pesticides from specialized stores. In some cases, farmers do not have enough money to buy pesticides and local stores will often sell on credit, whereas specialized stores will not. Sometimes local stores will sell pre-mixed 'pesticide cocktails'. The survey found that 97% of traders were selling more pesticides and were giving them more shelf space. Pesticide traders said they had no difficulty in acquiring pesticides and assumed that all pesticides were legal in Cambodia. All pesticide retailers were unaware of the 1998 sub-decree on Standards and Management of Agricultural Materials that lists pesticides that are banned or of restricted use in Cambodia.

The chemical products used in Cambodian agriculture are mainly fertilizers and pesticides. While Cambodia is not an agro-chemical producer (table2); and mainly imports from neighboring countries (Thailand & Vietnam), there are some cases in which pesticides are imported from China and European Union members states.

According to the law, agrochemical importing companies must be registered at the MAFF before allowing them to be imported into Cambodia. However, there were not all agrochemical importing companies which have been registered; some of them still imported without registering their products. Some unofficial reports indicated that around 60-80% of imported pesticides were illegally imported bought along the Thai and Vietnam borders. Official data recorded that till now December 2013 registered pesticides are used in Cambodia are 750 common names and trade name of pesticides, while the retailers holding license, which directly deliver to the users are only 35 holders

(Table 2).

Table2- Pesticide data in brief		
No.	Description	Number
1	Pesticide registered from 01 Oct 2012 to 10 <sup>th</sup> Dec 2013	750
2	Pesticide registered till 01Oct 2012 to 10 <sup>th</sup> Dec 2013	750
3	License holder (Retailers)	35
4	Trained personnel (Safe storage and Use)	9300

Pesticide use: Before 1980, farmers who used pesticides in their farm production were only 7%. The number of pesticide consumption increased up to 49% in 1985-1994 in donation framework (Anonymous, 2009). A basic study in 2004 reported that about 67% of farmers used chemical pesticides in their production crops at least one time a year. The use of chemical pesticides also varied depending on the seasonal crops; high usage of pesticides occurs during the dry season crop, where 98% of the community use chemical pesticides in their vegetable, tobacco, bean and dry season rice crop (8-15% of the wet season rice crop) (Anonymous, 2009). There is no records of the exact volume of chemical pesticides used; but it were estimated about 3,570 tons were used in 2007.

Bamate
Bent 600
Filitox 50EC
Filitox 60DD
Filitox 70SC
Giant 50%WW EC
Giant 70DD
L. Talon
Marathon
Methamidophos 70SL
Methamidophos 60
Methamidophos 70%
Methaphos 70SC
Monitor 50EC

Monitor 50SC
Monitor 60SC
Monitor 70DD
Methon
Morris
Ovansu
Sigtifos
Siter-Nissan
Tom 50EC
Tom 60EC
Tom 70EC
U-T 70
U-T 80
Vindo



Fig. 1. The 28 trade names of Methamidophos

Type of pesticide use: there are 522 trade names of 133 common names of chemical pesticides available in local markets; most of them are unregistered pesticides. We found several trade names in one common name of those unregistered pesticide such as Methamidophos and Abamectin (Fig. 1 & Fig. 2). Unregistered/illegal pesticides mostly are extremely and highly hazardous pesticides (Fig. 3). There were 13 common names of banned and restricted pesticides for use observed in the markets in 2007; they are Methyl parathion, Mevinphos, Methamidophos, Methomyl, Monocrotophos, Dichlophos, DDT and Chlodane.

Ababest	kabamax
Abalimec 36EC	Masket
Abamectin	Masta
Abamet	Maxagro
Abatimec 1.8EC	Naicer
Abatin 1.8EC	Pivbek
Amerec 36EC	Plutel 3.6EC
Avina	Pro 3K
Bambin	Saco-sdim
Citrameth-Luxen	Samsin
Fanty 2.5 EC	Sitramec
Geno mectin	Ste Kodsilla
Hen Abid	Supermectin
Intak	Voi Thai 2.6EC
Inter Face	Vertimec 1.8 EC
Jacket	World mekin 2EC



Fig. 2. Some trade names of Abamectin

Several studies on pesticide impact showed that Cambodian farmers used a highly hazardous pesticide which has been well recorded. FAOs’ study indicated that the percentage of using highly hazardous pesticides class ‘1a’ decreased from 77% to 43% in 2008. Moreover, the study found that: among the 84% of farmers using highly hazardous, there are 43% using ‘1a’ class, 9% using ‘1b’ class and 32% using II class (Fig. 3).

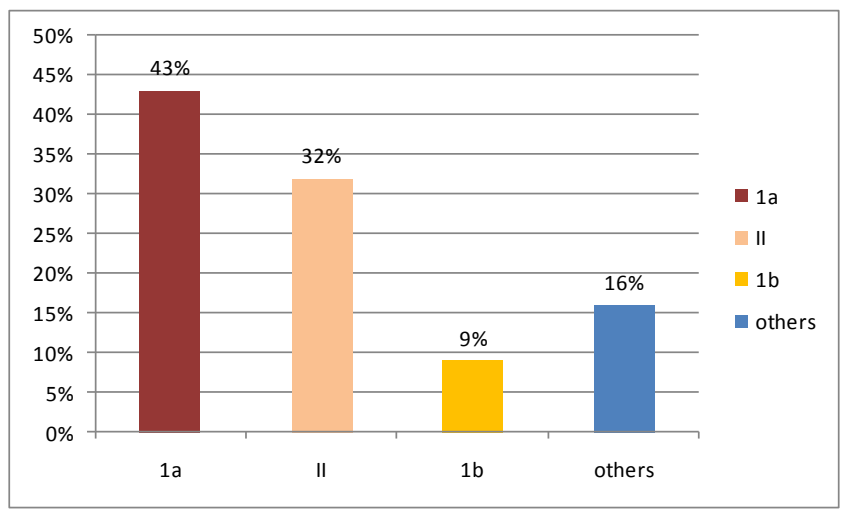


Fig. 3. Percentage of pesticide used in different class of WHO’s classification (Anonymous, 2009)

Cambodian farmers commonly use at least 12 insecticides belonging to the neonicotinoid family (Cheang, 2013). These insecticides are not yet included in the country’s updated list of banned or restricted pesticides (MAFF 2012).

Indiscriminate use of pesticides not only puts sustainable agricultural production at risk through the disruption of vital ecosystem services, pesticide residues on fresh produce that exceed the maximum(allowable) residue limits (MRLs) also raise food safety concerns and jeopardize their export potentials. MRLs are standards set by individual countries for traded agricultural commodities according to types of pesticides. Pesticide residues result from: 1) heavy pesticide use on the growing crop;2) insecticide used in post-harvest management to preserve food during storage; and 3) the persistence and carry-over effect of residues in the soil.

Survey studies of pesticide contamination of vegetables in Cambodian markets found produce containing residues of organochlorine (Wang *et al.*, 2011), organophosphate and carbamate (Neufeld *et al.*, 2010) exceeding MRLs. Cambodia ranks first among 13 countries in the region with the highest pesticide residue on vegetables, particularly leafy vegetables from Kandal province (Wang *et al.*, 2011).

Based on pesticides displayed in the markets for sale, the study found that the majority of pesticides being used in Cambodia were in ‘1a’ class of WHO’s classification with the 18% of common names and 2% of trade names. Moreover, the POPs’ pesticides such as DDT and Chlodane were still found to be used in the farms (EJF, 2002).



Pesticides are displayed for sale together with other food stuff in unregistered shops.



Pesticide application service provider is available at the farm level.

Even with the National targets and efforts regarding pesticide risk reduction as well as phasing out highly hazardous pesticides, Cambodia is still facing a big obstacle due to the limitation of human resources for anti-counterfeiting/illegal pesticides and farmers still prefer to use pesticides because their perception on pesticide use is that it is the more the effective option (Anonymous, 2009).

Several unregistered shops have signages in foreigner languages (Thai & Vietnam), carrying those pesticides which are banned for use in Cambodia and are not available in those countries. Moreover, the labels are too old and already expired (EJF, 2002).

Pesticides disposal: However, the Ministry of Agriculture, Forestry and Fisheries (MAFF) has taken the priority action to minimize this hot issue. The sub-decree no. 69 was not fully implemented in the pesticide management departments; therefore the Law on the Management of Pesticides and Fertilizers has been ratified by the National Assembly on December 21<sup>st</sup>, 2011.

### **Future actions:**

As chemical pesticides are widely available almost practically anywhere and most of them are illegal, counterfeit products in Cambodia should take priority action as suggested below:

- Improve pesticide movement inspection activities in the borders, which is a key part in strengthening pesticide

management;

- The limitation of law enforcement with lack of public awareness should have the following priority actions: Strengthen Law enforcement especially on Law on the Management of Pesticides and Fertilizers, The government should lead the push for the enforcement of policies, regulations and legislation relating to environmental protection and the responsible use of pesticides to reduce the risks and impacts of agro-chemicals use. The implementation of the law should be mandatory, not voluntary. Financial or other penalties should be imposed on traders for illegally importing, selling or distributing banned pesticides, and on farmers for using them. Information about the law should be well disseminated and explained to farmers, retailers, importers and border inspectors through newspapers, television, radio and other forms of media.
- Focus on reviewing and revising pesticide management legislation toward reducing highly toxic pesticides (Ministerial declaration on banned, restricted, and permitted pesticides for use);
- Step-by-step phase out of highly toxic pesticides; use pesticides in accordance with regulations related to ensure safety for humans, animals, plants, environment and food;
- Promote study and application of science and technology to production, trading and use of bio-pesticides and other environmentally friendly control measures; develop pest-free areas. Educational efforts, especially at the farm level, are needed to improve compliance with ASEAN GAP standards. Furthermore, the global and domestic markets for organic foods and beverages are growing and the demand for food safety is increasing.
- Build a system for waste container collection and treatment; use containers made from recyclable materials;
- Encourage traders and plant protection service organizations to provide training and guiding for safe and effective use of pesticides; provide technical training for manufacturers;
- Encourage IPM and GAP measures; encourage plant protection service activities, organize specialized agricultural technical services.

## CONCLUSION

The Ministry of Agriculture, Forestry and Fisheries (MAFF) in Cambodia is playing an important role to solve the sensitive issue of the national socio-economic, environment and agriculture sector; this ministry should lead the enforcement of policies, regulations and legislation related to environmental protection and the responsible use of pesticides to reduce the risks and impacts of agro-chemicals use. In MAFF there are three departments responsible for the regulatory authority in charge of pesticide registration, licensing, inspection (DAL), technical adviser infield evaluation of pesticides and efficacy field testing for registration (PPSPSD), and analysis of pesticides for supporting counterfeit and illegal pesticides policy (NAL).

The problem with use of pesticides takes its roots based on the limited knowledge of pesticide use along with lack of law enforcement. This has created a big challenge for pesticide management in Cambodia. Most banned and restricted pesticides are still available in the local markets. Cambodia shall take the prime actions to improve border inspection on the movement of pesticides; this action is part of firing against counterfeit and illegal pesticide products; which is very often found in unregistered pesticide shops/retailers.

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