Research Journal of Agriculture and Forestry Sciences _____ ISSN 2320-6063
Vol. **3(3),** 26-29, March **(2015)** *Res. J. Agriculture and Forestry Sci.*

Review Paper

A Review on Status of Pesticides Use in Nepal

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Available online at: www.isca.in, www.isca.me
Received 22nd January 2015, revised 25th February 2015, accepted 4th March 2015

Abstract

Pesticides are used for increasing the agricultural productivity and safeguarding the public health. This paper analyses the trend of pesticide import, formulation and consumption in Nepal. Moreover, quantity of pesticide used per hectare of agriculture field in Nepal has been compared with other countries of the world and banned pesticides in Nepal have been reported along with their hazard level. Results show an increasing trend of pesticide consumption for agricultural purposes. Fungicides are the major form of pesticide used in the country.

Keywords: Pesticides, agriculture, consumption, Nepal.

Introduction

It has not been long that people started using chemicals in order to increase the agricultural productivity and securing human health. These chemicals are often called as pesticides and insecticides even though they are found under different brands and names in the market. According to EPA, pesticides are the chemicals used to prevent, destroy, repel and mitigate the insects and pests. Pesticides are of two types: chemical based and biological products based; later one is much more sustainable solution for pest control. Identification of DDT as a potential pesticide by Paul Herman Muller in 1939, for which a Nobel Prize was awarded, opened the gate to the extensive use of the chemicals for various purposes. In Nepal, during the 1950s, DDT was introduced for malaria eradication program which was later imported by the Government of Nepal. Later on, other pesticides like Gammexene and nicotine sulfates were imported for the same purpose. Gradually, new kinds of pesticides like organochlorines, organophosphates and carbamates were introduced.

Uses of pesticides come with adverse effects on the health of the people[1], land and environment. Studies have already confirmed that the use of pesticides and insecticides might results in the cancer[2], non-cancer[3] and improper neural development[4-7]. Other fatal effects of pesticides are dermatological effects[8], acute and chronic neurotoxicity[9], birth defects[4], fetal death[10,11], altered growth[12] and genotoxicity[13], destroys habitat[14]. Even though the effects of the pesticides are already pronounced, people in developing countries are still using the pesticides.

In 2007, about 2363 million kg of pesticides was used in the world with herbicides constituting the highest share of 950.7 million kg followed by 404.6 million kg of insecticides followed by 262.17 million kg of fungicides. Other pesticides like nematicides and fumigants etc also constituted the share of 773.37 million kg[15].

Data Source

This study is based on the secondary information published by the relevant organization in Nepal and beyond. Pesticide consumption data has been taken from the publications of Ministry of Agriculture Development- Nepal and Environment Statistics of Nepal, 2013[16].

Results and Discussion

Consumption of pesticides in Nepal: About two million tons of pesticides are used globally among which 45 percent is consumed in Europe followed by 24 percent in the USA and remaining 25 percent in the rest of the world[17]. Figure-1 shows the consumption of pesticides in some selected countries of the world. The domestic consumption of pesticide in Nepal is very low 0.142 a.i. kg/ha (kilogram per hectare)[18] comparing with other countries like India (0.5 kg/ha), Mexico (0.75 kg/ha), Germany (3 kg/ha), UK (5 kg/ha), USA (7kg/ha), Netherlands (9.4kg/ha), Japan (12 kg/ha), China (14 kg/ha) and Taiwan (17 kg/ha)[19,20]. Fungicides are the dominant form of pesticides used in Nepal. In the year 2011/2012, more than 48% of pesticides were used in the form of fungicides[21]. Total active ingredients used in the pesticides during 2011/2012 were about 345 thousands kg or liters of which very minimal amount has been used for public health use.

Banned pesticides in Nepal: At present, 67 firms are registered for pesticide import in Nepal and five companies for pesticide formulation. Likewise, ten companies have been given the license for commercial pesticides spraying. A total of 108 pesticides have been registered under different common name whereas 1098 under different trade name[21].

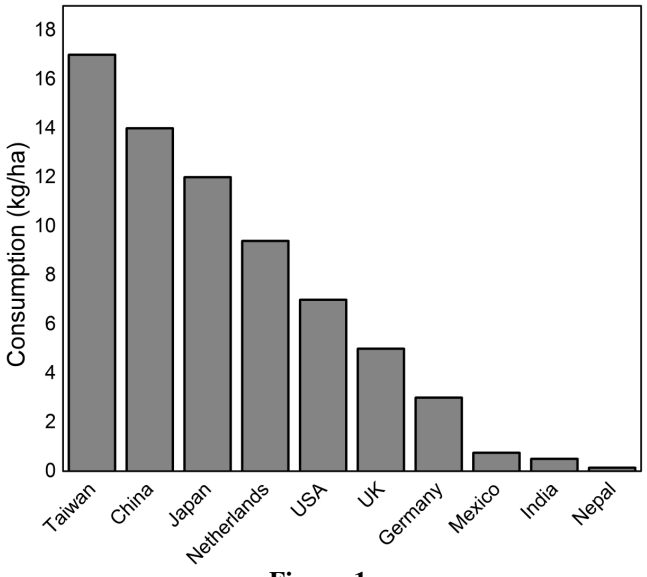

Figure-1
Pesticide consumption (kg/ha) in different countries

After the Rotterdam Convention, many countries have banned the use of various pesticides because of its health and environmental effects. Indian has banned a total of 32 pesticides and pesticide formulation for import, manufacture and use[22]. Table-1 shows the list of banned pesticides in Nepal along with the chemical formula. Most of the pesticides banned in Nepal are under moderately hazardous level according to World Health Organization[23]. Pesticides like Aldrin, Dieldrin, Endrin, Heptachlor, Morex and Toxafen are no longer used as pesticides. Moreover, the pesticides like Methyl parathion, monocrotophos and phosphamidon are highly and extremely hazardous.

Pesticides import and formulation: Figure-2 shows the trend of pesticides import and formulation in Nepal along with its monetary value. Quantity of pesticide is given in active ingredients or a.i. USEPA has defined a.i. as the substance or chemicals of pesticides which can kill, repel, attract or mitigate the pests. Remaining portion of the pesticides consists of inert ingredients which act for other reasons than pesticide effects. In 1997/1998, pesticide imported and formulated in Nepal was about 50 thousands kg which has soared to about 350 thousands kg in 2011/2012 which is more than 6 folds increase. Regarding the expenditure for pesticide import and formulation, in 1997/1998 about 51 million Nepalese rupees (NRs.) was spent. This expenditure rose to more than 374 million NRs in 2011/2012. This might help in proving the increasing dependency upon the chemical for increase in agricultural productivity.

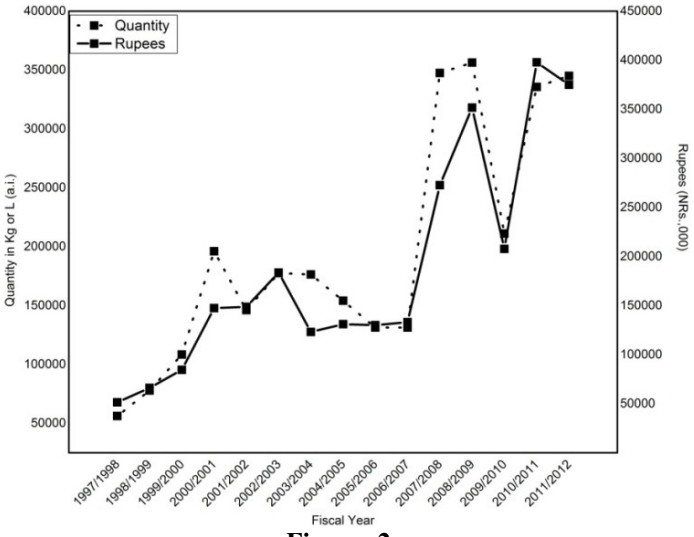

Figure -2
Trend of pesticides import and formulation in Nepal along and monetary value

Table-1
Banned pesticides in Nepal along with chemical formula, WHO group and associated hazard level

Name	Formula	WHO group	Hazard level
Aldrin	$C_{12}H8Cl6$	O	Obsolete as pesticide, not classified
BHC	C6H6Cl6	II	Moderately hazardous
Chlordane	$C_{10}H_6Cl_8$	II	Moderately hazardous
DDT	$C_{14}H_9Cl_5$	II	Moderately hazardous
Dieldrin	$C_{12}H_8Cl_6O$	O	Obsolete as pesticide, not classified
Endosulphan*	$C_9H_6Cl_6O_3S$	II	Moderately hazardous
Endrin	$C_{12}H_8Cl_6O$	O	Obsolete as pesticide, not classified
Heptachlor	$C_{10}H_5Cl_7$	O	Obsolete as pesticide, not classified
Lindane	$C_6H_6Cl_6$	II	Moderately hazardous
Methyl parathion	$C_8H_{10}NO_5PS$	Ia	Extremely hazardous
Mirex	$C_{10}Cl_{12}$	O	Obsolete as pesticide, not classified
Monocrotophos	$C_7H_{14}NO_5P$	Ib	Highly hazardous
Organo mercury chloride	Cl_2Hg	II	Moderately hazardous
Phosphamidon	$C_{10}H_{19}ClNO_5P$	Ia	Extremely hazardous
Toxafen	$C_{10}H_{10}Cl_8$	O	Obsolete as pesticide, not classified

Use of pesticides for agriculture and public health purposes: Not only for agricultural purpose is pesticides used but for the public health purposes as well. Pesticide was imported in Nepal at first for getting rid of malaria parasite. Pesticides have been classified into two parts: i. Agricultural use and ii. Public health use. Agricultural use pesticides includes insecticides (organochlorine, organophosphates, carbamates, synthetic pyerthroids, botanical products, mixed insecticides and others), herbicides, fungicides, rodenticides, bio-pesticides, acaricides, bactericides and others. In Nepal, pesticide for agricultural purposes are mainly used for controlling the pests, weeds and rodents whereas for public health purposes its mainly used for the control of malaria, dengue fever etc as in India[17]. Department of Food Technology and Quality Control Nepal carried out a study during 1995-2007 and found that 12.1 percent of 1034 food samples were contaminated with pesticides[24]. A study conducted in Delhi, India also found that majority of the vegetables is contaminated with pesticide[25]. Figure-3 shows the temporal trend of pesticides quantity used for agricultural and public health purposes in Nepal. In the year 2011/2012, total a.i. in agricultural pesticide was 0.3 million kg but that in pesticide for public health purpose was only 174 kg. Noticeable reduction in the quantity of pesticide for public health use might have occurred as the levels of awareness in people regarding the harmful effects of pesticides are increasing.

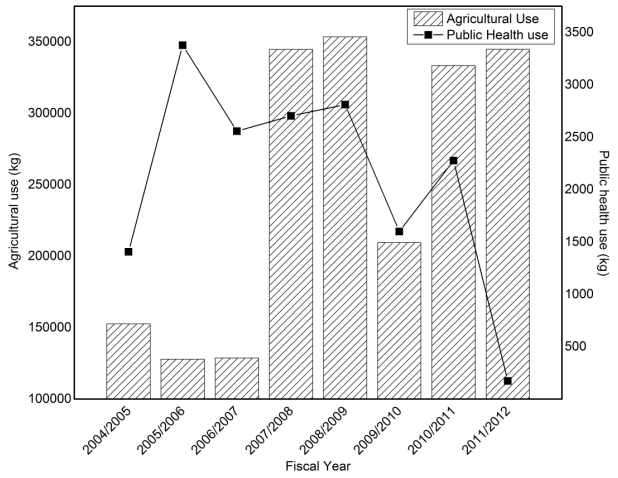

Figure – 3
Quantity of pesticides used for agriculture and public health purposes

Trends and constituents of pesticides: In broader sense, insecticides are a part of pesticides. Insecticides are the chemicals intended to kill the insects or control them from their undesirable behavior by acting upon the nervous system of the insects. Figure-4 shows the trends of insecticides, fungicides, herbicides use in Nepal. For most of the cases, we can observe the increasing trend with fluctuation in the use of the chemicals. Insecticides have been subdivided into five sub-categories: organochlorines, organophosphates, carbamates, synthetic pyrethoids and others or mixed. Organophosphates are the major constituents of insecticides. From 2004/2005 the use of mixed/others insecticide is also increasing.

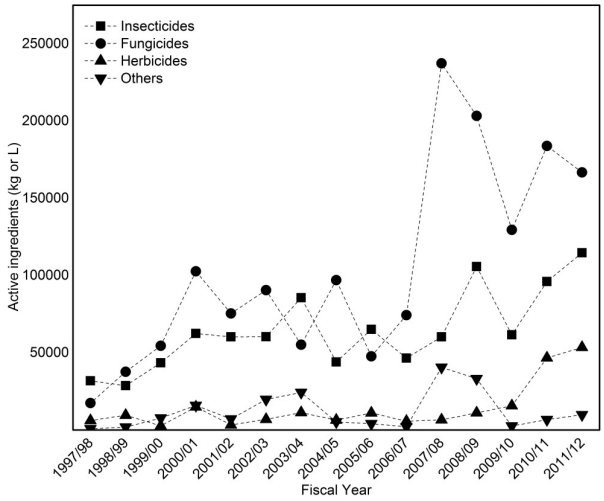

Figure – 4
Trends of insecticides, fungicides and herbicides consumption in Nepal

Conclusion

Since 1950s, pesticides have been used for increasing the agricultural productivity and safeguarding the public health in Nepal. Every year the consumption of pesticide for agriculture purpose is increasing but the quantity of consumption per hectare in agricultural field is very low comparing with other countries of the globe. Trend of pesticide import, formulation and consumption in Nepal have been analyzed. The results showed an increasing trend of pesticide consumption for agricultural purposes but quantity of pesticide used for public health purposed has been decreased. Among various forms of pesticides, fungicides are the main pesticide used in the country.

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