Knowledge and Practice of Pesticide Used in Agriculture and Its Effect on Health of Vegetable Growers in Mahalaxmi Municipality, Dhankuta

A Thesis

Submitted to Department of Health and Population

in the Partial Fulfillment for Master of Education in Health Education

Submitted by

Anjana Rai

Tribhuvan University

Faculty of Education

Central Department of Education

Health and Population Education Department

Kirtipur, Kathmandu

2021

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शिक्षाशास्त्र संकाय
स्वास्थ्य तथा जनसङ्ख्या शिक्षा विभाग

TRIBHUVAN UNIVERSITY
FACULTY OF EDUCATION
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Recommendation

The research work entitled '**Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegetable Growers in Mahalaxmi Municipality, Dhankuta District**' is prepared by **Anjana Rai** under my supervision, as a part of the requirement to complete Master of Education. To the best of my knowledge, the study is original and carries useful information on the Vegetable Growers in Mahalaxmi Municipality, Dhankuta District. I forward this to the thesis committee with recommendation.

Date: …… ……..……....……

Prof. Dr. Deep Bahadur Adhikari
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Health and PopulationEducation Department
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Approval Sheet

This dissertation work entitled '**Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegetable Growers in Mahalaxmi Municipality, Dhankuta District**' submitted by Anjana Rai in partial fulfillment of the requirement of the degree of Maser Degree in Health education has been approved.

Thesis Evaluation Committee	**Signature**
Pitamber Acharya, Head Lecturer, Health and Population Education Department, Tribhuvan University, Kirtipur	_____ Chairperson
Prof. Dr. Deep Bahadur Adhikari Health and Population Education Department Tribhuvan University, Kirtipur	_____ Supervisor
…….. ……	_____ External

Date:

Declaration

I, hereby, declare that, to the best of my knowledge, this thesis is my original work no part of it was earlier submitted for the candidature of research degree to any university, colleges or educational institutions. The subject matter presented in this thesis report is the result of my own work.

Date: .....…….

Anjana Rai

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This thesis has been completed with the great deal of support and encouragement from many people and institutions. It was impossible to complete this without their valuable inputs. Now I a taking this opportunity express my acknowledge for their inputs.

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Anjana Rai

Abstract

Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegetable Growers in Mahalaxmi Municipality, Dhankuta District is a representative vision of the reality. Main thrust of the study is to find out the social and economic background of the study area, to analyze the knowledge and attitude and practice on pesticides used among the vegetable growers and to assess the effect of pesticides on health of vegetable growers

This study has mainly based on the quantitative and descriptive research design.In this study, both primary and secondary sources of data have been used Primary data mainly used to present and analyze the Pesticides practices in the study areas. There is 1450 population and 214 household of farmers in the Marekatahare Ghumaune of Mahalaxmi Municipality-1 of Dhankuta. All those were the population of this study area in order to conduct this study. Research has selected 140 farmers applying simple random sampling method (Lottery Method).

Interview was the main tools of data collection. The researcher was made different sets of interview questions for farmers. The interview schedule was pretested in 12 household in Marekatahare Ghumaune 1 of Mahalaxmi Municipality Dhankuta. The tools were modified and finalized according to the advice of the supervisor and pre-test result. In data collection procedures, the researcher personally was visited each of the selected farmers and introduced herself about the study area and explained aim of the visit. The researcher was requested them to answer the questions based on the interview schedule.

Pest control as the application of technology, in the context of biological knowledge, to achieve a satisfactory reduction, it should be appreciated that the decisions whether or not to apply control measures are usually required before pest populations reach the damage threshold. The concept of pest management depends on the population dynamics of the pest and the level of the damage caused by them. The use of pesticides for plant protection has steadily increased. Increasing demands for chemical pesticides resulted in private dealerships selling and distributing pesticides throughout the country.

Pest control procedures may be categorized under different headings such as cultural, biological, chemical etc. However, there is now a strong tendency to use two or more approaches together in a system of integrated control and is called as “Integrated Pest

Management". Integrated Pest Management is therefore, can be defined as blending of two or more control measures in order to control pests below economic injury level.

The seasonal appearance of pest during tea cultivation necessitates timely management of the crop through pesticides. Pesticides due to it's highly toxicity adversely affect the balance between pest and their natural enemies like predators and parasitoids on many crops; including tea. An avoidance of pesticide during the main period of predator activity is desirable but in vegetable the periods of the activities of the major pests and their predators get synchronized at different density levels. However, care should be taken not to overdose on pesticides because these can lead to a high residue level of toxic substances in the vegetable. Pest that commonly attack vegetable crops includes grasshopper mites, thrips, jassids, moth, beetles and defoliating caterpillars. The presence of pesticide residues in food commodities has always a matter of serious concern. The level of pesticide residue in foodstuffs are generally legislated so as to minimize or unnecessary intake of pesticides.

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Chapter I: Introduction

Background of the Study

The balance between population increase and sufficient food production is one of the most important challenges in South Asian Countries, including Nepal. The use of pesticides is an effective method to protect crops from being damaged and to improve yields. Over the past years there has been an increase in the use of pesticides in developing countries now account for about 20% of the worlds expenditure on pesticides. However, improper use of pesticides can cause human poisonings, accumulate as residues in food and the environment, and lead to the development of resistance in pests (Agnihothrudu, 1993).

Pesticides are unique toxic chemical substances which are potentially “biocides” and that are deliberately added to the environment to eliminate or suppress different types of pest in the agricultural field. Most of the pesticides released into the environment every year by human activity, persistent pesticides are among the most dangerous (Palikhe, 2005).

Pesticides have profoundly improved the human livelihood. Their dramatic effort in preventing crop loss and controlling vectors of diseases have led to their acceptance and expanded use throughout the world (Sharp & Peter, 2005). However, being toxic in nature, they are the agents of human diseases and environmental pollution. It has been observed that during cultivation of tea, many pests may attack it. Tea growers apply several agro-chemicals including pesticides. Pesticides do not differentiate between target and non-target species and hence threatens the health and well beings of humans and wildlife’s in every regions of the world (Thapa & Shakya, 2006).

These highly stable compounds can lasts for decades before breaking down. Their highly toxicity cause an array of adverse effects, notably death, diseases, and birth defects among human and animals. Specific effects can include cancer, allergies and hypersensitivity damage to the central and peripheral nervous system, reproductive disorders and disruption of the immune system (Strecct, 1981. Maroni, 2006). Being highly toxic, pesticides are essentially is subjected to safe and judicious use. In Nepal, due to injudicious and indiscriminate use of pesticides, many accidents have occurred in every parts of the country. Presence of pesticides in food, fruits, vegetables, and environment and even in the mother’s milk is a matter of grave concern. They circulate globally and persistent pesticides released in

one part of the world can be transmitted through a repeated process of evaporation and deposit through atmosphere to regions far away from the original source (Williams, 2000).

Use of pesticides in agriculture has created fourfold problem through tropic levels: health problems, environmental problems, yield loss due to non target pesticide application resulting in pesticide induced pests' resurgence and finally financial burden to the farmers (Ghimire , 2007). Specific studies dealing with the Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegetable Growers to can help policy decisions to bring about changes in the agriculture practices.

Statement of the Problem

In addition to their agricultural use in crop protection, pesticides are important public health tools that are used to prevent vector-borne disease and to increase food supplies. However, recent research has shown that pesticides may also have negative impacts on public health. Studies have demonstrated acutely toxic effects at high doses, as well as chronic effects at low levels of exposure. Organophosphate (OP), carbamate, pyrethroid, and organochlorine insecticides have been shown to cross the human placenta, exposing developing fetuses. Prenatal exposure to pesticides is of particular concern due to the demonstrated neurodevelopmental toxicity of certain classes of pesticides. Due to the potential health effects of pesticide exposure, most countries have developed regulations to encourage safe use and control production, import, and export of pesticides (AEC/FNCCI, 2007).

Nonetheless, regulation and enforcement is weaker in some countries than others. For example, some pesticides that are banned in certain countries due to their demonstrated health or ecological effects are still used elsewhere. In addition, safe practices, such as the use of personal protective equipment and following recommendations on pesticide container labels, are weak or absent in some places (Banerjee, 1970)

The use of chemical pesticides in Thailand dates back to World War II, when DDT was imported to control the spread of malaria. Since then, their use has expanded to agricultural, industrial, and residential pest control. Most pesticides used in Thailand are imported rather than produced in-country, likely due to the difficulty in obtaining a permit for production from the government. The most recently published statistics showed that over

50,000 tons of active ingredients of pesticides (including insecticides, fungicides, herbicides, and other classes) were imported into Thailand in 2003. In the same year, 54% of agricultural holdings reported using pesticides, with 73% of holdings in the northern region of the country reporting use (Banerjee, 1996).

There are about 319 types of pesticides (Insecticides-213, Fungicides-71, Herbicides-23, Rodenticides-8, Acaricides-2 and others-2) have been registered for used under Pesticides Act and Rules of Nepal. Several available pesticides are possibly carcinogenic to humans. BHC (Benzene Hexachloride) dust is the most frequently sold chemical pesticide followed by Parathion methyl, Zinc phosphide, Aluminium phosphide, Malathion, Dithane and Phorate. Worldwide estimates suggest that there are about 3 million (1,000,000 intentional and 2,000,000 unintentional) acute pesticides poisionings and approximately 220,000 death each year.

The true number is likely higher, as reported incidents include only those individuals with symptoms severe enough to require medical attention and/or with access to healthcare. In addition, underdiagnosis and underreporting of acute pesticide poisoning are well-recognized issues in developing countries and may also contribute to higher than recorded pesticide poisoning incidents

Objectives of the Study

General objective was the study is to analyze the knowledge and practice of pesticide used in agriculture and its effect on health of vegetable growers in Mahalaxmi Municipality Dhankuta District.

The specific objectives of the study were as follows:

- To find out the social background of the study area.
- To analyze the knowledge and practice on pesticides used among the vegetable growers.
- To assess the effect of pesticides on health of vegetable growers

Significance of the Study

The knowledge and practice on pesticides is the most important factors of the people, which determines the health status of people.

The main significance of the study is as follows.

- It guidelines for farmers, as well as consumers for developing awareness towards the concerned field.
- It is helpful for planners, policy makers to formulate the policy regarding use of pesticides
- It finally may be useful to launch for similar (programs) to control the problems created due to use of pesticides.
- It would be helpful to the further research of same type of study.

Delimitation of the Study

Delimitations of the study are marked being concerned for time, financial resource and material to make the study more valuable and reliable. The delimitation of the study can be state as follows.

- The study has conducted in Mahalaxmi Municipality-1 of Dhankuta District.
- Both farmers and vegetable growers has selected in the study.

Definition of the Terms Used

Attitude: It refers to the way of feeling thinking or behaving towards Tiffin.

Etymology: The study of the origin and history of words and their meanings.

Mortality Rate: pregnant and delivered mother who death in a year per thousand is called MMR

Nutrition: The process of providing and receiving food necessary health and grow nourishing.

Nutritional Status: Nutritional status is the condition of the body as it relates to consumption and utilization of food.

Pesticides: A chemical used for killing pests, especially insects

Toxic: Harmful components like free radical

Chapter II: Review of Related Literature

A review of literature on various studies related to the present study was prior to the study till completion of this work. A brief account of the literature reviewed is presented in this chapter. This attempt has been made to achieve clarity in the discussion that follows.

Theoretical Literature

Until the 1950s, the people of Nepal remain unaware of modern chemical pesticides and were dependent upon traditional organic techniques for killing pests. Chemical pesticides were first introduced to Nepal in 1952 when Paris Green, gamaxane, and nicotine sulphates were imported from USA for malaria control. DDT made its first impact in 1956. This was soon followed by a varieties of other organochlorines (1950s), organophosphates (1960s), Carbamates (in 1970s), and Synthetic pyrethroids (in 1980s) (Koirala, 2008)

Use of pesticides in Nepal was introduced about 1952 and its' use has been increasing over the years. It has been estimated that the use of pesticides in the developing countries approximately doubled even ten years between 1945 and 1995. The establishment of development of agriculture, initiated the application of chemical pesticides for crop protection during the mid of the 1960s. Since then, the use of pesticides for plant protection has steadily increased. Increasing demands for chemical pesticides resulted in private dealerships selling and distributing pesticides throughout the country (Karlman, 1987).

In 1977, the Nepal Pesticides and Chemical Industries Pvt. Ltd. (NEPCIL) were established in Bahadurgunj to supply BHC dust, Malathion, Nepcil parathion among others locally. The Indian representative such as Crop Health Production Ltd., Excel Industries Ltd., Cyanamid India Ltd., and Bharat Pulverizing Mills Ltd. were the main suppliers of pesticides in Nepal. Organizations like the Cotton Development Board (CDB) and Nepal Malaria Eradication Programs were also authorized to purchase pesticides from foreign distributors. Presently, Indian Pesticides Dealers cross the open border freely, selling pesticides in the Terai region and in major towns of Nepal (Palikhe, 2005).

There are around 50 common pesticides under 150 trade names available in the markets. Several available pesticides are possibly carcinogenic to humans. Benzene Hexachloride (BHC) dust is the most frequently sold chemical pesticide followed by

parathion methyl, Zinc phosphide, Aluminum phosphide, Malathion, Dithane, and Phorate. Worldwide estimates suggest that there are about three million (1,000,000 intentional and 2,000,000 unintentional) acute pesticides poisonings and approximately 220,000 deaths each year. Most of the poisonings and 99% of deaths occur in the developing countries.

At present, large persistent chemical pesticides such as, Chlordane, DDT, dieldrin, aldrin, heptachlor, mirex, toxaphene, BHC, Lindane, Phosphamidon and Organo-mercury fungicides are banned in Nepal for agriculture and public health from 9th April, 2001. Prohibitions on the use of highly toxic pesticides in tea are quinalphos, ethion, monocrotophos, and phorate (Palikhe, 2005).

The term “Pest control” can be defined as the application of technology, in the context of biological knowledge, to achieve a satisfactory reduction or maintenance of pest population below the damage threshold. It should be appreciated that the decisions whether or not to apply control measures are usually required before pest populations reach the damage threshold. The concept of pest management depends on the population dynamics of the pest and the level of the damage caused by them.

Pest control procedures may be categorized under different headings such as cultural, biological, chemical etc. However, there is now a strong tendency to use two or more approaches together in a system of integrated control and is called as “Integrated Pest Management” or IPM. Integrated Pest Management is therefore, can be defined as blending of two or more control measures in order to control pests below economic injury level.

Pesticides due to it’s highly toxicity adversely affect the balance between pest and their natural enemies like predators and parasitoids on many crops; including tea. An avoidance of pesticide during the main period of predator activity is desirable but in tea the periods of the activities of the major pests and their predators get synchronized at different density levels.

However, care should be taken not to overdose on pesticides because these can lead to a high residue level of toxic substances in the tea leaves in excess of the MRL set by the importing countries. Pest that commonly attack tea crops include mites, thrips, jassids, tea mosquito bug, leaf eating beetles and defoliating caterpillars.

The control effect by mass-trapping technique on tea tussock moth, *Euproctis pseudoconspera* (Lepidoptera: Lymanteridae) was investigated by Wang *et. al*., (2006) with synthetic sex pheromone in South China. The optimal dosage of synthetic sex pheromone was 1.5mg/septum in a trap. Twenty-five traps per hector were used in two years, large scale mass trapping experiments and a total of 146,767 males were captured. In the pheromones treated field, mating rates were significantly reduced on 9 to 12 samples dates. Larva and egg densities were reduced by 27.87-50.85 and 38.89-51.11 percent respectively compared with the pheromone untreated field. The result of the experiment indicated that the mating disruption method with sex pheromone lure could all as an agents in controlling tea tussock moth.

The use of a wide range of pesticides – mostly of "moderately hazardous" to "highly hazardous" category- among our study farmers is worrisome. Above 75% of the farmers use pesticides, which are in these above mentioned categories Food and Agriculture Organization recommends that WHO la (extremely hazardous) and lb (Highly hazardous) pesticides should not be used in developing countries.<www. pan-uk org/briefing/Li stoll pdf>

It also suggests that class II (Moderately hazardous) pesticides be avoided. But the practice of spraying these "powerful" pesticides continues. Preliminary results of environmental sampling tests done in the study area support this statement. Large chemical industries reinforce the myth by adopting aggressive marketing strategies that more potent pesticides are necessary to prevent crop loss. This scenario has been reported from other countries also (Nigg, H.N. et al., 1990).

Most farmers in our study were not aware of the health hazards caused by the inappropriate handling of pesticides. The use of cotton apparel as protective clothing was common among them. Studies show that wet cotton clothing and cotton cloth masks in fact increase the person's personal absorption rate of pesticides (Kishi, M. et al., 1995).

The practice of chewing or smoking while spraying "to reduce the nauseating feeling" is also hazardous to health. This may also indicate that the farmers were symptomatic enough to self-medicate during a pesticide spraying session. The re-entry of farmers into the field for work after pesticides is sometimes less than 24 hours. The continuation of pesticides spraying and other farming activities concurrently in the field, can lead to "direct" exposure to pesticides as they may be still dispersed in air.

Pesticide use in Nepal started in the early 1950s especially with the use of DDT for malaria eradication (Manandhar, D. N., 2005). In the past, Nepal's government had emphasized to import and supply chemical pesticides to increase agricultural production. As a result, pesticide started to be used indiscriminately and widely since 1960s in Nepal. Plant Protection Act 1972; Plant protection Rules 1975; Pesticide Act in 199 l ; Pesticide rules1993; Environmental Protection Act 1996; Environmental Protection Rules in order to manage the discriminate use of pesticides (Palikhe, 1998).

The application of fungicides, especially Mancozeb, was observed to be widely applied having both short- and long-term health effects to people exposed to its unsafe levels. The use of harmful insecticides is likely to increase as new crops are being introduced in the cropping systems. Despite considerable knowledge of individuals about environmental risks of pesticide use, farm workers did not appear to adopt adequate safety precautions resulting in the greater risk of exposure to chemicals. Exposure to organophosphates significantly reduced Assessing Erythrocyte Acetyl cholinesterase activity across seasons, but its uses were not sufficient to claim clinical symptoms whereas the use of Pyrethroid insecticides and fungicides' was sufficient to claim acute symptoms of poisoning (Atreya, K. & et. al., 2013).

The above theoretical literature shows that, the maximum apply of pesticide in vegetable in Nepal. It is public problem in Nepal. But the laws are still unbehavioural in the case of pesticide practice. So the pesticide use practice in vegetable is the most burning problem of Nepal.

Use of pesticides comes along with the adverse effect in the Health of people, land and environment, field loss due to non-target pesticides application resulting in pesticide induced pest resurgence and increasing financial burden to dose and frequency cocktail spray because of lack of awareness regarding the harmful effect such as cancer improper fetal development. (GC & Ghimire, 2018)

Empirical Review

Agnihothrudu (1993) focused on the pesticides on vegetable are generally applied after plucking. If the spray is done between plucking, the residue can be high. As spray is done after plucking the deposits are left on the matured tea leaves and on the shoots and

leaves which are in different stages of growth. By the time of immature leaves attain the pluckable size the residue of the pesticides on them will be very low

Agnihothrudu (1993) focused on the problem of pesticide residue on processed tea is receiving attention. The monitoring is strict for the tea which is exported. This problem has not been recognized in tea for local consumption. However, teas which contain more than tolerance limits of pesticides run the risk of being discarded or destroyed. The pesticides applied on tea are discarded and further, diluted by rain and dew, evaporation, photolysis through sunlight and biodegradation. Synthetic pyrethroids and also the organochlorines are lipophilic and they get bound to the cuticle. This is possibly why pesticides like dicofol are appearing in the exported tea. Considerable amount of pesticides on the leaves is lost during the process of manufacture. The loss may be 30-60% (by evaporation on thermal decomposition) compounds with higher vapour pressure are likely to leave fewer residues than those with lower vapour pressure. Processed tea when infused with boiling water will extract smaller quantities of minimum residue leaves in tea in relation to standardized method of extraction in the liquor rather than on black/green tea as it is the liquor which is consumed.

The seasonal appearance of pest during tea cultivation necessitates timely management of the crop through pesticides. The main reason for sub-optimal control of pest problem that pesticide application technology is not sufficiently developed to the target sites in the drift plant parts and within the canopy all resulting in the drift of spray droplets away from the tea (Banerjee, 1976).

Being highly toxic in nature, they do not differentiate between target and non-target species. The thick foliage of the unpruned tea often prevents spray droplets from penetrating deep into the canopy where pest are often located. The unpruned only about 30%of the spray droplets are able to penetrate the top 20% of the foliage with the balance getting drifted away.

Tvedten (2002) focused on tetradifon is the most effective pesticide to counter a potent pest- red spider mite (*Oligonychus coffeae).* For other mites dicofol and ethion are used. Endosulfan helps to tackle pest like thrips, aphids, tea mosquito bug and other sap feeders. Organophosphate, insecticides such as Quinalphos and Phosphamidon are also used to control sap feeders and leaf eaters. The conventional chlorinated hydrocarbons like endosulfan fails to control leaf eaters and defoliators, synthetic pyrethroids like deltamehrin

are applied. On account of the complex pest situations in tea cultivation a total avoidance of pesticides does not appear feasible. It is in this context that MRL assumes importance.

Maroni (2006) studied over the last 50 years, agriculture deeply changed with a massive utilization of pesticides to enhanced crop protection. For many reasons, the severity of pesticide hazards is much pronounced in third world countries.

Koirala (2008) studied in Nepal, about 319 types of pesticides (Insecticides-213, Fungicides-71, Herbicides-23, Rodenticides-8, Acaricides-2 and others-2) have been registered for used under Pesticides Act and Rules of Nepal. Several available pesticides are possibly carcinogenic to humans. BHC (Benzene Hexachloride) dust is the most frequently sold chemical pesticide followed by Parathion methyl, Zinc phosphide, Aluminium phosphide, Malathion, Dithane and Phorate. Worldwide estimates suggest that there are about 3 million (1,000,000 intentional and 2,000,000 unintentional) acute pesticides poisionings and approximately 220,000 death each year.

Koirala (2008) studied that Nepal has exported potential for agriculture and processed products in the international market. Nepal's specific geographic, agro-climatic environment friendly agriculture system, less use of fertilizer and pesticides are main reasons for the export possibilities. Nepalese tea due to its unique flavour, aroma, is popular in the domestic as well as in the international market. Therefore, there is a rise of export volume in the markets. But recent years, Nepalese agri-products have faced some problems in the export market due to the presence of pesticides and other chemicals. Sensitivity of pesticides to light is an important factor, which determines their residues on tea. One of the most commonly used pesticides is monochrotophos, listed by the World Health Organization as class Ib, highly hazardous. Monochrotophos, an organo phosphate used to kill insects and mites, is a nerve toxin that can cause weakness, blurred vision, profuse perspiration, confusion, vomiting and pain. In 1992-93, Germany refuse to import a shipment of Darjeeling tea contaminated with tetradifon, used against spider mite larva. A one kilogram sample from the shipment contained 240 micrograms of tetradifon. Twenty-four times above the maximum residue limit. As a result of continuous use of pesticide, the plant resistance to pest and diseases has declined. At the same time, increased pesticide use has made pest immune to the chemical.

The presence of pesticide residues in food commodities has always a matter of serious concern. The level of pesticide residue in foodstuffs are generally legislated so as to minimize or unnecessary intake of pesticides (Zorka, 2009). The pesticide residues thus occurred can have long term health implications such as cancer, allergies hypersensitivity, damage of the central and peripheral nervous system, reproductive disorders, disruption of the immune system and even death (Strecct, 1981; Marooni, 1990). Thus the effective tea development policy along with scientific agriculture practice, efficient quality control mechanism and technology for cultivation, harvesting production, processing, storage and distribution is current need to strengthen Nepalese vegetable economy and consumers' safety.

Nepal depends heavily on the use of pesticides to increase production. Total annual amount of pesticides used is 128.697 MT (a.i) (PPD, 2008). Approximately 50% of the farmers don't Read pesticide Labels before Using them "they Trust pesticide dealers" and follow their advice rather than to read and follow written instruction (18%). FAO (1975) estimates up to 50% crop production losses due to pests and diseases in developing countries. Pesticides are applied at higher doses than Needed (Manandhar, 2005).

A total of thirty households were surveyed during the study. Half (50%) of the Vegetable grower were literate and majority of them (70%) had only primary education. Forty percent work hard daily about 5-9 hours in the vegetable field. Preponderance (86.6%) applies pesticides to vegetables. This showed that in the current year the uses of the pesticides in vegetables has increased and is in rising trend. Nearly a half (46.6%) applies pesticide 5-6 times, whereas, nearly one-fourth (23.3 %) use it 3-4 times depending on severity of pest problem in vegetables. It indicates that there is a high frequency of pesticides use in the vegetable that are possibly to increase toxic residue in the vegetable that might pose higher risk to vegetable growers and consumers (Shrestha and et. al., 2010).

A proportional random sampling (based on farmers' category and altitudinal variation) was used to draw a total sample of 403 households from the watershed in Kavreplanchwok district. It was found that local farmers underestimate the risks of pesticide exposure. They also believe that such risks of pesticide exposures are a part of daily "farm life." Furthermore, it is uncommon that individuals adopt adequate safety precautions while applying pesticides. Farmers in the study area would be likely to increase pesticide application in vegetable farming with minimal safety precautions for better livelihoods; but they are at high risk of exposure and are reluctant to comprehend the pesticide risks unless they observe the risk are

real. Community level integrated pest management could reduce pesticide expenses, health and environmental effects and also enhance capability of local people for decision making thus, promoting 1PM as an alternative to chemical pesticides, along with education and awareness on the safe use and handling of pesticides is of great importance. Farmer training at regular intervals focusing on sustainable management of the local agro-ecosystems, emphasizing local understanding of pesticide risks of exposure to human and environmental resources along with safety measures are highly recommended (Atreya, K. and et. al., 2013).

Even though the pesticide use is increasing, various factors influence its effective utilization typically in developing country that may lead to reduced health, economic loss, environmental damage etc. Thus, pesticide use has not necessarily been profitable to us.

According to the FAO International Code of Conduct on the Distribution and use of Pesticides (1986), "Toxicity is a physiological or biological property which determines the capacity of a chemical to do harm or produce injury to a living organism by other than mechanical means." The use of a wide range of pesticides - mostly of "moderately hazardous "To highly hazardous" category - among our study farmers is worrisome. Above 75% of the farmers use pesticides, which are in these above mentioned categories food and Agriculture Organization recommends that WHO (extremely hazardous) and Ib (Highly hazardous) pesticides should not be used in developing countries (Shrestha and et. al., 2010).

Another property of pesticides, besides being toxic, is their persistence. Persistence can be defined as the quality of a pesticide to occur as an effective residue for a period of time due to low volatility and chemical stability. Pesticide persistence in the environment is generally measured in terms of its half - life or the length of time required for the quantity of the compound to be reduced in half. The study suggests that class II (Moderately hazardous) pesticides be avoided. But the practice of spraying these "powerful" pesticides continues. Preliminary results of environmental sampling tests done in the study area support this statement. Large chemical industries reinforce the myth by adopting aggressive marketing strategies that more potent pesticides are necessary to prevent crop loss. This scenario has been reported from other countries also (Nigg, Nill, Sone, & Russ, 1990).

A poison for pests is a poison for all living beings. It is also a matter of doses (also depends on how it entered the body). The effect shall mean any harmful influence, either directly or indirectly incurred by the pesticides used for controlling pests, weeds, and disease.

Similarly, environment shall mean, any environment including agricultural, rural and urban and associated components, there of (soil, water and air) (Girl, 1990). Most farmers in our study were not aware of the health hazards caused by the inappropriate handling of pesticides. The use of cotton apparel as protective clothing was. Above theoretical literature and empirical literature shows that, the maximum apply of pesticide in vegetable in Nepal. It is emerging challenge for human health. Therefore, the pesticide use practice in vegetable is the most burning problem of Nepal.

Hen *et. al*., (2003) worked on the behaviour and electrophysiological responses of the natural enemies to synomones from tea shoots and kairomones from tea aphids, *Toxoptera aurantii*. Olfactometer bioassays and electrophysiological studies showed that the aphid parasitoids, Aphidius sp., responded volatile from tea aphids, *Toxoptera aurantii*, to hexane or ether rinses off tea aphid cuticle, and so synomones released by aphid damaged tea shoots as well as to the tea shoot aphid complex. They found that the interaction between synomones from aphid damaged shoots and kairomones from tea aphid enhanced the responses to the plant host complex.

Similarly, several other investigations were also carried out for the control of tea pest. Sharma *et. al*., (2003) worked on the prospects in use of neem formulation and biocides in tea pest management in North-East India. From this investigation he found that neem formulations containing 0.03% and 1.5% azadirachtin showed percent reduction to the tune of 37.6-68.3%, 31.8-34.7% and 29.4% in red spider mites, thrips, and green fly respectively up to 4 weeks but 20.32-57.86% week. Their trails revealed that among sucking pest green fly was more sensible to neem formulations followed by red spider mites and thrips.

Tsimbiri et al., (2015) had done research under the title *Health Impact of Pesticides on Residents and Horticultural Workers in the Lake Naivasha Region, Kenya'*, There is growing awareness in Kenya of the health impacts of pesticide use. The Route to Food Initiative, the Biodiversity and Biosafety Association of Kenya and the Kenya Organic Agriculture Network have pushed for a ban on 24 chemicals known to be carcinogenic and/or mutagenic. A study sampling 800 residents in the Lake Naivasha region, the centre of large-scale horticulture in Kenya, showed evidence of respiratory, skin, bone and nervous system problems. The frequency of symptoms is higher among planters, weeders and harvesters. The health impacts on children of pesticide use are closely related to child rights. Agriculture in Kenya is a major sector in which child labour is used (US Department of Labor, 2019),

particularly for crops such as tea, coffee, rice, sugarcane, flowers, tobacco and cotton. Children may be more vulnerable to pesticides as their nervous systems are developing, and because they are less likely to be supplied with protective clothing or trained in appropriate use of agrochemicals.

Sapkota (2015) conducted study on *pesticide knowledge, practice and attitude and how it affects the health of small-scale farmers in Gulmi* and conclude that Nepal depends heavily on the use of pesticides to increase production. Approximately 50% of the farmers don't Read pesticide Labels before Using them "they Trust pesticide dealers" and follow their advice rather than to read and follow written instruction. FAO estimates up to 55% crop production losses due to pests and diseases in developing countries. Pesticides are applied at higher doses than needed.

Kharel (2015) research on *Pesticide knowledge, practice and attitude of Pesticide* and conclude that total of thirty households were surveyed during the study. Half (50%) of the Vegetable grower were literate and majority of themhad only primary education. Forty percent work hard daily about 5-9 hours in the vegetable field. Preponderance (76.6%) applies pesticides to vegetables. It indicates that there is a high frequency of pesticides use in the vegetable that are possibly to increase toxic residue in the vegetable that might pose higher risk to vegetable growers and consumers.

Kandel (2015) study on *effects of organo-chlorine insecticides and immunologic process* and conclude that a poison for pests is a poison for all living beings.. Most farmers in our study were not aware of the health hazards caused by the inappropriate handling of pesticides. The use of cotton apparel as protective clothing was. The maximum apply of pesticide in vegetable in Nepal. It is emerging challenge for human health. Therefore, the pesticide use practice in vegetable is the most burning problem of Nepal.

Knipe et al., (2017) research under the title '*Suicide prevention through means restriction: Impact of the 2008-2011 Pesticide Restrictions on Suicide in Sri Lanka'* There is evidence that farmers, their families and those living adjacent to farming areas may face long-term health risks associated with the use of pesticides, although the impact of pesticide use is often undetected. In developing countries, incidents involving handlers of pesticide occur more often and the health impacts may be more immediate, given a frequent lack of

PPE and minimal education about the correct way to spray chemicals. About 20 % of the approximately 800 000 people who die from suicide every year do so by ingesting pesticides The issue is particularly significant in Asia, where pesticides are often used in 'impulsive' suicide attempts brought on by stress. A ban on paraquat and two other pesticides resulted in a 21 % fall in suicide mortality in Sri Lanka between 2011 and 2015.

Bombardi, (2017) research on *Atlas: Geografia do Uso de Agrotóxicos no Brasil e Conexões com a União Européia.* Individuals and families living in the vicinity of an area where pesticides are used are at risk. In South Africa, there have been many cases focused on the occupational health risks of pesticides for farm workers, and some in which people living adjacent to agricultural fields have reported symptoms associated with exposure to spray drift. A key factor has been the proximity of residential areas to farming areas, a situation which appears to be increasingly common and indicates a need for a clear buffer zone between farming operations and residential housing. Data from Brazil shows a similar risk to those living adjacent to areas that experience the spraying of pesticides.

Nampeera et al., (2019) research under the title of '*Farmers' Knowledge and Practices in the Management of Insect Pests of Leafy Amaranth in Kenya'* and conclude that Since the active ingredients for pesticides are not produced on the African continent, and very few countries have any pesticide formulation capacity, Kenya is reliant on importing pesticides either from China (42 %) or from the EU (30 %)5. Demand for pesticides in Kenya is increasing rapidly, with imports increasing from 6 400 tonnes to 15 600 tonnes between 2015-2018, according to the Association of Agrochemicals of Kenya. This demand helps explain why as much as 18 % of the pesticides used in Kenya may be counterfeit. Significant volumes of pesticide come into Kenya from neighbouring Tanzania and Uganda, which are hotspots of fake agrochemical production and where counterfeit pesticide levels may be over 40 %. Kenya also has a serious problem of stocks of obsolete pesticides, which are not stored safely and so could contaminate drinking water.

Ngolo et al., (2019) research under the title *Pesticide Residue Levels in Soil, Water, Kales and Tomatoes in Ewaso Narok Wetland, Laipikia, County, Kenya'* and conclude that several independent studies have demonstrated that a significant proportion of registered ingredients are dangerous for health and the environment in Kenya, and its vegetables are on the EU quality watch list6. Kenya is one of 14 countries listed in the 2017 European Food Safety Agency report (published 2019) in which Maximum Residue Limits (MRLs) were exceeded

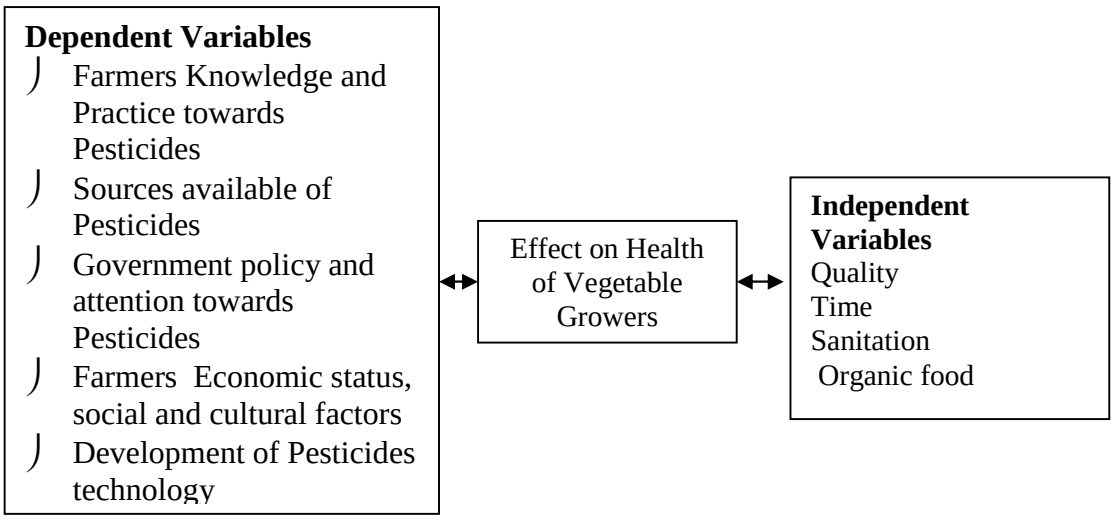
in more than 10 % of samples tested. Residue levels that exceed the European MRLs were found in kale, tomatoes and water.

Tkachenko et al., (2019) research on *'Hygienic Assessment of Changes in the Assortment and Ranges of Application of Pesticides in the Agriculture of Ukraine from 2015 to 2019'* and conclude that increased usage can be driven by the expansion of export markets or changing opportunity costs for labour, which makes hiring local workers more expensive. It may also be caused by disease, like the coffee leaf rust in Central America that began in the 2011-2012 harvest, which prompted the return to pesticide use for coffee farmers. Emergency situations can sometimes lead to strong increases in pesticide use. In Kazakhstan, the area treated with pesticides to control locusts quadrupled between 1998 and 2000 due to the development of a locust outbreak. The outbreak of Black Sigatoka disease affecting the banana crop in Honduras led to a doubling of national fungicide use from 1991 to 1992. However, in most cases it is the general development and industrialisation of agricultural practices that explains the evolution of the pesticide market. While only 2-4 % of the global usage is in Africa, demand for pesticides is expected to surge in the continent, driven, among other factors, by population growth and the expansion of local markets. Directly bordering the EU, Ukraine saw a 47 % increase in pesticide use between 2015-2019, a trend that is expected to continue.

Conceptual Framework:

Theoretical framework is the theoretical bases of the study. The theoretical study consists of the theories or issues in which study is embedded. The conceptual framework is the base of problems. Becoming specific to the study, the theoretical base is the definition given by different scholars. The conceptual framework of the study can draw in the following way:

Fig. 1.Conceptual Framework:



Chapter III: Methods of Procedures of the Study

This part reveals the way and methods used to conduct this study. Research methodology refers to the various sequential steps to adopt by a researcher in studying a problem with certain objectives in view. In other words, Research Methodology describes the methods and procedure has applied in the entire aspect of the study.

Research Design

Design of the study refers to the overall strategy that the researcher selects to integrate the different components of the study in a coherent and logical way. It is a logical sequence in which the study is carried out, and constitutes the blue print for collection, measuring and analysis of data (Kothari, 2004). This study has mainly based on the quantitative and descriptive research design. The descriptive research design helps to describe and analyses the social and economic background of the study area, knowledge and attitude and practice on pesticides used and effect on health of vegetable growers.

Sources of Data

In this study, both primary and secondary sources of data were used Primary data were taken from respondents. Secondary data was obtained reviewing various literature, published books, journals, periodicals, etc.

Population, Sampling Procedure and Sample Size

There was 1450 population and 214 household of farmers in the Marekatahare Ghumaune of Mahalaxmi Municipality-1 of Dhankuta. All those were the population of this study area in order conduct this study. Researcher had selected 140 farmers applying simple random sampling method, under the simply random sampling method Lottery Method was applied in order to free from biasness.

Data Collection Tools

Interview schedule was the main tools of data collection. The researcher was made different sets of interview questions for farmers. Questions were related about knowledge and practice and effects of pesticides.

Standardization of the Tools

The interview schedule was pretested in 12 household in Marekatahare Ghumaune 1 of Mahalaxmi Municipality Dhankuta. The tools were modifed and finalized according to the advice of the supervisor and pre-test result.

Data Collection Procedure

In data collection procedures, the researcher had personally visited each of the selected farmers and introduced herself about the study area and explained aim of the visit. The researcher requested them to answer the questions based on the interview schedule.

Data Analysis and Interpretation Procedure

The process of data analysis was started after the collection of raw data from interview. Data analysis is a process, which involves editing, coding, classification, and tabulation of the collected data (Kothari, 2004).The collected data was properly checked before tabulating. Gathered data and information were compiled and analyzed. Quantitative data was processed through editing, coding and tabulation. Finally data was analyzed and interpreted based on simple statistics like percentage and ratio. Tables and figures were also be used to make presentation more effective.

Ethical Consideration

The researcher had maintained ethical consideration throughout the research activities. Before conducting research, formal approval was taken form concerned authority of the study area by submitting an official letter from department. Researcher was also taken verbal permission from the local authority. Like wise Researcher was mentioned the respondent confidently during and after data collection

Chapter IV: Results and Discussion

This chapter is divided into two parts. First parts deals with the personal information of respondents and second parts describe about use of pesticides.

Personal Information of Respondents

This section explains about the personal information of the respondents. Like gender, age, marital status, level of education and types of family.

Gender of the respondents. More equal gender relations within households and communities contribute to agricultural, including gains in productivity and nutrition. Women play important and varied roles in agriculture, but they are constrained by two important types of gender gaps: women have unequal access, relative to men, to productive resources, and there is insufficient information about the roles and resources of women and men.

Table 1

Gender Distribution of the Respondents

Distribution	Number	Percentage
Male	86	61.42
Female	54	38.57
Total	140	100

Table 1 shows that about gender distribution of the respondents. 61 % respondents are male whereas, 38% respondents are female.

Age distribution. Age is basic characteristics or the biological attributes of any population which affects fertility, mortality and migration behavior. Age and sex structure not only reflect the present demographic situations of population but also give the basis for the study of past as well as future demographic situations of the population in the table no. 2.

Table 2

Age Distribution

Age Group	Number	Percentage
15-25	13	9.28
26-35	15	10.71
36-45	27	19.28
46-55	43	30.71
56-65	32	22.85
66 Above	10	7.14
Total	140	100

According to this table-2, 9 % of respondent's age group is 15-25, 10 % respondent's age group is 26-35, 19 % respondent's age group is 36-45, 30 % respondent's age group is 46-55, 22 % respondent's age group is 56-65, 7 % respondent's age group is 66 above.

Table 3

Cast Composition

Caste and Ethnicity	Number	Percentage
Gurung	87	62.14
Darlami	18	12.85
Thapa	14	10
Basnet	21	15
Total	140	100

According to this table-3, 62.14 % of respondents are belong to Gurung, 12.85 % respondents are Darlami, 10 % respondents are Thapa and 15 % are from Bashnet Family.

Marital status. Marriage is an important status giving device. Marriage is a source of personal gratification as well as extension of social relations and responsibilities.

Table 4

Marital Status

Marital Status	Number	Percentage
Married	120	85.71
Unmarried	8	5.71
Widowed	9	6.42
Divorced	3	2.14
Total	140	100

Table 4 shows that about 85 % respondents are married, 5 % respondents are unmarried 6 % are respondents are widower and 2 % respondents were divorced. It can be concluded that there are more married man are involve in the agriculture.

Educational level. Education is the backbone of development. It is an important factor for social and economic transformation of a society. People as means of development require knowledge and skill for the production of goods and services. Education is considered as a single means to achieve these ends. Definitely education is a vehicle for the radical change of the society. It is means that provides us new knowledge, information and technology. Literacy is a basic step towards the education which is quite essential for development. It enables the person to improve the knowledge and skill necessary to conduct the daily life easily. Without education no one can expect over all development of the society. Respondent's educational status has been presented in the table no.5:

Table 5

Educational Level of Respondents

Educational Status	Number	Percentage
Illiterate	32	22.85
Just Literature	28	20
Primary	20	14.28
Lower Secondary Level	24	17.14
Secondary	20	14.28
+2	10	7.14
Bachelor	6	4.28
Total	140	100

Table 5 shows that about 22 % were illiterate, 20 % are just literate 14 % have up to primary education, 17 % have up to lower secondary level education 14 % have up to

secondary level 4 % have up to bachelor. Illiterate and just literate are covered about more than 40 percent of the respondents in Mahalaxmi Municipality of Dhankuta.

Types of family. The next important variable is family structure which is defined in terms of nuclear and joint families. Several studies have demonstrated how family composition and structure are related to social influence, innovative behaviour and other dynamics of modernization. McClelland (1961), for instance, found a relationship between personality traits and family structural variables. Rogers (1969) hypothesized has levels of achievement motivation vary directly with the nature of family structure and personality socialization; and from the Colombian study he received tentative support for his hypothesis that achievement motivation is negatively related to patriarchialism. The family status in this study is presented in table no. 6.

Table 6

Family Status

Types of family	Number	Percentage
Joint Family	115	82.14
Nuclear Family	25	17.85
Total	140	100

Table 6 shows how that about 82 % of respondents have joint family whereas 17 % belong to nuclear family. Joint family is more common in the village areas in comparison of city areas. Joint family is one of the characteristics of the rural areas.

Knowledge and Practices of Pesticides

Pest control and its knowledge can be defined as the application of technology, in the context of biological knowledge, to achieve a satisfactory reduction or maintenance of pest population below the damage threshold. It should be appreciated that the decisions whether or not to apply control measures are usually required before pest populations reach the damage threshold. The concept of pest management depends on the population dynamics of the pest and the level of the damage caused by them.

Table 7

Respondents Doing Agriculture

Period of Time	Number	Percentage
Less than 5 years	4	2.85
6 to 10 years	26	18.57
11 to 20 years	68	48.57
Above 21 years	42	30
Total	140	100

Table 7 shows that about how many years have been doing agriculture 48 % of respondents doing 11-20 years, 30 % above 21 years, 18 % doing agriculture 6-10 years. More experience and matured farmers were represented as sample in the Mahalaxmi Municipality of Dhankuta.

Table 8

Respondents Engaged the Field in a Day

Working time	Number	Percentages
Less than 3 hours	30	21.42
4 to 6 hours	34	24.28
6 to 9 hours	52	37.14
More than 10 hours	24	17.14
Total	140	100

Table 8 shows that about hours work in the yield in a day 21.42 % respondents are work less than 3 hours, 24.28 % respondents are work 4-6 hours, 37.14 % respondents are work 6-9 hours and 17.14 % respondents are work more than 10 hours.

Method for pest management. Biological pest control, Cultural control, Trap cropping, Pesticides, Hunting, Physical pest control, Poisoned bait and Fumigation are important way to Method for Pest Management.

Table 9

Method for Pest Management

Method	Number	Percentages
Biological control	-	-

Organic production	15	13.57
Rotation of crop	5	4.28
Manual cleaning	-	-
Chemical Pesticide	120	85.71
Total	140	100

Table 9 shows that about method used 10.7 % used organic production, 3.5 % used rotation production and 85 % used chemical pesticide. Chemical method is one of the popular method in the study areas. Chemical method also takes problems in health of farmers as well as consumers.

Pesticide Use

During the field survey, it has been found that about twenty one types of pesticides were used by the farmers. The names of such pesticides are given in the table

Table 10

Number of Respondents Using Pesticide

Response	Number	Percentages
Yes	120	85.71
No	20	14.28
Total	140	100

Table 10 shows about pesticide use in vegetable in the field 85 % used pesticides whereas 14 % did not use pesticides.

Use of pesticides/ duration. Chronic effects may not appear for weeks, months or even years after exposure, making it difficult to link health impacts to pesticides. Pesticides have been implicated in human studies of leukemia, lymphoma and cancers of the brain, breasts, prostate, testes and ovaries.

The liver and kidneys become less able to remove pesticides from the body as we age. Pesticides may speed up aging of the liver or kidneys if these organs are injured during an exposure. The longer a pesticide stays in the body, the more likely it is to build up to levels that may cause injury.

Table 11

Respondents Using the Pesticides/ Duration

Period time	Number	Percentages
1-5 years	32	26.66
5-10 years	70	58.33
10-15 years	18	15
More than 15 years	-	-
Total	120	100

Table 11 shows about how long you have been using the pesticides 58 % 5-10 years, 26 % 1-5 year and 15 % 10-15 years. Long term use of pesticides takes serious consequences in the farmers health. It also effects in the health of consumers.

Sources of the pesticides. Potential point sources of pesticides include pesticide manufacturing plants, mixing-and-loading facilities, spills, waste water recharge facilities (wells or basins), waste disposal sites, and sewage treatment plants. Botanical pesticides come from plants. Nicotine, Neem, Rotenone, Sabadilla, and Pyrethrins are all derived from other plants. Pyrethrins for instance, come from the chrysanthemum plant and are effective on flying insects and to flush out larvae and grubs. Shop, agriculture office and agro-vet are sources of purchasing the pesticides in the context of Nepal.

Table 12

Sources of Purchasing the Pesticides

Buy from	Number	Percentages
Shop	40	33.33
Agriculture office	-	-
Agro-vet	80	66.66
Total	120	100

Table 12 shows that about from where do buy the pesticides. 33.33 % buy from shop, 66.66 % from Agro-vet. Agro-vet is the main center for pesticides.

Types of Pesticides Used

A registered pesticide has two names, i.e., common name and the trade name. The common name is given by international organizations or national traders whereas the trade name is the name given by the manufacturer. Both the names must appear on the label, but the trade (proprietary) name is usually more prominent.

Table 13

Types of Pesticides Purchase and Use in Vegetable

Types of pesticides	Number	Percentages
Extermely Hazardous	-	-
Highly Hazardous	36	30
Moderately Hazardous	45	37.5
Non Hazardous	19	15.83
Non responded	20	16.66
Total	120	99.99

Table 13 shows that about types of pesticides you buy and use in vegetable 37 % moderately hazardous 30 % highly hazardous, 16 % non- hazardous.

Table 14

Apply the Pesticides in Each Item of Vegetable

Response	Number	Percentages
Yes	68	56.66
No	52	43.33
Total	120	100

Table 14 shows that about apply the pesticides in each item of vegetable 56 % apply the pesticides in each item of vegetable whereas 43 %.

Personal hygiene right after the apply of pesticides. Remove personal items, such as toys, clothing, or tools from the spray area to avoid contamination. When spraying pesticides indoors, make sure the area is well ventilated. When applying pesticides as a spray or dust outside, avoid windy conditions and close the doors and windows to your home. After

countless studies, pesticides have been linked to cancer, Alzheimer's Disease, ADHD, and even birth defects. Pesticides also have the potential to harm the nervous system, the reproductive system, and the endocrine system which is more sensitive. Farmer pay attention about the consumers health as well.

Table 15

Personal Hygiene Right After the Apply of Pesticides

Response	Number	Percent
Yes	120	100
No	0	0
Total	120	100
If Yes, What do you do ?		
Take a bath	24	20
Clean hands and font	71	59.16
Change the cloth	25	20.83
Total	120	100

Table 15 shows about keep the personal hygiene. 100 % keep the personal hygiene. Personal hygiene is one of the fundamental aspects after applying pesticides. Farmers have to pay great attention in the personal hygiene.

Table 15 shows about keep the personal hygiene right after the apply of pesticides. 59 % clean hands and face, 20 % change the clothes, 20 % take a bath.

Because of highly toxicity it is important to avoid absorption of pesticides through skin, lungs, eyes and mouth. Thus, the objective of personal protection is to keep the exposure of workers handling as low as possible. Personal protection benefits the person who uses it. The types of personal protective equipment used in the field of mask, gloves, full length trouser/lunghi, full length shirt, shoes, hat or head cover etc.

Table 16

After Application before Enter the Field

Enter the field	Number	Percentage
1-4 days	25	20.83

5-9 days	35	29.16
10-15 days	30	25
Above 15 days	30	25
Total	120	100

Table 16 shows about how long is it, after application before you enter the field. 29 % respondents enter the field after 5-9 days, 20 % respondents enter the field after 1-4 days, 25 % enter the field after 10-15 days and 25 % enter the field above 15 days.

Dispose pesticide. Albertans can take empty and rinsed non- returnable plastic and metal pesticide containers to approved pesticide container collection sites across the province. Empty pesticide containers are collected through an pesticide industry stewardship program, processed and recycled or used for heat (energy) recovery. Pouring garden chemicals into a storm drain, down the sink, or into the toilet pollutes water and is against the law! The only allowable way to dispose of pesticides is to use them up according to label directions, or to take them to a household hazardous waste site.

Table 17

How do you dispose pesticide usually?

Dispose of pesticide	Number	Percentages
Spraying the yield	5	4.16
Spilled in the open place	75	62.5
Spilled on deep hole	40	33.33
Total	120	100

Table 17 shows about how you dispose pesticide usually. 62 % respondents depose of pesticide spraying the yield, 33 % respondents depose of pesticide spilled on deep note and 4 % respondents depose of pesticide spilled in the open place.

Adverse effect of pesticide. Immediate health effects from pesticide exposure includes irritation of the nose, throat, and skin causing burning, stinging and itching as well as rashes and blisters. Nausea, dizziness and diarrhea are also common. Exposure to various pesticides can cause short-term health problems (acute) as well as long-term diseases (chronic). Acute effects include rashes, nausea, diarrhoea, dizziness, breathing problems, eye

irritation, etc. Chronic effects can cause birth defects, cancers, neurological harm, reproductive harm, etc.

Table 18

Adverse Effect of Pesticide to Human Health

Response	Number	Percentage
Yes	110	91.66
No	10	8.33
Total	120	100

Table 18 shows about adverse effect of pesticide to human health. Among the total respondents 91 % know the adverse effect of pesticide to human health whereas 8 % do not know the adverse effect of pesticide to human health.

Pesticide enter the body. Immediate health effects from pesticide exposure includes irritation of the nose, throat, and skin causing burning, stinging and itching as well as rashes and blisters. Nausea, dizziness and diarrhea are also common.

In most work situations, absorption through the skin is the most common route of pesticide exposure. People can be exposed to a splash or mist when mixing, loading or applying the pesticide.

Table 19

Pesticide Enter the Body

Enter the body	Number	Percentage
Skin	50	41.66
Eye	25	20.83
Vegetable made item	7	5.83
All routes	38	31.66
Total	120	100

Table 19 shows about the pesticide enter the body. 41 % respondents asked skin 20 % respondents' eye, 5 % respondents' vegetable made item and 31 % respondents asked all round enter the body.

Health hazards due to use pesticide. Few leading symptoms related to the autonomic nervous system are abdominal cramps; nausea, diarrhea, salivation, miosis and symptoms related to the central nervous system are dizziness, tremor, anxiety, and confusion.

Pesticides have been implicated in human studies of leukemia, lymphoma and cancers of the brain, breasts, prostate, testes and ovaries. Reproductive harm from pesticides includes birth defects, still birth, spontaneous abortion, sterility and infertility.

Table 20

Health Hazards Due to Use Pesticide

Response	Number	Percentages
Yes	62	51.66
No	58	48.33
Total	120	100

Table 20 shows heard any health hazards due to use pesticide 51 % respondents out hazards and 48 % do not heard hazards in pesticide use.

Table 21

Experienced of the Health Hazards from Pesticide Use

Hazards experienced	Number	Percentages
Yes	51	42.5
No	69	57.5
Total	120	100

Table 21 shows experienced of the health hazards from pesticide use 57 % respondents experience health hazards from pesticide use whereas 57 % do not experienced of the health hazards from pesticide use.

Table 22

Health Hazards Occurred Mostly to that Person

Hazards of respondents	Number	Percentages
Eye irritation	15	29.41

Headache	25	49.01
Dizziness	-	-
Diarrnea	-	-
Romiting	-	-
Fever	-	-
Skin irritation	11	21.56
Total	51	100

Table 22 shows health hazards occurred mostly 49 % respondents have headache, 29 % have eye irritation and 21 % have skin irritation.

Pesticides are those substances use to kill pests. Being highly toxic in nature they do not differentiate between target and non- target species and threaten health and well being of humans and wildlife in every region of the world. Pesticides can also affect local ecosystem by disrupting natural ecological balance. For example: by disseminating a certain species on which the survival of others depends. Pesticides can also affect predatory insects and other animals, resulting in initiating or increase of second pest infestations. Unintentional exposure of the general public to pesticide can occur in various ways to various degrees. Contamination of food or drink with pesticides is an example of accidental poisoning.

Basic training on sale and applying pesticide. By law, everyone who sells pesticides for agricultural use must have a certificate of competence or be working under the direct supervision of someone with a certificate of competence. You should contact BASIS (Registration) Ltd to find out about this type of course.

Table 23

Received basic Training on Sale and Applying Pesticide

Response	Number	Pesticides
Yes	15	12.5
No	105	87.5
Total	120	100

Table 23 shows that about the received basic training on sale and applying pesticide, 12 % received basic training on sale and applying pesticide and 87 % do not received basic training on sale and applying pesticide.

Integrated Pest Management (IPM)

Integrated Pest Management means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations, keep pesticides use and other interventions to level that are economically justified and reduced or minimize the risk to human health and the environment. Integrated pest management can be applied to both agricultural and non-agricultural settings, such as home, garden and workplace. IPM strategy involves one or combinations of control techniques to optimize pest populations and keep use of pesticides and other interventions to level that reduce or minimize risks to human health and environment.

During the field survey it has been found that more than two out of three heard about IPM. But in practice, there was none of the farmers were adopting IPM in their field because of its high cost of labour as compared to pesticides application.

Table 24

Knowledge about Integrate Pest Management

Response	Number	Percentage
Yes	18	15
No	102	85
Total	120	100

Table 24 shows that about know about integrate pest management 1 5 % of respondents know about integrate pest management where as 85 % respondents do not know about integrate pest management.

Table 25

Opinion on the Use of Pesticide

Response	Number	Percentages
Should be increased	17	12.14
Use it in the same trends	36	25.71
Should not be used at any level	74	52.85
Don't know	13	9.28
Total	140	100

Table 25 shows that about opinion on the use of pesticide 12 % believe it should be increased, 25 % use it in the same trends, 52 % believe it should not be used at any level and 9% do not know.

Findings

- Knowledge and practice of pesticide used in agriculture and its effect on health of vegetable farmers. 9 % of respondent's age group is 15-25, 10 % respondent's age group is 26-35, 19 % respondent's age group is 36-45, 30 % respondent's age group is 46-55, 22 % respondent's age group is 56-65, 7 % respondent's age group is 66 above. 85 % respondents are married, 5 % respondents are unmarried 6 % are respondents are widower and 2 % respondents are divorced.
- Regarding the education level of the respondents, 22 % were illiterate, 20 % are just literate 14 % have up to primary education, 17 % have up to lower secondary level education 14 % have up to secondary level 4 % have up to bachelor.
- Regarding the hazardous experience of the respondents, 37 % moderately hazardous 30 % highly hazardous, 16 % non- hazardous.
- Keep the personal hygine right after the apply of pesticides. 59 % clean hands and face, 20 % change the clothes, 20 % take a bath. After application before you enter the field.

- Regarding the enter in the field after application of pesticide, 29 % respondents enter the field after 5-9 days, 20 % respondents enter the field after 1-4 days, 25 % enter the field after 10-15 days and 25 % enter the field above 15 days. 62 % respondents depose of pesticide spraying the yield, 33 % respondents depose of pesticide spilled on deep note and 4 % respondents depose of pesticide spilled in the sate place.
- Respondents mention that 91 % know the adverse effect of pesticide to human health whereas 8 % do not know the adverse effect of pesticide to human health. 41 % respondents asked skin 20 % respondents' eye, 5 % respondents' vegetable made item and 31 % respondents asked all round enter the body.
- Regarding the hazards after application of pesticide, 51 % respondents out hazards and 48 % do not heard hazards in pesticide use. 57 % respondents experience health hazards from pesticide use whereas 57 % do not experienced of the health hazards from pesticide use.
- Respondents mention that 12 % received basic training on sale and applying pesticide and 87 % do not received basic training on sale and applying pesticide. 1 5 % of respondents know about integrate pest management where as 85 % respondents do not know about integrate pest management. 12 % believe it should be increased, 25 % use it in the same trends, 52 % believe it should not be used at any level and 9% do not know.

Chapter V: Conclusion and Recommendations

Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegatable Growers in Mahalaxmi Municipality, Dhankuta District is a representative vision of the reality. Main thrust of the study is to find out the social and economic background of the study area, to analyze the knowledge and practice on pesticides used among the vegetable growers and to assess the effect of pesticides on health of vegetable growers. After analysis and interpretation following points are taken as the findings of the study.

Conclusion

Pest control as the application of technology, in the context of biological knowledge, to achieve a satisfactory reduction or maintenance of pest population below the damage threshold. It should be appreciated that the decisions whether or not to apply control measures are usually required before pest populations reach the damage threshold. The concept of pest management depends on the population dynamics of the pest and the level of the damage caused by them. The use of pesticides for plant protection has steadily increased. Increasing demands for chemical pesticides resulted in private dealerships selling and distributing pesticides throughout the country.

Pest control procedures may be categorized under different headings such as cultural, biological, chemical etc. However, there is now a strong tendency to use two or more approaches together in a system of integrated control and is called as “Integrated Pest Management”. Integrated Pest Management is therefore, can be defined as blending of two or more control measures in order to control pests below economic injury level. Pesticides due to it’s highly toxicity adversely affect the balance between pest and their natural enemies like predators and parasitoids on many crops; including vegitables. An avoidance of pesticide during the main period of predator activity is desirable but in vegetable the periods of the activities of the major pests and their predators get synchronized at different density levels.

However, care should be taken not to overdose on pesticides because these can lead to a high residue level of toxic substances in the vegetable. Pest that commonly attack vegetable crops includes grasshopper mites, thrips, jassids, moth, beetles and defoliating caterpillars. The presence of pesticide residues in food commodities has always a matter of serious

concern. The level of pesticide residue in foodstuffs are generally legislated so as to minimize or unnecessary intake of pesticides.

Recommendations

The recommendation of the present study entitled Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegetable Growers in Mahalaxmi Municipality, Dhankuta District is presented as follows.

Recommendations for ppractice

- Training on Pesticide use and alternative techniques of pesticides such as integrated pest and vector management in agriculture pest control (cultural practices, including pruning, cultivation of resistance variety of plant, biological control agents, sanitation and creation of buffer zones are suggested.
- Pest and disease vectors can be managed by various methods, the use of pesticides being only one. The control method chosen should be adapted to the local conditions and pesticides should be used only when absolutely necessary.
- Use of information from pesticides label and its dealer is most before applying it to the field. One should never use a pesticide from unlabelled container. A pesticide should not be poured into an unlabelled container unless it is to be diluted and used immediately.
- Use of Personal Protective Equipment (PPE) should be recommended during pesticides application in the field. Pesticides should be applied only with good, well maintained equipment to reduce leaks and spillage.

Recommendations for policy improvement

- Governments also should give top attention to make better policy for production as well as distribution and use of pesticides.

Recommendations for further study

- Human beings are most vulnerable to the health risk, because tea plant parts are directly consumed by the human. So, it is strongly recommended to use different bio-pesticides, plant based pesticides etc.

- Further research at macro level about knowledge and practice of pesticide used in agriculture and its effect on health of vegetable growers should be done.
- Further research about alternative techniques of pesticides, cultural practices, cultivation of resistance, biological control is suggested.

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Appendix

Interview Schedule

Topics: Knowledge and Practice of Pesticide Used in Agriculture and its Effect on Health of Vegetable Growers

1.

Personal information							
S.No.	Name of the Respondents	Permanent address	Sex	Age group	Education	Marital status	Types of Family

Knowledge and Practices of Pesticides

1. How many years, you have been doing agriculture?

a. Less than 5 years

b. 6 to 10 years

c. 11to 20 years

d. Above 21 years

2. How many hours do you work in the field in a day?

a. Less than 3 hours

b. 4to 6 hours

c. 6to 9 hours

d. More than 10 hours

3. Do you use pesticide in Vegetable in your field?

a. Yes

b. No

4. How long you have been using the pesticide?

a. l-5 years

b. 5-10 years

c. 10- 15 years

c. More than 15 year

5. From where do you buy the pesticide?

a. Shop

b. Agriculture Department

c. Authorized Shop

d. Other

6. What types of Pesticide you Buy and Use in Vegetable?

a. Extremely Hazardous (……)

b. Highly Hazardous (……..)

c. Moderately Hazardous (……..)

d. Non Hazardous (.....)

e. Non responded (……)

7. If yes, do you read/try to understand the information?

a Yes

b. No

8. Do you apply the pesticide in each item of vegetables?

a. Yes

b. No

9. Do you keep the personal hygiene right after the application of pesticide?

a. Yes

b. No

If yes what do you do?

a. Take a bath

b. Clean hands and foot

c. Changes the clothes

d. Other

10. How long is it, after application before you enter the field?

a, 1 to 4 Days

b. 5-9 days

c. 10 to ¡5 days

d. Above ¡5 days

11. How do you dispose pesticide usually?

a Spraying in the field

b. Spilled in the safe place

c. Spilled on deep Hole

d. Other

12. Do you know the adverse effect of pesticide to human health?

a. Yes

b. No

13. How does pesticide enter the body?

a. Skin

b. Eye

c. Vegetable Made items

d. All routes

14. Which method do you use?

a. Organic production

b. Biological control

c. Rotation of Crop

d. Manual clearing

15. What is your opinion on the use of pesticide?

a. Should be increased

b. Use it in the same trend

c. Should not be used at any level

d. Don’t Know

16. Do you have heard any health hazards due to exposure/use pesticide?

a. Yes

b. No

17. What health hazards occurred mostly to that person?

a. Eye irritation.

b. Headache

c. Dizziness

d. Diarrhea

e. Vomiting

f. Fever

g. Skin irritation

18 Do you have experienced of the health hazards from pesticide exposure/use?

a. Yes

b. No

19. Have you received basic training on safe handling and applying pesticides?

a. Yes

b. No

20 Do you know about integrate pest management?

a. Yes

b. No