National Peer Reviewed Journal
DOI: https://doi.org/10.59120/drj.v6i1.49

Pesticide Utilization of Vegetable Industry in Maragusan Compostela Valley Province

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Abstract

The objective of the study was to determine the vegetables grown, particular pesticides used, frequency of applications, volume applied for a particular cropping and the sources of pesticides. The data were obtained through an interview schedule and from the sales records of Agrochemical stores in Maragusan, and Tagum City. Findings reveal that the consumption of insecticides (50%) ranks first followed by fungicides (41%) and herbicides (8%) in vegetable production at Maragusan, Compostela Valley. Farmers rely on chemical pesticides as a method of protecting plants against pests. Most farmers (91 used the same pesticides on varieties of crops and used several pesticides on one type of crop. There were twelve (12) kinds of vegetable crops grown in Maragusan. Tomato, bell pepper, ampalaya, eggplant, and cabbage were found to have the highest pesticides consumption. Most farmers purchased pesticides by kilo and by liter, since they only till about two (2) hectares and below. On the other hand, the applications of pesticides were not influenced by its cost and financial.

Keywords: Pesticides, Pest, Insecticides, Fungicides, Herbicides, and Utilization

Introduction

The quest for sustainable food production is taking its toll on the environment. The continuous interventions of pest plus the slowly deteriorating soil are obstacles and limiting factors to meet this goal in agriculture, pest is the most critical aspect of the human fight for survival (Jago, et. al, 1993). Traditionally, much energy has been expended in acquiring high yields due to the attack of pest. This has been a widespread problem of farmers, which causes both post and pre-harvest losses. This dramatic decrease pushes them. farmer to seek for the ultimate remedy, a magic bullet that would rapidly eliminate natural enemies.

With the rise of modern agricultural sciences, chemical pesticides were developed and the use of these has grown greatly (Botkin and Keller, 1995). The distinctive qualities that make pesticides widely used in the world point out the following benefits: pesticides save lives, it reduces outbreaks of insect-transmitted

diseases such as malaria and save millions of people from illness and premature death from malnutrition, by keeping food production, increase food supplies and lower food cost, increase profits for farmers, work faster, etc. (Miller Jr., 1992). An increased reliance on pesticides has been an important contributor to the increase of yields.

Pest protection is particularly important in the Philippines where agriculture is the major industry and a vital source of the economy. The Philippine expenditure for insecticides is greater than for other classes of pesticides followed by herbicides and fungicides (Rejesus, 1983). One of the major characteristics of insecticides that make them effective as control agent, is they are very stable chemical compound, long lasting and are called persistent pesticide. They can be applied once and be effective for a long period of time (Enger and Smith, 1995).

The rapid use and misuse of synthetic chemicals has been an existing scenario in the recent years. This occurs worldwide, but it is of special concern in developing countries, where farmers are unfamiliar with these technologies and their risks, where regulatory restrictions are not as strong, and where governments are ill equipped to legislate and implement the necessary controls to prevent over-use of pesticides (de Padua, 1999).

Methodology

Data were obtained from 21 barangays in Maragusan, Compostela Valley. Number of respondents was proportionate to the number of growers in the barangay. The gathering of data was done during the following dates: August 22- 24, September 25- 29, and December 20- 23 of the year 2001. Relevant information such as the kind of vegetable grown, particular pesticide used, mode and interval between application, volume of pesticides applied for a particular cropping, and the sources of pesticides were obtained through an interview schedule and the sales records of agrochemical stores in Maragusan, Compostela Valley and Tagum City. Data were analyzed descriptively.

Results and Discussion

Maragusan is quite suitable for vegetable production. Approximately a total of 451 hectares are presently devoted to vegetables with 608 farmers involved in the production. These vegetable production areas are unevenly distributed to 23 barangays. About 12 kinds of vegetable grown in the area (Table 1).

General Socio-Demographic characteristics of the Respondents

Table 2 shows the general socio- demographic characteristics of the farmers. Most of them were male (97%), married (86%) and between the ages of 31 to 35 years old (34%). Most of them have household members of 4-6 (57%) and has a monthly

income ranging from Ph 3001- Ph 5000 (42%). Only a few of them reached or finished tertiary education (2%); majority finished elementary education (71%). The relatively small income of the farmers is attributed to their occupation as vegetable grower since their income its dependent on the market price of the vegetable.

Table 1. Distribution of vegetable production in Maragusan, Compostela Valley

Barangay	Leafy/Ha.	Fruit/Ha.	Root/Ha.	Total	Percentage	Number of Growers
Bagong Silang	2.0	1.0	2.0	5.0	1.10	12
Canbagang	8.0	5.0	3.0	16	3.54	19
Coronobe	4.0	3.0	1.5	8.5	1.88	12
Katipunan	6.0	3.0	1.0	10.0	2.21	15
Lahi	3.0	1.5	0.5	5.0	1.1	10
Langgawisan	8.0	2.0	2.0	12.0	2.65	20
Mabugnao	8.5	4.0	3.0	15.5	3.43	28
Mahayahay	4.5	2.0	3.5	10.0	2.21	34
Magkagong	14.0	6.0	2.0	22.0	4.86	37
Mapawa	17.0	23.0	15.0	55.0	12.17	100
Mauswagon	1.5	2.0	1.0	4.5	0.99	10
New Albay	2.0	7.0	3.0	12.0	2.65	5
New Katipunan	3.0	3.5	2.0	8.5	1.88	13
New Panay	0.5	0.4	0.2	1.1	0.24	3
New Manay	5.0	20.0	5.0	30.0	6.63	15
Pamintaran	6.0	2.0	2.0	10.0	2.21	39
Paloc	25	75.0	25.0	125.0	27.66	150
Parasanon	13.0	6.0	4.0	23.0	5.09	25
Pob. Maragusan	6.0	4.5	2.7	12.8	2.83	4
Tandik	15.8	8.0	4.0	27.8	6.15	16
Tupas	16.0	6.0	9.5	31.5	6.97	16
Tigbao	1.5	1.0	1.0	3.5	0.77	18
Talian	1.0	2.0	0.3	3.3	0.73	8
Total	**171.3**	**187.9**	**93.2**	**451.85**		**608**

Source: Department of Agricultures Office Maragusan, Compostela Valley.

Table 2. General Socio- demographic Characteristics of the Respondents

Total Number of Respondents: 410	Frequency Count	Percentage (%)
Sex		
Male	399	97.31
Female	11	2.69
Total	**410**	**100**
Civil Status		
Single	43	10.48
Married	352	85.85
Widow/Widower	15	3.66
Total	**410**	**100**
Age		
25-below	37	9.02
26-30	82	20.01
31-35	142	34.32
36-40	112	27.32
41-45	24	5.85
46-50	8	1.95
51-55	2	.49
56-60	3	.73
61-above	-	-
Total	**410**	**100**
Members of the Family		
3-below	58	14.14
4-6	232	56.59
7-9	109	26.59
10-12	11	2.69
Total	**410**	**100**
Educational Attainment		
No Education	11	22.68
Elementary	281	70.73
Secondary	100	24.40
Tertiary	9	2.20
Total	**410**	**100**
Monthly Income		
PhP 3000-below	117	28.54
PhP 3001-PhP 5000	174	42.44
PhP 5001-PhP 7000	46	11.22
PhP 7001-PhP 9001	46	11.22
PhP 9001-above	27	6.58
Total	**410**	**100**

Common Vegetable Grown in Maragusan Compostela Valley

Maragusan is one of the known vegetable-producing municipalities. climate. The most common vegetables grown by the respondents were sayote (19 %), followed by tomato (13%), cabbage (11%), baguio beans (9%), eggplant (7%), bell pepper (6%), petchay (6%), ampaiaya (6%), carrots (5%), radish (5%), onion leaves (45%), string beans (3%) and lettuce (3%). They were categorized as fruit vegetables (55%), leafy vegetables (22%), legumes (12%) and root vegetables (11%) (Table 3).

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Table 3. Common Vegetables Grown by Farmers.

Vegetable	Frequency count	Percentage (%)
Radish	97	5.42
Baguio beans	166	9.28
Ampalaya	106	5.92
Tomato	236	13.19
Cabbage	199	11.12
Bell pepper	112	6.26
Carrots	101	5.65
Eggplant	134	7.49
Petchay	110	6.15
Onion leaves	82	4.58
Sayote	344	19.23
String beans	56	3.13
Lettuce	46	2.57
Total	**1789**	**100**
Type of Vegetables	**Frequency count**	**Percentage (%)**
Root vegetable	198	11.06
Leafy vegetable	391	21.85
Legumes	222	12.42
Fruits	978	54.66
Total	**1789**	**100**

Most of the farmers cultivate (45%) 3000m2 and below. Only 13 percent till an area of more than 10,000m^2 (1 hectare above).

Table 4. Area Cultivated for the Vegetable Production.

Size of Area (Ha)	Frequency Count	Percentage (%)
.100 – below	75	18.29%
.101- .200	6	1.46
.201 - .300	102	24.87
.301 - .400		
.401 - .500	60	14.63
.501 - .600		
.601 - 700		
.701- .800	45	10.97
.801- .900	5	1.21
.901 – 1.00	65	15.85
1.00 – above	52	12.68
Total	**410**	**100**

Pesticide Utilization

The utilization of pesticides in Maragusan, Compostela Valley is shown in Fig. 1. Insecticides were found to be widely used (50%) compared to some other classes of pesticides such as fungicides (41 and herbicides (9 %). The farmers used only small percentage of herbicides because they prefer to weed the area instead of applying herbicides. The farmers in the area rely heavily on chemical pesticides as a method of protecting crops against pests.

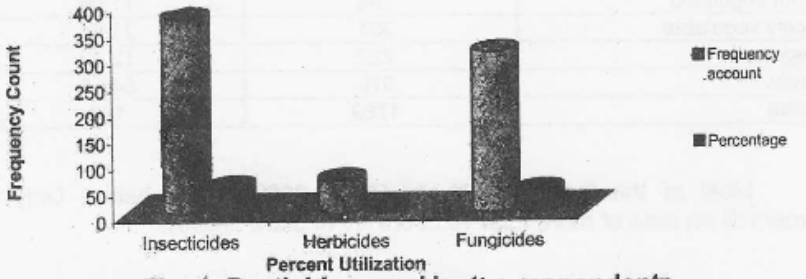

Fig. 1. Pesticides used by the respondents

Table 5. Brands of Insecticides, Herbicides and Fungicides Used by the farmers.

Insecticides	Frequency account	Percentage
Pesterer	26	1.21
Malathion	42	1.96
Cymbush	357	16.70
Decis-R	202	9.45
Parapest	37	1.73
Karate	360	16.84
Selecron	163	7.62
Brodan	41	1.91
Lannate	168	7.86
Bushwack	183	8.56
Magnum	61	2.85
Cotrin	32	1.49
Coside	31	1.45
Daconil	31	1.45
Shotgun	132	6.17
Bulls eye	150	7.01
Tamaron	37	1.73
Basudin	31	1.45
Fenon D	27	1.26
Sumicidin	26	1.21
Total	**2137**	**100**
Herbicides		
Round-Up	23	28.75
Machete	6	7.75
Advance	11	13.75
Power	40	50.00
Total	**80**	**100**
Fungicides		
Maneb	104	22.75
Manzate	88	19.38
Dithane	225	49.56
Benlate	17	3.74
Vitigran Blue	9	1.98
Agroseb	11	2.42
Total	**454**	**100**

Several pesticides were being used on just one crop or use the same pesticides on more than one crop. Farmers believe that shifting in the use of pesticides was necessary to prevent development of insect resistance. Furthermore, they make it a point to find a pesticide, which is prevalent and effective in just one setting. The pesticides which have proved to be the most saleable, and most widely used, and considered to be the most reliable input in controlling pests were the following; the chemical fungicides Dithane and Maneb, chemical herbicide Round-Up and Power, chemical insecticides Cymbush and Karate. Moreover, these pesticides were found to be very effective and economical based on the sales record of agrochemical stores.

Most farmers (96%) purchased pesticides from the Agrochemical stores, more often in Maragusan and Tagum City very rarely in Davao City. Only 39 percent get pesticides from the Department of Agriculture, who were usually those who were assigned and designate as Agriculture Technician in a certain barangay at the same time a vegetable grower (Table 6).

Table 6. Source of Pesticides used by the Farmers.

Source	Frequency Count	Percentage (%)
Agrochemical Store	364	96.10
Department of Agriculture	16	3.90
Total	**410**	**100**

Pesticides Application

The appropriate selection of application equipment is one necessary aspect in uplifting the ability and biological efficacy of pesticides formulation to attain the purpose of managing pests without sacrificing safety and cost-effectiveness. The most common and widely used application equipment of farmers in Maragusan, Compostela Valley is the knapsack sprayer. It is operated manually by hand pumping to build up the necessary pressure and break the pressurized spray solution into correct spray droplets (Table 7).

Three (3 %) percent of the total number of farmers applied pesticides every other day; 91percent of it applied pesticides once every week and 6 percent applying twice every week. Herbicides are not included since one application of it is enough for 2-3 days with result already. The farmers really follow the weekly applications of insecticides and fungicides. Farmers just apply herbicides whenever weeds are present or if not, they prefer to clean the surface area with the use of bolo and other cutting equipment's. However, the application of these pesticides depends on certain weather conditions. Rainy days, demand twice a week application, whereas, fair weather would merit a once-a-week application.

Table 7. Mode of Application of Pesticides.

Mode	Frequency Count	Percentage (%)
Knap Sack	410	100
Others	-	-
Total	**410**	**100**

Table 8. Frequency of insecticides and fungicides application

Frequency Of Application	Frequency Count	Percentage (%)
Every other day	13	3.17
Once a week	372	90.73
Twice a week	25	6.10
Total	**410**	**100**

The frequency of spraying and dosage of pesticides application among vegetable farmers was based on the recommended dosage suggested in the label. Nevertheless, there were times when farmers reduce the dosage of the pesticides application to save on pesticides expense (Table 9).

Thirty-three (33%) percent of the farmers conformed that the availability and cost of pesticides influenced their application while 67 percent disagreed, as the availability and cost of pesticides has never been a limiting factor for them. The latter farmers experienced vegetable production failure if

pesticide application is taken for granted. Ninety-one (91%) percent applied several pesticides to a type of vegetable crop while 9 percent applied one pesticide for just one vegetable crop and others applied similar pesticides for more than one vegetable crops. They were aware that using different kinds of pesticides applied alternately would avoid pest resurgence and population build-up.

Farmers usually purchased pesticides by kilogram or by liter for powder and liquid preparation respectively. The applications depend on the area tilled, attack of pests, weather condition and availability of funds. For powder insecticides, 3.33 kg. consumed per hectare for one cropping and for liquid insecticides, 1.11 liters consumed per hectare. Only 5.19 liters were consumed for herbicides and 4.58kg of fungicides were consumed per hectare for one cropping. Insecticides (either liquid or powder) were frequently used followed by fungicides as powder pesticides and then herbicides (Table 10). This implies that farmers relied heavily on chemical pesticides against pest.

Table 9. Responses of farmers on whether the availability and cost of pesticides influenced the application.

Answer	Frequency Count	Percentage (%)
Yes	137	33.41
No	273	66.59
Total	**420**	**100**
Responses on Whether Several Pesticides were Used for a Vegetable Crop.		
Answer	**Frequency Count**	**Percentage (%)**
Yes	374	91.22
No	36	8.78
Total	**410**	**100**
Responses on Whether The Same Pesticides were Used for More Than One Crop.		
Answer	**Frequency Count**	**Percentage (%)**
Yes	371	90.49
No	39	9.51
Total	**410**	**100**

Table 10. Volume of pesticides consumed per season

Type of Pesticides	Average of Pesticides Consumed Per Ha.
Insecticides	
Solid	3.33 Kg
Liquid	1.11 L
Herbicides	5.19 L
Fungicides	4.58Kg

Farmers have been using pesticide for many years, a one-hundred fifty-six (156) farmers (38%) have been using pesticides for 16 to 20, and 23 percent, for 11 to 15 years, 14 (%) percent for 6 to 10 years, and 1 percent for more than 36 years. There were also farmers who were neophytes in the field of pesticides application-

There were some farmers practice alternative pests controlling method. This is the use of Tide powder (32%), Chlorine (21%), Chili (21%), and "Tawas" (27%).

Table 11. Duration of Pesticide use.

Number of Years	Frequency Count	Percentage (%)
5yrs.-below	52	12.68
6yrs.-10yrs.	57	13.90
11yrs.-15yrs.	96	23.41
16yrs.-20yrs.	156	38.05
21yrs.-25yrs.	22	5.37
26yrs.-30yrs.	13	3.17
31yrs.-35yrs.	9	2.20
36yrs-above	5	1.22
Total	410	100
Responses on Whether the Simple Integrated Management System for Pest Control were Still Practiced.		
Answer	**Frequency Count**	**Percentage**
Yes	101	24.63
No	309	75.36
Total	**410**	**100**
Common Alternative Used by the Respondents.		
Common Alternative	**Frequency Count**	**Percentage (%)**
Tide Powder	52	32.50
Chili	33	20.62
Chlorine	33	20.62
Tawas	43	26.87
Total	**160**	**100**

Accordingly, these alternatives were not as effective as synthetic pesticides; as such, 75 percent of the farmers still stick to synthetic inputs despite its high prices.

Table 12 shows the unforeseen health side effects attributed to pesticides. These where adverse side effects may not be predictable at the stage of first evaluation, but are noticed only after a longer period of use. Only 7 percent of the farmers, mostly aged, perceived that they experienced; itching, skin irritations, throat problem, cough, fatigue, and difficulty in breathing. They also experienced back pains, weight loss and pallor. Majority (93%) denied ever experiencing any side effects.

However, these alleged side effects might also be attributed to some other factors like environmental or physical factors. It was probably caused by sudden changes in weather conditions and not solely associated with their application of pesticides. Besides, there were no scientific evidences or medical studies, which prove the various mentioned pesticides, gave off such alleged effects. Sixty (60 %) percent of the farmers wear the proper clothing during application. They wear mask, boots, and jacket. long pants, and globs. Only 40 percent did not conform to the recommended suit.

Table 12. Responses on Whether there is any Occurrence of Unforeseen Health Side Effects Attributed to Pesticides?"

Answer	Frequency Count	Percentage
Yes	28	6.83
No	382	93.17
Total	410	100
Responses on Whether Proper Protective Clothing is worn Upon Applying Pesticides"?		
Answer	Frequency	Percentage
Yes	247	60.24
No	163	39.76
Total	410	100

Given the benefits attributed to. pesticides, the problem on the effects of these chemicals in users and environment were also recognized (Table 13). Part of the pesticides that we spray goes into the soil, water and air. With the continuous application of pesticides, target organisms can adopt to these pesticides by developing resistance. The most resistant members of a population survive pesticide treatment and produce more offspring like themselves with genes that enable them to withstand further chemical treatment (Arms, 1994). The aged farmers who have been engaged in vegetable farming for more than 30 years perceived problems encountered. About 24 percent farmers experienced soil deterioration.

National Peer Reviewed Journal
DOI: https://doi.org/10.59120/drj.v6i1.49

Conclusion

The common vegetables grown by the farmers were sayote, tomato, cabbage, baguio beans, eggplant, bell pepper, petchay, ampalaya, carrots, radish, onion leaves, string beans and lettuce.

Farmers involve in the vegetable production are quite young, rarely reach college but most are in elementary and school level. They are mostly married with relatively bigger number in the family. Their income is relatively far below from poverty line.

Insecticides, fungicides, and herbicides where insecticides as the most commonly used.

The consumption of herbicides was limited since farmers applied it only when weeds were present and more often farmers just prefer to clean the area.

Farmers acquire pesticides from agrochemical stores in Maragusan and Tagum City.

The vegetable farmers genuinely depend on chemical pesticides in combating pests many years ago. They are aware of the hazards associated with pesticide application. In fact, some of them employed alternative botanical pesticide.

The application of pesticides of common farmers was not influenced by the availability and cost of pesticides.

Continuous increase in prices become prohibitive to small farmers involve in vegetable production.

Recommendation

In view of the study, the researcher would like to recommend the following:

1. There is a need for a follow-up study of the said area, which would focus on the investigation of chemical residue of vegetables, particularly tomato and cabbage.

2. There is a need for a continuous monitoring of the utilization of pesticides in the area particularly the application and proper handling of pesticides.

3. Farmers need to be encouraged to use Integrated Pest

4. Management Scheme (‘PM) instead of synthetic pesticides, which are detrimental to environmental health.

5. Farmers need to maintain a record of farm operation (calendar spraying) to be more accurate:

6. Legislations are necessary for farmers and consumers to in relation to pesticide utilization.

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