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Indigenous pest control: The case of Meranao farmers in Southern Philippines

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Abstract
The effectiveness of indigenous pest control shown by various research findings are quite motivating. Likewise, the diminishing of IKS due to a lack of proper documentation of those indigenous practices that is found to be effective, particularly in farming and more specifically in pest control is also a challenging. This paper aimed to explore the indigenous pest control of some selected Meranao Farmers in Southern Mindanao. A case study design and mixed method of quantitative and qualitative approached was used in documenting the 30 Meranao farmers' indigenous pest control. Survey questionnaire and informal interview was used as the data collection tools. Findings revealed that the farmers use an amalgamation of traditional, indigenous and conventional methods of pest management control on their farm. Their indigenous knowledge (IK) on pest management have helped them control and sustainably manage pest problems and meet their subsistence needs without depending on costly energy-based inputs. The continued utilization may be attributed to the effectiveness, affordability, communicability, ecological soundness and sustainability of these practices in controlling pests, and diseases. Since practices of IKS for pest management is eco-friendly and cost-effective, it is therefore recommended that the IKS of a different Indigenous group of people may be recorded and be used for innovative research before it will vanish in history.

Keywords: IKS, pest management, farmers, pest control

Introduction
This study is a short-term research exploring on the indigenous pest control of selected Meranao farmers in Marawi City, Lanao del Sur. Meranao are known to have a very rich cultural practices, traditions and religious beliefs which could be applied for their plant or crop protection which could be handed down from their ancestors. This practice is also known as indigenous knowledge. Indigenous or traditional knowledge is the product of centuries of trial and error experienced by the traditional or indigenous farmers. Different cultures and ethnic groups are still using this indigenous knowledge system (IKS) in their farming practices, to include pest management. Different ethnic groups may have similarities and differences on their traditional methods of pest control. Traditional knowledge or IKS naturally based on cultural orientation and cultural identity of each culture, and these are quietly endemic to a particularly region and ethnicity (Deka *et al*,. 2006) [2]. The most advantage of the IKS like pest management and control is that they are cost-effective, sustainable, and have minimum risk to farmers (Karthikeyan *et al*., 2006) [4]. Practice of traditional or indigenous pest control is eco-friendly, cost-effective, ingredients are readily available, and has minimum risks (Mitra, Sarkar, Patra and Chatterjee, 2019) [7].
Several studies had shown the ongoing IKS approach in pest management and most of their findings revealed that indigenous knowledge (IK) on pest control is cost-effective and ecofriendly. Mitra, Sarkar, Patra and Chatterjee (2019) [7] investigate the indigenous pest management in Northeast India and found out that the ethnic tribal communities follow a number of traditional pest management practices for controlling pests and diseases of various crops. Shakrawar, Naberia and Pande (2018) [11] conducted a study on indigenous technical knowledge for pest, disease and weed management in agriculture. Their study concluded that indigenous technical knowledge (ITKs) has been found effective in management of pest, disease and weed in agriculture, but they need to be validated scientifically. Findings of the study conducted by Nicolas and Cabarogias (2015) [16] on indigenous knowledge and sustainable pest management in rice farming communities of Southeastern Luzon, Philippines

pointed out that IK on pest management have helped the farmers control and sustainably manage pest problems on their farm and meet their subsistence needs without depending on costly energy-based inputs.

The development of IKS is cumulative, representing generations of experience, careful observations, and trial and error. ITK is stored in people's memories and activities and are expressed in stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs, rituals, community laws, local languages, agricultural practices, equipment, materials, plant species and animal breeds etc. (Mushtaq, Pathania, Khan and Ahmad, 2020) [8]. IKS is still very effective in plant protection, considering that plant protection has become a serious matter due to changes in climate which also influence the continuous change of the ecology and biology of different insect pests which makes pest control mechanisms more difficult and complex (Singh *et al*., 2019) [13]. ITK being applied in pest management have inherent characteristics of cultural and environmental compatibility as well as sustainability with cost-effectiveness (Pradhan *et al*., 2017) [10]. However, IKS is continuously depleting day by day because of lack of consciousness about its value and impact as well as proper documentation (Mushtaq, Pathania, Khan and Ahmad, 2020) [8]. With this, an urgent need to properly document the IKS of different cultures or ethnic tribes is encourage. As such, a need to study, identify, document and share, some of the specific farming practices and experiences of the tribal farmers like their indigenous knowledge on pest control which could be useful today is highly inspired. ITKs being applied in pest management should be documented, promoted, and encouraged in combination with scientific knowledge among the farming communities (Naharki and Jaishi, 2020) [5]. Documentations will help in developing the contents of ITKs which will be disseminated to the entire community for its future implication (Pradhan *et al*., 2017) [10]. As such, this study will document the indigenous pest control of selected Meranao farmers in Marawi City with the following specific objectives

1. To record the personal profile of the farmer's participants
2. To record the farm profile of the farmers
3. To investigate the indigenous pest control method employed by the farmers in various production phase and
4. To evaluate the association between the farmers demographic profile, farmers profile and their indigenous pest control practices?

Methodology

Study area and design

This study was conducted to collect and document the indigenous pest control of selected Meranao farmers in Marawi City, Lanao del Sur. Marawi City is the only City in Lanao del Sur. Lanao del Sur is nestled in the hinterland of Mindanao at an elevation of 702 meters above sea level. The province is enclosed within the Bukidnon-Lanao highland areas. Its landscape is mainly characterized by rolling hills and valleys, placid lakes and rivers.

This short-term case study made used of a cross-sectional descriptive survey employing a mixed-method design of a qualitative-quantitative methodological triangulation to determine the socio-demographic information, and the indigenous pest control practice by the research participants. The design employed a pragmatic approach through the complementarity of the findings from survey, and interviews to permit the breadth and depth of understanding about the subject matter and enable data collection within a short period (Palinkas, *et al*, 2015; Warfa, 2016) [9, 15].

Ethical Consent

Proper entry protocol and informed consent were followed. Confidentiality of information was taken into consideration by not indicating the name of the participants. These prohibit me from plagiarism, harm or violation the rights of the involved in the research study. All participants were informed and oriented about the study objectives and their consent was obtained prior to interview and answering the survey questionnaire.

Participants and Data Collection Procedure

The survey was conducted in the selected 2 barangays in Marawi City that were purposively selected based on purposive and convenient sampling, and snowball approach. A total sample size of 30 participants was interviewed with a semi-structured and open-ended questionnaire between April and May 2023. Aside from interview, a survey questionnaire was also distributed to each participant to obtain more information about their socio-demographic profile and indigenous pest control practices on their farm. The questionnaire on indigenous pest control practices is in the form of a Likert scale. The semi-structured and open-ended interview questions was use to collect qualitative data while the survey questionnaire was use to collect the quantitative data. Interviews, transect walks, and observation were used for validation and documentation of their farm and pest control practices.

Data analysis

The analysis of data was performed using SPSS (Version-16.0) and MS Excel 2016. Descriptive and correlational statistic were used to analyzed the quantitative data. Collected data from interview and observation was transcribed, summarized, and used as illustrative quotes to support the findings of the study.

Results and Discussions

Profile of the farmer's participants

The profile of the participants that was included in this survey are their personal and farm profile in which the results is shown in Table 1. For personal profile, age, gender, civil status, educational attainment and monthly income were surveyed and the results showed that 50% of the participants are above 50 years old, 70% were male, 90% were married, 53% were obtained elementary education only, and 67% has a very low monthly income. Research studies have shown that today's generation, the younger generations are now less engaged into agriculture or farming, while the older ones are there to impart expertise, which comes from experience or exposure, to the younger farmers (Nicolas and Cabarogias, 2015) [16]. It is also notable that male is more inclined to farming than female, particularly among Meranao culture in which they value women more than men. However, the participation of women (10%) in farming cannot be taken for granted as they play an undeniably important role in agriculture as they help their husbands on the farm. It is also not surprising that most of the farmers who participated in this survey are only having elementary education since Meranao culture tend not to farm as they gained knowledge and become professionals. They prefer white collar job than farming despite the fact that the topography and climate in the

province are more favorable for agricultural activities. The relatively low level of literacy of the farmers tend to limit their knowledge in farm management and they usually rely on their relevant experiences in farming.

In terms of their farm profile, they are only small-scale farmer having a small farm size with 1 hectare to 2 hectares only. However, only 57% are the land owners, others are tenant (7%), while 37% are renting the farm. With regards to their farming experience and crops planted, most of them are a farmers for 6 to more than 10 years, planting with varied crops through a multicopying system, in order to maximize their small farm land. This imply that these farmers are in small scale, and absolutely farming is they way of life for them survive.

Table 1: Frequency and percentage distribution of participants profile (n-30)

Personal Profile	f	%		Farm Profile	f	%
1) Age				1) Farm size		
20-30 yrs old	3	10		Less than 1 ha	5	16.7
31-40 yrs old	9	30		1 ha	12	40
41-50 yrs old	3	10		1.5 -2 ha	6	20
Above 50 yrs old	15	50		unidentified	7	23.3
Gender				**Land tenure**		
Male	21	70		Owner	17	56.7
Female	9	30		Tenant	2	6.67
Civil Status				Rental	11	36.7
Single	2	6.67		**Years in farming**		
Married	27	90		Less than 5 years	7	23.3
Widow	1	3.33		6-10 years	6	20
Educational Attainment				Above 10 years	17	56.67
Elementary	16	53.33		**Crops planted**		
High school	8	26.67		Corn	5	16.7
College	2	6.67		Rice	8	26.7
Others	4	13.33		Cassava	15	50
Monthly Income				Fruit trees	14	46.7
5-10 thousand	20	66.7		Vegetables	28	93.3
11-15 thousand	0	0		Spices	11	36.67
Below 5 thousand	9	30		Papaya	1	3.33
Above 20 thousand	1	3.33		Banana	3	10

1) Indigenous pest control method employed by the farmers in various production phase of their crops

During informal interviews, they were asked if they encountered pest attacks in their farm, and they all said; *yes, many times.* However, the common destroyers of their farm are wild pigs, monkey, rats, birds and worms. As they said, they claimed that they usually used cultural and traditional method of pest control which include traps, weeding, burning dry plants, fencing the farm and putting scarecrows. Some of them used plant extracts as their pesticides or insecticides.

According to farmers 1, 4, 9, 13, and 20

We usually used "lag't (betel leaf)- a type of plant who has the power to keep away the insects which is the alternative made –spray that our grandparents used to keep insects from attacking.

Others had said

Cleaning regularly and by following some "lihi" tradition of my grandfather/ parents. Sometimes we spray with anti-pest (farmers 5,16 & 30).

During harvest, we identify most damages of the crops due to some instances like summer or overheat, eaten by worms, and many more, but with regards to insect/pest attacks, we are thankful there are less here since its rough soil not watery (5 farmers had said).

Table 2 shows the indigenous pest control of the farmers who participated in this survey. In the *pre-planting stage*, they use plowing and harrowing. According to them (83%) they will plow and harrow the soil to expose soil-dwelling insets under the sun until they will die of exhaustion. In plowing, farmers use a traditional hoe or an animal-drawn plow. Cow is the common animal they use in plowing. Plowing and harrowing is a cultural method of pest control in which both of them has the same effects towards killing pests and insects under the sun. According to Nicolas and Cabarogias (2015) [16], the soil-dwelling and soil-loving insects as well as those that spend their immature stages under the soil are killed or life cycle is broken through plowing and harrowing. This practice has scientific basis according to the scientific standards of pest control and management. Deep ploughing in summer is helpful in preventing from soil burrowing nematodes, white grubs, etc. (Shakrawar, Naberia, and Pande, 2018) [11].

In the *planting stage*, the farmers have employed various practices which is an amalgamation of traditional, cultural, and advance technological. As shown in Table 2, 100% believed that uttering prayers will protect their farm against pest, insects and diseases. In terms of planting schedule 43% always follow the phases of the moon, 43% never follow the full/new moon phase, while 10% and 3% seldomly and frequently follow respectively. It is also noted that some (43%) always follow the ocean tide (low/high tide) in planting, while 30% never use this method. Some other practices during planting stage are by regulating the number of seeds to be planted (100% always do this), using *lihi* in which 17% seldomly use, 10% frequently use, and 23% always use. However, few, (40%) of the farmers are already adopted the technique of planting plant a variety that is high in pest/insect resistance, and almost (97%) all of them mowed and tillage the farm properly to destroy possible insect/pest.

In the *post planting stage*, they use chemical, traditional, and cultural pest control method. However, the chemical method

of pest control using chilly extract onto the eggs/larvae/pupae of insect pests was only practice by few farmers, 7% and 27% seldomly and always use it respectively. For the traditional which is uttering prayers to protect their crops/farm against insects, pest and diseases, 93% practice it always, always, 87% always practice the cultural method which is regularly mowed and till the land to destroy possible insects/pest in the soil.

During *growing and maturity stage*, the farmers has varying methods to control the pest/insects and rodents. Some farmers use mechanical, cultural, chemical, traditional, physical and biological methods to control pest, insects and diseases of their planted crops, while other farmers did not use any measures to control pest, insects, birds and rodents that could probably attack their crops. As shown in Table 2 only 60% always use cultural method by planting some shrub/trees around the farm as a barrier to prevent pest or insects' attacks, 77% use cleaning and weeding the farm regularly, 83% removed infected plant parts or the entire plant, 70% fence their farm, and 50% put a scarecrow in the farm. The other farmers tend to use these cultural methods seldomly, frequently and never use anything. For the chemical method using plant extract as spray, only 7% always do this practice, others are seldom (7%), frequent (3), and the 83% never use this type of pest control. Majority of the farmers did not also used mechanical type of pest control except for fencing their farm in which 70% of the farmers do make fence their farm. Majority of the farmer did not also use biological and traditional/superstitious methods against pest control.

In the *pre and during harvesting stage*, majority (80%) of the farmers practice weeding/removing grasses in the farm to minimize insect/pest hosts as cultural method, and 97% uttered prayers before harvesting which is their traditional/superstitious practice, while 10% always follow the moon in scheduling the harvest time.

In the post harvesting stage, farmers use cultural and traditional/superstitious control methods against pest, insects and plant damage. They burn straw and other plant remains to kills the pests present in the farm field (43% always do, and 20% seldomly done), 87% always do proper drying of grains to prevent damage due to insects/pest/mold/fungi, and only 7% do offerings to God, Saints, and Spirits to express gratitude and asking for a good harvest in the next cropping season. Burning of waste material in field to produce the heat. The heat which is produced by burning of waste material sterilizes the soil and kills the harmful microbes and controls damping off in nursery (Shakrawar, Naberia, and Pande, 2018) [11].

In general, farmers have varying practices and methods used to control pest, insects, and diseases in their farm, while others did not intent to have pest control. The most commonly used pest control among farmers is cultural (12), followed by traditional/superstitious (9), then mechanical (6), and they rarely use chemical, biological, and advance technological methods. This imply that indigenous practices of pest control are highly specialized among Meranao farmers. This finding is similar to the research findings conducted by Nicolas and Cabarogias, (2015) [16] indicated that the traditional farmers in Camarines Sur continuously patronize the use of indigenous knowledge system in pest management despite of having a widespread chemical pesticide in the market.

Many research studies found out the effectiveness and sustainability of indigenous pest control management. Karthikeyan *et al*, (2006) [4] concluded in their study that IKS pest management and control are cost effective, sustainable and not risky to the farmers use. Indigenous technical knowledge (ITKs) is effective method for pest management and control as long as it is properly used and implemented (Naberia and Pande, 2018); IKS is still very effective in plant protection, for different insect pests (Singh *et al*., 2019) [11, 13]. Indigenous methods of pest control significantly contribute to sustainable agriculture. It is therefore necessary to assess the potentials of local experiences and practices adopted by traditional rice farmers in controlling pests (Sibanda, 1998) [12]. Mushtaq, Pathania, Khan and Ahmad (2020) [8]. ITKs if organized and used scientifically may help in insect pest management and reduce the indiscriminate use of chemical insecticides.

Table 2: Indigenous pest control practices of Meranao farmers and their frequency of usage

Meranao farmers pest control practices & Belief	Utilization				Pest Controlled	Type of Control
	N	S	F	A		
	%	%	%	%		
1. Pre-Planting Stage						
During plowing, I expose the weed seeds and the immature stages of soil dwelling/loving insect pests under the sun to kill them	10	6.67	0	83.3	Soil dwelling insects	Cultural
In harrowing, I expose the weed seeds and crushes the immature stages of soil-dwelling/loving insects under the sun to kill them.	10	6.67	0	83.3	Soil dwelling insects	Cultural
2. Planting stage						
I uttered prayer during the time I planted the crop	0	0	0	100	Pest, insects & diseases	Traditional/ superstitious
I based my planting schedule according to full moon and new moon to ensure good harvest and to avoid insects/pest attacks.	43.3	10	3.33	43.3	Pest, insects & diseases	Traditional/ superstitious
I based my planting schedule of certain crops according to low tide and high tide to ensure good harvest and to avoid insects/pest attacks	30	10	10	43.3	Pest, insects & diseases	Traditional/ superstitious
I regulate the number of seeds, distances, and deepness whenever I plant crops	0	0	0	100	Scavengers and pest	Cultural
I usually use some "lihi" in planting crops to ensure good harvest and avoid insects/pest attacks	50	16.7	10	23.3	Pest, insects & diseases	Traditional/ superstitious
I only plant a variety that is high in pest/insect resistance	60	23.3	6.67	10	Pest, insects & diseases	Advance technological
I mowed and tillage the farm properly to destroy possible insect/pest	3.33	0	0	96.7	Soil-dwelling insects & pest	Cultural
3. Post-Planting Stage						
I sprayed chilly extract, betel leaf onto the eggs/larvae/pupae of insect	66.7	6.67	0	26.7	Pest, insects,	Chemical

pests					mollusks & diseases	
Uttering a prayer during fertilizer application Plants become robust, healthy and less susceptible to insect pests and diseases	3.33	0	3.33	93.3	Pest, insects & diseases	Traditional/ superstitious
Regularly mowed and till the land to destroy possible insects/pest in the soil	3.33	3.33	10	86.7	Soil-dwelling insects & pest	Cultural
4. Growing and Maturity Stage						
Staking inverted coconut fronds that looks like snake or owl in the rice field to scares away field rats	66.7	6.67	0	26.7	Rodents	Mechanical
Plant some shrub/trees around the farm as barrier to prevent pest or insects' attacks	30	3.33	6.67	60	Pest and insects	Cultural
Fence the farm to prevent from rats and other pest attacks	23.3	3.33	3.33	70	Rodents, scavengers	Mechanical
Planting lemon grass (Bawing) at the periphery of the rice field drives away insect pests due to its odor	56.7	23.3	0	20	Insects and pests	Cultural
Planting other plants with strong odor (Like madre de cacao, marigold) to drive insects/pest away	66.7	10	3.33	20	Insects and pests	cultural
Putting scarecrows in the farm	50	3.33	0	50	Birds, and other pests/insects	Mechanical
Tying cans, plastic bags along the farm to create frightening sounds that could scare birds/pest/insects	60	0	0	40	Birds, insects and pests	Mechanical
Spraying plant extracts from oregano (Origanum vulgare), gumamela (Hibiscus sp.) and herbabuena (Mentha cordifolia)	83.3	6.67	3.33	6.67	Insects, pest, mollusks	Chemical
Installing mouse/rat traps	83.3	6.67	0	10	Rodents	Mechanical
Putting salts on plants stem and leaves	83.3	6.67	0	10	Insects, and pests	Traditional/ superstitious
Herding ducks in the rice field	80	0	0	20	Snail and other mollusks	Biological
Using cages with dehydrated coconut meat as bait	93.3	0	0	6.67	Rodents	Mechanical
Handpicking of insects/pest in crops	26.7	0	10	60	Insects & pests	Physical
Cleaning and weeding the farm regularly	3.33	13.3	6.67	76.7	Pests and insects	Cultural
Removing infected plant parts or the entire plant	13.3	3.33	0	83.3	Plant diseases	Physical
Using cats and other animals to drive pest/insects away	76.7	3.33	0	13.3	Rodents and another insects/pest	Biological
5. Pre and during harvesting stage						
Weeding/removing grasses in the farm to minimize insect/pest hosts	3.33	10	6.67	80	Insect & pest	cultural
Follow the moon in scheduling the harvest time	96.7	6.67	0	10	Insects, pests & diseases	Traditional/ superstitious
Utter prayers before harvesting	3.33	0	0	96.7	Insects, pests & diseases	Traditional/ superstitious
6. Post-harvesting stage						
Burning straw and other plant remains to kills the pests present in the farm field	30	20	0	43.3	Pests and insects	Cultural
Proper drying of grains to prevent damage due to insects/pest/mold/fungi	3.33	3.33	6.67	86.7	Pests, insects & diseases	Cultural
Offering foods to God, Saints, and Spirits to express gratitude and asking for a good harvest in the next cropping season	93.3	0	0	6.67		Traditional/ superstitious

Legend: N = never S= seldom F= Frequent A= Always

During interview, the farmers were also asked about the benefits of controlling and managing pest/insects in their farm, and if their methods of controlling or pest management effective. Excerpt below were a direct quote from their statements.

Question: What are the benefits of controlling and managing pest/insects in your farm?
Farmers said
Less damage to the farm and more harvest
It prevents the animals/insects from eating our plants in farm.
The plants grow healthy when no insects have entered.
It keeps my farm healthy and achieving good harvest

Question: Is your method effective why you say so please give reasons
Farmers said
Yes, our methods are effective with less disturbances of insects.
Yes, as for the insect attacks but not for weather attacks, especially when overheated or raining, it gives disadvantages to our crops/plants.

Yes, in general to maintains my plant from growing. However sometimes we encountered bad day which is normal to farmers but as long as you give what's best for your crops surely, you'll harvest is fortunate.

Yes, so far, they are confident of what they harvest. Specifically there are no such disturbances in the farm as we always check or guard it to make sure that the good harvest is expected to accomplish.

Yes, I engaged farming when I was still young and up until now my methods of farming is so effective.

2) Association between the farmers profile and their indigenous pest control practices

Table 3 shows the relationship of the farmers profile to their indigenous pest control practices. As shown in the table, gender, education, monthly income and land tenure is not associated with their pre-planting pest control practices. On

the other hand, civil status does not also influence on their pest, insects control practices during post-planting, growing and maturity, and post-harvesting stage, but significantly and positively correlated to pre-planting, planting, and pre-harvesting stage. The age, farm size, years in farming and crops planted is significantly and positively correlated to their pest, insects, diseases control management during pre-planting, planting, post-planting, growing and maturity, pre-harvesting, and post harvesting stages. This implies that their pest, insects, and disease control management on their crops are directly influence and directly proportional to their age, gender, education, monthly income, farm size, land tenure, years in farming and crops planted.

Table 3: Relationship between farmers profile and their indigenous pest control using Pearson Correlation (n=30)

		Pre planting	Planting	Post planting	Growing & maturity	Pre harvesting	Post harvesting
Age	r	.598**	.968**	.940**	.881**	.940**	.936**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
Gender	r	.249	.686**	.641**	.839**	.638**	.656**
	Sig. (2-tailed)	.184	.000	.000	.000	.000	.000
education	r	.254	.699**	.654**	.834**	.650**	.669**
	Sig. (2-tailed)	.175	.000	.000	.000	.000	.000
Civil status	r	.747**	.410*	.357	.321	.368*	.353
	Sig. (2-tailed)	.000	.024	.053	.083	.045	.055
Monthly income	r	.220	.604**	.565**	.739**	.562**	.578**
	Sig. (2-tailed)	.243	.000	.001	.000	.001	.001
Farm size	r	.480**	.828**	.754**	.874**	.759**	.762**
	Sig. (2-tailed)	.007	.000	.000	.000	.000	.000
Land tenure	r	.259	.712**	.666**	.871**	.662**	.681**
	Sig. (2-tailed)	.167	.000	.000	.000	.000	.000
Years of farming	r	.518**	.964**	.944**	.763**	.965**	.940**
	Sig. (2-tailed)	.003	.000	.000	.000	.000	.000
Crops planted	r	.568**	.904**	.880**	.771**	.887**	.889**
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.000

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Research studies have shown that indigenous agricultural practices are influenced by the knowledge and skills of the farmers as well their economic availability. Indigenous pest control is cost-effective, poses less production risks and environmental degradation and prevents development of pest resistance to chemicals Hansen, and Erbaugh, J.M. (1987), Vanek, (1989), Alcorn, (1991) [3, 14, 1]. Research findings of Nicolas and Cabarogias (2015) [16] pointed out that IK on pest management have helped farmers control and sustainably manage pest problems and meet their subsistence needs without depending on costly energy-based inputs. It is also said that many medium and small-scale farmers tend to use traditional organic methods for pest and disease control to avoid so much hazard, and this indigenous pest control is unique and endemic culture but sometimes have similarities across the region (Mitra, A. Sakar, M., Patra, A. and Chatterjee, C., 2019) [7].

Summary/Conclusion and Recommendation

This study explored the indigenous pest control of selected Meranao farmers in Marawi City, Lanao del Sur. Findings indicates that despite the increasing modernization and commercialization of agriculture, and widespread synthetic chemical pesticides and insecticides, small-scale farmers like the Meranao farmers in selected areas in Lanao del Sur still embrace and patronize some of the use of Indigenous Knowledge (IK) that they experienced and have inherited from their ancestors many decades ago. The IKS that they use in different planting stages to control pest, insects, and diseases were either cultural, mechanical, chemical, biological and physical methods. Although not all of the IKS for pest management and control are always used during the different plant stages, IK on pest management have helped them control and sustainably manage pest problems and meet their subsistence needs without depending on costly energy-based inputs. The continued utilization may be attributed to the effectiveness, affordability, communicability, ecological soundness and sustainability of these practices in controlling pests, and diseases. Since practices if IKS for pest management is eco-friendly and cost-effective, it is therefore recommended that the IKS of different Indigenous group of people may be recorded and be used for innovative research before it will vanish in history. Through research, these practices may be refined and validated first prior to its possible harmonization and integration into the Integrated Pest Management System towards achieving a successful and sustained pest control program. Likewise, traditional and scientific methods must be integrated for most effective and sustainable pest management and control. Integrating of traditional knowledge system with mainstream science in the curricular education system is also recommended to organize any form of knowledge exchange and in a way that puts protection and preservation of the indigenous knowledge system.

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