FELDA SETTLERS' PERCEPTIONS TOWARDS INTEGRATED PEST MANAGEMENT (IPM) PRACTICES

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Abstract: Despite the rapid growth of the oil palm industry in Malaysia, the oil palm remains prone to the threat by a variety of insect pests. The practice of Integrated Pest Management (IPM) among oil palm growers in Malaysia helps to remove the overdependence on pesticides thus making the process more sustainable. The objectives of this study were to understand the FELDA settlers' perceptions of IPM practices, to determine the types of IPM practices being used by the settlers, and to identify the constraints affecting the adoption of IPM practices. The study was conducted with randomly selected 204 FELDA settlers in Jengka, Pahang, Malaysia. The results revealed that 91% of respondents were unfamiliar with the terms and meaning of IPM, 54% perceived IPM implementation might increase management costs and 98% of settlers reported that they constantly used resistant crops and occasionally identified insect pests in their plantation. Lack of exposure to IPM techniques, requiring discipline and schedules to follow, and lack of support by the government and statutory body were the major constraints reported by the settlers. Conclusively, the settlers' knowledge and attitudes towards the use of pesticides in accordance with the principles of IPM can be increased more effectively in the future.

Keywords: FELDA, IPM, oil palm, perception, pest

Introduction

Malaysia currently accounts for 39% of the world palm oil production and 44% of the world exports (MPOC, 2018). It is the most sustainable crop to feed the hungry mouths of the world as it is recognized universally as the most efficient, effective, and highest yielding form of edible oil production (Basiron, 2014). The Department of Statistics Malaysia (2019) reported that oil palm was a major contributor to the Gross Domestic Product (GDP) of the agriculture sector at 46.6% followed by other sectors. According to the Malaysian Palm Oil Board (2018), oil palm planted area reached 5.84 million hectares, an increase of 0.7% as against 5.81 million hectares recorded in 2017. Peninsular Malaysia (with 11 States) accounted for 2.71 million hectares of the total planted area and the largest plantation is in Pahang that is owned by the Federal Land Development Authority (FELDA). FELDA with 112,635 number of settlers has continued to carry a major role by providing adequate and modern facilities under the government scheme by having 706,558 hectares of planted areas as compared to FELCRA and RISDA. Fig. 1 shows FELDA contributes the highest planted area under the government scheme.

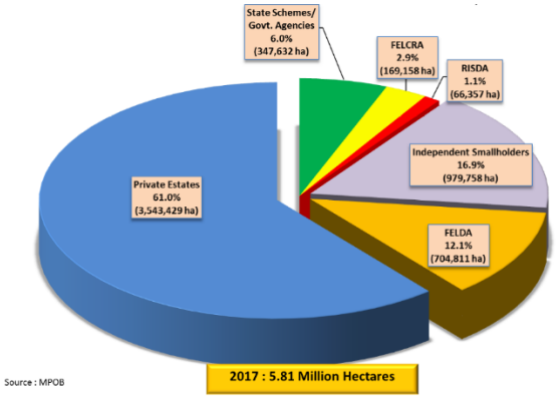

Fig. 1 Oil palm planted area by category, 2017

Even though the oil palm industry experiences rapid growth, specifically in Malaysia, oil palm remains prone to the threat by a variety of pests and diseases. They prevent normal healthy growth and cause a significant reduction of crop yield. The damage caused by pests and diseases affect the growth of the oil palm industry and become the main obstacles to the cultivation of the oil palm. Therefore, IPM is the effective and efficient management of pests and diseases to ensure the healthy growth of the oil palms. One IPM strategy is a coordinated approach to the deployment of pest-management practices. According to Flint et al. (1991), IPM is a pest management strategy that focuses on long-term prevention or suppression of the pest problems with minimum impact on human health, the environment, and non-target organisms. IPM employs an integrated combination of techniques to reduce pest populations to acceptable levels. The EPA (2017) stresses IPM is an environmentally sensitive approach to pest management that relies on a combination of common-sense practices. These practices use comprehensive information on the life cycles of pests and other interaction with the environment, in combination with available pest control methods to prevent or control pest damage. A survey is one method for evaluating the adoption of agronomic practices and perceptions about those practices. Surveys on farmers' perception about IPM in Kanpur Dehat (Chaudhary, 2005), farmers' perceptions of insect pests of fruit vegetables in Nigeria (Olaniran et al., 2014), perceptions about HT cultivars in the Western United States (Harrington et al., 2009), and growers' perception and adoption practices of IPM in West Virginia (Vommi et al., 2013) are examples of surveys used to document practices and perceptions. Thus, this study had been undertaken to fulfil the following objectives: to understand the FELDA settlers' knowledge and perceptions of IPM practices, to determine the types of IPM practices being used by the settlers, and to identify the constraints affecting the adoption of IPM practices.

Method

This study was conducted at FELDA Jengka 1 to FELDA Jengka 25 in Jengka, Pahang. A self-administered questionnaire was used to assess the perceptions of FELDA settlers towards IPM practices and identify the main challenges faced by FELDA settlers in the adoption of IPM practices in their oil palm plantations. Even though the number of residents in Jengka is around 50,485, only 10,099 constitutes as FELDA settlers. The total samples in this study consist of 204 settlers based on the Roscoe (1975) sampling technique (Hill, 1998). The questionnaires were then distributed to settlers that managed their own plantations.

Formulation of Questionnaires

In this study, a combination of dichotomous questions, closed-format questions, and Likert scale questions were used. Dichotomous questions require respondents to answer "Yes" or "No" while Likert scale questions require respondents to indicate the level of agreement or disagreement with the statements. The questionnaire consisted of 31 items distributed into four dimensions:

1. Demographic of the respondents;
2. Perception of IPM practices;

3. Current practices of pests;
4. Challenges of IPM practices.

Survey Distribution and Data Validation

The survey document was distributed in August 2013. Statistical analysis of the collected questionnaires was conducted using the Statistical Package for Social Sciences (SPSS). Descriptive analyses were carried out to present the findings in the form of frequency counts and percentage for every dataset.

Results and Discussion

Demographic Information

Out of 204 respondents involved in the study, settlers can be characterized as being older than 50 years old (95%). The majority (99.5%) were male while 5% were female, and a large percentage (94.6%) of the settlers had primary education (Table 1). These results are comparable with Pingel (1991) and Bruening (1989). As stated by Heltberg and Tarp (2002), education enhances the skills and ability to utilize information. Table 2 demonstrates the percentages of operational activities conducted by FELDA settlers or by contracts. The data clearly showed that activities of manuring, and weeding and insect's pest control were done by the respondents themselves at 54.9% and 56.4% respectively. Meanwhile, 80% of the respondents hired contract workers for the harvesting activity.

Table 1 Demographic information of FELDA settlers

Particular (s)	Frequency	Percent
1. Age		
30-39	1	0.5
40-49	1	0.5
Above 50	202	99.0
2. Gender		
Male	203	99.5
Female	1	0.5
3. Level of Education		
Primary school	193	94.6
High school	9	4.4
Certificate/ Diploma	2	1.0

Table 2 Operational activities of oil palm field

Particular (s)	Own doing	Contract
1. Manuring	54.9	45.1
2. Weed and insect's pest control	56.4	43.6
3. Harvesting	19.6	80.4

FELDA Settlers' Perception towards IPM Practices

This section represents the perception of FELDA settlers towards IPM practices in the oil palm plantation (Table 3). There were five (5) perceived questions consisting of the definition of IPM, how IPM practices are conducted, the benefits of IPM practices, the importance of identifying pests, and disadvantages of IPM practices. The data in Table 3 indicated that the majority (89.2%) of the respondents were not familiar with IPM definitions while 10.8% of them said that they were familiar with the definition of IPM. The same result was gained by Chaudhary (2005) who mentioned that most of the farmers were unaware of IPM technologies. Besides, Tackie et al. (2009) also reported the same result. They found that many of the farmers were not familiar with the term IPM and did not fully understand what it meant and only a third believed that IPM would be useful on their farms.

In this present study, nearly 65% of the settlers perceived IPM as a practice that relies on the use of pesticide solely (Table 3). This result was aligned with Tackie et al. (2009) in their study that stated

most farmers they surveyed cultivated vegetables and sprayed pesticides on crops. Besides, other studies also reported that some of the farmers depended on the use of chemical control, this is aligned with the reports of the growing dependence on synthetic insecticides for control of vegetable crop pests (Olaniran, 2014). However, only 8.8% of the respondents agreed that IPM techniques are practicing biological and chemical control and implementing good agricultural practices in the field. Kuntom et al. (2007) in their study stated IPM is the combination of both chemical and biological means. In this concept, the use of the chemical is strictly for reducing the pest population if it exceeds a certain threshold. Once it is reduced, integrated biological control agent is encouraged for long-term control such as using insect predators and parasitoid, fungi, bacteria, and virus which are host specific to certain pests.

Based on Table 3, most of the respondents agreed that IPM practices contributed more benefits to them. About 49% of the respondents saw the IPM technique as the fastest way to control pests in the field and 42 of the respondents perceived IPM as an easy method to be implemented in the oil palm field. This is because IPM incorporates ecological and economic factors into decision making, and addresses all concerns about environmental quality and food safety (Dhawan & Peshin, 2009).

Planning is the heart of an IPM program. This is because every crop has pests that need to be considered. Thus, a good IPM practice is by identifying and monitoring the pests' problem by crop scouting. This current study described that 36.8% of the respondents identified their insect pests in the field so that they were able to identify and monitor the pest populations (Table 3). About 27.0% of the respondents agreed that by monitoring pests in the field it could eliminate other insect pests. As stated by Flint et al. (1991), to develop an IPM program, it was crucial to identify all potential pests in the systems. They needed to verify damage symptoms associated with pests and identify natural enemies around them. However, the majority of the settlers (54.4%) mentioned that they were fearful that IPM is more expensive than the traditional pest control method. Pawan (2013) in his study has reported that there has been an increase in the cost of cultivation after the participation in IPM. The reasons behind the increase in the cost of cultivation were due to cost increment in purchasing of hybrid varieties of crops, fertilizers, labor charges, farm machinery, expansion of cultivation area etc.

Table 3 Perception of settlers towards IPM practices

Particular (s)		**Frequency**	**Percent**
1. Definition of IPM	Yes	22	10.8
	No	182	89.2
2. IPM practices in the field			
IPM practices are rely on the use of pesticides		133	65.2
IPM practices does not use any pesticides/chemical substances		7.0	3.4
IPM practice biological control, chemical control and good agricultural practices to control the insect pests		18.0	8.8
Others		46	22.5
3. Benefits of IPM practices			
IPM practices is environmentally friendly		15	7.4
IPM is the fastest way to control pests		99	48.5
IPM is easy to implement in the field		42	20.6
Others		48	23.5
4. Importance to identify pests in the field			
a) To get right information about pests' control		75	36.8
b) Different types of pests need different control techniques		17	8.3
c) Both a and b		6	2.9
d) Can eliminate others insect pests		55	27.0
e) Others		51	25.0
5. Disadvantages of IPM practices			
Increases the management costs		111	54.4
Requires an extensive knowledge to implement		7	3.4
Reduction in crop production		24	11.8
Take more time to control the pests		13	6.4

Others	49	24.0

Current IPM Practices Adopted by FELDA Settlers

This section consists of ten (10) current practices of oil palm pests control among FELDA settlers in Jengka, Pahang. The data in Table 4 showed that 97.5% of the respondents continuously used resistant crops to minimize the pest and disease attacks at their oil palm plantation. As reported by Harrington et al. (2009), who conducted an online survey to assess the insect-resistant (IR) crops on IPM practices in the Western US, found that respondents perceived a beneficial reduction in the application of both broad-spectrum and selective insecticides. Additionally, IR crops were perceived to be effective insect management tools with relatively low potential for causing additional management problems. In IPM, identification of insect pests is important so that the potential problems can be detected at an early stage. However, most of the respondents admitted that they infrequently identify insect pests in their plantation (44.1%).

Moreover, 36.8% of the settlers in this study were using organic pesticide in the field. Pesticides are chemicals that kill pests or disrupt pest populations. Most of the pesticides can be categorized as either synthetic pesticides, organic pesticides, inorganic pesticides and biorational pesticides (DeAngelis, 2018). According to Barbercheck (2010), organic pesticides are pesticides made from naturally occurring substance and often considered safer than non-organic pesticides for the environment, people, and animals. Some examples of organic pesticides are rotenone, pyrethrum, nicotine, neem oil, and all the botanical pesticides are products of living organisms. Moreover, the use of a wide range of herbicides from different groups will reduce the potential for herbicide-resistant weeds to develop. This existing study also identified that about 20.1% of the settlers used diverse types of pesticides for every cycle of pesticide application. Vommi et al. (2013) in their study has reported most of the farmers in West Virginia perceived the repeated use of herbicides with the same mode of action leads to herbicide-resistance weeds.

Monitoring for insects is an essential part of successful integrated pest management programs. The data in Table 4 clearly showed that most of the respondents (96.6%) never used the pheromone or sticky traps to monitor the pests' infestation in their oil palm fields. Besides, most of them stated that they never used any of the insect pest reports and results from soil and leaf sampling reports as their guideline to control and manage the pest problems in the field. Good weather information is necessary for timing cultural practices and for predicting pest outbreaks. However, the result from this study revealed that about 97% of the respondents never referred to the local weather reports before the application of pesticides in the field. Moreover, 90.2% of the respondents stated that they never implemented the barn owl technique to control the rat population in the field. The application of cover crops in the oil palm field is a common method to control the pest population, especially in controlling grasshopper attacked. However, results showed 87.3% of the respondents did not plant cover crops in the field.

Table 4 Percentages of IPM practices conducted by FELDA settlers

Particular (s)	Always	Sometimes	Seldom	Never
1. Identification of insect pests in the oil palm field	8.3	15.7	44.1	31.9
2. Using resistant crop	97.5	1.5	1.0	-
3. Using insect pests reports in controlling pests	2.5	2.9	6.9	87.7
4. Using local weather reports in controlling insect pests	0.5	1.0	2.0	96.6
5. Using soil and leaf sampling reports in controlling insect pests	-	1.5	3.4	95.1
6. Installing barn owl boxes in the oil palm field	2.5	0.5	6.9	90.2
7. Using organic pesticides to control pests	1.0	6.4	36.8	55.9
8. Using cover crops to control insect pests	8.3	1.0	3.4	87.3
9. Using different types of pesticides for every cycle of pesticide application	13.7	20.1	29.9	36.3
10.Using pheromones traps to control insect pests	1.0	1.5	1.0	96.6

Constraints of FELDA Settlers in Practicing IPM

Table 5 specified the constraints of IPM techniques according to their obtained scores. It is clearly stated that the statement "Lack of exposure to new techniques of IPM" got the highest score and hence was considered as the first ranked challenge faced among the settlers. This is due to the lack of IPM information given by the extension workers about IPM techniques. A similar finding was reported by Govind and Perumal (2004). The lack of persuasion by extension agents and the inability to contact the extension agents at the appropriate time was found as the major constraints in their study. Kumari (2012) also attributed the same constraints that hinder the adoption process. The findings show that the IPM-FFS training program had failed to increase the knowledge and skill of respondents. The statement "IPM requires discipline and a strict schedule to follow" got the second ranked constraint. IPM require FELDA settlers to be more discipline and constantly follow the schedule of IPM practices. Dhaliwal et al. (2004) mentioned that IPM requires an interdisciplinary, multifunctional approach to solving pest problems. In this recent study, it also found that lack of favorable government policies and support was the biggest constraints to the settlers in Jengka, Pahang. The same findings are also reported by Kumari (2012) and Parsa (2014). The result in Table 5 also revealed that the statement "Lack of government and statutory bodies support" became the third ranked restraint. This may be due to lack of efforts by the government and statutory body to create awareness about the importance of practicing the IPM techniques among the settlers. The national programs of developing countries have lacked a policy commitment to IPM in the agricultural development. This has resulted in a low priority for IPM from national programs alike (Dhaliwal et al., 2004). Moreover, the statement of "IPM requires more knowledge" and "IPM techniques is time-consuming" occupied fifth and sixth ranked respectively. On the other hand, "IPM reduces crop yields" was considered as the least problem by the settlers because they already knew that IPM techniques will minimize the numbers of pest attacks in the field.

Table 5 Challenges faced by settlers in adopting IPM techniques

Challenge (s)	Obtained score	Rank order
Lack of exposure with new techniques of IPM	199	1
IPM requires discipline and strict schedule to follow	194	2
Lack of government and statutory bodies support	193	3
IPM techniques incurred high costs	137	4
IPM requires more knowledge on beneficial and harmful insects	126	5
IPM techniques is time consuming	116	6
IPM reduces crop yields	29	7

Reviewers

- Reviewer 1
- Reviewer 2
- Reviewer 3

Conclusion

The results revealed that the lack of knowledge is the key obstacle to the adoption of IPM practices among the FELDA settlers. Most of the settlers reported they were unfamiliar with the meaning and concept of IPM. The lack of exposure of IPM techniques was also reported by the respondents as a major constraint. This reveals that there were some respondents who possessed an unfavorable perception of IPM. Many of them perceived IPM as a tool used to control pests by using pesticides solely and sees IPM practices as increasing the management costs. However, they also had positive perceptions toward IPM. They agreed that IPM is the fastest way to control the pests if they could manage IPM method properly. They also seem that it is important for them to monitor and identify the pests in the field so that the level of pest and disease infestations can be reduced. Despite that, most of them never implemented the IPM practices in their field except for the insect resistant crop. More than half of the settlers certainly did not apply the pheromone or sticky traps, using insect pest reports, local weather reports, soil and leaf sampling reports and install the barn owl in their oil palm fields. Thus, it is indicative that there is scope to take necessary steps to make them aware of the effectiveness of IPM.

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