Faculty of Technology Management and Technopreneurship

THE RELATIONSHIP BETWEEN FARMERS SAFETY BEHAVIOUR AND PESTICIDES USAGE IN IMPROVING UAE AGRICULTURE

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DEDICATION

This work is dedicated to the inspiring person towards my life… my dear father and my dear mother who always want me to have the best, for her love, the prayers that she made for me.

…To my great guide…

My dear supervisor, Dr. Norfaridatul Akmaliah Othman for her visions in the use in Farmers Behavior on Pesticides Usage in Improving Agriculture.

ABSTRACT

Farmers in developing countries, including UAE, are exposed to agricultural pesticides, including pesticides that are restricted or banned in developed countries. There is little information available on pesticide use safety practices and associated factors among UAE farmers, particularly in the research area.The intent of the current research is the relationship between farmers safety behaviour and pesticides usage in improving UAE agriculture.This research employed a quantitative research approach, with a cross-sectional time hori-zon for data collection. A developed and validated questionnaire was distributed to the farmers consisting of 310 participants selected from UAE. The data collected were analysed using Partial Least Square Structural Equation Modeling (PLS-SEM) using SmartPLS software. The research revealed that good safety practices were low in the research area. Being educated, having experience with pesticide spraying, having good knowledge of pesticide usage, having access to safety materials, and having received pesticide use training all increased the likelihood of good pesticide use practice. Insufficient training opportunities and material access, weak law enforcement, limited access to guidelines, and a shortage of media coverage were challenges identified qualitatively.The results also reveal that the farmers behavior improve agriculture properly in the country and support the re-evaluation of pesticide registrations in developing countries to be in line with FAO/WHO Code of Conduct.This research contributions will serve as a source of information and training forum for farmers on safe application of agrochemical and safety of equipments during mixing and spraying pesticides. The research concludes on the need to develop an approach that will help strengthen capacity-building programmes farmers safety behaviour and pesticides usage in improving UAE agriculture. Pesticides can have negative effects on human health if they are handled improperly. The adoption and application of safety measures are necessary to avoid the detrimental effects of pesticides, it is suggested that certain policy changes be made with regard to pesticide poisoning, designing and implementing extensive educational and training programs on scientific pesticide management, and routinely monitoring occupational pesticide exposure and related health effects.

HUBUNGAN ANTARA TINGKAH LAKU KESELAMATAN PELADANG DAN PENGGUNAAN RACOS DALAM MENINGKATKAN PERTANIAN UAE

ABSTRAK

Petani di negara membangun, termasuk UAE, terdedah kepada racun perosak pertanian, termasuk racun perosak yang dihadkan atau diharamkan di negara maju. Terdapat sedikit maklumat yang tersedia tentang amalan keselamatan penggunaan racun perosak dan faktor yang berkaitan dalam kalangan petani UAE, terutamanya di kawasan penyelidikan. Tujuan penyelidikan semasa ialah hubungan antara tingkah laku keselamatan petani dan penggunaan racun perosak dalam meningkatkan pertanian UAE. Penyelidikan ini menggunakan penyelidikan kuantitatif pendekatan, dengan horizon masa keratan rentas untuk pengumpulan data. Soal selidik yang dibangunkan dan disahkan telah diedarkan kepada petani yang terdiri daripada 310 peserta yang dipilih dari UAE. Data yang dikumpul dianalisis menggunakan Partial Least Square Structural Equation Modelling (PLS-SEM) menggunakan perisian SmartPLS. Penyelidikan mendedahkan bahawa amalan keselamatan yang baik adalah rendah di kawasan penyelidikan. Berpendidikan, mempunyai pengalaman dengan penyemburan racun perosak, mempunyai pengetahuan yang baik tentang penggunaan racun perosak, mempunyai akses kepada bahan keselamatan, dan telah menerima latihan penggunaan racun perosak semuanya meningkatkan kemungkinan amalan penggunaan racun perosak yang baik. Peluang latihan dan akses material yang tidak mencukupi, penguatkuasaan undang-undang yang lemah, akses terhad kepada garis panduan, dan kekurangan liputan media merupakan cabaran yang dikenal pasti secara kualitatif. Hasilnya juga mendedahkan bahawa tingkah laku petani meningkatkan pertanian dengan betul di negara ini dan menyokong penilaian semula pendaftaran racun perosak. di negara membangun agar selaras dengan Tatakelakuan FAO/WHO. Sumbangan penyelidikan ini akan menjadi sumber maklumat dan forum latihan untuk petani tentang penggunaan agrokimia dan keselamatan peralatan yang selamat semasa mencampur dan menyembur racun perosak. Penyelidikan menyimpulkan tentang keperluan untuk membangunkan pendekatan yang akan membantu mengukuhkan program pembinaan kapasiti tingkah laku keselamatan petani dan penggunaan racun perosak dalam meningkatkan pertanian UAE. Racun perosak boleh memberi kesan negatif kepada kesihatan manusia jika ia dikendalikan secara tidak wajar. Penggunaan dan penggunaan langkah-langkah keselamatan adalah perlu untuk mengelakkan kesan buruk racun perosak, adalah dicadangkan bahawa perubahan dasar tertentu dibuat berkenaan dengan keracunan racun perosak, mereka bentuk dan melaksanakan program pendidikan dan latihan yang meluas mengenai pengurusan racun perosak saintifik, dan secara rutin memantau racun perosak pekerjaan. pendedahan dan kesan kesihatan yang berkaitan.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AVE	-	Average variance extracted
CFA	-	Confirmatory factor analysis
PLS	-	Partial least squares
SDG	-	sustainable development goals
SEM	-	Structural equation modelling
SPSS	-	Statistical package for the social science
VIF	-	Variance inflation factor
VRIN	-	Valuable, rare, inimitable, and non-substitutable

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter starts with the research background, a brief introduction of improving UAE agriculture. The problem statement regarding the topic described is presented, followed by research questions and research objectives. The significance of the research, scope, and limitation are also mentioned. The chapter ends with the structure of the research.

1.2 Background

Agriculture is an old activity in the United Arab Emirates practiced in Ras Al Khaimah, Fujairah, Al Ain and in some cases, such as the Liwa oasis. The sector developed rapidly since 1971, despite problems due to the scarcity of water resources and arable land, soil salinity, difficult environmental conditions, high production costs, agricultural pests and post-harvest losses. Agriculture has become an economic activity that relies on the use of the latest technologies. The late Sheikh Zayed bin Sultan Al Nahyan played a significant role in the evolution and development of the agriculture sector in the country. While obstacles such as scarcity of water resources, severe environmental conditions and soil salinity have affected development, the UAE has found innovative solutions to circumvent these challenges. These solutions have been largely found in the underground aquifers or underground water supplies from the mountains.

Agriculture in the UAE is carried out on a total, cultivable area of around 160,000 hectares, most of which is taken up by date palms. Over the years, the governments in each emirate have provided incentives to farmers, in efforts to increase production. For instance, farmers in the UAE receive 50% subsidy on seeds, fertilisers and pesticides, as well as special loans to buy machinery and equipment.

Today, there are more than 30,000 farmers in the UAE, an exponential increase from around 4,000 farmers in the early 1970s. The rapid development of agriculture in the UAE was seen during the 1980s, when the country started using up to 30% of its food requirements. Apart from farming in Dubai and the other emirates, there has also been an increase in fishing and poultry production, with local dairies meeting 92% of the demand in the country.

The important key pillar to achieve food security is the role of agriculture in this regard, besides its significant impact and role in enhancing the country economic activities. There is a great international example handled by Abu Dhabi emirate; it made a central and vast stride in the agricultural sector, they did a great effort to overcome and avoid the dry conditions associated with their desert climate, and also they could to convert the arid terrain into a green farm; they were able to produce various types of fruits and vegetables in the UAE market. During the past 4 decades, the plant holds number were increased by 38 folds into 634 in 1971, and increased to 24,018 in 2017. Moreover, the arable land has been expanded by 33-fold to be increased into 749,868 donum from 22,377 within the same time period. These advancements elated to the wise and strategic policies from the government of Arab Emirates, where Abu Dhabi excelled to overcome the tough high temperature and arid conditions, besides they succeeded to establish successful agricultural activities which reflects the ambitious of the country to achieve the sustainable

developments. Agriculture considered one of the most important aspects of economic and social development of Abu Dhabi Emirate (Elessawy, 2020).

The country economic development is directly affected by the agricultural activities handled by the sector; it considered as a cornerstone to achieve and meet the objectives of the country developments. Agriculture is a productive sector and within the major sectors that contributes in the country gross domestic product (GDP) . Moreover, it plays a major role in supplying raw materials and food commodities for the Emirates food industry. The importance of this sector is to build an accurate database for the all agricultural activities that are associated with the relative statistics to be the key for the strategic planning policy of the Emirates. The emirates statistical yearbook has qualitative and quantitative statistics to support the Emirates decision-making process and planning. These statistics has the required information about the size of the agricultural land, farmers number, agricultural quantities of production and values and the crop area indicators (Elessawy, 2020).

Pesticides and chemical controls are playing a significant role in the developing countries in protecting the agricultural products due to the advancements in the agricultural technology (Dodic et al. 2019). However, is usually this process performed incompletely because the farmers have inadequate knowledge and practice for the proper principles of the chemical control's practices, moreover, their failure in achieving the intended outcome, it will interfere and interrupt the natural balance and the most dangerous impact is to poison the pesticides users and the consumable agricultural products in the long run (Zhang et al., 2022). However, the method and the usage of the chemical pesticides in the developed countries are more logically and adhered with the environmentally friendly ways, besides to that there are regulatory organizations and laws to control this usage of pesticides (Grover, 2019).

There is something called the acute effect; it means that body will be vulnerable to these chemicals because of the ingestion into the bodies. There are many symptoms cause from its bad effect on the human health such as diarrhea, nausea, dizziness, lung inflammation, vomiting, skin lesions, and even death (Bagheri et al., 2024; Garcia et al. 2016). Regardless the public awareness about the associated risk with the excessive use of chemical pesticides and the fertilizers; there is an incremental cost on the environment linked with this excessive use of pesticides and fertilizers in the agricultural activities (Chopra et al., 2022). Pest control is one of the major reasons to use the chemical pesticides in agriculture (Damalas and Abdollahzadeh, 2019). Food and Agriculture Organization reported that there are many poisoning and contamination cases among the farmers who working in the agricultural sector because of the usage of the chemical pesticides.

The World Health Organization (WHO) announced that the majority of the agrochemical pesticides were considered as hazardous materials and many of them have been listed by the government authorities. One of the global problems of the public health is pesticide poisoning. Around 3 million acute poisonings cases occurred each year globally (WHO). In developing countries; pesticide poisoning is a serious and frequent problem regardless whether in developed countries pesticides sales have greater quantities than the amounts in developing countries (Boedeker et al., 2022).

The reason behind this problem is the weak or the absence in the pesticide controls practices and regulations, and also the shortages in the training programs for pesticides users and inspectors in the developing countries (Boedeker et al., 2022; Ecobichon, 2019). In developing countries, around 25% they are lack in the regulating laws that control the pesticides use and distributions, and 80% of them they don't have sufficient resources to impose the related legislation for the existing pesticides. Another important issue, which is

too critical about the bad usage behavior of pesticides; according the research findings that shows the pesticide ingestion is the reason for more than 60% of suicides cases in different rural areas especially in South-East Asia and China. The international poisoning such as suicide by pesticides ingestion is the reason for 300,000 deaths each year. Pesticide poisoning considered the most likely method of suicide worldwide (Gunnell and Eddleston, 2019).

Moreover, the farmer's practices and behavior toward the usage of pesticides in their own crops and farmers have a significant negative effect on their health; Occupational acute pesticide poisoning among agricultural workers is a major issue in the developing countries with poorly regulated pesticide use. Despite of low consumption of pesticides on global scale, cases of pesticide poisoning among farmers are increasing every year. This might be attributed to low level of education, continued use of hazardous pesticides, lack of training, inability to afford protective clothing or equipment, practical difficulty of wearing protective clothing in hot and humid climates and mainly because of faulty pesticide handling behavior. Important health problems faced farmers includes bad odor of pesticides, skin irritation, headache and dizziness, eye irritation, vomiting, breathing problem and severe cases leading to death. Thus, considering all these important issues of concern, it is advocated that there is a need for some policy implications regarding, regular monitoring of occupational pesticide exposure and associated health effects, designing and conducting massive educational and training programs on scientific management of pesticides and pesticide poisoning (Lamichhane et al., 2018).

In developing countries, common pesticide practices have been assessed farmers. The reference of storage places for pesticides, the results show that 60% of farmers store their pesticides in warehouse and stalls, whereas 8.5% of them store it in their own houses. While the majority of farmers around 71.5% said that they handle the pesticide preparation

next to the irrigation wells or in the orchards. Mostly 1 out of 3 farmers which is 32.8% reporting that they dump the empty pesticide containers in orchard fields with an equal percentage of 32.8% said that practice to bury the empty pesticide containers. There are common symptoms that the majority of farmers have experienced from the usage of pesticides; burning eyes (irritating) and the blurred vision were common symptoms. Coveralls goggles are rarely used by farmers, whereas long-sleeve shirts/blouses, trousers, and gloves were the most common used by farmers when spraying pesticides. PPE usage and the safety behavior negatively affected by farmer's experience and their ages; the surprising thing that the experienced farmers along with old farmers don't follow the pesticides safety procedures. While farmers who have information about pesticides, educated farmers, and the professional farmers as farming their own career show more safety behavior. The famers exposure level to pesticides depends on their usage of pesticides. The main aim of the extension services to ensure the human safety related to pesticides usage in agriculture (Bagheri et al., 2018).

Pesticides such as Dichloro Diphenyl Trichloroethane (DDT) and Endosulfan have been restricted to be used by farmers by European Union (EU) because of environmental and health reasons (PANUK, 2018); but unfortunately farmers in the developing countries are still using it including UAE. For consumption pattern has compelled the use of pesticides for producing farm products. The research of Ahmed et al., (2015), posed striking results of the use of pesticide in the country UAE consumed more pesticide per hectare, 10 kilograms per hectare, than used India, or United States of America, or European Countries. Although there have been studies on the use of pesticides and the extent of damage caused by its use, the researchers have fallen short of thinking about the cause. The inordinate amount of use of pesticide has caused harm not only to the consumers of that farm product but also to the growers or workers in the farm. Although,

in the UAE, there have been regulations on the careful use of such sensitive chemicals, farmers for its use seem to be hindering the proper application and careful use of pesticides on the farmers.

The first of the research on the ill-effects of pesticides on the farmers was conducted by Boedeker et al. (2022). The research gave a profound idea on how the excessive use of pesticides was toxic for the farmer's health – using pesticides were more prone to chronic respiratory illnesses than non-farmers. Moreover, studies on the malpractice of consuming pesticide by the farmers have caused a different havoc in the entire world. The regulated use of the pesticide is in question. The third issue that raises doubts on the literacy of the farmers regarding the use of the pesticides is covered in the case research (Kumari and John, 2018) which is a detailed research on the lack of good practices in handling pesticides while using it in the farm and storing it. Among the studies conducted by taking first hand data on the handling of the pesticides, Raimondo et al. (2022) gives us a first-hand account, based on the questionnaire targeted at peasant farmers of the developing countries, of how the farmers applied and stored the pesticides – the two main focuses of this research. It also outlines corrective measures that a government of the developing nation like UAE might take in order to increase the knowledge of the farmers.

1.3 Problem statement

Farmers in developing countries continue to use pesticides in increasing quantities because of ignorance of the sustainability of pesticide use, a lack of alternatives to pesticides, an underestimation of the short- and long-term effects of pesticide use, and weak enforcement of laws and regulations (Bagheri et al., 2018; Ahmed et al., 2015). Pesticide importation into Arabian countries is rapidly increasing. On the other hand, the program for controlling pesticides is limited. The reason behind this is that users have no information about the purpose of each pesticide product, the hazard level (toxicology

class), the, dosage and concentration, the method of protection, or access to protective equipment (Ahmed et al., 2015).

In UAE there is no integrated poison center with a reporting system and disease-hampering estimation institutions, particularly on pesticides' effects on health and the environment of the community. This is a clear indication of a lack of concern for pesticide-related health effects and insignificant intervention in agricultural pesticide use practices. According to studies, farmers who had a positive attitude toward pesticide use safety practices took more precautions, used safety equipment, and used pesticides safely than those who had a negative attitude (Boedeker et al., 2022; Shajua and Laohasiriwong, 2021; Houbraken et al., 2020; Memon et al., 2019). Whatever efforts have been undertaken, pesticide users in UAE in general, and the research area of Abu Dhabi wetland, in particular, are heavily exposed to short-term (example skin and eye irritation, headaches and dizziness). Therefore, the aim of the research is to investigate the relationship between farmer's safety behaviour and pesticides usage in improving UAE agriculture.

There are many linkages between agricultural practices and products and environmental health problems, according to evidence from throughout the world (Sarkar et al., 2012). Agricultural worker risk perception studies are frequently linked to averting any accident or occupational sickness (Cecchini et al., 2018).

UAE aspires to become a developed nation by the year 2030 through achieving Vision 2030 initiative to achieve millennium which development goals for UAE on the UAE environmental sustainability programs (MDGs report, 2000-2008). In addition, it is hope the researcher is looking for that this research will be as a guiding policy for the development agencies in the UAE. In order to safety and protective behavior in handling pesticide in UAE Agriculture in use of agrochemicals in different cropping systems. Also provide useful agricultural information's to UAE farmers, so appropriate policies and

developmental programs will be formulated and to be implemented for the best management practices and the utilization to achieve the sustainable development approach. and also to ensure that the Governmental agencies formulates safe quality procedures for the UAE farmers. This research will try to engage with the methods, policies, and practices of using, handling and disposing pesticides. A detailed research on the state's approach towards campaigns, workshops, and educational programs regarding the use of the pesticide can provide extensive understanding on the lack of awareness of farmers in using pesticides.

1.4 Research questions

This research attempts to the relationship between farmers safety behaviour and pesticides usage in improving UAE Agriculture. Specifically, the questions are as follows:

1. What is the relationship between the behavior personal protective equipment and pesticide use?
2. What is the relationship between behavior life-threatening health risks and pesticide use?
3. What is the relationship between behavior applying of safety and health principles during spraying and pesticide use?
4. What is the relationship between behavior based on the use of empty poisons and pesticide use?

1.5 Research objectives

The aim of this research is to the relationship between farmers safety behaviour and pesticides usage in improving UAE Agriculture. To achieve the aims, several objectives were identified. Specifically, the objectives are as follows: