



The Reality of Implementing Environmental and Health Safety Practices in Cucumber Cultivation in Al-Mada'in District in Baghdad

Yusra Khalid Salman^{1*}, Prof. Dr. Hussein Ali Hussein²

Abstract

The study aimed to assess the extent to which cucumber farmers in the Madain District apply sustainable environmental and health safety practices, as well as to identify the priorities for implementing such practices among cucumber farmers in the Madain District according to their importance.

The research was conducted in the Madain district of Baghdad Governorate and included a study population of 200 cucumber farmers; a simple random sample of 100 farmers (50% of the study population) was selected. To achieve the research objective, a questionnaire was developed based on studies and research relevant to the topic, as well as the opinions of specialists and experts in the field. The questionnaire consisted of seven items to measure the level of implementation of sustainable marketing practices. A four-point scale was adopted based on the level of implementation, with responses weighted as 0, 1, 2 and 3. The data were analysed using SPSS, and the results showed that the majority of respondents fell within the medium level of implementation of sustainable environmental and health safety practices, accounting for 51%, whilst those at the high level accounted for 18%, and those at the low level accounted for 17%. It also emerged that the item 'Avoid spraying pesticides when it is windy' ranked first with a percentage weight of 83%, whilst the item 'Use protective equipment when spraying' ranked last with a percentage weight of 31.33%. The research concluded that the overall level of sustainable environmental and health safety practices implemented by farmers in cucumber production in the Al-Mada'in region was average, and there was a significant difference between farmers in their adoption of these practices. It was also noted that some practices for the safe use of pesticides were emphasised more than others, and that some preventive and health practices were still poorly implemented, highlighting the need to improve awareness and agricultural guidance to achieve more sustainable farming and better protection of the environment and human health. The study recommended the need to increase the level of guidance and training for cucumber farmers in the Al-Mada'in region with the aim of raising their awareness of sustainable measures for environmental and health safety. This includes attention to the safe use of pesticides, personal protective equipment, and the proper disposal of agricultural waste, whilst making efforts to support farmers and provide them with information and materials that will improve their implementation and achieve agricultural sustainability.

¹ Department of Agricultural Extension and Technology Transfer, College of Agricultural Engineering Sciences, University of Baghdad, Iraq, Email: yusra.hamad2409m@coagri.uobaghdad.edu.iq, ORCID: 0009-0004-9535-676X

² Department of Agricultural Extension and Technology Transfer, College of Agricultural Engineering Sciences, University of Baghdad, Iraq, Email: hussein.ali@coagri.uobaghdad.edu.iq

Corresponding Author*: Yusra Khalid Salman, Department of Agricultural Extension and Technology Transfer, College of Agricultural Engineering Sciences, University of Baghdad, Iraq, Email: yusra.hamad2409m@coagri.uobaghdad.edu.iq, ORCID: 0009-0004-9535-676X

Keywords: Sustainable Environmental, Health Safety Practices, Environment, Cucumber Cultivation, Madain District.

1. Introduction

Agriculture is one of the cornerstones of any country's economy; it not only provides food but also plays a vital role in achieving sustainable development and promoting economic stability through its contribution to food security and job creation, particularly in rural areas. According to the Food and Agriculture Organisation of the United Nations, agriculture is the main source of livelihood and economic activity for millions of households and is a key contributor to rural poverty alleviation and economic development. (Ghanawi & Saleh, 2024, p.323), (Rahim & Tawfik, 2026, p.2).

The agricultural sector has adopted intensive farming practices that make heavy use of fertilisers, pesticides and agricultural hormones with the aim of increasing productivity and economic returns as demand for food rises. However, this rise in chemical input has brought with it numerous problems regarding environmental and health and safety. Over the years, the intensive use of pesticides and chemical fertilisers has had negative impacts on the environment and human health, and experts and researchers have expressed concerns regarding the sustainability of agricultural production relying on pesticides and chemical fertilisers (Biscontini, 2024). These effects have been termed 'negative externalities' due to their harmful repercussions on the environment and society (Moss, 2008).

2. Theoretical framework

Given their ongoing impact on human health and the environment, the use of agricultural pesticides is considered one of the main sources of environmental risk, with total pesticide use estimated at around 3 million metric tonnes annually worldwide (Ali et al., 2024). Pesticides adversely affect humans both directly and indirectly through food, water and crops (Mahdi & Sultan, 2022, p.37). In recent years, research has revealed that successful agricultural development in the modern era has been accompanied by serious environmental and health impacts, which have been documented, along with their economic and social costs (Zhao et al., 2008).

Farming systems that incorporate pesticide reduction have been shown to generate greater social and health benefits, such as a reduction in the incidence of disease among farmers and their families, and the associated treatment costs. In the Philippines, the externalities of pesticides in rice farming in China cost approximately US\$1.4 billion annually, including health expenditure, environmental damage, and loss of biodiversity. In Ecuador, there have been cases of pesticide poisoning with high mortality rates, reaching 21 deaths per 100,000 people in remote agricultural areas (Pretty, 2008). It has also been found that some pesticides cause neurological and degenerative diseases and can cause birth defects or cancer in humans (Agrawal et al., 2010). Furthermore, it was observed that many farmers were not wearing personal protective equipment during spraying operations, such as masks and gloves, which may expose them to pesticides through inhalation or skin contact, adversely affecting the respiratory system, skin and eyes, posing a risk to farmers (Singh, 2019).

Vegetables are considered economically and nutritionally important crops, as they represent a major source of income and food for millions of farmers, in addition to their role in achieving sustainable food security and supporting various food industries. The National Development Plan (2018–2022) emphasised the importance of developing vegetable crop cultivation in terms of both quantity and quality (Ministry of Planning, 2018). Vegetable cultivation holds an important position in Iraq, with the country ranking sixth in the Arab world for vegetable production, and productivity rising by 24.1% in 2019 (Central Bureau of Statistics, 2019). This agricultural activity is also the main source of income for thousands of farmers and their families across various Iraqi governorates (Al-Hafidh & Al-Taiy, 2022), as well as contributing to the revitalisation of the national economy and increasing the agricultural sector's contribution to gross domestic product (Al-Fatlawi & Al-Ta'I, 2018).

The cucumber crop is one of the most important vegetable crops grown in Iraq, given its nutritional and economic significance. It requires constant care and the frequent use of fertilisers and pesticides to combat pests and diseases and improve productivity, which underscores the importance of adhering to environmental and health safety practices during various agricultural operations. In 2022, Baghdad Governorate led cucumber production among the governorates with a yield of 39,100 tonnes, representing 20.0% of Iraq's total production of this crop, whilst the area under cucumber cultivation in Baghdad in 2021 was approximately 14,793 dunums, with a total production of 31,002 tonnes and an average yield of 2,095.7 kg/dunum (Ministry of Planning, Statistics and Geographic Information Systems Authority, 2024). These indicators highlight the importance of Baghdad Governorate, particularly the Madain District, as an agricultural region suitable for studying the implementation of environmental and health safety practices in cucumber cultivation.

The Food and Agriculture Organization of the United Nations (FAO) emphasises that sustainable agriculture is based on the management of natural resources in a way that conserves soil, water and biodiversity, whilst minimising the negative environmental impacts resulting from the excessive use of agricultural inputs and achieving long-term food security (FAO, 2021). These practices include integrated pest management, the safe use of pesticides, the conservation of natural resources, and the use of organic fertilisers and environmentally friendly agricultural methods, thereby contributing to the protection of human health and the environment and the

achievement of agricultural sustainability (Srivastav et al., 2021), (Kremsa, 2021) (Latching et al., 2022). In light of the above, this research aims to answer the following questions:

- To what extent do cucumber farmers in the Madani district apply sustainable environmental and health safety practices?
- What are the priorities for applying sustainable environmental and health safety practices among cucumber farmers in the Madain district, ranked by importance?

The objectives of the research can be summarized as follows :

1. To determine the extent to which cucumber farmers in the Madain district apply sustainable environmental and health safety practices.
2. To prioritise the application of sustainable environmental and health safety practices among cucumber farmers in the Madain district according to their importance.

The study put forward several key hypotheses, which we summarise as follows:

1. There is a varying degree of adherence to environmental and health safety practices among cucumber farmers in the Madain district.
2. The priorities regarding the implementation of sustainable environmental and health safety practices among cucumber farmers in the Madain district vary according to their importance.

3. Materials And Working Methods

a. Research methodology

The present study adopts a descriptive approach, which is a research methodology that involves observing and describing the behaviour, characteristics or circumstances of a specific population group or phenomenon without manipulating any variables, The primary aim of descriptive studies is to provide an accurate and detailed description of natural phenomena through the use of various data collection techniques, such as questionnaires, interviews and observations (Mind the Graph, 2023 – Internet).

b. The research population

The research population is defined as all the elements or units to be studied, i.e. the homogeneous and integrated groups of individuals who share common characteristics that can be tracked and analysed by the researcher, thereby facilitating the generalization of the research findings to them (Abu Samra and Al-Titi, 2020: 450). The research population comprised all cucumber farmers in the Madalin district, numbering 200 farmers. A simple random sample of 50% was drawn from the research population, resulting in a sample size of 100 farmers (open-field cultivation).

c. Research Tool

The questionnaire was drafted in its initial form after reviewing studies and research related to the application of sustainable environmental and health safety practices and consists of seven items.

d. Validity and Reliability

The face validity and content validity of the research instrument were verified by presenting it to a panel of 14 experts. They assessed the accuracy of the wording and clarity of the meanings, as well as providing their comments and suggestions regarding possible amendments, whether by deletion, addition or modification. In light of this, the final questionnaire was prepared.

To verify reliability, a pre-test of the questionnaire was conducted on 4 March 2026 with a sample of 20 farmers from outside the research community to verify the reliability of the scales included in the questionnaire. To measure reliability statistically, the pre-test data were analysed using Cronbach's alpha, and the questionnaire's reliability coefficient was 0.78, which is a high score (Taber, 2018). This indicates that the questionnaire is suitable for final data collection.

e. Data collection

The questionnaire was used as the primary tool for collecting data from the research participants, as it is one of the most common and appropriate methods in field studies. A total of 100 questionnaires were distributed to the sample included in the research, and data were collected between 24 March 2026 and 29 April 2026 .

f. Data analysis

After the data had been collected, coded, and categorised, it was analysed using manual analysis and SPSS. Accordingly, the following statistical measures were used (arithmetic mean, standard deviation, percentage weight, Pearson's correlation coefficient, Spearman-Brown correlation coefficient, and the t-test) .

5. Presentation Of Results

5.1 Assessing the extent to which cucumber farmers in the Madain district apply sustainable environmental and health safety practices

The study involved 100 farmers in the Baghdad/Al-Mada'in Governorate, with the aim of assessing their level of implementation of sustainable environmental and health safety practices. The farmers were classified into three categories based on their scores, as shown in Table 1.

Table 1 shows the level of implementation of sustainable environmental and health safety practices among cucumber farmers in the Madain district. The results indicate that the majority of respondents fall into the 'moderate' implementation category, comprising 51 farmers (51%), with an average implementation score of

9.84, indicating that farmers apply environmental and health safety practices to a moderate degree; however, this implementation still requires development and reinforcement to reach the required level of sustainable practices. The results also showed that the low application category ranked second, comprising 31 farmers (31%) with an average application score of 7.06. This reflects the existence of a segment of farmers who struggle to adopt or implement environmental and health safety practices, which may be due to limited knowledge or a lack of agricultural guidance and training.

Meanwhile, the high implementation category ranked last, comprising 18 farmers (18%) with an average implementation score of 12.61, indicating that only a limited proportion of farmers demonstrate a high level of commitment to sustainable environmental and health practices.

Overall, the total arithmetic mean for the level of implementation was 9.48 points with a standard deviation of 2.11, indicating a relative variation in the level of implementation among farmers, with results tending towards the average level. These results indicate the need to intensify extension and training programmes to raise farmers' awareness of the importance of applying sustainable environmental and health safety practices in cucumber cultivation.

5.2 Prioritising the implementation of sustainable environmental and health safety practices among cucumber farmers in the Madain district according to their importance.

In order to identify the priorities of cucumber farmers in the adoption of sustainable environmental and health safety practices, the arithmetic means and percentage weights for the items under the 'sustainable marketing practices' category were calculated and then ranked in descending order according to the degree of adoption as perceived by the respondents, as shown in Table 2.

Table 2 shows that the statement 'Avoid spraying pesticides when it is windy' received the highest arithmetic mean (2.49) and percentage weight (83%), indicating a high level of adherence to this practice among farmers. This indicates their understanding of the need to minimise the drift of pesticides to neighbouring crops or their impact on human health and the environment.

The statement "Use sterilised water during spraying", however, received the lowest arithmetic mean (0.12) and percentage weight (4%), and was given the lowest overall score, suggesting that this practice is the least commonly applied. This may be because farmers are unaware of the value of using sterilised water or because the necessary resources are not readily available to them.

Conclusions

The research findings showed that the level of implementation of sustainable environmental and health safety practices among cucumber farmers in the Madain district was generally average, with clear variations among farmers in their degree of adherence to these practices. It also emerged that some practices relating to the safe use of pesticides receive greater attention than others, whilst certain preventive and health-related practices continue to be implemented at low levels. This indicates a need to enhance awareness and provide agricultural guidance to achieve more sustainable farming that better protects the environment and human health.

Recommendations

The research recommends that the level of guidance and training provided to cucumber farmers in the Al-Mada'in region should be increased, with the aim of raising their awareness of sustainable environmental and health safety measures. This includes attention to the safe use of pesticides, personal protective equipment, and the proper disposal of agricultural waste, whilst making efforts to support farmers and provide them with information and materials that will improve their practices and achieve agricultural sustainability.

Appreciation and gratitude

The authors would like to express their gratitude to the Department of Agricultural Extension and Technology Transfer at the Faculty of Agricultural Engineering, University of Baghdad, for their support, which contributed significantly to the completion of this research. The authors would also like to thank the farmers for their valuable cooperation during the collection of data for this study.

Contributions by the authors

Hussein Ali Hussein: Conceptualization of the idea, and general supervision (theoretical and practical).

Yusra Khalid Salman: Data collection and statistical analysis.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this research.

References

1. Abu Samra, Mahmoud Ahmed, and Al-Titi, Muhammad Abd al-Ilah, (2020) Scientific Research Methods: From Explanation to Empowerment, Dar Al-Yazouri Publishing, Amman, Jordan.

2. Iraqi Ministry of Planning, Statistics and Geographic Information Systems Authority. (2024). Agricultural Production Statistics for Crops and Vegetables in Iraq for the Year 2023. Central Statistical Organisation, Baghdad.
3. Al-Fatlawi, R. and H,K Al-Ta'i. 2018, Problems facing the spread of agriculture in greenhouses in Qadisiyah Governorate, The Iraqi Research Journal of Agriculture, 23 (207-221).
4. Al-Hafidh, F. S., & Al-Ta'iy, H. K. (2022). Suggested visualization for some quality elements of extension service for vegetable farmers from their viewpoint in the Governorate of Baghdad. *Iraqi Journal of Agricultural Sciences*, 53(5), 1203–1211.
5. Ali, I. H., Bayar, A. H. A., & Arif, M. A. (2024). Determination of optimum conditions for bioremediation of imidacloprid by Rhizobium pusense strain IHB1 (OP218458.1) and Psychrobacter celer strain IHB2 (OP672320.1). *Iraqi Journal of Market Research and Consumer Protection*, 16(2), 136–148. <https://doi.org/10.28936/jmracpc16.2.2024.12>
6. Biscontini, T. (2024). High-input agriculture (industrialized agriculture). <https://www.ebsco.com/research-starters/agriculture-and-agribusiness/high-input-agriculture-industrialized-agriculture>
7. Central Bureau of Statistics, Agricultural Statistics Directorate, Crop and Vegetable Production Report for 2019, Iraq.pp:22.
8. Food and Agriculture Organisation of the United Nations (FAO). (2021). Sustainable food and agriculture. FAO, Rome. <https://www.fao.org/sustainability>
9. Ghanawi, M. A., & Saleh Al- Kubaisi, L. Y. (2024). Government Investment Spending and Its Role in the Agricultural Sector for the Period (2004-2021). *Journal of Economics and Administrative Sciences*,30(142), 322-337. <https://doi.org/10.33095/6thpfj85>
10. Kremsa, V. S. (2021). Sustainable management of agricultural resources (crops and animals). In *Sustainable Resource Management* (pp. 99-145). Academic Press. <https://doi.org/10.1016/B978-0-12-824342-8.00010-9>
11. Mahdii, B. A., Y. F. Al Fatlawy., and L. J. Sultan. (2022). The effect of pesticides on the environment and living organisms. *Anbar Journal of Agricultural SCIENCES*, 20(1): 36-44.
12. Mind the Graph. What is descriptive study and why is it important in research? Published September 15, 2023. <https://mindthegraph.com/blog/what-is-a-descriptive-study/>
13. Ministry of Planning / Central Statistical Organization, 2018, National Development Plan 2018-2022, Baghdad, Iraq
14. Moss B. Water pollution by agriculture. *Phil. Trans. R. Soc. B.* 2008 ;363:659–666. doi: 10.1098/rstb.2007.2176. doi:10.1098/rstb.2007.2176.
15. Pretty J. (2008). Agricultural sustainability: concepts, principles and evidence. *Philosophical Transactions of the Royal Society of London. Series B, Biological sciences*, 363(1491), 447–465. <https://doi.org/10.1098/rstb.2007.2163>
16. Rahim, S. M. & Tawfik. J. K. (2026). Problems facing the performance of female agricultural employees in providing extension services in the field of environmental sustainability / Baghdad Province. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1596, p. 012020). IOP Publishing. <https://doi.org/10.1088/1755>
17. Singh, M. (2019). Effects of pesticides and chemical fertilisers on human health. *International Journal of Research and Analytical Reviews (IJRAR)*, 6(2), 195.
18. Srivastav, A. L., Dhyani, R., Ranjan, M., & Madhav, S. (2021). Climate-resilient strategies for sustainable management of water resources and agriculture. *Environmental Science and Pollution Research*, 28, 41576–41595. <https://doi.org/10.1007/s11356-021-14332-4>.
19. Taber, K.S. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Res Sci Educ* 48, 1273–1296 (2018). <https://doi.org/10.1007/s11165-016-9602-2>
20. Zhao J, Luo Q, Deng H, Yan Y. Opportunities and challenges of sustainable agricultural development in China. *Phil. Trans. R. Soc. B.* 2008;363:893–904. doi: 10.1098/rstb.2007.2190. doi:10.1098/rstb.2007.2190.