



IMPROVING BROILER BREEDERS' ADOPTION OF CAGE BREEDING TECHNOLOGY IN BABYLON GOVERNORATE

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ABSTRACT

The research aims to improve broiler breeders' adoption of cage breeding technology in Babylon governorate, Iraq. A random sample consisting of 107 broiler breeders was taken. A questionnaire was prepared that included five main areas: suggestions for improving the agricultural extension system, improving related to the breeders, improving the environmental and management, improving the economic and marketing, as well as improving related to cage breeding technology. The research results have shown a high level of agreement among breeders on the suggestions that improve the adoption of Cage Breeding Technology. Consequently, this high level of agreement (approval) and satisfaction with the suggestions presented in the research must be matched by an organized process to put these suggestions into actual practice by decision-makers. This will significantly and effectively contribute in increasing the number of adopters of cage breeding technology and achieving the desired economic and social aims.

Keywords: Technology, Economics, Marketing, Environmental.

تحسين تبني مُربي فروج اللحم لتقانة التربية بالأقفاص في محافظة بابل

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الخلاصة

يهدف البحث إلى تحسين تبني مُربي فروج اللحم لتقانة التربية بالأقفاص في محافظة بابل، العراق، تم أخذ عينة عشوائية بسيطة تتكون من 107 مُربي لفروج اللحم، وأعدت استبانة ضمت خمسة محاور، وهي: محور مقترحات تحسين الجهاز الإرشادي، ومقترحات التحسين الشخصية المتعلقة بالمُربين، ومقترحات التحسين البيئية والتنظيمية، ومقترحات التحسين الاقتصادية والتسويقية، فضلاً عن مقترحات التحسين المتعلقة بتقانة التربية بالأقفاص. وقد أظهرت نتائج البحث موافقة الغالبية العظمى من المُربين على مقترحات التحسين المقدمة لهم. وعليه فإن هذا المستوى العالي من الموافقة والرضا على المقترحات المقدمة في البحث لا بد أن يقابله عملية منظمة تعمل على وضع هذه المقترحات موضع التطبيق الفعلي من قبل الجهات المتخذة للقرار، والتي بلا شك ستساهم بشكل رئيس وفعال في زيادة اعداد المتبنين لتقانة التربية بالأقفاص وتحقيق الأهداف الاقتصادية والاجتماعية المرجوة منها.
الكلمات المفتاحية: تقانة، اقتصادية، تسويقية، بيئية.

* This article is taken from the first researcher's master's thesis.



INTRODUCTION

Iraq faces great challenges in the field of agricultural production, as the world food and agriculture organization indicated in its report on food security and social living conditions in Iraq that approximately (2.6) million people suffer from insufficient food consumption. Among eighteen governorates throughout Iraq, the prevalence of insufficient food consumption in Babylon governorate was the first to record an increase of (34%) compared to the rest of the governorates of Iraq (FAO *et al.*, 2021). This means that the issue of food security comes at the forefront of the challenges faced by Iraq. In addition to the challenges related to combating desertification, the drought crisis, population increase, the effects of the corona pandemic, high poverty rates, high food and commodity prices as a result of high inflation, deterioration of agricultural soils, and low productivity of agricultural crops (Yassin, 2015; Fayza, 2021; Mohammed, 2016; Al-mashhadani, 2020).

This requires diligent and efficient work to optimally exploit the country's natural resources to ensure the sustainability of natural resources for future generations. This can be achieved through the improvement and development of infrastructure, the diffusion and adoption of modern technology, and providing technical, financial and moral support to workers in the agricultural sector. Which should include the most vulnerable people (helpless), including women and rural young people, to ensure their economic and social well-being. (Abdullamunim, 2023; FAO *et al.*, 2022; Koriem, 2023).

Thus, it is important to work first to bring about desirable behavioral changes among workers in the agricultural sector by providing them with the necessary knowledge, skills and experience in their field, using appropriate methods and aids of agricultural extension, as well as urging and encouraging them to adopt modern agricultural technologies and use them in their production work in the animal and plant aspect (Al-Mashhadani *et al.*, 2017; Campuzano *et al.*, 2023). That will not be achieved unless the role of agricultural extension agencies is activated, through organizing, planning and implementing programs of dissemination and adoption of modern agricultural ideas and technologies, using appropriate agricultural extension activities, which target farmers and breeders. Then working on follow up and evaluate these activities in order to achieve the highest effectiveness and efficiency in agricultural production work (Najris, 2023; Al-Taiy, 2009; Alazy & Al-Mashhadani, 2023).

The process of disseminating and adopting agricultural technologies is one of the most important tasks carried out by the agricultural extension system in the countryside. Which occupies a large space in field work; to confront various challenges in the agricultural sector, most notably the issue of food security (Salman, 2020; Al-Taye *et al.*, 2021; Panwar *et al.*, 2024; Pratt *et al.*, 2021).

The poultry sector has a particular importance in the field of livestock. It is one of the most important bases for achieving food security, due to short production periods (especially meat broilers) and its cheap prices compared to livestock and fish at the present time, as well as provides the nutritional needs of individuals from low-fat animal protein, also the high nutritional value of its meat because of the high energy and abundance of essential amino and fatty acids that essential for human life (Leeson & Summers, 2005; Al-Hasani & Kamash, 2021; Kadhim, 2021; Al-Mashhadani & Al-Rubaie, 2023). In addition to its health



importance for the human body, as it limits or reduces obesity, cardiovascular diseases, and diabetes, it is also considered a preventive food against cancer (**Jilo & Hasan, 2022**).

These economic, food and health reasons have made the poultry production sector (both laying hens and broilers) in Iraq one of the most important production sectors. Which its production and sustainability closely linked to the movement of global markets, the amount of fixed and variable costs, which includes a large part of the production requirements, such as: medicines, vaccines, hatching eggs, feed, warehouses, generators and spare tools, etc. (**Mohamed, 2009; Mohamed, 2023; Lamah, 2020**). The amount of poultry meat production in Iraq (except the Kurdistan region) for the year (2022) in the private sector is (162,500) tons, with an increase of (17,800) tons, compared to the total production of Iraq for (2021), which was (144,700) tons, with an increase rate of (12.3%) (**Ezzat et al., 2023**).

Quantities of imported poultry meat have reached a very large number, which includes: fresh chicken meat, frozen chicken meat, minced chicken meat (Burker), frozen chicken breast, frozen chicken thigh, Kentucky, also giblets, heart and liver, which amounted to (127,962) tons, at a financial cost estimated at (220) million US dollars annually (**Jaafar et al., 2023**).

Therefore, the process of increasing local production and developing its quality has become an economic, social, food and national demand, in order to invest the huge funds spent on importing in local economic projects based on the use of modern breeding technologies such as cage technology in broiler breeding. This provides high production quantities and good quality compared to traditional breeding methods and will also contribute to filling the growing local need for various poultry products. Also, jobs will be provided by these projects for unemployed rural young people and improve the economic and social level of workers in this important sector.

The poultry industry is widespread in most governorates of Iraq, including Babylon governorate, which is one of the famous governorates for poultry farming, because it includes (695) licensed fields for the production of broilers, also mothers' fields, table egg chickens, also hatcheries and feed factories (**Babylon Agriculture Directorate- Livestock Services Department, 2024a**). Unfortunately, statistics indicate a noticeable decline in the number of fields operating at the governorate level, which has become less than a third (that is, out of 695 fields), which necessarily led to a decrease in production rates. The statistics also indicate that the number of fields adopting modern breeding technologies, especially cage breeding technology, is very rare in the field of broiler breeding (**Babylon Agriculture Directorate - Livestock Services Department, 2024b**). That may be due to financial, marketing, environmental, organizational, and political reasons. Based on the above and as a result of the lack of Iraqi research on improving the adoption of cage breeding technology by broiler breeders, the current research has come to answer the following research question:

_What are the suggestions to improve broiler breeders' adoption of cage breeding technology in Babylon governorate?

Research Aims:

To improve broiler breeders' adoption of cage breeding technology, the research has aimed to determine the suggestions below:

1. Determine suggestions related to the agricultural extension work.
2. Determine suggestions related to breeders themselves.



3. Determine suggestions related to management and environmental aspects.
4. Determine suggestions related to economic and marketing aspects.
5. Determine suggestions related to cage breeding technology itself.

Research Hypothesis:

The process of determining suggestions to improve broiler breeders' adoption of cage breeding technology in Babylon governorate will show high agreement by broiler breeders on these suggestions.

The Importance Of Research:

1. The current research is considered a qualitative addition to the field of scientific research, as it is one of the first researches that dealt with determining the suggestions of improving the adoption of broiler breeders' adoption of cage breeding technology.
2. The importance of the research is related to the economic importance of broiler breeding in particular, as it is possible to obtain a significant economic return within a short period of time not exceeding 5-6 weeks.
3. The importance of the research is related to the important contribution of this sector to achieving an important aspect of local food security; due to the nutritional value provided by chicken meat, and what it contains of the good amounts of animal protein, and essential amino acids which are very important for human health.

MATERIALS AND METHODS:

Research Methodology:

The descriptive approach is used for conducting the current research as it is considered the most suitable research approach. The diagnostic-analytical method which is considered the most appropriate research technique within the descriptive approach has been adopted to determine suggestions for improving the broiler breeders' adoption of cage breeding technology. This type of research approach has proven effective in various fields, including political, economic, and social domains, among others. The technique involves using data collection methods and interpreting information through a questionnaire (Odaybat *et al.*, 2021).

Population And Sample:

The research population included all broiler breeders in the Babylon governorate, totaling 695 broiler breeders, distributed across sixteen agricultural divisions within the Babylon governorate. A simple random sample was taken, representing 33.33%, of the agricultural divisions in the governorate, to represent the research population. Consequently, the sample included the Mahawil, Markaz, Alexandria, Hashemite as well as Midhatia, as they represent the largest number of breeders, as well as covering the Northern, Central, and Southern regions of the governorate. Therefore, a simple random sample of breeders within these agricultural divisions was then taken, representing 50% of working fields, resulting in a final research sample of 107 broiler breeders, as shown in the following table:

**Table (1):** Distribution of the research population and sample by agricultural divisions in Babylon governorate.

No.	Agri. Division	Total Fields	Working Fields	Sample	Representing 50% of Working Field	Sample and Pre-Test
1	Mahawil	117	38	38	31	Sample
2	Nile	84	7			
3	Mashruah	63	8			
4	Al- Marcaz	57	16	16	13	Sample
5	Al-Musayyib	50	17			Pre-Test
6	Al-Shomali	48	8			
7	Al-Kafil	46	6			
8	Alexandria	47	20	20	16	Sample
9	Hashemite	39	33	33	27	Sample
10	Al-Qasim	31	8			
11	Abu Gharq	25	11			Pre-Test
12	Al-Imam	24	8			
13	Al- Medhatia	30	24	24	20	Sample
14	Al- Taliah	13	6			
15	Al- Saadah	9	4			Pre-Test
16	Jurf Al-Naser	12	0			
Total		695	214	131	107	

Research Tool:

In order to develop a scale for determining the suggestions to improve the broiler breeders' adoption of cage breeding technology, a set of scientific resources in the field of agricultural extension, and broiler breeding were adopted, as well as the opinions of a group of experts specialized in agricultural extension and livestock, were considered. Five research areas were determined:

1. Suggestions for improving the agricultural extension system (11 items).
2. Suggestions related to breeders themselves (7 items).
3. Suggestions for improving management and environmental aspects (5 items).
4. Suggestions for improving economic and marketing (8 items).
5. Suggestions related to cage breeding technology itself (3 items).

The agreement of these suggestions was measured using a three-level Likert scale (Agree, Somewhat Agree, Disagree), with scores of 3, 2, and 1 assigned to the scale items, respectively: Accordingly, the total scale score ranged between 34-102 points.

Reliability And Validity Of The Questionnaire:



The method of content validity and face validity (**Bhattacharjee, 2012**) was used to measure the validity of the questionnaire by presenting the questionnaire (in its initial form) to twelve arbitrators and experts from the college of Agricultural Engineering Sciences \ University of Baghdad, as well as experts who have worked in the Agriculture Directorate in Babylon. The necessary adjustments were made to the questionnaire, and after completing the questionnaire in its final form, the preliminary test (Pre-test) was conducted in December of the year (2023) using the final questionnaire on a random sample consisting of (32) broiler breeders in the agricultural areas in Al-Musayyib, Al- Saadah, and Abu Gharq, who were excluded from the final data collection process. The aim of conducting the pretest was to verify the reliability and consistency of the results, as well as to reveal the sincerity of the content and the extent of clarity and distinction of the statements in the questionnaire.

The Cronbach's Alpha (α) equation was used to examine the reliability of the results, as it is suitable for obtaining reliability coefficients from the special data set for a graded scale of statements, as this method is characterized by its shortening of effort, avoiding the transfer effect of training or avoiding the effect of remembering, and all of these are features that are invalid in the re-test method (**Arifij et al., 1999**).

The results have shown that the reliability coefficient of the five areas of the improving suggestions of adopting the cage breeding technology were all high, which ranged between (0.744) minimum and (0.776) maximum, and these have indicated that the questionnaire has a high degree of reliability in terms of axes (areas), and can be relied upon in field application to achieve the aims of the research, this is according to Nunnally & Bernstein scale, which adopted (0.7) as the minimum reliability limit, and another source has indicated that the reliability coefficient is considered average when the percentage is between (60-70%) (**Nunnally & Bernstein, 1994; Hassan, 2006**).

Pearson Linear Correlation Coefficient was used to examine the validity of the internal consistency between each statement of the axis (area) and the total score of the axis (area) itself. The results showed that all correlation coefficients were statistically significant, at a significant level of (0.01) and (0.05). The minimum of the correlation coefficients was (0.351) while the maximum was (0.792). Accordingly, all the statements of each axis (area) are internally consistent with the axis to which they belong, which has proved the validity of the internal consistency of the axes and statements that belong to each axis.

Data Collection:

The data for the research was collected by the final questionnaire, which was distributed to the broiler breeders within the agricultural divisions representing the research sample.

Accordingly, the process of collecting data took approximately one month, from 12/25/2023 to 1/25/2024, noting that all questionnaire forms were obtained from the broiler breeders.

Statistical Analysis:

Appropriate statistical methods were used to achieve the research aims, including the arithmetic mean, counts and percentages, as well as a weighted average in analyzing and presenting the research results.

RESULTS AND DISCUSSION



Suggestions for improving the broiler breeders' adoption of cage breeding technology in Babylon governorate were determined across all five previous areas, indicating the level of agreement among broiler breeders. The research results have shown that the highest numerical value for broiler breeders' agreement was 102 points, while the lowest numerical value was 68 points, with a mean and standard deviation of 93.32 and 7.296 points, respectively, as shown in the following table:

Table (2): Distribution of broiler breeders' responses according to their overall agreement level on suggestions for improving the adoption of cage breeding technology.

No.	Agreement Level on the five Suggestion Areas	Categories	Counts	(%)	Average	Notes	
1	Low Agreement	34 - 56	0	0	0	Max=	102
2	Medium Agreement	57 – 79	6	5.6	74.67	Min=	68
3	High Agreement	80 – 102	101	94.4	94.43	S.D=	7.296
Total			107	100%	Total Average=	93.32	

From the table above, we have concluded that the level of agreement among broiler breeders on the suggestions for improving the broiler breeders' adoption of cage breeding technology has been described as high by the majority of broiler breeders, with an arithmetic mean of 94.4 points, which is higher than the overall average of 93.32 points. This may reflect the realism and objectivity of the suggestions that have been discussed in the research.

Therefore, the high level of agreement and satisfaction with these suggestions is likely to facilitate and ensure the successful implementation by decision-makers, represented by the Ministry of Agriculture in all its specialized formations, as well as other supporting ministries. This will undoubtedly contribute significantly and effectively to increasing the number of broiler breeders who will adopt the cage breeding technology and achieve the desired economic aims. Here, the results of the agreement on these suggestions will be detailed, covering the five areas in some depth and discussing the possible reasons behind their ranking, as follows:

1. Determine suggestions related to the agricultural extension work:

The research results have shown that all suggestions related to the agricultural extension work have received approval from the vast majority of broiler breeders (Table 3). The overall average of the weighted averages for this area is 2.716, indicating a high level of agreement on these suggestions, as shown in the following table.



Table (3): Distribution of breeders according to their agreement on improvement suggestions related to the agricultural extension work.

N o.	Improvement Suggestions Related to the Agricultural Extension work	W. AV	Rank
1.	The necessity to conduct a continuous follow-up process for breeders adopting modern breeding technologies (including cage breeding) to identify and solve problems, as well as ensure the continued adoption of modern technology.	2.832	1
2.	Increasing the number of specialists with experience and skill in the field of livestock and veterinary, to facilitate the process of adopting modern breeding technologies, including cage breeding in the field of broilers.	2.804	2
3.	Increasing the number of specific extension activities in the field of broiler breeding, by extension divisions, similar to the existing interest in field crops or vegetable crops activities.	2.794	3.5
4.	Focus on providing specialized extension services for poultry, whether in the breeding or veterinary aspect	2.794	3.5
5.	The necessity to conduct a formative and summative evaluation process by agricultural extension workers to determine the levels of success and failure in the process of adopting cage breeding technology.	2.766	5
6.	The necessity of shifting towards using modern extension methods, such as: field schools, training and visits, which achieve continuous, effective and fast communication with breeders, and increase their conviction in adopting modern breeding techniques, including cage breeding.	2.757	6
7.	The necessity of implementing a National Extension Program to change the attitudes of breeders towards the adoption of new technologies, including cage breeding in the field of broilers.	2.72	7
8.	The necessity of using modern aids of communication such as: the agricultural extension service's website on Facebook, YouTube, and WhatsApp, etc. to promote and encourage the adoption of cage breeding technology in the field of broilers.	2.664	8
9.	Creating an extension unit consisting of two or three agricultural extension workers to coordinate and cooperate between the extension system and production sources of cage breeding technology to provide it for broiler breeders, whether from the government sector, the private sector, or the mixed sector.	2.617	9
10.	The necessity of using field demonstrations, seminars, and training courses that dealing with the adoption of modern breeding technologies (including cage breeding) to explain their advantages and how to use them, as well as the determinants (limits) of their use.	2.579	10
11.	The necessity of using brochures, posters and specialized extension publications related to the adoption of cage breeding technology in the field of broilers, and distribute them on a large scale among breeders.	2.551	11
The overall average of the weighted averages = 2.716 1 – 1.66 = (Low Agreement), 1.67 – 2.33 = (Medium Agreement), 2.34 – 3 = (High Agreement)			

The results in Table (3) have shown that the suggestion ranked first had a weighted average value of 2.832, which is higher than the overall average of the weighted averages for this area. This can be attributed to the importance of the continuous follow-up process for breeders in terms of helping them diagnose problems that occur when installing and using technology, as well as working to find quick and effective solutions. In addition, providing the necessary on-site training on modern or complex technical practices, thus, ensuring the continuation of the adoption process efficiently and effectively.

The results in table (3) have shown that the suggestion ranked second had a weighted average value of 2.804, which is higher than the overall average of the weighted average for



this area. This may reflect the logical sequence of this suggestion (after the first). The success of the periodic follow-up process depends on the availability of specialists with experience and practical skill, in executive positions at the divisions and agricultural extension farms. This is to cover the largest possible number of breeders in an appropriate time, less effort and with high efficiency.

Also, the results in table (3) have shown that the two suggestions ranked third and half had a weighted average higher than the overall average of the weighted average for this area. This may reflect the urgent need of breeders to increase the number of extension activities related to the field of animal production (specifically for poultry), just as the field of plant production, which has the greatest importance and space in the agricultural extension work. It is also necessary to focus on the quality of agricultural extension activities in the animal field (i.e., their objectives and topics), and not just pay attention to their number, but rather, it is necessary to focus on the technical and veterinary topics that relate to broiler breeding in particular.

Also, it can be concluded from Table (3) that the suggestion ranked last had a weighted average lower than the overall average of the weighted average for this area, but it is still within the high agreement category. This may be due to breeders' preference for field extension activities of a practical nature, and then they prefer to read printed or written extension materials.

2. Determine suggestions related to broiler breeders themselves:

The research results have shown that all suggestions related to the broiler breeders themselves have received approval from the vast majority of broiler breeders (Table 4). The overall average of the weighted averages for this area is 2.762, indicating a high level of agreement on these suggestions, as shown in the following table.

Table (4): Distribution of breeders according to their agreement on improvement suggestions related to broiler breeders themselves.

No.	Improvement suggestions related to the Broiler Breeder themselves	W. AV	Rank
1.	Encouraging and urging broiler breeders to participate in extension activities related to the dissemination and adoption of cage breeding technology through moral or financial honoring for distinguishing breeders.	2.841	1.5
2.	Encouraging broiler breeders to participate in training courses to develop their skills and experience in the field of cage breeding; by giving financial or administrative facilities when equipping agricultural technologies to breeders participating in training courses.	2.841	1.5
3.	The necessity of conducting field visits for supervision and follow-up, ensure continued adoption of cage breeding technology, solve problems that appear upon application, and ensure that they do not relapse and abandon the adoption of cage breeding technology.	2.832	3
4.	The necessity of conducting field visits to broiler breeders with a low level of education, who adhere to simple and easy-to-apply methods, and working to encourage them to adopt modern technologies, including cage breeding technology.	2.794	4
5.	Inviting distinguished breeders, especially local leaders, to participate in the official social networking sites of the Agricultural Extension Service to learn about everything in their field, finding a solution to their priority problems, as well as encouraging other broiler	2.701	5



No.	Improvement suggestions related to the Broiler Breeder themselves	W. AV	Rank
	breeders to adopt modern technologies including cage breeding technology.		
6.	Encouraging broiler breeders, especially local leaders, to create their own (informal) groups on social media for exchanging knowledge, skills and experiences in their field, including that related to cage breeding.	2.692	6
7.	Planning to develop mechanisms (real steps) to achieve partnership between broiler breeders, agricultural development organizations and government organizations to benefit from them in facilitating the adopting of modern technologies, including the technology of cage breeding.	2.636	7
The overall average of the weighted averages = 2.762 1 – 1.66 = (Low Agreement), 1.67 – 2.33 = (Medium Agreement), 2.34 – 3 = (High Agreement)			

The results in Table (4) have shown that the suggestion ranked first had a weighted average value of 2.841, which is higher than the overall average of the weighted averages for this area. This can be attributed to the importance of financial and moral motivation for broiler breeders to ensure their active and continuous participation in agricultural extension activities. This has also shown the importance of holding training courses to develop the skills and expertise of breeders in cage breeding technology.

Also, the results have shown that the suggestion ranked third had a weighted average higher than the overall average of the weighted averages for this area. This may once again confirm the importance of continuous field visits for broiler breeders. That ensures continued adoption, by diagnosing the problems when implementing technology. This avoids the occurrence of undesirable reactions among broiler breeders, which may contribute to abandoning the adoption of the technology and not continuing to apply it. It is worth noting that this suggestion is completely identical to the first suggestion related to the agricultural extension work.

The results have indicated that the suggestion ranked last had a weighted average lower than the overall average of the weighted averages for this area, but it is still within the high agreement category. This may be attributed to the urgent need for breeders to connect them with agricultural development organizations and governmental organizations working in the field of broiler breeding, as this has an impact on increasing their knowledge, developing their skills, and improving their attitudes towards adopting modern technologies.

3. Determine suggestions related to management and environmental aspects:

The research results have shown that all suggestions related to management and environmental aspects have received approval from the vast majority of broiler breeders (Table 5). The overall average of the weighted averages for this area is 2.766, indicating a high level of agreement on these suggestions, as shown in the following table.



Table (5): Distribution of breeders according to their agreement on improvement suggestions related to management and environmental aspects.

NO.	Improvement suggestions related to management and environmental aspects	W. AV	Rank
1.	The necessity for finding a strong government policy or legal legislation that protects the local product from commodity dumping of imported products, to increase the desire of adopt modern technology, including cage breeding technology, in a way that ensures the preservation of capital and the achievement of remunerative profits.	2.907	1
2.	Creating legal legislation for agricultural projects insurance, to increase breeders' desire to adopt modern technologies, including cage breeding technology.	2.86	2
3.	Creating legal legislation and following a government policy related to agricultural equipment, including equipping cage breeding technology for broiler breeders.	2.832	3
4.	The necessity for implementing economic projects by agricultural associations based on participating in the application of cage breeding technology in the breeders' fields and then sharing the profits among themselves.	2.645	4
5.	The necessity for agricultural associations to encourage broiler breeders to adopt cage breeding technology by explain its economic advantages and introduce it during the periodic meetings held by the association for breeders.	2.589	5
The overall average of the weighted averages = 2.766 1 – 1.66 = (Low Agreement), 1.67 – 2.33 = (Medium Agreement), 2.34 – 3 = (High Agreement)			

The results in Table (5) have shown that the suggestion ranked first had a weighted average value of 2.907, which is higher than the overall average of the weighted averages for this area. This may reflect the need to find government policies and laws implemented on the ground (away from favoritism or administrative corruption). This works to protect the national product from commodity dumping of imported poultry products. These policies also ensure the activation of the role of the Agricultural Quarantine Committee of the Ministry of Agriculture, especially when local production is abundant. This ensures a balance in the process of supply and demand to achieve the breeders' economic goals as well as the consumers' nutritional needs alike.

The suggestion that ranked second had weighted averages higher than the overall average for this area. These results indicate the importance of financial insurance on agricultural projects, as it is the true guarantor of protecting the capital of breeders' projects, especially in the event of economic losses outside the control of breeders, for example, in cases of natural disasters or the occurrence of epidemics and diseases.

Furthermore, the results in table (5) have shown that the suggestion that ranked third had a weighted average value lower than the overall average of the weighted averages, but it still falls within the high agreement category. This may be attributed to the importance of the availability of equipment for agricultural technologies in general, including cage breeding technology, because it ensures the adoption of technology easily and conveniently. As well as ensuring the providing of original spare equipment and tools for technology at appropriate prices for their maintenance and sustainability in the long term.

4. Determine suggestions related to economic and marketing aspects:

The research results have shown that all suggestions related to economic and marketing aspects have received approval from the vast majority of broiler breeders (Table 6). The overall



average of the weighted averages for this area is 2.804, indicating a high level of agreement on these suggestions, as shown in the following table.

Table (6): Distribution of breeders according to their agreement on improvement suggestions related to economic and marketing aspects.

NO.	Improvement suggestions related to economic and marketing aspects	W. AV	Rank
1.	The necessity for the Ministry of Agriculture to follow a partnership's policy with the private sector, to provide modern technologies, including cage breeding technology, in sufficient quantity and at appropriate prices for broiler breeders.	2.85	1.5
2.	The necessity for the Ministry of Agriculture to establish and operate new government slaughterhouses for broiler chickens.	2.85	1.5
3.	The necessity of coordination and cooperation between the Ministry of Agriculture, the Ministry of trade and the Ministry of Finance, to determine the price of broilers in local markets, to achieve a good profit for the breeder, and to protect the breeder and the consumer from price fluctuations, which encourages the breeder to expand his economic projects, including adopting cage breeding technology.	2.804	4
4.	The necessity for the Ministry of Agriculture to develop plans to receive the products of broiler breeders (similar to grain crops), and then market them through cooperative associations, central markets, or direct sales outlets of the Ministry of Agriculture, which contributes to encouraging the breeder to expand his economic projects.	2.804	4
5.	The necessity for the Ministry of Agriculture to urge and encourage the Ministry of Defense, the Ministry of Interior and the Ministry of Health to contract with owners of broiler breeding projects to purchase and supply their products to these ministries.	2.804	4
6.	Launching an agricultural initiative that focuses on profitable agricultural economic projects with great local need, including broiler breeding projects, which enables breeders to bear the financial expenses of modern breeding technology.	2.794	6
7.	Agricultural extension workers should assist the breeder in studying the feasibility of the cage breeding project according to his economic capabilities (land, capital, and labor), which increases the likelihood of his desire to adopt it.	2.776	7
8.	The Ministry of Agriculture should suggest to the Ministry of Finance to follow a formula for financial lending from agricultural banks based on participation in production and then sharing the profits as well as bearing losses if they occur, which would motivate the breeder to adopt the cage breeding technology.	2.757	8
The overall average of the weighted averages = 2.8048 1 – 1.66 = (Low Agreement), 1.67 – 2.33 = (Medium Agreement), 2.34 – 3 = (High Agreement)			

The results in Table (6) have shown that the suggestion ranked first and half had a weighted average value of 2.850, which is higher than the overall average of the weighted averages for this area. This may confirm that the partnership policy between the government sector and the private sector has become urgent and necessary to provide modern technologies in quantities that cover all broiler breeders who wish to adopt, and provide them at appropriate prices. These suggestions emphasize the need for the Ministry of Agriculture to establish and operate advanced government slaughterhouses. These slaughterhouses must be well-suited to the broilers' production volume. That will motivate breeders to adopt cage breeding technology and increase production in the near future.

Also, the results have shown in table (6) that the suggestion ranked last received weighted averages lower than the overall average for this area. However, they still fall within the high agreement category. This may reduce the feeling of fear and unwillingness to take



risks among broiler breeders, especially small business owners, and encourage them to expand their production projects by adopting cage breeding technology.

5. Determine suggestions related to cage breeding technology itself:

The research results have shown that all suggestions related to cage breeding technology itself have received approval from the vast majority of broiler breeders (Table 7). The overall average of the weighted averages for this area is 2.613, indicating a high level of agreement on these suggestions, as shown in the following table.

Table (7): Distribution of breeders according to their agreement on improvement suggestions related to cage breeding technology itself.

NO.	Improvement suggestions related to cage breeding technology itself	W. AV	Rank
1.	The necessity for agricultural extension agencies to experiment the cage technology in breeding broilers at a research center or at the field of a distinguished breeder, to demonstrate its ability to increase production, increase profits, reduce effort and time, as well as reduce losses, and then invite other breeders to see these results.	2.757	1
2.	The necessity for agricultural extension agencies to involve local leaders and distinguished breeders in the process of promoting and disseminating cage breeding technology by explaining the advantages and determinants of it to other breeders in the region.	2.589	2
3.	The need for agricultural extension workers to carry out seminars or symposiums that clarify the compatibility of cage breeding technology with the capabilities of the local breeders, as well as the simplicity and lack of complexity in its use, would increase the adoption of this technology by breeders.	2.495	3
The overall average of the weighted averages = 2.613 1 – 1.66 = (Low Agreement), 1.67 – 2.33 = (Medium Agreement), 2.34 – 3 = (High Agreement)			

The results in Table (7) have shown that the suggestion ranked first had a weighted average value of 2.757, which is higher than the overall average of the weighted averages for this area. This may be attributed to the nature of humans based on believing what the eyes see and ears hear and hands tried and applied. Thus, if modern technology is capable of experimentation on a small scale and sees its comparative advantages or economic benefits, this will lead to its rapid adoption by breeders, and vice versa.

The suggestion ranked second had a weighted average value lower than the overall average of the weighted averages, but it still falls within the high agreement category. This may be due to the important role that local leaders and distinguished breeders can play in the process of encouraging other breeders to adopt cage breeding technology. That is because they are considered a reliable source for obtaining up-to-date information for their work.

The results also have indicated that the suggestion ranked last had a weighted average value lower than the overall average of the weighted averages. However, it still falls within the high agreement category. This may be attributed to the nature of this method based on providing an appropriate atmosphere for discussion and raising inquiries by broiler breeders, then answering them from agricultural extension workers and specialists. Accordingly, these methods reduce fears and attempt to overcome the problems that prevent the adoption of cage breeding technology.



CONCLUSIONS

Based on the research results, we conclude the following:

1. The research results have concluded that all five suggested areas received approval from the vast majority of broiler breeders. The highest-rated suggestion area is related to the economic and marketing aspects. This has been followed by suggestions related to management and environmental in second place, suggestions related to broiler breeders in third place, followed by suggestions related to the agricultural extension work, and finally, suggestions related to cage breeding technology in last place. This ranking is based on the overall average of the weighted averages.
2. It is worth clarifying and emphasizing that all the suggestions that have been mentioned in the five areas are of high importance based on their value of the weighted average.
3. The most important suggestions to improve the agricultural extension work focused on the number of agricultural extension workers specialized in the field of livestock, and conducting follow-up operations, as well as focusing on the quantity and quality of extension activities implemented.
4. The most important improvement suggestions related to broiler breeders were focused on encouraging broiler breeders to participate in some specialized extension activities, explaining the importance of moral and financial honor, and focusing on the importance of field visits.
5. The most important improvement suggestions related to management and the environmental focused on the importance of government policy and legal legislation in the field of protecting local products, agricultural insurance, agricultural equipment, as well as focusing on the role of agricultural associations in assisting broiler breeders.
6. The most important improvement suggestions related to economic and marketing focused on the role of the private sector, the Ministry of Agriculture, the Ministry of Trade, the Ministry of Finance, the Ministry of Health, as well as the role of the Ministry of Defense and the Interior, in improving the broiler breeders' adoption of cage breeding technology.
7. The most important improvement suggestions related to cage breeding technology focused on the role of promoting and experimenting with the technology, and the role of seminars in improving the broiler breeders' adoption of cage breeding technology.
8. Based on the above conclusions (from point 1-6), we can accept the research hypothesis, which states that the process of determining suggestions to improve broiler breeders' adoption of cage breeding technology in Babylon governorate will show high agreement by broiler breeders on these suggestions.

RECOMMENDATIONS

1. The necessity for the Ministry of Agriculture to provide sufficient numbers of agricultural extension workers and veterinarians to work at the executive administrative levels. This is done by using job rotation or transferring agricultural extension workers from places with large numbers (crowded with employees) to places with urgent need, or addressing the Federal Public Service Council to increase the number of appointments exclusively for



- rare specialties, especially veterinarians. This is to ensure periodic and continuous follow-up of breeders adopting cage breeding technology, and to diagnose and solve problems in a way that motivates breeders to continue adopting modern technologies in the future.
2. The necessity for workers in agricultural extension farms and divisions to encourage distinguished breeders through moral and financial honor, as well as encourage them to participate in training courses and conduct field visits for them to develop their skills and knowledge in the field of cage breeding, as well as facilitate the administrative procedures when equipping them with modern agricultural technologies.
 3. The necessity for the Ministry of Agriculture to cooperate and coordinate with the Prime Minister and the Iraqi Parliament to create legal policies and legislation that protects local product from commodity dumping of imported products, and to ensure the supply of production requirements in the quantities and types required by breeders, in addition to setting up legislation for financial insurance for agricultural projects, as it is the true guarantor of protecting the capital of breeder projects.
 4. The necessity for the Ministry of Agriculture (represented by the Agricultural Equipment Department) to follow a policy of partnership with the private sector. This is to provide modern technologies (especially cage breeding) in sufficient numbers and appropriate prices, as well as the Ministry of Agriculture coordinating and cooperating with the Ministry of Industry to establish and operate modern government slaughterhouses for poultry.
 5. The Ministry of Agriculture should coordinate and cooperate with the Ministry of Trade to establish and operate marketing outlets for poultry products, through cooperative associations, central markets, and direct sales outlets of the Ministry of Agriculture.
 6. The Ministry of Agriculture should coordinate and cooperate with the Ministry of Finance to find a new formula for financial lending from agricultural banks. That is based on participation in the production work, then sharing profits as well as bearing losses if they occur, with the need to test the new formula with distinguished breeders, and then diffuse it to the rest of the breeders if it is successful.
 7. The need for agricultural research centers to experiment the cage breeding technology in the research center or in the field of a distinguished breeder. That is to promote it and clarify its advantages and limitations, in addition to holding discussions to listen to breeders' questions and answer them.
 8. The Agricultural Extension and Training Department should review all the suggestions that have been contained in the research, and strive to implement them according to a system of priorities and in cooperation and coordination with the relevant authorities inside and outside the ministry, to overcome most obstacles and solve most of the problems that the poultry sector suffers from, and ensure the highest effectiveness and efficiency in the production work of poultry breeders in Babylon governorate, and then generalize the success results of this experiment to the rest governorates.



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