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**THE LEVEL OF MODERN TECHNOLOGIES APPLICATION IN  
IMPROVING THE PRODUCTIVITY OF COWS BY COW BREEDERS IN  
DUHOK GOVERNORATE/ KURDISTAN REGION-IRAQ**

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**Abstract**

The main objective of the research was to identify the level of Modern Technologies Application in Improving the Productivity of cows by cow Breeders in Duhok Governorate / Kurdistan Region-Iraq. The results of the research showed that the degrees of the application level of technologies ranged between (42-62), with an arithmetic mean of (51.71) degrees and a standard deviation of (6.09). It was found that the level of modern technologies application by cow breeders is low tends to medium. The results also showed that the technology {( Improving the nutritional value of the stored feed (increasing the storage period for the stored feed) (the use of antifungals and antioxidants in the stored feed) } in the field of (technologies for the exploitation of fodder and feeding methods ) came first in terms of application with a mean of (2.44) and a standard deviation (0.67). While in the field of (techniques to improve genetic structures and increase offspring) the technology {Selection of mothers with good genotype (females selected for the purpose of vaccination)} came first in terms of application with a mean of (1.87) and a standard deviation (0.81). As for In the field of (Animal health care technologies) the technology (The use of diagnostic technology and early detection of diseases) came first with a mean (2.48) and a standard deviation (0.6). it was found that there is a significant correlation at the probability level (0.05) of the Years of experience in raising cows and annual income from raising cows while it was found that there is a significant correlation at the probability level (0.01) of the purpose of breeding, herd size, and communication with information sources on modern technologies. As for the obstacles facing cattle breeders in the field of applying modern technologies, the obstacle (The high costs of using modern technologies and market challenges) ranked first among (9) obstacles facing cow breeders

**Keyword:** Modern Technologies, Productivity of Cows, Cow Breeders, Duhok.

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## Introduction

Livestock are a major source of employment in developing countries and in rural areas especially, providing food, a source of power for industry, ploughing for crops and transport through to providing clothing products. However, there are also number of additional severe and increasing environmental degradation from waterways from intensive production systems and, more recently, livestock's contribution to climate change. According to FAO (2011), fast growing human population and a greater per capita income increases in demand for livestock products. livestock overgrazing rangelands, nutrient pollution into streams and Today livestock breeders increasingly use robots on production or algorithms to optimize their farm management decisions. Technological developments are creating a new modern automation system in which more flexible and smarter work possibilities in livestock production (Kearney 2017). Cows are unique in their ability to convert feeding materials into edible input for human nutrition, although when compared with other livestock, high feed conversion efficiency (Ertl et al 2016). Meat and milk from cows and bison are estimated to account for approximately 45% of the global protein supply for humans (Mottet et al. 2017). Livestock production system have both positive and negative effects on the natural resource base, social equity and economic growth, public health, (World Bank 2009).

The increased world population is demanding more reliable quality livestock products the number of farms is decreasing but the number of animals for per farm and animal production are increasing. In addition to this trend livestock production problem also increasing (Thornton 2010). The solution of these problems comes from multidisciplinary studies from very different fields such as technology. In large enterprises it is not possible to obtain the expected performance without using technology and automation systems from animals with very high genetic values. Daily work on livestock farming is simple in and standard application routinely data monitoring in the modern dairy farm enables the ongoing control of production, animal health, and welfare (Thornton 2010). However, as the number of animals increases, error burden and work load increase. Successful livestock farmers will be capable of rapidly adapting their infrastructures to exploit changes in technology for better production. The productivity of cows has increased by continuous selection and application of various breeding techniques, improved feeding strategies, and enhanced healthcare (Arefaine and Bertilsson, 2015).

To establish comfortable conditions for cows that meet the important requirements of housing, water and feeding contributes not only to increase the productivity of cows, but also increases the production life of their economic use (Kulikova et al. 2019, Loretts et al. 2018). The application of both single or multiple tools in integrated systems. This has been made possible by technological developments over the last 20 years in fields such as information and communication technologies, internet of things, and Internet access availability (Terrasson et al., 2017).

Livestock in Iraq is one of the most prominent features of the agricultural sector in terms of number and diversity, and it constitutes an important source of food sources in the country and contributes significantly to achieving food security, Although there are many modern technologies that have an effective role in the development of animal production, but production and productivity are still at low levels that do not meet the aspirations of those interested in this sector despite the available capabilities and resources, Therefore, the country suffers from a food gap in many of the main food commodities, especially red meat and dairy, In order to overcome this problem, there was an urgent need to adopt modern means of knowledge and modern production technologies in order to achieve qualitative and quantitative leaps that meet the growing needs of society for animal products. This situation requires giving utmost importance to this sector by following modern breeding systems as well as diffusion modern technologies among cow breeders and encouraging them to adoption and application them. From here, this research came to determine the level of application of modern technologies by cow breeders in the governorate of Dohuk, and to identify the most important obstacles facing cow breeders in applying these technologies. to infer from them the relevant authorities the necessary plans to design effective extension programs directed to cow breeders, for the purpose of providing them with the necessary information and skills in this field, As well as diffusion these technologies among breeders for the purpose of adopting and applying them, thus increasing productivity and contributing to providing food to members of society on the one hand and on the other hand increasing profits for breeders and thus improving the standard of living for them and their family members.

In light of the foregoing, a number of research questions were generated, as follows:

1. What are the personal, social and economic characteristics that distinguish the respondents?
2. What is the level of cow breeders' application of modern technologies in Dohuk Governorate?
3. What are the obstacles that cow breeders face in the field of the application of modern technologies?

### **Research Objectives**

1. To identify the level of Modern Technologies Application in Improving the Productivity of Cows by cow Breeders in Duhok Governorate
2. To Identify some personal, social and economic characteristics of cow breeders in Dohuk Governorate.
3. Ranking the domains of modern technologies according to the extent of their application by cow breeders.
4. To Identify the correlation between the level of application of modern technologies and each of the independent variables under study.
5. To Identify the obstacles to the application of modern technologies in improving the productive performance of cow breeders in Dohuk governorate.

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### Procedural Definitions

**Modern Technologies:** In this research it meant a set of modern technologies that are used to improve the productive performance of cows, distributed into three domains: (Technologies for the exploitation of fodder and feeding methods, Techniques to improve genetic structures and increase offspring, and Animal health care technologies).

**Cow Breeders:** In this research, they are meant for people who raise at least six cows for the purpose of producing milk, meat, or both.

### Research Hypothesis:

To achieve the fourth objective of the research, the following research hypothesis was formulated:

There is no significant correlation between the level of application of modern technologies and the following studied independent variables: (Age, Educational level, Number of family members, The purpose of raising cows, Years of experience in raising cows, Herd size, Annual income from raising cows, Communication with information sources on modern technologies).

### Materials and Methods

#### Population and Sample

The study was carried out in Dohuk Governorate in the Kurdistan Region of Iraq, with a total area of about 2961660 dunums. The area of arable land is 1106362 dunums. Dohuk Governorate is located near latitudes 36° 10'36" and 37° 23'24" and longitudes 42° 20'36" and 44° 18'38", in northwest of Iraq (Tovi, 2017). The research population included all cow breeders in Dohuk governorate, which numbered (120) breeders, and a simple random sample of them was selected, amounting to (73) breeders representing about 60.8% of the research population.

#### Research Design and Data Analysis

The research data was collected by a questionnaire designed to achieve the objectives of the research and it consists of three parts, the first part of which is to identify some personal, social and economic characteristics of the respondents (age, Educational level, Number of family members, The purpose of raising cows, Years of experience in raising cows, herd size, Annual income from raising cows, Communication with information sources on modern technologies). The second part of the questionnaire included a tripartite scale to measure the level of the respondents' application of modern technologies. It consisted of 28 items distributed over three main domains, the first domain: (Technologies for the exploitation of fodder and feeding methods) included (10) items, the second domain: (Techniques to improve genetic structures and increase offspring) included (11) items, while the third domain: (Animal health care technologies) included (7) items, in front of each items three alternatives (always,

sometimes, and do not apply) were given to which the numerical values (3, 2, 1) were given respectively, the overall score obtained by the respondent according to this scale reflects the level of his application of these technologies. As for the third part, it included an open question about the obstacles facing cow breeders in the field of application of modern technologies. The form was presented in its initial form to a group of specialists in animal production and agricultural extension to indicate its validity, and verifying the apparent validity and authenticity of the content, Based on their comments, a number of items were deleted and modified, Also, a pre- test of the questionnaire was conducted on a random sample of (10) breeders who were later excluded from the research sample in order to identify the validity and reliability of the scale. Where the reliability coefficient was found by the split-half method and the Pearson correlation coefficient was used to find the relationship between the odd and even items of the scale. The value of the reliability coefficient was (0.73), and then the validity coefficient was found by the root of the reliability coefficient, as its value reached (0.85), which indicates that the scale is characterized by high stability and validity, and it is valid for data collection from the respondents. The data were collected, unloaded, classified and analyzed using a number of statistical methods, including (frequencies, percentage, mean, Pearson's simple correlation coefficient, and Spearman's ordinal correlation coefficient) using the program of Statistical Package for Social Sciences (SPSS).

## Results and Discussion

The following is a description of the results of this research and their discussion in order of objectives:

### **First: To identify the level of Modern Technologies Application in Improving the Productivity of Cows by cow Breeders in Duhok Governorate**

The results of the research showed that the degrees of the application level of technologies ranged between (42-62), with an arithmetic mean of (51.71) degrees and a standard deviation of (6.09), The respondents were distributed according to the degree of application level into three categories, as shown in Table No. (1), The table shows that the highest percentage of respondents falls within the low-level category, with a rate of (39.73%), While the rest of the number of respondents was distributed among the middle and high categories with a percentage of (32.88%) and high (27.39%). This result indicates that the level of modern technologies application by cow breeders is low, tends to medium, The reason for this may be due to the weakness of the extension role in this field, weak adoption for cow breeders to these technologies, as well as weak communication with information sources regarding these technologies and the difficulty of obtaining these technologies and the lack of state support for cow breeders by providing these technologies in terms of quantity and price.



Table (1) Distribution of the respondents according to their application level

Application level categories	Degrees of Application	Frequency	%	Mean	Std. deviation
Low	(42 – 48)	29	39.73	51.71	6.09
Moderate	(49 – 55)	24	32.88		
High	(56 – 62)	20	27.39		
Total		73	100		

## Second: To Identify some personal, social and economic characteristics of cow breeders in Dohuk Governorate.

**1. Age:** The results of the research showed that the ages of the respondents ranged between (20-67) years, with a mean of (42.64) and a standard deviation of (11.01), the respondents were divided into three categories according to the law of range and length of the category, as shown in Table (2), as the highest percentage of respondents is the middle-aged group with a percentage of (47.94%), followed by the group of young people with a percentage of (32,88%), while the percentage of people with old ages reached (19.18%), and this result indicates that the majority of the respondents are of medium to young ages, and these ages are consistent with the nature of the work of the cow breeder.

**2. Educational level:** the respondents were divided according to this variable into (6) categories as shown in the table (2), where the percentage of illiterate respondents was (16.4%), While the percentage of respondents who read and write was (21.9%), While the percentage of those with an educational level (primary) reached (31.5%), high school (17.8%), and diploma (11%), and finally, the percentage of respondents who obtained a bachelor's degree was (1.4%), This result indicates that the educational level of the respondents is generally low, as about (70%) of them are of the educational level (illiterate, read & write, and primary).

**3. Number of family members:** the results showed that the number of respondents' family members ranged between (2-13) people, with a mean of (7.4) and a standard deviation of (3.14). The respondents were divided into three categories according to the extent and length of the category, as shown in the table (2), and it was clear from the results that the respondents of the medium family size category, whose family members ranged between (6-9) individuals, were the highest, with a percentage of (42.46). %), while the percentage of the small family was (31.51%), and the percentage of the large family (26.03%), and this indicates that nearly half of the respondents are from a middle family.

**4. The purpose of raising cows:** the respondents were divided according to this variable into (3) categories and as shown in the table (2), and the results showed that more than half of the respondents were within the category of breeders who raise cows for the purpose of producing meat and milk together at a rate of (52.05%), As for breeders who are raised for the purpose of producing milk only, their percentage has reached (35.62%), while the percentage of breeders who are raised for the purpose of meat production only is (12.33%).

**5. Years of experience in raising cows:** The results of the research showed that the mean for years of experience for the respondents was (12,71), with a standard deviation of (7.31), The respondents were divided into three categories as in table (2), the first category was with little experience and the highest percentage of respondents within this category reached (60.27%), while the second category was the medium-experienced respondents, whose percentage amounted to (27,40%). ), while the third category was the respondents with great experience, which amounted to (12.33%), and this result indicates that more than two-thirds of the respondents have little experience in the field of cow breeding, which may affect the level of their application of modern technologies.

**6. Herd size:** The results showed that the herd size of the respondents ranged between (6-47) cows, with a mean of (20.45) and a standard deviation of (12.07), the respondents were divided into three categories as shown in Table (2), the results indicate that more than half of the respondents own a small herd size, reaching (57,53%), followed by the medium herd size category with (21.92%). While the percentage of respondents with large herd size was (20.55%), which means that the majority of the respondents are from the small and medium categories, as their percentage together reached (79.45%).

**7. Annual income from raising cows:** The results of the research showed that the annual income from raising cows ranged between (1.5 - 8.5) million Iraqi dinars, with a mean of (3513699) and a standard deviation of (1476982), The respondents were divided into three categories as shown in the table (2), where the category of people with small income and the category of middle income came with the same percentage (45.21%) for each, while the percentage of the category of people with large income was (9.58%), which It means that the annual income obtained from raising cows is few to medium.

**8. Communication with information sources on modern technologies:** The results of the research showed that the level of communication with information sources on modern technologies ranged between (16 - 39) degrees, with a mean of (23.29) and a standard deviation of (5.52), The respondents were divided according to their level of contact with information sources into three categories as in Table (2), The

results indicate that the level of communication with information sources is weak, as the percentage of respondents in the category of weak communication level reached (60.27%), while the percentage of the medium and large communication categories reached (28.77%) and (10.96%), respectively.

Table 2: Describe some personal and economic characteristics of the respondents

Characteristics	Categories	Frequency	%	Mean	Std. deviation
Age	Young (20 – 35)	24	32.88	42.64	11.01
	Medium (36 – 51)	35	47.94		
	Old (52 – 67)	14	19.18		
	Total	73	100		
Educational level	Illiterate	12	16.4		
	Read & write	16	21.9		
	Primary	23	31.5		
	High School	13	17.8		
	Diploma	8	11.0		
	Bachelor's	1	1.4		
	Total	73	100		
Number of family members	Small (2 – 5)	23	31.51	7.4	3.14
	Medium (6 – 9)	31	42.46		
	Large (10 – 13)	19	26.03		
	Total	73	100		
The purpose of raising cows	Meat production	9	12.33		
	Milk production	26	35.62		
	Meat& Milk production	38	52.05		
	Total	73	100		
Years of experience in raising cows	Little (4 – 12)	44	60.27	12.71	7.31
	Medium (13 – 21)	20	27.40		
	Great (22 – 30)	9	12.33		
	Total	73	100		
Herd size	Small (6 – 19)	42	57.53	20.45	12.07
	Medium (20 – 33)	16	21.92		
	Large (34 – 47)	15	20.55		
	Total	73	100		
Annual income from raising cows (Million Iraqi dinars)	Small (less than 3.5)	33	45.21	3513699	1476982
	Middle (3.5 – 5.5)	33	45.21		
	Large (more than 5.5)	7	9.58		
	Total	73	100		
Communication with information sources on modern technologies	Weak (16 – 23)	44	60.27	23.79	5.52
	Medium (24 – 31)	21	28.77		
	Great (32 – 39)	8	10.96		
	Total	73	100		



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**Third: Ranking the domains of modern technologies according to the extent of their application by cow breeders.****1. Arrange of modern technologies in each domain of research according to their mean application by the respondents:**

With regard to (technologies for the exploitation of fodder and feeding methods), the results of the research showed, as in Table (3), that the technology of {Improving the nutritional value of the stored feed (increasing the storage period for the stored feed) (the use of antifungals and antioxidants in the stored feed)} came first in terms of application by cow breeders with a mean of (2.44) and a standard deviation of (0.67). While the technology (using the balanced diet) came in the second rank with a mean of (2.39) and a standard deviation of (0.66), while the technology (the use of silage and hay) came in the third rank with a mean of (2.38) and a standard deviation (0.69), as well as the technology (using chicken waste (poultry litter) as feed for cows) came in the last rank, with a mean of (1.49) and a standard deviation of (0.53).

As for technologies (Improve genetic structures and increasing offspring) the results of the research showed, as in Table (4), that the technology of (Selection of mothers with good genotype (females selected for the purpose of vaccination)) came first in terms of application by cow breeders with a mean of (1.87) and a standard deviation of (0.81). While the technology (Genetic selection within local lineages) came in the second rank with a mean of (1.73) and a standard deviation of (0.75), while the technology (The use of the technique of regulating estrus in females) came in the third rank with a mean of (1.71) and a standard deviation (0.75), as well as the technology (The use of in vitro fertilization technology) came in the last rank, with a mean of (1.34) and a standard deviation of (0.51).

In the field of (animal health care technologies), the results showed that, as in Table (5), the technology of (The use of diagnostic technology and early detection of diseases) came first in terms of application by cow breeders with a mean of (2.48) and a standard deviation of (0.6). While the technology (Using technologies to control insects and ticks that cause or transmit certain diseases to cows) came in the second rank with a mean of (2.37) and a standard deviation of (0.58), while the technology (Use of technology to treat diseases using antibodies) came in the third rank with a mean of (2.26) and a standard deviation (0.7), as well as the technology (The use of direct detection technology for blood parasites) came in the last rank, with a mean of (1.66) and a standard deviation of (0.69).

Table 3: Arrange of technologies for the exploitation of fodder and feeding methods

No.	Technologies		Scope of application			Mean	Std. Deviation	Rank
			Always	Sometimes	No			
1.	Use of salt cubes	N	30	32	11	2.26	0.71	4
		%	41.1	43.8	15.1			
2.	Using hormones to increase production	N	12	36	25	1.82	0.69	6
		%	16.4	49.3	34.3			
3.	Use a balanced diet	N	36	30	7	2.39	0.66	2
		%	49.3	41.1	9.6			
4.	Use of urea supplements as a source of non-protein nitrogen	N	8	34	31	1.68	0.66	8
		%	11	46.5	42.5			
5.	Using chicken waste (poultry litter) as feed for cows	N	1	34	38	1.49	0.53	10
		%	1.4	46.5	52.1			
6.	The use of enzymes to increase the digestibility of feed materials	N	2	44	27	1.66	0.53	9
		%	2.7	60.3	37			
7.	Increasing the rate of digestion in rough feeds of low nutritional value	N	15	32	26	1.85	0.73	5
		%	20.5	43.8	35.6			
8.	Improving the nutritional value of cereal crops used as feed	N	8	40	25	1.77	0.63	7
		%	11	54.8	34.2			
9.	Use of silage and hay	N	37	27	9	2.38	0.69	3
		%	50.7	37	12.3			
10.	Improving the nutritional value of the stored feed (increasing the storage period for the stored feed) (the use of antifungals and antioxidants in the stored feed)	N	39	27	7	2.44	0.67	1
		%	53.4	37	9.6			
Weighted mean						1.98		
Std. Deviation							0.27	

Table 4: Arrange of techniques to improve genetic structures and increase offspring

No.	Technologies		Scope of application			Mean	Std. Deviation	Rank
			Always	sometimes	No			
1.	The use of artificial insemination technology in crossbreeding (animal reproduction)	N	12	23	38	1.64	0.75	6
		%	16.4	31.5	52.1			
2.	Use of liquid nitrogen to preserve genetic material and semen (gametes)	N	9	29	35	1.64	0.69	5
		%	12.3	39.7	47.9			
3.	Use of good genetic materials, structures and methods (gametes) for selected males as fathers	N	12	20	41	1.6	0.75	7
		%	16.4	27.4	56.2			
4.	Selection of mothers with good genotype (females selected for the purpose of vaccination)	N	20	24	29	1.87	0.81	1
		%	27.4	32.9	39.7			
5.	Use of embryo transfer technology	N	7	18	48	1.44	0.67	9
		%	9.6	24.7	65.8			
6.	The use of in vitro fertilization technology	N	1	23	49	1.34	0.51	11
		%	1.4	31.5	67.1			
7.	Breeding of pure foreign lineages	N	8	31	34	1.64	0.67	4
		%	11	42.5	46.6			
8.	Genetic selection within local lineages	N	13	27	33	1.73	0.75	2
		%	17.8	37	45.2			
9.	The use of the technique of regulating estrus in females	N	13	26	34	1.71	0.75	3
		%	17.8	35.6	46.6			
10.	Use of ovulation induction technology	N	2	25	46	1.4	0.55	10
		%	2.7	34.3	63			
11.	Use of multiple ovulation stimulation technology	N	2	31	40	1.5	0.56	8
		%	2.7	42.5	54.8			
Weighted mean						1.59		
Std. Deviation							0.39	

Table 5: Arrange of Animal health care technologies

No.	Technologies		Scope of application			Mean	Std. Deviation	Rank
			Always	Sometimes	No			
1.	The use of diagnostic technology and early detection of diseases	N	39	30	4	2.48	0.6	1
		%	53.4	41.1	5.5			
2.	Use of technology to treat diseases using antibodies	N	30	32	11	2.26	0.7	3
		%	41.1	43.8	15.1			
3.	The use of radiological examination technology	N	15	22	36	1.71	0.79	6
		%	20.6	30.1	49.3			
4.	The use of vaccination technology (the use of vaccines) to combat infectious diseases	N	21	48	4	2.23	0.54	4
		%	28.8	65.7	5.5			
5.	Using technologies to control insects and ticks that cause or transmit certain diseases to cows	N	31	38	4	2.37	0.58	2
		%	42.4	52.1	5.5			
6.	The use of direct detection technology for blood parasites	N	9	30	34	1.66	0.69	7
		%	12.3	41.1	46.6			
7.	Using technology for early detection of pregnancy	N	13	27	33	1.73	0.75	5
		%	17.8	37	45.2			
Weighted mean						2.06		
Std. Deviation						0.35		

## 2. Arrange the domains of application of modern technologies to improve the productive performance of cows in general:

To identify the arrangement of the domains of application of modern technologies were arranged according to the weighted average and the percentage weight for each domain, The results were as in Table (6). It is clear from the results that the domain of animal health care technologies came in the first rank, while the domain of technologies for exploiting feed and feeding methods came in the second rank, and the domain of technologies for improving genetic structures and increasing offspring in the third rank, and this may be due to the fact that cow breeders care about health care for cows more than the other two domains, as well as the availability of health care technologies more than the rest of the other technologies.

Table 6: Arrange of the domains of applying modern technologies in general

The domains	Weighted mean	Weight percentile	Rank
Animal health care technologies	2.06	68	1
Technologies for the exploitation of fodder and feeding methods	1.98	66	2
Techniques to improve genetic structures and increase offspring	1.59	53	3

**Fourth: To identify the correlation between the level of application of modern technologies and each of the independent variables under study.**

The results of the research showed as in the table (7) that there is a significant correlation between the level of application of modern technologies by cow breeders and each of the following variables:

**-The purpose of breeding:** it was found that there is a significant correlation at the probability level (0.01). Thus, the research hypothesis (the null hypothesis) is rejected and the alternative hypothesis is accepted. This indicates that Multiple purpose of cow breeders Increases the level of breeders' application of modern technologies, The reason for this may be that raising cows for more than one purpose is considered a profitable project if it is managed correctly. This is why breeders in this type of breeding want to apply modern technologies more than breeders for one purpose.

**-Years of experience in raising cows:** it was found that there is a significant correlation at the probability level (0.05). Thus, the research hypothesis (the null hypothesis) is rejected and the alternative hypothesis is accepted, and this indicates that increase of leads to an increase in the level of breeders' application of modern technologies. This may be due to the years of experience that breeders gain more information about these technologies and their usefulness, thus increasing their adoption and application of these technologies.

**- Herd size:** There is a negative significant correlation at the probability level (0.01). Thus, the research hypothesis (the null hypothesis) is rejected and the alternative hypothesis is accepted. which means that by increasing the size of the herd, the level of application of modern technologies by breeders will decrease, and vice versa. This may be due to the fact that the application of modern technologies with large numbers of cows (a large herd) leads to an increase in costs and the breeder may consider it a loss for him, in addition to the fact that owners of small herds apply modern technologies in their desire to develop their herds and increase and improve production.



- **Annual income from raising cows:** it was found that there is a significant correlation at the probability level (0.05) Thus, the research hypothesis (the null hypothesis) is rejected and the alternative hypothesis is accepted. and this indicates that Which means that with the increase in income the level of application of modern technologies by breeders increases, and this may be due to the fact that the increase in the breeder's income provides him with financial liquidity that enables him to purchase these technologies and thus increase their application.

- **Communication with information sources on modern technologies:** : it was found that there is a significant correlation at the probability level (0.01). Thus, the research hypothesis (the null hypothesis) is rejected and the alternative hypothesis is accepted. and this indicates that The multiplicity and increase in the level of communication with information sources on modern technologies leads to an increase in the level of their application, and this may be due to the information these sources provide to breeders about these technologies and thus increase their knowledge and information, which leads to an increase in their application of these technologies.

While the results showed that there is no significant relationship between the level of application of modern technologies and each of the independent variables (age, educational level and number of family members).

Table 7: Correlational relationships between the level of application of modern technologies and each of the independent variables.

variables	Pearson correlation	Spearman correlation	Level of significance
Age	0.029		NS
Educational level		0.091	NS
Number of family members	0.025		NS
The purpose of raising cows		0.489	**
Years of experience in raising cows	0.241		*
Herd size	- 0.451		**
Annual income from raising cows (million Iraqi dinars)	0.270		*
Communication with information sources on modern technologies	0.608		**

\*\* Correlation is significant at the 0.01 ,

\* Correlation is significant at the 0.05

NS Correlation is not significant

#### **Fifth: To Identify the obstacles to the application of modern technologies in improving the productive performance of cow breeders in Dohuk governorate:**

Obstacles is a situation of being faced with something that needs great physical or mental effort in order to be done successfully (Ayele *et al.* 2003). However, recently, the situation of economic and social competence of cow production has faced

insecurity with many obstacles. The results of the research showed that there are a number of obstacles facing cow breeders in the field of application of modern technologies, which are as follows: The high costs of using modern technologies and market challenges, Low availability of fodder, especially in cold seasons and high prices, High prices of vaccines and antibiotics and it is not available on a regular basis, genetic limitation, lack and inefficiency of artificial insemination services, Weakness of veterinary services provided to cattle breeders, low adoption of improved technologies, Weakness of agricultural extension services and training, limited knowledge of cow's husbandry practices, policy and socio-economic challenges. These obstacles were arranged according to their frequency by the respondents, as shown in the table (8).

Table 8: Arrange the obstacles according to their frequency by the respondents

The obstacles	Frequency	Rank
The high costs of using modern technologies and market challenges	31	1
Low availability of fodder, especially in cold seasons and high prices	29	2
High prices of vaccines and antibiotics, and it is not available on a regular basis	28	3
Genetic limitation, lack and inefficiency of artificial insemination services	24	4
Weakness of veterinary services provided to cattle breeders	23	5
Low adoption of improved technologies	18	6
Weakness of agricultural extension services and training	15	7
Limited knowledge of cow's husbandry practices	14	8
Policy and socio-economic	10	9

## Conclusions

From the results obtained, we conclude the following:

1. the level of modern technologies application by cow breeders is low, tends to medium, which indicates a weakness in the application of modern technologies in Improving the Productivity of Cows by cow breeders in the research zone.
2. In the domain of (the exploitation of fodder and feeding methods), the technique of (Improving the nutritional value of the stored feed) came first in terms of application. As for the domain of (improve genetic structures and increase offspring), the technology (Selection of mothers with good genotype) came first in terms of application. While the technology (The use of diagnostic technology and early detection of diseases) in the domain of (Animal health care technologies) came first in terms of application

As for the ranking of the domains of application of modern technologies in general, the field (Animal health care technologies) came in the first rank, then the field of (Technologies for the exploitation of fodder and feeding methods) in the second rank,

and followed by the field of (Techniques to improve genetic structures and increase offspring) in the third rank.

3. There is a significant correlation between the level of application of modern technologies by cow breeders and each of the following variables: (The purpose of raising cows, Years of experience in raising cows, Herd size, Annual income from raising cows, Communication with information sources on modern technologies).
4. there are a number of obstacles facing cow breeders in the field of application of modern technologies.

### Recommendations

1. Holding seminars and training courses by the Agricultural Extension Agency and in coordination and cooperation with the Veterinary Department for cow breeders in the research zone for the purpose of providing them with information, knowledge and skills about modern technologies that can be used to improve the productive efficiency of cows.
2. To take the agricultural extension apparatus into consideration and give priority to the technologies that the breeders' application level was weak, and to extension and encourage the breeders to adopt and apply them in order to improve the productivity of their cows.
3. The government agencies concerned with supporting cow breeding should work to overcome the obstacles facing cow breeders in the application of modern technologies, and this can be done through the following matters:
  - a. Providing various types of fodder to cow breeders at subsidized prices.
  - b. Encouraging the use of artificial insemination technology and support from the competent authorities for the purpose of genetic development of cows.
  - c. Veterinary staff carry out epidemiological vaccinations for some diseases for free.
  - d. Supporting and encouraging breeders to import cows of good breeds that suit the Iraqi environment, especially the environment of the research zone for the purpose of breeding.
  - e. Providing treatments (veterinary medicines) at subsidized prices.

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