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Integration of Extension Services and Research Centers and Their Impact on Supporting Agricultural

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ABSTRACT

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The results reveal a fundamental flaw in the coordination between the Extension Department and research centers in Baghdad Governorate, negatively impacting program effectiveness and the application of scientific outputs. Key findings include the absence of specialized coordination units, undefined staff responsibilities, and fragmented planning without a strategic annual plan. Implementation is weak due to insufficient material, human, and financial resources, relying more on individual initiatives than institutional programs. Follow-up and evaluation phases are virtually inactive, with no systematic mechanisms to assess activities or correct deviations. Major coordination obstacles are insufficient funding, lack of clear policies, shared mechanisms, training, and specialized personnel. This issue is the primary reason for the limited achievements and lack of integration between research and application. A comprehensive restructuring based on formal organization, scientific planning, efficient resource use, monitoring, and evaluation with clear performance indicators is essential to improve extension services and enhance the role of research in serving the agricultural sector.

1-Introduction

The global agricultural sector stands at a critical juncture, facing the dual imperative of ensuring food security for a growing population while mitigating its environmental footprint [1]. This challenge is particularly acute for smallholder farmers, who produce a substantial proportion of the world's food yet are disproportionately vulnerable to climate variability, market instability, and resource degradation [2]. Sustainable agricultural practices (SAPs)—such as conservation tillage, integrated pest management, and precision nutrient management—offer a viable pathway to enhance resilience and productivity. However, their widespread adoption remains persistently low, creating a significant "innovation-knowledge gap" between the potential of agricultural science and on-farm reality [3].

Traditionally, the generation of agricultural innovation and its dissemination to end-users have operated within a linear transfer-of-technology (ToT) model. In this paradigm, research centers operate in isolation, developing technologies based on often decontextualized priorities. These are then handed off to extension services for delivery to farmers [4]. This disjuncture has proven ineffective, leading to poor adoption rates due to mismatches between researcher-driven solutions and the complex, localized socio-economic and agronomic realities farmers face. Extension agents, often under-resourced, struggle to translate generic recommendations into actionable advice, while researchers remain disconnected from practical field constraints [5].

To bridge this gap, the integration of Agricultural Knowledge and Innovation Systems (AKIS) has emerged as a central tenet in contemporary rural development discourse [6]. This approach advocates for a synergistic, feedback-driven collaboration between research centers and extension services, moving from a linear model to a participatory, co-creation ecosystem. Effective integration implies joint problem diagnosis, collaborative design and testing of technologies, and continuous feedback loops where field-level insights from extension agents and farmers

directly inform the research agenda [7]. This nexus is theorized to enhance the relevance, adaptability, and scalability of agricultural innovations. While the theoretical merits of integration are widely endorsed, empirical evidence on its quantifiable impact on key support outcomes remains fragmented and context-specific [8,9]. Critical questions persist: To what extent does deep institutional and operational integration actually improve smallholders' knowledge, attitudes, and adoption of SAPs? Which integration mechanisms—such as joint platforms, embedded researchers, or shared digital tools—are most effective in different institutional landscapes? Furthermore, how does this integration influence broader system outcomes, including the economic viability of farms, environmental sustainability metrics, and the institutional learning capacity of both research and extension entities? This study seeks to determine the degree of integration between extension services and research centers in Baghdad and its impact on agricultural development through a practical and institutional framework that would achieve more effective knowledge and innovation transfer to farmers, thereby increasing productivity at all levels.

2- Materials and Methods

Following data collection, the gathered information was coded, classified, and subsequently analyzed. The analysis employed a mixed-methods approach, combining qualitative thematic analysis with quantitative statistical processing. Quantitative data analysis was performed using the Statistical Package for the Social Sciences (SPSS, version XX). The descriptive statistical measures applied included:

1. Frequency counts: To enumerate responses within each category of the research scales.
2. Percentages: To describe the proportional distribution of respondents across the specified axes and items, calculated using the standard formula:

$\% = (\text{Frequency of Item} / \text{Total Sample Size}) \times 100$

3. Arithmetic Mean: To provide a central tendency measure for the research data, calculated as:
- $$\bar{X} = \frac{\sum Xi}{n}$$
- where \bar{X} represents the mean, $\sum Xi$ is the sum of all values, and *n* is the number of respondents.

3- Results and Discussion

3.1. The State of Coordination between the Extension Department and Research Centers

Informal Relationships

The existence of informal relationships between the Guidance Department and research centers, characterized by personal motivation, interpersonal relationships, and shared interests. Forms of Communication: Coordination between the Guidance Department and research centers is carried out through official correspondence and the internet. Table 1 illustrates this:

Table 1: The Reality of Coordinating

Activities Between the Guidance Department and Research Centers

Focus	Data
Organizational Coordination between the Guidance Department and Research Centers	The absence of a formal coordination mechanism between the Guidance Department and research centers.
Organizational Structure	The lack of a structured framework to organize and define coordination responsibilities between the Guidance Department and research centers.
Those Responsible for Coordination	The coordinators are agricultural extension officers with advanced degrees from the Extension Department and the Ministry of Agriculture, as well as researchers working in research centers, namely the College of Agricultural Engineering Sciences, the College of Veterinary Medicine, and the Department of Agricultural Research.
Objectives of Coordination between the Guidance Department and Research Centers	The objectives of the coordination are defined as follows: - Service objectives - Educational objectives - Research objectives
Integration of Coordination	The following organizations participate in the organization: Ministry of Agriculture, Extension Department, College of Agricultural Engineering Sciences, College of Veterinary Medicine, and the Department of Agricultural Research
Tasks and Responsibilities of Those Responsible for Coordination between the Guidance Department and Research Centers	The tasks and duties of the coordinators are defined as follows: 1- Building coordination links between the Extension Department and the research centers 2- Coordinating periodic and emergency meetings 3- Coordinating and following up with the relevant parties involved in the coordination process to implement the plans 4- Maintaining communication channels with the activities of the research centers and the Extension Department 5- Participating in workshops, seminars, and conferences 6- Reviewing and developing coordination objectives, policies, plans, and programs between the Extension Department and the research centers 7- Determining the methods Coordination between the two entities: 8- Organizing workshops and specialized training courses for those working in the coordination field. 9- Conducting experiments in producers' fields and analyzing the results within the research centers and the extension department.

Mechanism of Organizational Links between the Guidance Department and Research Centers

Establishing mechanisms for organizational links between the extension department and research centers, including official correspondence, joint studies and research, provision of technological and technical services, training opportunities, consultations and information, problem-solving, and community participation and civil society work.

Document analysis further exposed systemic weaknesses:

1. Absence of a formal, specialized coordination body, with cooperation limited to ad-hoc activities.
2. Lack of effective mechanisms to connect research outputs (technologies/information) with end-user needs.
3. No governing regulations or clear communication protocols between researchers and extension agents.
4. No dedicated coordination staff or committee; coordination is an ancillary duty for department heads.

5. Weak extension linkages between target groups and institutional entities.
6. Absence of formal job descriptions and selection criteria for coordination roles.

3.2. Planning for Coordination

A review of planning documents indicated a lack of a comprehensive, needs-based annual coordination plan. While high-level objectives (educational, service, research) are acknowledged, planning is driven by ministerial directives rather than participatory assessment. Key findings are presented in Table 2.

Table 2: Current Status of Planning Coordination Activities between the Guidance Department and Research Centers

Action Plan	Data
Plan Objectives	The absence of a comprehensive annual central plan for coordination between the Extension Department and research centers, specifying the activities and coordination programs offered to the target groups.
Participation in Plan Development	The plan has three objectives: A. Educational objectives: To deliver, train, and educate the target groups on the use of modern technologies in simplified ways through agricultural extension. B. Service objectives: To direct the services of research centers towards addressing the problems of the target groups. C. Research objectives: To strengthen the theoretical and scientific link between the Extension Department and research centers, and to provide information and technologies that meet the needs of the target groups.
Plan Content	The Extension Department and research centers should participate in preparing the coordination plan.
Plan Funding	The plan includes timelines for implementing coordination activities that bring together the Extension Department and

	research centers according to a specific schedule, as well as identifying the locations, methods, and approaches for implementing these activities.
Activities in Coordination	The absence of financial allocations for implementing the coordination plan.
Activity Objectives	Weakness in coordination activities, including service, educational, and research activities.
Action Plan	The objectives of these activities are educational, service-oriented, and research-based.

Identified planning weaknesses include:

1. Lack of detailed, written coordination plans.
2. Plans lack specific, actionable educational, service, and research objectives.
3. Planning is top-down, failing to address the articulated needs of target groups.
4. Limited participation of end-users (farmers) in the planning process.

5. Inadequate and inconsistent financial allocations for coordination.

3.3. Implementation of Coordination Activities

Limited joint activities were implemented, primarily in research (joint workshops, field experiments) and service (field visits). However, implementation was severely constrained, as outlined in Table 3.

Table 3: The Reality of Implementing Coordination Activities for Coordination between the Extension Department and Research Centers

Focus	Data
Implementation of Coordination Activities	Some coordination-related activities were implemented, including research, service, and extension activities.
Implementation Sites	Some coordination activities were implemented in (extension units affiliated with extension departments, extension centers, demonstration farms, and the fields of the targeted beneficiaries).
Participation in Implementation	Various entities participated in implementing the activities, with the activities varying according to their specialization in the coordination process.
Material Requirements	The necessary resources for coordination between the extension department and research centers were not provided.
Participation in the Organizational Aspect	The activities and tasks to be distributed among staff for coordination between the extension department and research centers were not defined.
Financial Allocations	The necessary financial allocations for coordination were not provided.

Key implementation weaknesses were:

1. Chronic delays and insufficiency of financial allocations.

2. Low implementation rates relative to the scale of field problems.
3. Scarcity of coordination supplies at extension centers and farms.
4. Generally weak cooperation between the involved entities.

The study found critical deficiencies in monitoring and evaluation (M&E), rendering the coordination process largely unaccountable. Data for monitoring and evaluation are presented in Tables 4 and 5, respectively.

3.4. Monitoring and Evaluation

Table 4: Actual monitoring of coordination activities undertaken by staff to coordinate between the Guidance Department and research centers

The focus	Data
Follow-up organization	Weak organization in monitoring the progress of coordination activities.
Follow-up procedures	Insufficient participation of agricultural extension agents and researchers in monitoring research and extension activities.
Follow-up mechanism	Lack of a mechanism for monitoring coordination activities between the extension department and research centers.
Follow-up methods and techniques	Lack of methods and means to monitor the locations where agricultural research and extension activities are implemented.
Feasibility of follow-up	Follow-up is ineffective due to unclear procedures and the failure to submit reports directly and regularly to prevent errors during implementation.

Table 5: The reality of evaluating the coordination activities carried out by the staff to coordinate between the Guidance Department and the research centers.

focus	Data:
Organizing the assessment	Lack of a specialized organization to evaluate coordination activities.
Those conducting the assessment	Lack of specialized personnel to evaluate coordination activities.
Type of assessment	Absence of any type of evaluation for coordination activities.
Writing the assessment results	Lack of written reports documenting the results of evaluating coordination activities.
Utilizing the assessment	No utilization of the results of evaluating coordination activities.

3.5. Key Challenges in Coordination

Respondents identified five major challenge axes. Analysis using weighted

means and percentage weights revealed **Funding Challenges** as the most critical, followed by policy, organizational, mechanistic, and training-related issues (Table 6).

Table 6: Mean weighted means and percentage weight for each axis of problems facing staff in coordinating between the Guidance Department and research centers

Sequence according to the form	Order of importance	Key Issues	Predicted average	Weight (percentage)
5	1	Funding Challenges	3.34	83.5%
1	2	Coordination Policy Challenges	3.17	79.25%
2	3	Coordination Organization Challenges	3.15	87/75%
3	4	Challenges in the Nature of the Coordination Mechanism	3.14	78.6%
4	5	Training and Capacity Building Challenges	3.06	76.5%
overall average			3.17	79.3%

A detailed analysis of Coordination Policy Challenges (overall mean: 3.17) highlighted the "Lack of a clear coordination policy" as the

most severe issue (Weighted Mean: 3.25), while "Lack of understanding of the nature of coordination" was ranked lowest (Weighted Mean: 3.10). Full data is available in Table 7.

Table 7: shows the weighted averages and percentage weights for the coordination policy problems between the Extension Department and research centers.

Sequence according to the questionnaire	Order of importance	Paragraphs	Scale	Frequency	Ratio	Weighted Mean	Percentage
9	1	Lack of a clear policy for coordination between the Extension Department and research centers	Strongly Agree	67	41.9	3.25	81.25
			Moderately Agree	72	45		
			Little Agree	15	9.4		
			Disagree	6	3.8		
5	2	Lack of communication channels between the Extension Department and research centers to unify ideas regarding coordination problems	Strongly Agree	71	44.4	3.22	80.50
			Moderately Agree	62	38.8		
			Little Agree	18	11.3		
			Disagree	71	44.4		
3	3.5	Lack of organized coordination mechanisms between the Extension Department and research centers	Strongly Agree	68	42.5	3.21	80.25
			Moderately Agree	66	41.3		
			Little Agree	18	11.3		
			Disagree	8	5		

10	3.5	Absence of programs and plans that lead to the establishment of working channels that can be followed for coordination between the Extension Department and research centers	Strongly Agree	69	43.1		
			Moderately Agree	61	38.1		80.25
			Little Agree	24	15.0	3.21	
			Disagree	6	3.8		
7	5	Presence of specific unstable factors or variables surrounding agricultural work that render the coordinator unable to perform their duties	Strongly Agree	70	43.8		
			Moderately Agree	57	35.6		
			Little Agree	23	14.4	3.17	79.25
			Disagree	10	6.3		
2	6	Weak coordination and organization of key processes and procedures between the Extension Department and research centers	Strongly Agree	66	41.3		
			Moderately Agree	63	39.4		79
			Little Agree	22	13.8	3.16	
			Disagree	9	5.6		
8	7	Lack of a suitable environment for exchanging coordination information between the Extension Department and research centers	Strongly Agree	70	43.8	3.15	78.75
			Moderately Agree	53	33.1		
			Little Agree	28	17.5		
			Disagree	9	5.6		
4	8	Inability to propose an appropriate method for the coordination process between the Extension Department and research centers	Strongly Agree	65	40.6		
			Moderately Agree	62	38.8	3.14	78.50
			Little Agree	23	14.4		
			Disagree	10	6.3		
6	9	Inability to address problems and undesirable situations during the coordination	Strongly Agree	63	39.4		77.75
			Moderately Agree	59	36.9	3.11	

		process between the Extension Department and research centers	Little Agree	31	19.4	
			Disagree	7	4.4	
1	10	Lack of understanding of the nature of coordination between the Extension Department and research centers	Strongly Agree	55	34.4	77.50
			Moderately Agree	71	44.4	3.10
			Little Agree	29	18.1	
			Disagree	5	3.1	
The axis as a whole						3.17 79.25

4- Conclusions

Based on the data analysis, the study concludes:

1. **Organizationally**, coordination is informal and unstructured due to the absence of a dedicated administrative framework, formal job descriptions, and permanent coordination committees.
2. **Planning** is deficient, lacking a central, needs-based annual plan and relying on top-down directives without field assessments.
3. **Implementation** is hampered by scant activities, a severe shortage of material and financial resources, and weak inter-institutional cooperation.
4. **Monitoring** is ineffective, with no clear mechanism, poor documentation, and unclear procedures.
5. **Evaluation** is systematically absent, with no institutional process to utilize findings for improvement.
6. **Funding** is the paramount challenge (83.5%), constituting the

primary obstacle to effective coordination, followed by policy, organizational, and mechanistic issues.

5- Recommendations

To address these deficiencies, the study recommends:

1. Establish formal coordination units within both extension and research institutions, linked to a clear organizational hierarchy, supported by a joint coordination committee.
2. Develop clear job descriptions and selection criteria for coordination personnel and create shared information databases.
3. Formulate a centralized, written annual coordination plan with SMART (Specific, Measurable, Achievable, Relevant, Time-bound) objectives, developed through participatory needs assessment with farmers, agents, and researchers.
4. Allocate a separate, sufficient budget for coordination activities, joint field trials, workshops, and necessary material resources.

5. Scale up service, awareness, and research activities to match the magnitude of field problems.
6. Institute a formal M&E system with a trained core team, regular reporting, and Key Performance Indicators (KPIs). Evaluation results must feed into subsequent planning cycles.
7. Provide sustained funding for joint programs and implement ongoing training in program management, communication, and modern agricultural technologies for coordination staff.

6- Final Summary

The study concludes that the coordination between research centers and extension services in Baghdad Governorate remains insufficient to effectively translate research into agricultural practice. This is due to a confluence of structural, financial, and procedural constraints. Implementing the recommended measures—centered on institutionalizing coordination, participatory planning, dedicated resourcing, and robust M&E—is essential for strengthening this critical linkage and contributing to sustainable agricultural development.

Ethics Statement

The authors have nothing to report.

Consent

Written informed consent was obtained from all study participants.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Research data are not shared.

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