

**Evaluation of Agricultural Extension services and their
impact on addressing Obstacles, Fostering collaborations,
and Engaging Farmers**

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تقييم خدمات الإرشاد الزراعي وأثرها على المعوقات والتعاون وإشراك المزارعين

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المخلص:

على الرغم من الجهود المبذولة لتحسين القطاع الزراعي، إلا أن التحديات لا تزال قائمة، مما يؤثر على النمو الشامل واستدامة الممارسات الزراعية في العراق. يدرس هذا البحث في فعالية خدمات الإرشاد في تعزيز التعاون وإشراك المزارعين وزيادة الإنتاج. تم جمع البيانات من المزارعين و العاملين في مجال الإرشاد الزراعي في محافظات أربيل والسليمانية ودهوك من خلال الاستطلاعات والمقابلات ودراسات الحالة. وقد أظهرت النتائج أن محافظة دهوك تعاني باستمرار من أعلى نسب المشكلات الأرشادية، بما في ذلك الافتقار إلى التنسيق بين مسؤوليات البحث والإرشاد الزراعي بنسبة يقارب (13.3%) ونقص آليات التعاون (33.3%) وتعد قيود الموارد والتأخيرات الإدارية والحواجز غير الكافية من الحواجز الشائعة في جميع المناطق. وكشف نتائج جلسات التدريب التي أجراها العاملون في مجال الإرشاد عن التحديات والاختلافات الإقليمية. حيث تبين بأن دهوك يضم أعلى معدل - بنسبة (53.3%) من العاملين في مجال الإرشاد الزراعي لم يعقدوا أي دورات تدريبية مما يدل على وجود

قصور في بناء القدرات. أن ندرة الدورات التدريبية المكثفة يدل على وجود معوقات في تنفيذ برامج بناء القدرات. تختلف معدلات تنفيذ البرامج الإرشادية عبر المحافظات، حيث تبلغ نسبة 40% في محافظة أربيل، ونسبة 33.3% في محافظة السليمانية، ونسبة 46.7% في محافظة دهوك. أما بخصوص التواصل مع المزارعين فقد أفاد 33% من المرشدين الزراعيين في محافظة دهوك بإجراء 1-4 زيارات سنويًا. وقد أفاد 40% من العاملين في الإرشاد الزراعي في محافظة السليمانية عن إجراء 1 إلى 4 زيارات في السنة، وتتمتع محافظة دهوك بتواصل أفضل حيث أفاد 20% من العاملين في مجال الإرشاد عن وجود 5 إلى 10 زيارات سنوية. تختلف الطرق المفضلة للمزارعين لنشر المعلومات الزراعية حسب كل محافظة تعد أنشطة اليوم الميداني والمواد التعليمية الخيارات المفضلة في جميع المناطق. تفضل مزارعو محافظة السليمانية الرؤى التي يقدمها المزارعون الرائدون، في حين تهتم مزارعو محافظة دهوك بالأساليب "الأخرى"، بما في ذلك ورش العمل والمنصات عبر الإنترنت. أظهرت إحصائية مربع كاي ($p=0.0001$) 23.33 تباينًا كبيرًا في التفاعل مع البرامج الإرشادية، حيث كان لدى محافظة السليمانية مشاركة أعلى في التفاعل مع البرامج الإرشادية. أما بالنسبة لجهود التعاون مع الفرق الإرشادية، كشفت إحصائية مربع كاي البالغة 17.91 ($p=0.0013$) عن وجود تباينات بين المحافظات الثلاث. وقد تعاونت محافظة السليمانية بشكل متكرر، في حين لم يتعاون 73.3% من مزارعي محافظة أربيل مع المرشدين. وكشفت الدراسة عن عدم الكفاءة، وتباين المشاركة، والتفاوت الإقليمي في خدمات الإرشاد. إن معالجة هذه التحديات تتطلب استراتيجيات خاصة بكل منطقة مثل بناء القدرات، وتعزيز التواصل، وتويع التدريس لتعزيز الاستدامة والإنتاجية في الزراعة في إقليم كردستان العراق. **الكلمات المفتاحية:** خدمات الإرشاد، إشراك المزارعين، برامج التدريب، ومعالجة العقبات.

ABSTRACT:

Despite some progress, Iraq's agricultural sector continues to grapple with ongoing challenges that impede its growth and sustainability. This study evaluates how effective extension services are in promoting collaboration, engaging farmers, and enhancing production. Data were collected from farmers and agricultural extension workers in Erbil (ER), Sulaymaniyah (SU), and Duhok (DU) through surveys, interviews, and case studies. Findings indicate that DU experiences the most significant extension issues, with a lack of coordination between agricultural research and extension (13.3%) and insufficient cooperation mechanisms (33.3%). Common barriers across regions include resource constraints, administrative delays, and inadequate incentives. Training sessions reveal challenges and regional disparities. In DU, 53.3% of extension workers have not conducted any training, highlighting a lack of capacity building. Implementation rates of extension programs vary: 40% in Erbil, 33.3% in SU, and 46.7% in DU. Communication with farmers is limited, with 33% of DU extension workers reporting conduct only 1-4 visits per year. In SU, 40% of extension workers also reported making 1-4 visits, whereas DU had better communication, with 20% conducting 5-10 visits. Farmers' preferred methods for receiving agricultural information differ by governorate. Field day activities and educational materials are favored across all regions. SU farmers prefer insights from lead farmers, while DU farmers lean towards workshops and online platforms. A chi-square statistic of 23.33 ($p=0.0001$) indicates significant variation in engagement with extension programs, with SU showing the highest engagement. Collaboration with extension teams varied significantly, as evidenced by a chi-square statistic of 17.91 ($p=0.0013$), with SU frequently collaborating while 73.3% of Erbil farmers did not engage with extension workers. The study highlights inefficiencies, disparities in engagement, and regional variations in extension services. Addressing these challenges necessitates region-specific strategies, including capacity building, improved communication, and diversified teaching methods to enhance agricultural sustainability and productivity in the Kurdistan Region of Iraq. **KEYWORDS:** Extension Services, Farmer engagement, Training programs, and Addressing Obstacles

transformations in the agricultural industry (Garner, 2023). In spite of the potential for research and extension services to tackle these challenges, inefficiencies persist within their collaborative structures. These inefficiencies are worsened by a lack of contextualized strategies and frameworks designed specifically distinctive socio-economic and environmental conditions (Khedir & Khedir, 2020). It is essential to reevaluate these frameworks in order to address current shortcomings and foster enduring sustainability in agriculture and food security (Muhamad, 2022). Through the development of stronger alliances, implementation of innovative approaches, and synchronization of endeavours with local conditions, the agricultural industry in the KRI has the potential to serve as a paradigm of durability and adaptability (Eklund & Dinc, 2024; Navid, 2024). The partnership between research and extension services is vital for translating scientific advancements into practical solutions for farmers. Research generates new knowledge and innovations, while extension services play a crucial role in effectively disseminating this information to farmers, traders, policymakers, and other stakeholders (Li et al., 2024). This research offers a detailed plan for attaining these objectives, highlighting the

significance of cooperation as the fundamental element for agricultural advancement in the KRI and beyond. This collaboration is essential for addressing the challenges that agricultural systems, particularly in developing regions like KRI, are confronted with. This research aims to contribute to the agricultural and rural development of KRI by promoting innovation, enhancing institutional capacity, and improving the livelihoods of KRI communities. It aims to offer practical insights for policymakers, practitioners, and other stakeholders to strengthen the collaboration between research and extension services in KRI and beyond.

Methodology

Two methods of research were taken into consideration: interviews and surveys. A triangulation strategy was selected for this study to ensure a thorough understanding of the various participants involved (Farquhar et al., 2020). The interview process included utilizing open-ended questions, while survey participants were given closed questions to produce quantifiable results. In addition, focus group discussions were scheduled to gather in-depth data (Nielsen et al., 2020). Sampling was conducted to ensure that all research participants are a true reflection of their workplace. Two producer focus groups from the district were carried out, and their contents will impact the upcoming survey and the on-site design (Arias Valencia, 2022; Craig et al., 2021). Study design Data collection techniques help analyze challenges, disparities, and potential benefits in the partnership (Johnston, 2023; Wong et al., 2024). In this study assesses collaboration between agricultural research and extension workers in KRI using mixed-methods approach. Methodology combined quantitative data from surveys with qualitative insights from interviews and focus group discussions. Data Collection Instruments: Surveys A constructed questionnaire was developed for 15 knowledgeable farmers and extension workers from the three provinces. Using close-ended inquiries, data was collected to evaluate the frequency, quality, and obstacles to AR-EW collaboration. The survey content was tested as a trial to ensure dependable and accurate measurement of the key variables. Interviews Structured discussions were held with a group of farmers and extension workers (Antwi-Agyei & Stringer, 2021). Employing open-ended questions, qualitative insights were gained into the dynamics, barriers, and potential solutions of collaboration. Precise recording and transcription of interviews upheld accuracy, while ensuring anonymity and confidentiality. In every province, two focus groups were organized consisting of farmers, extension workers, and researchers (Norton & Alwang, 2020; Rust et al., 2022). These discussions explored common challenges, perceptions, experiences, and strategies to enhance collaboration.

Results and Discussion

Challenges faced by agricultural laborers

The data depicted in Figure 1 shows the frequency of interactions between researchers and extension workers in the past year across three locations: ER, SU, and DU. The interactions are categorized into three groups based on the number of meetings: one meeting,

introduction

The agricultural landscape of the of Iraq has been a focal point of economic activity and development. The total agricultural area is under cultivation each year, which results in low crop yields due to the specific use of fertilizers and primitive farming methods. The reliance on traditional techniques, such as wooden ploughs drawn by draught animals, further exacerbates the inefficiencies within the agricultural sector. This foundational understanding sets the stage for recognizing the potential of the region's agricultural resources (H. Nasser, 1970). Walliser (2016) reiterates the critical role agriculture plays in the Kurdistan Region of Iraq (KRI), asserting that it accounts for over 90% of the region's GDP. The importance of modernizing agricultural practices through research and extension services to bridge the gap between technology and practical application. He emphasizes the necessity of essential inputs, including fertilizers, seeds, irrigation, and electricity, to enhance productivity and sustainability in the agricultural sector. Research institutions and extension services are vital for improving agricultural productivity and rural livelihoods (Toptancî, 2024). However, studies show that collaboration often falls short due to systemic inefficiencies, especially in developing countries like KRI (Mahmud, 2021). Robust collaboration is crucial for evidence-based policies and farm management. Strengthening connections between research and extension services is key (H and Ahmad, 2023). Investigation focuses on collaboration between research and extension groups in KRI and participation in joint ventures. The agricultural sector in KRI is significantly affected by socio-economic and environmental Agriculture has long been the primary driver of the economy in the KRI, contributing the most jobs and GDP (Mahmud, 2021). However, global issues such as changing oil prices and climate change have led many unemployed individuals to turn to farming for a livelihood (H and Ahmad, 2023). Despite technological

advancements offering potential for innovation and efficiency, the agricultural sector in the KRI is confronted with significant obstacles, including economic and technical pressures, limited institutional capacity, and inadequate funding (Nuri and Karakır, 2022; Nanakali, 2021). The lack of cooperation and coordination is hindering the effectiveness of research and extension services, which are crucial for addressing the challenges at hand. The problem is further aggravated by the lack of comprehensive assessments and tailored research that reflect the specific traits of the region. (Yang et al., 2022). In order to achieve sustainable agricultural development and food security, it is necessary to evaluate and enhance the collaboration between research and extension organizations. This evaluation will involve identifying systemic inefficiencies, promoting effective partnerships, and aligning agricultural strategies with the socio-economic and environmental realities of the region. In modern times, economic changes such as fluctuating oil prices and the effects of climate change have led to significant 1-5 meetings, and 6-10 meetings. The majority of extension workers in DU (66.7%) and ER (60%) reported having only one interaction in the past year. In SU, a smaller percentage (40%) reported the same, indicating a higher level of engagement in this region compared to DU and ER. Furthermore, SU had the highest percentage (53.3%) of extension workers reporting 1-5 interactions, suggesting more consistent collaboration between researchers and extension workers. In ER, 33.3% of extension workers had 1-5 interactions, while DU had the lowest proportion in this category (26.7%). Throughout three locations, only 6.7% of extension workers reported 6-10 interactions, indicating infrequent collaboration. Figure 1 shows sporadic interactions between workers and DU and ER, potentially limiting effective collaboration. SU displays a more balanced pattern, with a higher percentage having 1-5 meetings, enhancing the ability to address farmer challenges. Low Levels of High-Frequency Engagements (6-10 Meetings): The 6.7% emphasizes the need for improved interactions for sustained impact on agricultural issues.

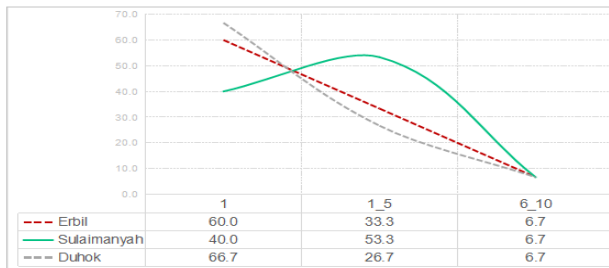
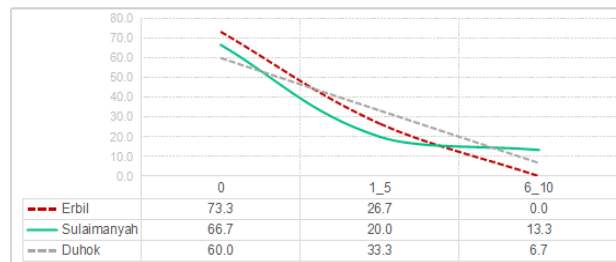


Fig.1. Demonstrates the engagements between the extension workers over the past year
Strengthening extension services enhances collaboration, while training for workers and researcher’s boosts



engagement. Improved interaction benefits both farmers and research plans, necessitating targeted strategies. A study on collaboration within the Ministry of Agriculture in KRI reveals the need for effective policies and offers insights for similar programs. Cooperation from administrators is critical, alongside new programs to tackle administrative challenges and the involvement of beneficiaries in planning. Enhancing cooperation is vital for agricultural development. Recommendations include regular reports and stakeholder meetings (Antwi-Agyei & Stringer, 2021; Osumba et al., 2021). Ongoing training enriches research and extension efforts, fostering involvement from all stakeholders. Practical training enhances competence since research and extension staff share similar goals. Implementing effective protocols can facilitate collaboration amid resource constraints, and innovation is essential for progress (McDermott, 2022; Wheeb et al., 2021). Activities of the program The data in Figure 2 shows joint efforts by extension workers and researchers with local and international funding. Collaborations are divided by frequency and location: ER, SU, and DU. ER had the highest no collaboration percentage (73.3%), while SU and DU had lower proportions at 66.7% and 60.0%. DU had the highest percentage (33.3%) of extension workers collaborating 1-5 times.

Fig.2. Demonstrates the cooperative efforts between outreach professionals and scholars, supported by both domestic and global financial support, over the past year. In terms of participation, ER and SU had engagement rates of 26.7% and 20.0%, respectively, showing lower involvement. SU had the highest percentage (13.3%) of extension workers collaborating frequently, while DU had only 6.7%. ER had no frequent collaborations, indicating a lack of interaction. Figure 2 shows a significant disparity in collaborative efforts across the three locations. Despite available funding, many extension workers, especially in ER, did not collaborate with researchers due to barriers like lack of awareness, poor coordination, and limited accessibility. DU maximizes funding for collaboration, possibly due to strong support. SU effectively uses funding for partnerships. Higher engagement and structured system promote interactions. ER shows gap in collaboration, efforts needed for communication and awareness. SU and DU strategies could be models for ER. Full potential of funding not realized. Enhancing funding mechanisms, providing training, and capacity-building could improve collaboration (Mohammed 2024, Habeeb & Mustafa, 2024). The utilization of the resources provided by the research center Figure 3 displays the frequency of resource utilization by extension workers at research centers. The information in Figure 3 shows DU highest at 66.7%. ER and SU non-utilization at 60.0%. Lack of awareness/access evident. Rare usage higher in SU (33.3%) than ER (26.7%) and DU (26.7%). Occasional use highest in ER (13.3%).

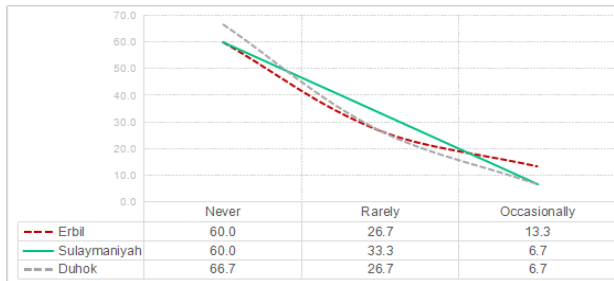
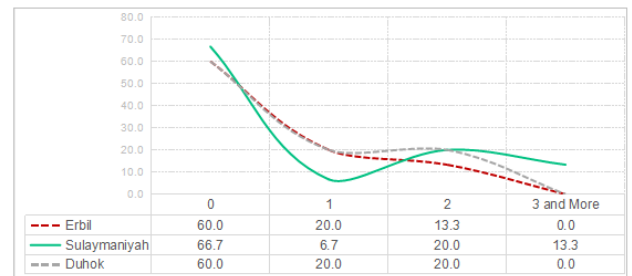
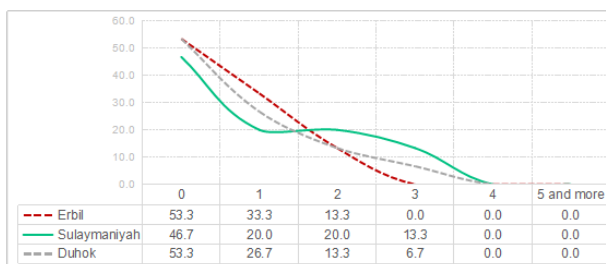


Fig.3. Demonstrates the most efficient use of resources provided by the research center. Findings indicate inadequate resource utilization. Significant underutilization in all locations. SU has higher usage rate, indicating better communication and relevant resources compared to ER and DU. This could enhance engagement in other regions. Low occasional usage percentages (highest in ER at 13.3%) emphasize the need for strategies to encourage more frequent use of resources. Workshops or awareness sessions for extension workers could be beneficial (Agbonifo et al., 2024). Establish mobile units or satellite offices to expand physical access to resources. Put in place feedback systems to identify obstacles to resource utilization and consistently enhance the offerings (Sharif et al. 2024). Dissemination of information Figure 4 shows monthly communication between extension workers and farmers or researchers in three regions: ER, SU, and DU. Data is organized by frequency (0-5+ times/month). ER and DU had 53.3% with no monthly communication. SU had 46.7%, slightly better engagement. The second most common category was one interaction per month, with ER leading (33.3%), followed by DU (26.7%) and SU (20%). SU had higher percentages of two monthly interactions (20%) compared to ER (13.3%) and DU (13.3%). SU had the highest proportion of three-monthly interactions (13.3%), while ER and DU had lower percentages (6.7% in DU and 0% in ER). No region reported interactions in the "4" or "5 and more" categories. Figure 4 highlights communication gaps among extension workers, farmers, and researchers, exacerbated by limited resources and awareness. The smaller proportion in SU suggests better communication

practices. Regular communication schedules and mobile apps for remote interactions are vital. Frequent consultations should be prioritized, and reasons for limited involvement assessed. Poor communication may delay responses to challenges, necessitating organized communication channels. Frequent consultations should be prioritized, and reasons for limited involvement assessed. Poor communication may delay responses to challenges, necessitating organized communication channels. This result is supported by (Khedir and Khedir, 2020; Tahir and Harun, 2022). **Fig.4.** Information is distributed regularly, either in meetings or through phone calls, every month. Conducting collaborative seminars and workshops. Figure 5 details collaborative seminars and workshops. Data categorized into 0, 1, 2, and 3 or More. SU has lower percentage, reporting highest percentage of organizing one seminar or workshop per month. SU's predominance in "1" and "2" categories indicates robust organizational initiatives. Factors may include improved funding and greater demand for collaborative events. The high number of participants in the "0" classification for ER and DU suggests obstacles to organizing routine seminars and workshops due to insufficient resources, recognition, and infrastructure. SU's dominance in



the "1" and "2" categories shows stronger organizational efforts to promote collaboration through regular events. Improved funding and a higher demand for knowledge-sharing events may contribute to this (Abdullah and Gray, 2022). The lack of participants in the "3 and More" category in all regions suggests that there have been insufficient and prolonged efforts to arrange regular seminars and workshops. This restricts the possibilities for thorough sharing of knowledge and working together.

Fig.5. Demonstrates the organization of monthly collaborative symposiums and workshops

Offer focused financial support and logistical assistance to regions with low levels of activity, such as ER and DU, to stimulate more frequent event planning. Inform stakeholders about the benefits of collaborative events for professional development, enhanced practices, and improved issue-solving in agriculture and related disciplines (Qadir et al., 2023). Determine the tactics and assets that are responsible for the heightened level of involvement in SU and implement these in ER and DU to enhance effectiveness. Develop reward systems to inspire the coordination of three or more seminars/workshops every month. Construct regional partnerships to distribute the responsibility of arranging regular events (Agbonifo et al., 2024). This data highlights the importance of refining the coordination of joint seminars and workshops, specifically in ER and DU, to enhance involvement and the exchange of knowledge among participants (Zuntz et al., 2022). By acknowledging the obstacles and utilizing the positive qualities showcased in SU, all areas can experience greater prospects for working together and career advancement. Develop reward systems to inspire coordination of three or more seminars/workshops monthly. Construct regional partnerships to distribute responsibility of arranging events. Refine coordination of joint seminars/workshops in ER and DU to enhance involvement and exchange of knowledge (Sharif et al., 2024). The statistical analysis involved conducting a Chi-Square test. The Chi-Square test results in Table 1 show regional variations in interaction frequency, collaboration efforts, resource utilization, and information sharing. SU had higher interaction frequency than DU and ER, indicating a stronger collaborative environment. SU also had more frequent collaborations compared to ER. These findings highlight SU's leadership in promoting consistent collaboration between researchers and extension workers. The resource usage study found no significant variation among regions (Chi-Square statistic = 4.75, p-value = 0.314). However, all regions had a high level of underutilization of research center resources, especially DU. This emphasizes the need to improve access and promote these resources for increased involvement. The Chi-Square test found no significant regional differences in communication (statistic: 3.98, p-value: 0.409). However, SU outperformed other regions in Interaction Frequency and Collaboration Efforts. ER and DU must address barriers to enhance engagement. Resource Utilization and Information Sharing show system inefficiencies. Targeted interventions are needed for collaboration improvement in all regions.

Table 1. Chi-Square test results

Category	Chi-Square Statistic	p-value	Degrees of Freedom	Significance
Interaction Frequency	23.33	0.0001	4	Significant
Collaboration Efforts	17.91	0.0013	4	Significant
Resource Utilization	4.75	0.314	4	Not Significant
Information Sharing	3.98	0.409	4	Not Significant

The Figure 6 displays Chi-Square test outcomes. The bar chart shows Chi-Square Statistics by Category, highlighting disparities in Interaction Frequency and Collaboration Efforts. Regional variations noted. The p-values in Figure 7 includes a significance threshold at $p = 0.05$. Categories below the threshold are statistically significant, above are not. Graphics demonstrate statistical significance and variability, providing an overview of areas needing attention. In terms of Interaction Frequency, Chi-Square is 23.33, p-value is 0.0001, confirming significant difference across regions. SU has higher engagement (1–5 times annually), while ER and DU have fewer interactions (only once per year), showing variance in engagement. Regarding Collaboration Efforts, Chi-Square is 17.91, p-value is 0.0013, indicating regional differences. SU has highest level of collaborations (6–10 times annually), ER has none, showing significant disparity.

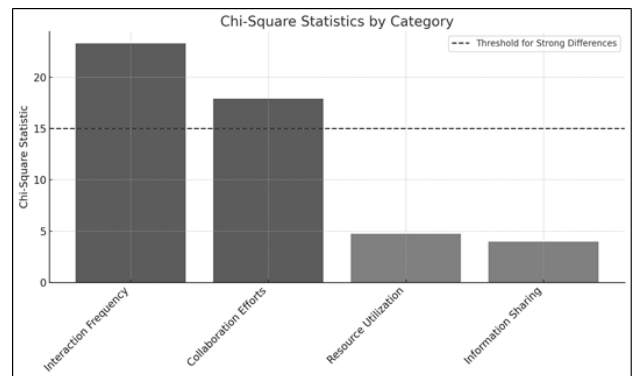
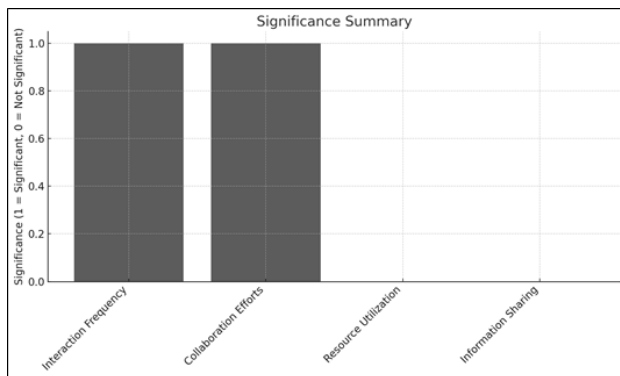


Fig.6. Showcases the Chi-Square statistics organized by category

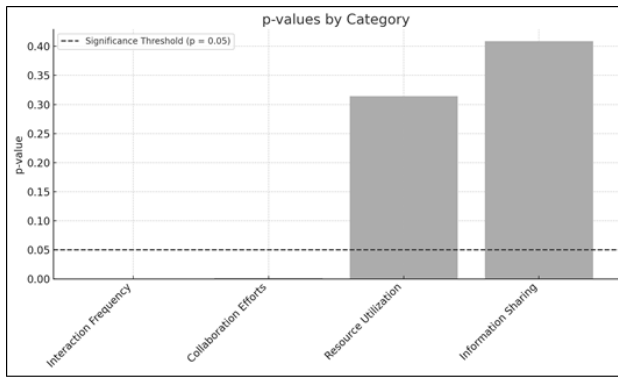


Fig.7. Displays the p-values according to category

For Resource Utilization, Chi-Square is 4.75, p-value is 0.314, indicating no differences across regions. Non-utilization remains high, especially in DU, highlighting need for better resource dissemination. Chi-Square is 3.98, p-value is 0.409, showing no variations in communication frequency. ER and DU had more participants reporting no monthly communication compared to SU. SU excelled in Interaction Frequency and Collaboration Efforts. Resource Utilization and Information Sharing showed no differences between regions. Low overall involvement indicates systemic inefficiencies. ER and DU need targeted interventions to enhance collaboration, resource utilization, and communication.

Fig.8. Significance summary

Chi-Square Statistics by Category in Figure 8 show disparities in Interaction Frequency and Collaboration Efforts, with high Chi-Square values and green bars indicating variation. Resource Utilization and Information Sharing have lower Chi-Square statistics, suggesting less diversity. P-values by Category show significance with p-values below 0.05 for Interaction Frequency and Collaboration Efforts, denoted by green bars. Resource Utilization and Information Sharing have p-values above 0.05 and are not significant, shown with grey bars. Significance Summary chart shows which metrics are significant (1) or not (0), highlighting categories needing attention. Visualizations summarize regional differences and areas needing targeted action. Regional comparison charts provide insights on interaction frequency, collaboration efforts, resource utilization, and information sharing. In the Interaction Frequency by Region category in Figure 9 and 12 shows, SU leads with the highest percentage of participants reporting 1–5 interactions annually. DU and ER have higher percentages reporting only one interaction. SU also stands out in Collaboration Efforts by Region with the highest percentage reporting frequent collaborations. Resource Utilization by Region shows low levels across all regions, with most never utilizing available resources. These findings highlight regional disparities in collaboration, resource utilization, and communication. While SU shows strengths, there are areas for improvement. Interventions in ER and DU are crucial to enhancing collaboration, resource access, and communication frameworks for better regional outcomes. SU demonstrates a higher rate of utilization at 33.3% compared to ER and DU, both at 26.7%, indicating a better accessibility or awareness of research center resources. However, 60% of participants in SU still reported never utilizing resources, similar to rates observed in ER. ER also shows low resource utilization, with rare and occasional usage rates well below impactful levels. Figure 10 show DU has the highest percentage, at 66.7%, of participants reporting never utilizing research resources, highlighting critical gaps in accessibility or relevance. SU dominates with 53.3% noting 1-5 interactions yearly, showing high engagement. 6.7% report more frequent interactions, not seen in ER. In ER, 60% have only one interaction yearly, indicating limited collaboration. DU has 66.7% with only one interaction yearly, showing lower engagement than SU. However, 46.7% in SU reported no communication, indicating missed opportunities.

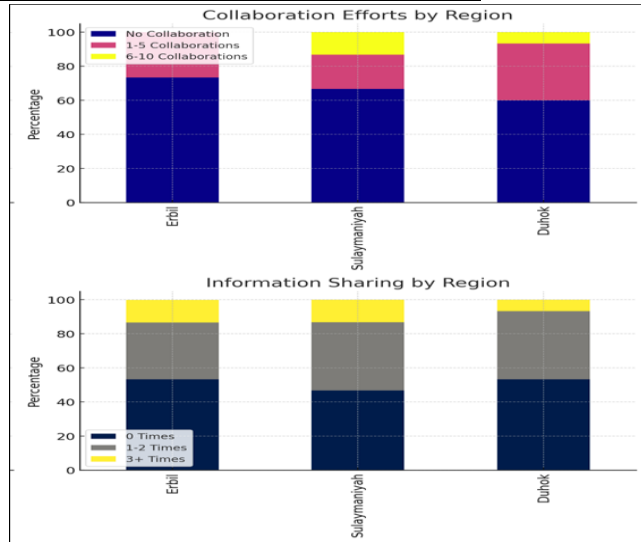


Fig.9. Frequency of Interaction in Various Regions and Utilization of Resources in Different Regions In ER and DU, 53.3% reported no communication, reflecting limited outreach. Collaboration between researchers and extension workers is vital for sharing research with farmers. Challenges and barriers were found in joint activities at the Ministry of Agriculture in the Kurdistan Region of Iraq. Optimal agricultural policies and effective development initiatives are imperative for economic growth and poverty reduction (Miković et al., 2020; Chierici et al., 2021). Collaboration between researchers and extension workers is vital for sharing research with farmers. Challenges and barriers exist in joint activities at the Ministry of Agriculture in KRI. Optimal agricultural policies are needed to prevent setbacks in economic development and poverty increase.

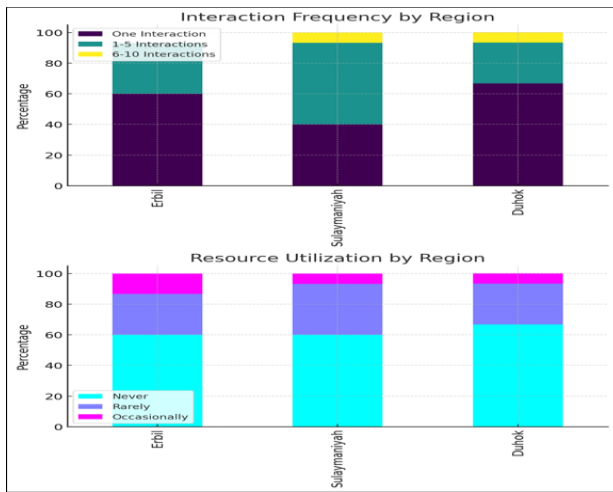


Fig.10. Collaboration Efforts by Region, and Information Sharing by Region
The results could guide organizations using the survey in decision-making workshops with input from stakeholders. Educational strategies and supportive environments must be developed for collaboration and linkages. Research and extension workers need to develop new programs focusing on critical areas to address administrative challenges. Implementing co-learning, co-formation, and co-creation concepts will enhance farmer performance and development (Shiell et al., 2020; Igalla et al., 2020).

Conclusions

The involvement of all beneficiaries in planning, implementation, and post-harvesting stages is crucial. Supporting participatory research through collaboration will lead to co-learning and co-formulation. Strengthen collaboration between research and extension workers in future agricultural development. Prepare situation analysis report for new and strategic programs every five years. Discuss report in stakeholders' meetings in five provinces to minimize conflicts and gather valuable input (Musavengane & Kloppers, 2020; Manafe et al., 2024). An examination found obstacles to collaboration in literature. Extension categories: governmental and research institutions. Cooperation between workers and researchers is sporadic. No established method for monitoring collaboration outcomes. Lack of sharing training materials and farmer involvement in experiments. Extension workers have limited education levels (Al-Omouh et al., 2022). Conversely, collaborative

experiences in other countries reveal established reporting mechanisms. Implementation of these mechanisms is not integrated within the existing framework. A dual approach using formal and informal systems is needed. Cultural rift within the profession is a difficult obstacle to overcome. Sharing of strategies in some countries is encouraged (Al-Omouh et al., 2020). As challenges arise, most survey participants suggest system improvements. Quality training in cooperation, especially in the extension field, is crucial for developing necessary skills. Research shows a positive trend in collaborative research and extension due to ongoing training, leading to a shift in institutional cultures. Training and change must be embraced by all stakeholders. Internet-supported practical training improves expertise in blended learning and personal development. Success is achievable as research and extension personnel share similar objectives. Guidelines can encourage collaboration, especially when resources are limited. Innovations are essential for bringing about change (Alghababsheh & Gallear, 2021).

Recommendations

Creating a platform for knowledge exchange is a fundamental step towards fostering collaboration between research and extension efforts. This collaboration is particularly crucial in regions like Iraq, where investment in mutual interests can significantly boost agricultural and research activities. To achieve this, it is essential to implement strategic recommendations that not only address existing challenges but also maximize available opportunities. One of the key recommendations is the establishment of a network that allows professionals to explore potential collaborations. For instance, creating online forums or discussion groups where experts can share their knowledge and experiences can lead to fruitful partnerships. Additionally, organizing activities such as newsletters, ambassador programs, or regular meetings can help in developing these networks over the long term. Stakeholder involvement in research planning is another critical aspect that should not be overlooked. While it is often the researchers who take the lead in this area, meaningful engagement from planners and funders can result in more inclusive and impactful research outcomes. By actively involving stakeholders in the decision-making process, a broader range of perspectives can be considered, leading to more robust and relevant research initiatives. Furthermore, collaborative training programs play a pivotal role in enhancing research impact. Unlike a reactive approach, where responses are triggered by specific events, proactive investments in training can better prepare individuals to tackle challenges and seize opportunities. By investing in initiatives that promote social capital and collaboration, the foundation for innovation and sustainable development can be strengthened.

In conclusion, creating a conducive environment for knowledge exchange, fostering collaboration among stakeholders, and implementing strategic recommendations are key elements in advancing agricultural and research activities in Iraq. By prioritizing these actions and investing in collaborative efforts, the region can unlock its full potential and drive meaningful progress in the field of agriculture and research.

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