



Investigating the gap between existing and required professional competencies of the agricultural extension agents and extracting their training needs in Iran

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ABSTRACT

For the agricultural sector to develop, a capable extension system is necessary. A literature review revealed the absence of comprehensive research in the field that considers all the competencies required by an agricultural agent to achieve optimal efficiency in their duties. To investigate this issue and identify the professional training needs of extension agents, a survey research method was applied. From 10,000 agricultural extension agents, 488 respondents were randomly selected across the country, and the Mann-Whitney test was used to analyze the variables. The results showed that most extension agents were employed despite having been educated in fields other than agricultural extension. Thus, to enhance the system, practical competencies alone are not sufficient. For better performance, extension practitioners must also be equipped with adequate theoretical knowledge (a combination of theory and practice). In terms of familiarity with professional competencies, agents had relatively good knowledge in agricultural sciences, conducting and directing needs assessments, organizing farm days, prioritizing needs and deficiencies, and coordinating participant observations. However, their technical knowledge was limited in areas such as fisheries, conducting brainstorming sessions, developing community-based organizations (CBOs), and conflict management.

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INTRODUCTION

Human resources are the most effective, important, and valuable factor in achieving organizational goals. Given their importance, many experts do not consider technology as a factor of superiority in global competition, instead highlighting that an organization's comparative advantage lies in the combination of human resources' capability, creativity, and performance (Erişen et al., 2009). As a key component of the extension system, an agent must continuously update their knowledge and skills to foster professional development. Providing better services to farmers and achieving agricultural development goals requires employing skilled experts with the highest levels of professional competence. In this context, professional competence refers to an agent's ability to meet professional needs and demands by applying an integrated set of knowledge, skills, and attitudes (Ahmadpour et al., 2021).

With the importance of agricultural development in Iran and the need for better management of agricultural extension, a new system was introduced and successfully passed its pilot stage in recent years. The hiring of 8,000 new extension agents, in addition to the 2,000 existing agents, created a significant opportunity for agricultural development in Iran. However, as is common in many developing countries, despite considerable investments, insufficient support policies and a lack of specialized workforce have hindered progress. Nevertheless, the agricultural sector remains one of the most profitable economic activities in Iran (Karim et al., 2014).

Christoplos concisely defines an agricultural extension system as "a system that facilitates farmers, farmer groups, and other actors' access to knowledge, information, and technologies; connects them with partners in research, education, agri-business, markets, and other relevant institutions; and helps them develop their own technical, organizational, and management skills and practices" (Christoplos, 2010). This critical task requires competence, which includes a set of knowledge, skills, and attitudes. The responsibility and quality of an

agricultural trainer can significantly aid village leaders and officials in supporting farmers and entrepreneurs in the agricultural field (Herawati and Susilo, 2019).

The Global Forum for Rural Advisory Services (GFRAS) defines competence as "the sufficiency of knowledge and skills that enable a person to act in a wide variety of situations. Competence is the ability to do something efficiently and effectively" (Davis, 2015). The competencies needed by extension agents can be broadly categorized into functional or technical skills and process or soft skills. A combination of both technical and process skills is essential for an extension agent to effectively fulfill their responsibilities (Davis, 2015; Suvedi and Kaplowitz, 2016).

There are generally two types of competencies: individual (comprising technical and behavioral competencies) and organizational (Lovett, 2021). Boyd categorized extension agents' competencies into five groups: organizational leadership, systems leadership, organizational culture, personal skills, and managerial skills (Boyd, 2004). Oven emphasized the importance of team building, budget management, modeling methods, change management, evaluation and accountability, training capacity, and the ability to effectively transfer technical knowledge to farmers (Oven, 2004). Another framework identified four key skill categories for extension agents: communication, technical knowledge, program design, and evaluation and monitoring (Lindner et al., 2003). Ahmadpour et al. (2015) listed seven important competencies: research, technical-professional, educational, managerial, personality, communication, and virtual technologies.

Interestingly, the skill level of extension agents is not related to factors such as gender, education, professional association, job position, or responsibility area. Emotional intelligence, interpersonal skills, adaptability to environmental changes, and resource management ability have the greatest influence on the competencies required for career success (Lakai et al., 2014). In a Nigerian survey, Demanang and colleagues found that

many extension workers had poor knowledge and communication skills (Demanang et al., 2015). Okeowo's research revealed that most agricultural extension personnel were highly educated, with 6-10 years of experience. They demonstrated relative efficiency in areas such as communication skills, planning demonstrations, evaluating trials, training farmers, and selecting contact farmers (Okeowo, 2015).

A study in Nepal highlighted the core competencies agricultural extension professionals need: communication, program planning, program implementation, personal and professional development, education and informational technology, diversity, program evaluation, and technical subject matter expertise. It also analyzed perceptions regarding the competency levels required for demand-driven extension and the methods for acquiring these competencies (Ghimire, 2016).

Training needs show significant correlations with the length of service and educational qualifications. Extension agents must possess sufficient competency and skills to understand the relationships between extension services and other agriculture-related organizations, recognize the influence of mass communication on society, and improve their competencies in the teaching-learning process (Al-Zahrani et al., 2017). In some cases, agents were mostly competent in using and disseminating agrochemical machinery, fertilizer distribution technology, and agronomic production techniques (Ayansina and Adeogun, 2017).

Key proficiencies include conducting farm and home visits, leading effective meetings, facilitating focus group discussions, and organizing community forums. However, significant competency gaps were noted in areas such as acquiring and allocating resources, using ICTs and web-based resources, report writing, and sharing results and impacts (Umar et al., 2017). Extension agents also need the ability to design and implement educational programs and manage information dissemination (Bahua, 2018). The current role of extension and advisory service providers focuses primarily on home and field visits, disseminating research results, and evaluating local extension programs (Chikaire et al., 2018).

In Cambodia, extension agents rated all competencies as highly or very highly important, but their perceived competency levels did not meet expectations (Suvedi et al., 2018). Saryam highlighted that program planning and implementation are crucial skills that extension professionals must develop to succeed (Saryam and Jena, 2019). Kaynakçi emphasized that extension agents have a wide range of roles and responsibilities, requiring professional, individual, and technical competencies to perform them effectively (Kaynakçi and Boz, 2019).

For better understanding of literature review, they have summarized through the table (1). As shown in the table, the bulk of literature can be categorized into four main aspects as the following:

Table 1
Summary of Literature Review.

Author(s)	Main aspect or issue	Main results
Boyd (2004)		1. Organizational leadership/ systems leadership/ organizational culture/ personal skills/ managerial skills
Davis (2015)	Categorization of competencies	2. Functional/ technical skills (soft skills)
Suvedi & Kaplowitz (2016)		3. Individual / organizational
Lovett (2021)		

Lindner et al. (2003)		
Oven (2004)		
Lakai et al. (2014)		1. Personal and professional development
Ahmadpour et al. (2015)		2. Technical knowledge
Ghimire (2016)		3. Emotional intelligence
Ayansina & Adeogun (2017)	requirements of extension agents	4. Organizational/system leadership
Bahua (2018)		5. Communication
Chikaire, et al. (2018)		6. Team building, focus group discussions
Kaynakçi and Boz (2019)		7. Management skills in the fields of; Resources, environment, groups, budget, change, information etc.
Saryam and Jena (2019)		8. Program planning, implementation, monitoring and evaluation
		9. Home and field visits
		10. Virtual technologies
Demanang et al. (2015)	Weaknesses of extension agents	1. Poor knowledge and communication
Umar et al. (2017)		2. Acquiring and allocating resources
		3. Use of ICTs and web-based resources
		4. Reporting
		They relatively are efficient in;
Okeowo (2015)	Strengths of extension agents	1. Communication skills
		2. Planning demonstration
		3. Evaluation of trials
		4. Farmers training
		5. Selection of contact farmers
		6. Use and dissemination of agrochemical machine

Although many studies have been conducted on extension agents' professional qualifications, comprehensive research that examines extensional, technical, and specialized agricultural competencies is limited. Most of the existing work has primarily focused on exten-

sional competencies. Drawing on the findings of previous research and adopting a comprehensive approach (as shown in Figure 1), this study aims to assess all the professional competencies necessary for extension agents to perform their duties effectively.

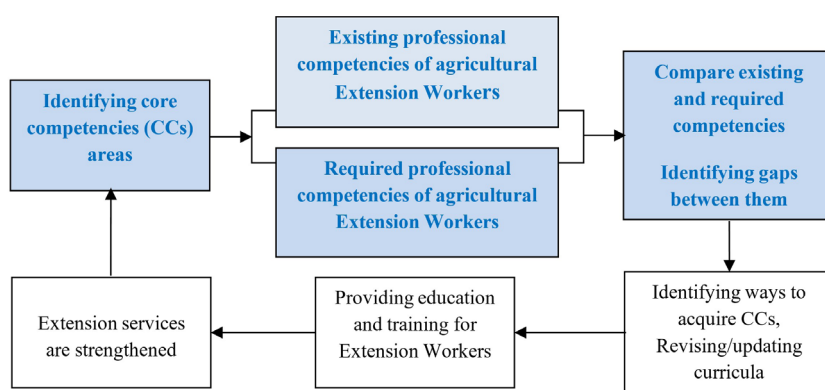


Figure 1. Conceptual Framework (Ghimire, 2016)

Despite the prominence of the issue of "Extension Agents' Competencies," there is a significant gap between the operational and theoretical aspects of the extension system in Iran, leading to performance inefficiencies. This is evidenced by the low Knowledge Penetration Coefficient in Iran's agricultural sector, which serves as an indicator of the extension system's effectiveness (Mir-rahimi and Mokher, 2021; Sadatinejad, 2021). Given this context, the key research questions are:

To what extent, and in which areas, is there a gap between the current and optimal levels of professional competencies of agricultural extension agents? What training needs do agricultural extension agents have to enhance their performance? The objectives of this research are:

1. Identifying the training needs of agricultural extension agents.
2. Prioritizing those needs

Methodology

To investigate the issue, a survey research method was used, and data were collected through researcher-made checklists in 2020. Following the conceptual framework present-

ed by Ghimire, this study adopted a comparative design to gather perceptual data on the current and required professional competencies of extension agents in Iran. The comparisons were made between the current and required levels of professional competencies across six categories: "Planning," "Implementing," "Evaluating," "Technical and Specialized Knowledge of Agriculture," "Communication and Information Technologies," and "General and Administrative Skills," as introduced by Suvedi and Kaplowitz (2016).

A questionnaire was designed with two major sections: (1) General information, and (2) Current and required competencies. The general information section covered variables such as age, education level, years of experience in extension services, major, and whether the respondents had taken core agricultural extension courses.

In the second section, the questions focused on 45 professional competencies identified from the literature review. These competencies were grouped into six main categories, and the reliability of the items was assessed using Cronbach's Alpha Coefficient (Table 2).

Table 2
Reliability Coefficient of Main Categories.

Categories	Number of items	Cronbach alpha
Program development competencies	11	0.924
Program implementation competencies	11	0.910
Program evaluation competencies	6	0.876
ICT competencies	5	0.753
Technical and specialized knowledge of agriculture	10	0.872
General and administrative skills	2	0.684

Using the following sample size formula and based on the last database, 448 persons out of 10000 the agricultural extension agents calculated as the sample size:

$$n = \frac{z^2 s^2}{d^2} = 3.8416 \times \frac{0.291}{0.0025} = 447.16 \approx 448$$

For sampling, we utilized the Ministry of Agriculture-Jihad's mapping system, which divides the country into five poles based on agricultural characteristics, rather than geographical ones. From each pole, one province was randomly selected. The sample size was then proportionally distributed across these provinces based on the number of extension agents in each province.

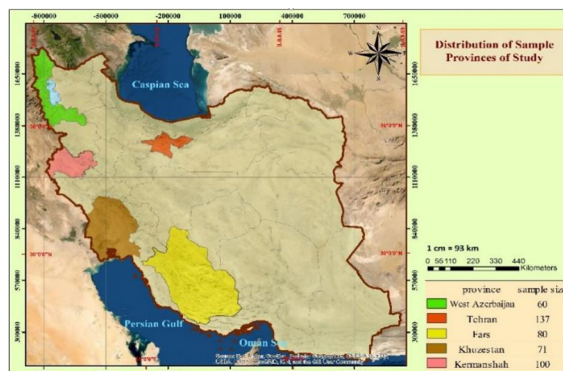


Figure 2. Sample Provinces in Iran. (Cartography: Authors)

The locations of the sample provinces are shown in Figure 2. As illustrated, the provinces included in the study are West Azerbaijan, Tehran, Fars, Khuzestan, and Kermanshah, from which 60, 137, 80, 71, and 100 individuals were interviewed, respectively.

Results and Discussion

General variables

To understand the general characteristics of the respondents, we examined variables such as age, experience, education, field of

Table 3

General variables. (n=448).

General Variables				
Variable	Group	Frequency	Percent	Mean
Age (years)	30-35 years	77	17.2	39.91
	36-40 years	209	46.6	
	41-45 years	96	21.4	
	Above 45 years	66	14.8	
Years of experience in agriculture	Less than 10 years	307	68.5	10.63
	10 to 20 years	107	23.9	
	Above 20 years	34	7.6	
Education level	Bachelor	221	49.4	----
	Masters and PhD	227	50.6	
Major	Agricultural extension	136	30.3	----
	Other disciplines	312	69.7	
Passing the course of principles of agricultural extension	Yes	344	76.8	----
	No	104	23.2	

Competencies

To effectively communicate with the local community, solve their problems, and transfer technical knowledge, extension agents must acquire a set of knowledge, attitudes, and skills known as extension competencies. These competencies include the ability to transfer technical knowledge to farmers,

study, and completion of extension principal courses. As shown in Table 3, 63.8 percent of the respondents were under 40 years old, and 68.5 percent had less than 10 years of work experience. Among the respondents, 49.4 percent held a Bachelor's degree, while 50.6 percent had a Master's or PhD. Approximately 30 percent graduated in agricultural extension, and 77 percent of the respondents had completed the "Agricultural Extension Principles" course at the university.

as well as skills in planning, implementing, evaluating, and utilizing new technologies, along with effective information and communication strategies. While definitions and applications of the term "professional competencies" vary among organizations based on their goals and objectives, they generally represent a critical component of workforce

performance. Professional competencies encompass the knowledge, attitudes, and skills that enable individuals to perform effectively in their professions (Zorzi et al., 2002).

The following tables (Tables 4 to 9) present two sets of information regarding different aspects of professional competencies: the first set pertains to the knowledge an extension agent possesses in their field, and the second set refers to their learning needs. These two sets are comparatively organized in the rows of the tables.

According to Tables 4 to 9, higher rates of the coefficient of variation in both knowledge and needs indicate lower levels of knowledge and needs for each item, and vice versa. The

last column in the tables shows the priority of each item in both sets of knowledge and needs. Note that if there is a mismatch between the number of items and the number of priorities, it is due to shared ranks. Additionally, the numbers 1-5 in the frequency column (in the header) indicate the following levels: very low, low, medium, high, and very high.

In this set of tables, there are six main categories, each containing several items related to professional competencies. It is evident that most of the competencies are concentrated in the categories of "Program Planning," "Program Implementation," and "Technical and Specialized Knowledge of Agriculture."

Table 4

Frequency Table of Professional Competencies and Coefficient of Variance: Program Planning.

Professional competencies: Program planning No A.*		Frequency						M	SD	CV	Priority
		1	2	3	4	5					
Conducting needs assessment	K.	2	15	36	166	202	27	3.43	0.85	0.2	10
	N.	3	1	43	97	254	50	3.69	0.80	0.2	9
Prioritizing needs and problems	K.	7	15	42	123	226	35	3.51	0.90	0.26	9
	N.	3	1	23	120	235	66	3.77	0.77	0.20	10
engaging stakeholders in programs	K.	7	13	50	83	225	70	3.66	0.97	0.3	8
	N.	3	5	59	102	176	103	3.7	1	0.27	4
Acquiring and allocating resources	K.	6	25	53	159	152	53	3.35	1.03	0.3	7
	N.	2	3	29	146	204	64	3.67	0.82	0.22	9
Conducting the Nominal Group method	K.	7	50	116	125	133	17	2.89	1.08	0.4	3
	N.	3	10	55	160	188	32	3.4	0.88	0.26	5
Conducting Community Forums	K.	9	69	87	120	140	23	2.91	1.16	0.4	2
	N.	3	23	46	130	177	69	3.5	1.04	0.30	1
Conducting Brainstorming exercises	K.	12	74	97	141	92	32	2.8	1.17	0.4	1
	N.	16	21	49	157	165	40	3.36	0.97	0.29	2
Identifying market opportunities	K.	19	47	61	176	130	15	3.01	1.01	0.3	4
	N.	11	4	42	140	170	81	3.65	0.92	0.25	6
Designing services based on Gender Analysis	K.	23	28	86	159	119	33	3.1	1.03	0.3	5
	N.	14	12	59	137	173	53	3.45	0.96	0.28	3
Developing Work Plans	K.	17	29	77	92	199	34	3.31	1.07	0.3	6
	N.	9	3	27	122	190	97	3.8	0.88	0.23	8
Developing Grant Proposals	K.	18	20	88	146	146	30	3.18	0.99	0.3	7
	N.	10	10	35	88	251	54	3.69	0.87	0.24	7

No A.* stands for "No answered", K for "Knowledge" and N for "Need"

In the first category (Table 4), extension agents demonstrate the most knowledge in “conducting needs assessments,” “prioritizing needs,” and “identifying stakeholders and involving them in programs,” as confirmed by Nowruzzi et al. (2017) and Ahmadpour et al. (2015). Conversely, the least knowledge is found in areas such as “brainstorming,” “community forums,” and the “nominal group method.”

In terms of educational needs, the most significant areas identified are “prioritizing

needs and problems,” “conducting needs assessments,” and “acquiring and allocating resources.” In contrast, “conducting community forums,” “conducting brainstorming exercises,” and “designing services based on gender analysis” represent the smaller number of educational needs. This observation is supported by the findings of Saryam and Jena (2019), Umar et al. (2017), Ghimire (2016), Okeowo (2015), Chikaire et al. (2018), Bahua (2018), Hamidi and Yaghoubi (2016), Rezaei and Rezavanfar (2008), and Hejazi et al. (2018).

Table 5

Frequency Table of Professional Competencies and Coefficient of Variance: Program Implementation.

Professional competencies: Program Implementation No A.*		Frequency						M	SD	CV	Priority
		1	2	3	4	5					
Conducting farm and home visit	K.	19	16	51	92	207	63	3.58	1	0.3	4
	N.	11	7	21	94	207	108	3.89	0.89	0.23	4
Method and Result Demonstration	K.	19	21	55	178	147	28	3.25	0.93	0.3	3
	N.	11	2	52	109	212	62	3.64	0.88	0.24	3
Organizing farmers' Field Schools	K.	21	15	89	128	151	44	3.28	1.02	0.3	2
	N.	14	6	47	63	204	114	3.86	0.97	0.25	2
Organizing field days	K.	17	20	33	100	251	27	3.54	0.90	0.2	6
	N.	11	7	43	65	199	123	3.89	0.98	.25	2
Establishing a model village	K.	19	32	77	118	155	47	3.25	1.1	0.3	1
	N.	10	13	62	94	160	109	3.66	1.09	0.30	1
Conducting meetings effectively	K.	16	17	69	106	166	74	3.49	1.08	0.3	2
	N.	9	5	32	98	175	129	3.89	0.95	0.24	3
Managing conflicts	K.	23	38	93	127	151	16	3.03	1.04	0.3	1
	N.	15	14	47	131	220	21	3.43	0.87	0.25	2
Time management	K.	17	12	60	104	201	54	3.52	0.97	0.28	4
	N.	10	2	32	86	203	115	3.91	0.89	0.23	4
Managing groups and team works	K.	17	16	36	117	206	56	3.58	0.95	0.26	5
	N.	10	6	27	85	230	90	3.85	0.86	0.22	5
Understanding group dynamics	K.	18	21	64	104	213	28	3.38	0.98	0.29	3
	N.	10	5	47	96	230	60	3.67	0.88	0.24	3
Writing Field Reports	K.	20	12	55	142	165	54	3.45	0.96	0.28	4
	N.	12	5	48	97	215	71	3.69	0.91	0.25	2

No A.* stands for “No answered”, K for “Knowledge” and N for “Need”

In the second category (Table 5), extension agents exhibit the highest levels of knowledge in “group management and teamwork,” “time management,” “field and home visiting,” and “field reports.” Conversely, the lowest knowl-

edge is found in “conducting a model village,” “conflict management,” and “holding meetings,” which aligns with the results of Chikaire et al. (2018), Nowruzzi et al. (2017), and Ahmadpour et al. (2015).

There is a high training need identified in “managing groups and teamwork,” “time management,” and “conducting farm and home visits,” while “creating a model village,” “conflict management,” and “writing reports” show a

lower need for training. These findings are further supported by the research of Saryam and Jena (2019), Umar et al. (2017), Ghimire (2016), Okeowo (2015), Chikaire et al. (2018), Bahua (2018), and Rezaei and Rezavanfar (2008).

Table 6
Frequency Table of Professional Competencies and Coefficient of Variance: Program Evaluation.

Professional competencies:		Frequency						M	SD	CV	Priority
Program evaluation		1	2	3	4	5					
No A.*											
Designing survey instrument	K.	20	20	80	205	101	22	3.06	0.90	0.29	2
	N.	11	14	66	153	170	34	3.33	0.93	0.28	1
Conducting surveys and personal interviews	K.	18	14	83	154	139	40	3.25	0.98	0.30	1
	N.	11	9	50	100	204	74	3.65	0.96	0.26	2
Conducting participant observations	K.	18	10	53	175	157	35	3.36	0.88	0.26	4
	N.	11	6	33	114	231	53	3.67	0.84	0.23	3
Conducting participatory rural appraisals	K.	25	15	80	183	123	22	3.13	0.90	0.29	2
	N.	17	6	41	102	174	108	3.78	0.97	0.26	2
Conducting focus group discussions	K.	17	10	55	136	187	43	3.46	0.92	0.27	3
	N.	9	5	36	76	224	98	3.85	0.90	0.23	3
Writing extension evaluation report	K.	19	12	75	139	166	37	3.33	0.96	0.29	2
	N.	10	4	31	77	207	119	3.93	0.90	0.23	3

No A.* stands for “No answered”, K for “Knowledge” and N for “Need”

In the third category (Table 6), extension agents demonstrate the most knowledge in “leading participants and focus group discussions,” while the least knowledge is found in “designing tools for surveying” and “conducting rapid assessments and rural participatory evaluations.” This finding is again confirmed by Chikaire et al. (2018), Nowruzzi et al. (2017), and Ahmadpour et al. (2015).

Regarding educational needs, the lowest rates

are observed in competencies such as “focus group discussions,” “writing extension evaluation reports,” and “sharing results and impacts.” In contrast, the highest rates of educational needs are identified in “designing surveys” and “conducting personal interviews.” These results are corroborated by the studies of Saryam and Jena (2019), Ghimire (2016), Okeowo (2015), Chikaire et al. (2018), Al-Zahrani et al. (2017), and Rezaei and Rezavanfar (2008).

Table 7
Frequency Table of Professional Competencies and Coefficient of Variance: Communication and I.T: Information Technologies.

Professional competencies:		Frequency						M	SD	CV	Priority
Communication and I.T (Information Technologies)		No A.*	1	2	3	4	5				
Making effective presentations	K.	16	10	88	119	162	53	3.37	1.02	0.30	2
	N.	5	6	42	104	196	95	3.75	0.94	0.25	3
Communicating effectively with community leaders	K.	9	14	43	175	158	49	3.42	0.92	0.27	4
	N.	3	7	29	79	211	119	3.91	0.92	0.23	5

Organizing extension campaigns	K.	8	34	85	172	108	41	3.08	1.06	0.34	1
	N.	3	3	68	79	207	88	3.69	0.98	0.27	2
Writing for mass media	K.	11	50	55	215	93	24	2.97	1.01	0.34	1
	N.	7	20	54	133	177	57	3.45	1.01	0.29	1
Use of information and communication technology	K.	8	1	83	164	138	54	3.37	0.93	0.28	3
	N.	3	4	41	61	204	135	3.96	0.94	0.24	4

No A.* stands for “No answered”, K for “Knowledge” and N for “Need”

In the fourth category (Table 7), extension agents show the highest knowledge in “effective communication with local leaders” and “use of information technologies,” while the minimum knowledge is observed in the other competencies. This aligns with the findings of Bahua (2018), Listiana et al. (2019), and Ahmadpour et al. (2015).

The need for training is particularly high in areas such as “writing for newspapers or mass media,” “making good use of information,” and “communication technology,” which is supported by the findings of Umar et al. (2017), Ghimire (2016), Okeowo (2015), Chikaire et al. (2018), Bahua (2018), Listiana et al. (2019), Hamidi and Yaghoubi (2016), and Rezaei and Rezavanfar (2008).

Table 8

Frequency Table of Professional Competencies and Coefficient of Variance: Technical and Specialized Knowledge of Agriculture.

Professional competencies: Technical and specialized knowledge of agriculture		Frequency							M	SD	CV	Priority
		No A.*	1	2	3	4	5					
Agronomy	K.	7	2	33	143	197	66	3.66	0.84	0.23	8	
	N.	4	1	14	83	191	155	4.09	0.82	0.20	9	
Horticulture	K.	8	14	81	172	129	44	3.25	0.97	0.30	4	
	N.	3	3	50	87	156	149	3.89	1.02	0.26	5	
Animal science	K.	8	11	114	151	100	64	3.21	1.06	0.33	2	
	N.	4	8	57	105	163	111	3.7	1.04	0.28	4	
Irrigation and modern irrigation systems	K.	8	12	89	200	106	33	3.13	0.91	0.29	5	
	N.	3	4	46	96	189	110	3.8	0.96	0.25	6	
Natural Resources and Watershed Management	K.	7	20	102	143	125	51	3.19	1.06	0.33	2	
	N.	4	15	67	101	160	101	3.6	1.1	0.31	2	
Machinery and mechanization	K.	8	16	66	187	151	20	3.21	0.88	0.27	7	
	N.	3	5	62	114	154	110	3.68	1.03	0.28	4	
Fisheries	K.	8	59	134	134	66	47	2.79	1.17	0.42	1	
	N.	5	48	88	98	141	68	3.21	1.23	0.38	1	
Agricultural Industries	K.	8	24	104	177	112	23	3.01	0.96	0.32	3	
	N.	6	13	50	141	142	96	3.58	1.04	0.29	3	
Plant Protection	K.	9	14	67	145	155	58	3.40	1	0.29	5	
	N.	4	9	28	54	220	133	3.99	0.93	0.23	8	
Soil Science and Nutrition	K.	7	14	75	172	150	30	3.24	0.92	0.28	6	
	N.	6	2	34	114	164	128	3.86	0.94	0.24	7	

No A.* stands for “No answered”, K for “Knowledge” and N for “Need”

In the fifth category (Table 8), the highest degree of knowledge is observed in “agronomy,” “mechanization,” and “soil science and nutrition,” while the lowest knowledge levels are found in the fields of fisheries, livestock, and natural resources. These findings align with those of Hamidi and Yaghoubi (2016), Nowruzi et al. (2017), Bakhshi and Zamani (2012), Ahmadpour et

al. (2015), Chikaire et al. (2018), Lovett (2021), and Asadi et al. (2004).

Additionally, there is a greater need for training in “agricultural industries,” “plant protection,” and “soil sciences and nutrition” compared to “agronomy,” “horticulture,” and “animal sciences.” These results are consistent with the studies conducted by Saryam and Jena (2019), Ghimire (2016), Chikaire et al. (2018), and Rezaei and Rezavanfar (2008).

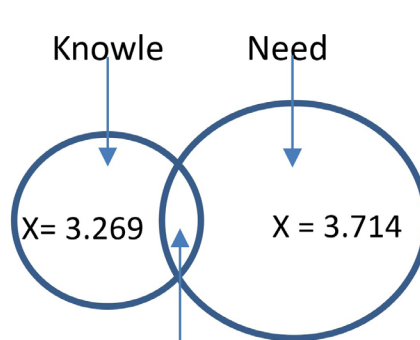
Table 9
Frequency Table of Professional Competencies and Coefficient of Variance: General and Administrative Skills.

Professional competencies: General and administrative skills		Frequency						M	SD	CV	Priority
		No A.*	1	2	3	4	5				
Familiarity with English	K.	10	19	86	201	88	44	3.12	0.98	0.31	1
	N.	3	7	51	120	183	84	3.64	0.97	0.27	1
Familiarity with administrative correspondence	K.	8	14	43	121	188	74	3.6	0.98	0.27	2
	N.	4	6	18	64	204	152	4.08	0.88	0.21	2

No A.* stands for “No answered”, K for “Knowledge” and N for “Need”

In the sixth category (Table 9), “familiarity with administrative correspondence” exhibited the highest degree of knowledge, while “English skills” had the lowest. These findings are also reflected in the studies of Hamidi and Yaghoubi (2016), Hejazi et al. (2018), Ahmadpour et al. (2015), and Asadi et al. (2004). The greatest need for training is concentrated

in “familiarity with administrative correspondence,” a finding supported by Hamidi and Yaghoubi (2016), Rezaei and Rezavanfar (2008), and Hejazi et al. (2018). Due to the extensive data in the aforementioned tables, we decided to clarify the information through a schematic figure, represented as Figure 3.



Area of perfect performance: 4.4% out of 45 programs are in the area in which agents have adequate knowledge (theoretical and practical) in the field.

Figure 2. schematic summary of tables 4 to 9

As previously mentioned, a high coefficient of variation in an item within the knowledge set indicates lower knowledge in that area. Consequently, a greater need for training should logically be present in these areas. However, as illustrated in Table 10, we observe minimal training needs in most cases,

which contradicts this expectation. In other words, areas with lower knowledge should correlate with higher learning needs, yet we find less demand for training in these fields. This pattern of coinciding lower knowledge with lower training needs is also evident in several other items.

Table 10
Summary Table of Professional Competencies.

Main categories	Less knowledge	More knowledge	Less need	More need
Program planning	Brainstorming Community forums Nominal group methods	Needs assessment Needs priority Engaging stakeholders	Brainstorming Community forums Service designing	Needs priority Needs assessment Resource allocation
Program implementation	Model village Conflict management Holding meetings	Teamwork Time management Home & field visit Field reports	Model village Conflict management Field repots	Teamwork Time management Home & farm visit
Program evaluation	Tools design for survey Participatory appraisals	Lead participants Focus groups	Survey designing	Focus groups Extension evaluation report Participant observation
Communication and IT	All other items	Communication with locals Use of IT	Writing for mass media	Communication with locals Use of IT
Technical and specialized knowledge of agriculture	Fisheries Livestock Naturel resources	Agronomy Mechanization Soil sciences	Natural resources Fisheries Agri. industries	Agronomy Plant protection Soil sciences
General and administrative skills	English skill	administrative correspondence	English skill	administrative correspondence

The reason for this discrepancy may stem from a lack of utility or awareness regarding the benefits of certain tools and capabilities. It seems that the latter is more applicable, as many extension agents lack information about the mechanisms and advantages of these items, leading to a diminished perceived need for learning them. If they were aware of the applications of these items, they would likely recognize them as educational needs.

This reasoning is further supported by the fact that 70 percent of our sample have studied a major other than extension, and 23 percent have never completed a course in extension principles. Consequently, they may not fully understand what they truly need for their professional de-

velopment. Conversely, some agents possess significant knowledge in a specific area but still feel a need for further learning. These experienced agents understand their work and domains well and recognize that additional training is essential for improving their efficiency.

Means comparison

As previously mentioned, the Mann-Whitney test was employed to compare the knowledge and needs levels of extension agents based on their professional competencies and to determine their Training Priorities (T.P.). As illustrated in Table 11, significant differences exist between the levels of knowledge and the rates of needs, with the exceptions of “Identifying Stakeholders” and “Engaging them in Programs.” The data indicate

that the need levels are significantly higher than the knowledge levels across all items, highlight-

ing a clear necessity for professional training for extension agents.

Table 11
Training Priorities.

Professional Competencies	Z	p-value	T.P.	Professional Competencies	Z	p-value	T.P.
Personal interviews	-6.23	0.00	25	Needs assessment	-3.95	0.00	43
Participant observation	-5.67	0.00	31	Prioritizing needs	-4.01	0.00	42
Participatory appraisal	-9.79	0.00	2	Engaging stakeholders	-0.82	0.42	45
Focus groups	-6.23	0.00	26	Resource allocation	-5.07	0.00	37
Extension reports	-9.30	0.00	7	Nominal group method	-7.06	0.00	20
Making presentation	-5.60	0.00	32	Community forums	-7.41	0.00	18
Communicate with locals	-8.28	0.00	11	Brainstorming exercises	-7.42	0.00	17
Extension campaigns	-8.72	0.00	8	Market opportunities	-8.71	0.00	9
Writing for media	-7.13	0.00	19	Service designing	-5.12	0.00	36
Use of IT	-9.46	0.00	3	Work plan	-6.43	0.00	23
Agronomy	-7.62	0.00	16	Developing a grant proposal	-8.24	0.00	12
Horticulture	-9.44	0.00	4	Farm & home visits	-4.39	0.00	39
Animal sciences	-7.01	0.00	22	Method & result demonstration	-6.32	0.00	24
Irrigation systems	-10.3	0.00	1	Farmer's field schools	-8.53	0.00	10
Natural resources	-5.69	0.00	30	Field days	-6.16	0.00	27
Mechanization	-7.03	0.00	21	Model village	-5.45	0.00	34
Fisheries	-5.31	0.00	35	Effective meetings	-5.52	0.00	33
Agri. Industries	-8.16	0.00	13	Conflict management	-5.75	0.00	29
Plant protection	-9.32	0.00	6	Time management	-5.82	0.00	28
Soil sciences	-9.36	0.00	5	Teamwork	-4.32	0.00	40
English skill	-8.11	0.00	14	Group dynamics	-4.24	0.00	41
Administrative correspondence	-7.63	0.00	15	Field reports	-3.80	0.00	44
Designing survey tools	-4.66	0.00	38	-	-	-	-

* $p < 0.05$

Conclusions

For an organization, human resources represent a crucial advantage and are the most effective, important, and valuable factors in achieving organizational goals (Namdar et al., 2013). With the establishment of the New Extension System in Iran, 8,000 agents were integrated with existing personnel to assist in agricultural development within local communities. At that time, a

critical question arose regarding their readiness and ability to perform key tasks. Consequently, the fundamental focus of our research was on the competencies necessary for extension agents and the gap between their existing and required professional competencies. Given the lack of comprehensive research in this field in Iran, with existing literature concentrating on specific aspects, there was a genuine need to develop a compre-

hensive framework that considers all individual and organizational dimensions of an extension agent.

Descriptive statistics indicate that a significant portion of the agents have less than 10 years of experience, highlighting the necessity to empower them through professional qualifications to provide suitable services in the field. In terms of familiarity with professional competencies, agents demonstrated relatively good knowledge in agricultural sciences, conducting and directing needs assessments, organizing farm days, prioritizing needs and deficiencies, and facilitating participant observations. However, technical knowledge in fisheries, conducting brainstorming sessions, developing community-based organizations (CBOs), and conflict management was found to be minimal among the extension agents. It is evident that in areas where agents possess less knowledge, there is a greater need for training.

Due to resource limitations, it is highly recommended that the Staff Training Office within the Ministry of Agriculture Jihad introduce educational programs for extension agents based on the findings of this research.

Comparison of means indicates a significant gap between the existing and required professional competencies among extension agents. The results reveal a mismatch between courses offered and the actual training needs of localities. Older extension agents may be less willing to participate in empowerment programs, whereas younger agents, who are early in their careers and lack sufficient field experience, have a pressing need for such training. As 70% of respondents graduated in fields other than agricultural extension, they may not be adequately equipped to formulate, implement, and evaluate programs requiring a theoretical background. Therefore, special initiatives, such as think-tank meetings or collaborative sessions between researchers and academic experts, are recommended to clarify the role of agricultural extension agents in agricultural development and explore ways to enhance their performance in the field.

Based on our findings, it is essential to conduct training programs in the following areas: Irrigation and Modern Irrigation Systems, Rapid Rural Appraisals (RRA), Participatory Rural Appraisals

(PRA), Information and Communication Technologies, Conducting Brainstorming Exercises, Establishing Model Villages, Conflict Management, Conducting Surveys and Personal Interviews, Organizing Extension Campaigns, Fisheries, and English language courses.

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