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A Root Analysis of The Factors Limiting Multifunctional Agriculture in Iran

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Abstract

Despite numerous studies on multifunctional agriculture, the development of this practice in developing countries, including Iran, remains uncertain. The purpose of this qualitative study was to analyze the underlying factors limiting multifunctional agriculture in western Iran. The study population consisted of 12 purposefully selected experts and farmers involved in multifunctional agriculture in Dehloran Township, Iran. Data were collected through semi-structured interviews, following a root cause analysis approach proposed by the American Society for Quality (ASQ). The analysis of the interviews identified 19 direct causes categorized into six groups, along with 234 superficial causes. Additionally, 12 root causes that significantly impact the problem were identified. Using the GUT (Gravity, Urgency, and Tendency) decision matrix and Pareto diagram for scoring and prioritizing, eight key root causes emerged: Absence of research laboratories. Inefficient supervision of agricultural processes. Lack of guaranteed support for all agricultural products in the region. Failure to promote multifunctional agriculture. Failure to formulate strategic policies based on regional conditions. Inefficient policies for training multifunctional agricultural experts. Lack of targeted support plans. Inadequate policy-making to support multifunctional farmers. By addressing and rectifying these root causes, not only can superficial causes be eliminated, but also the development of multifunctional agriculture can be expedited.

Keywords:
Multifunctional agriculture; root causes analysis (RCA(; five whys technique; GUT decision matrix; Iran

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INTRODUCTION

Agriculture plays a vital role in human survival and development (Laurett et al., 2021; Yu et al., 2019) by providing the essentials for human livelihood, including the supply of food, freshwater, and ecosystem services (Ikram et al., 2020). However, agriculture has undergone significant changes and encountered various challenges in recent decades (Wójcik-Leń et al., 2018; Wilson, 2009). These challenges pose a threat to the future of agriculture, the environment, natural resources, ecosystem performance, and food security (Frei et al., 2020). Moreover, the pursuit of maximizing production exerts pressure on the environment (Renner et al., 2020). In response to these concerns (Buysse et al., 2007), significant efforts have been made to transition towards multifunctional agriculture (Moon, 2015).

In addition to its primary role in food and fiber production, multifunctional agriculture encompasses a range of other activities. These include landscape conservation, environmental protection, natural landscape preservation, natural resource management, water management, employment generation, biodiversity conservation, sustainable management of renewable resources, and the promotion of vitality in rural areas (Borrelli, 2016; Spataru et al., 2020; Yu et al., 2019).

Despite the paramount importance of agriculture and the imperative to consider not only economic goals but also social, cultural, and environmental objectives (Hendrickson et al., 2008), the agriculture sector faces increasing resource pressures for food production, leading to instability (Amissah-Arthur and Miller, 2002). This instability can trigger crises that run counter to the aims of agricultural development (Burandt and Mölders, 2017). Therefore, identifying the root causes of these crises is a crucial step toward process control and problem-solving (Jayaprasad et al., 2016).

Numerous studies have been conducted in the field of multifunctional agriculture over recent decades, representing a new approach to sustainable rural development (Argent, 2020). Nevertheless, its practical implementation has faced limitations (Moon, 2015). A review of multiple studies in this domain has revealed that the constraints of multifunctional agriculture originate from various causes. However, these studies often suffer from methodological flaws, and there exists no consensus regarding the underlying causes. Moreover, these studies have primarily focused on superficial reasons, whereas the primary objective of the present study is to identify all direct, superficial, and root causes of constraints in multifunctional agriculture.

Lack of cooperation between different agricultural sectors, driven by a purely profit-oriented perspective (Dessein et al., 2013). A narrow focus on productivity without due consideration of environmental and social concerns (Moon, 2015). Inadequate education, insufficient rural infrastructure and facilities (Peng et al., 2017). Limited promotion of pilot projects and restricted access to microcredit (Bretagnolle et al., 2018). Neglect of non-market functions (Parra-López et al., 2008). Lack of awareness (Renting et al., 2009). Rigid and prescriptive management approaches (Hodbod et al., 2016; Li et al., 2021). Weak agricultural monitoring systems (Wilson, 2009). Inactivity, high fixed agricultural costs, and dispersion of rural areas (Romstad et al., 2000), leading to low participation rates among farmers and villagers in multifunctional agricultural activities (Heringa et al., 2013). These factors collectively contribute to the challenges faced in the development of multifunctional agriculture.

In general, a review of studies reveals that the agricultural values and functions of multifunctional agriculture vary from one region to another, influenced by factors such as climate conditions, access to water resources, availability of suitable agricultural tools, land management practices, the political climate within the community (Spataru et al., 2020), financial status of farmers and villagers, personal characteristics of farmers, and other

situational and governmental conditions (Heringa et al., 2013). In Iran, despite its vast potential and climatic diversity, the consumption of water and natural resources predominantly follows production-focused approaches, which may potentially lead to irreversible environmental disasters (Eftekhari and Shadparwar, 2018).

The history of agriculture in the western region of Iran dates back to the sixth millennium BC (Hole et al., 2020). The region boasts significant agricultural potential, characterized by climatic diversity, including a hot and dry climate in the east and a temperate climate in the west. It features orchards, diverse landscapes, mountainous areas in the western part, extensive agricultural lands, deserts, natural pastures, and the presence of dams such as Maymeh and Doiraj in the east. However, despite these abundant resources, the transition from a production-centric approach to multifunctional agricultural activities has been slow in recent decades. The region's agricultural practices have only taken initial steps toward multifunctional agriculture. This implies that the majority of agricultural stakeholders have primarily focused on production, striving to maximize output, often without sufficient consideration for other dimensions and functions. The current production landscape does not align with the objectives of multifunctional agricultural development (Kheirollahi et al., 2021).

The results of agricultural studies are often influenced by a multitude of factors. Despite the technological advancements and the increasing emphasis on environmental, cultural, and social considerations in agriculture, there remains a perplexing trend in the Dehloran Township region. Farmers in this area seem to be predominantly focused on productive agriculture, driven by the goal of maximizing production, often at the expense of other dimensions and functions within agriculture. This one-dimensional focus raises a critical question: Why are farmers in this region primarily concentrating on productive agriculture while neglecting other important aspects? To unravel this enigma and gain a comprehensive understanding of the factors contributing to this trend, this study has a clear objective: to identify and analyze all the direct, superficial, and root causes of constraints that hinder the development of multifunctional agriculture in Dehloran Township. Employing a root cause analysis (RCA) approach, this study aims to delve deep into the underlying reasons behind this phenomenon. Through a thorough investigation, this research hopes to illuminate the complex factors at play and provide insights that can pave the way for more balanced and sustainable agricultural practices in the region (Figure 1).

This study represents a crucial step toward conducting in-depth research to uncover the root causes behind the underdevelopment of multifunctional agriculture in the area.

METHODOLOGY

Activities and issues often require a careful examination of their underlying causes (Suárez-Barraza and Francisco, 2019). In this qualitative study, the RCA (Root Cause Analysis) technique was employed to analyze the root causes of limiting factors in multifunc-

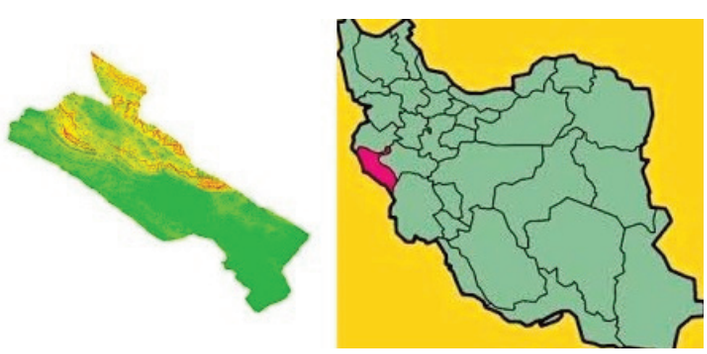

Figure 1. Location of Ilam Province in Iran and the Township under study

tional agriculture. To better understand this technique, it's essential to recognize the distinction between three categories of causes: symptoms, direct causes, and root causes.

Symptoms represent the visible and apparent evidence of a problem. Direct causes are the immediate and clear reasons behind these symptoms, but they should not be confused with root causes. Removing or addressing only symptoms or direct causes may provide temporary relief, but the problem is likely to persist (Rosenfeld, 2014). Root causes, on the other hand, are the fundamental and underlying factors that give rise to the problem. By identifying and addressing root causes, the issues at hand can be effectively resolved (Suárez-Barraza and Francisco, 2019).

In line with the American Quality Association (ASQ) approach, the RCA technique employed in this study followed six steps: defining the problem, identifying possible direct causes, determining the root causes, proposing solutions, implementing those solutions, and measuring and evaluating the outcomes (Andersen et al., 2013). However, it's important to note that this study primarily focused on the identification of root causes related to multifunctional agricultural constraints, and therefore, the presentation of solutions was not within the scope of this research. Consequently, only the first three steps of the RCA technique were carried out (Table 1).

Step 1. Problem definition

Based on the situation of multifunctional agricultural components in Dehloran Township (where agriculture had a relatively low degree of multifunctionality) (Kheirollahi et al., 2021), the main problem was partially clarified. We selected members for the RCA group by considering criteria such as participation, motivation, ability to cooperate, and possession of sufficient knowledge and information from various facets of the problem. We used a set of criteria (Patton, 2001) to guide the selection process. We initiated contact with the director of the agricultural organization for Dehloran Township and requested that they compile a list of experts and multifunctional farmers. The agricultural organization director provided a list comprising ten experts and two farmers. All 12 individuals agreed to participate in the study.

Step 2: The direct causes

In this step, information was collected from the list of direct causes (first-level causes) of the problem through semi-structured interviews conducted in three sessions.

Session 1: During an interview with the RCA group, 54 potential causes were identified.

Session 2: Approximately 11 days after data collection, a meeting was convened with the RCA group to further refine and expand the list of potential direct causes. During this session, 43 new potential causes, independent of the previous 54 causes, were identified. Through continuous comparison and consolidation of findings from the first session (54 causes) and the second session (43 causes) after a total of 12 interviews, a comprehensive list of 97 potential direct causes was compiled.

Session 3: Through a process of review, categorization, merging/refining, and elimination of similar and unrelated issues, 14 causes from the initial 54 causes of the first stage and five causes from the 43 identified in the second stage were singled out. By comparing these causes in terms of their similarities and differences, six categories were formed. Qualitative content analysis was employed for data analysis, utilizing a conventional approach (Hsieh and Shannon, 2005) with two stages of open and axial coding conducted in Max-QDA (v 2020).

Upon completion of the second step, in order to comprehend the relationships among the identified direct causes, a graphic radar diagram was created. Additionally, the fishbone diagram tool was employed to visualize these relationships, as diagrams are commonly recognized as more explicit and

Table 1

Steps of Root Cause Analysis and Main Tools of Analysis

Steps	Tools	Application of tools
Define the problem	-Gantt Chart-interview-Survey	-Visualize the project plan and develop a detailed plan-Powerful approach in gathering verbal information from people involved in the event-Collect data related to people's attitudes, feelings and opinions
Find the direct causes	-flowchart-Brainstorming-High level mapping-Fish bone diagram	-Capture the flow of activities in a process-Creating as many ideas as possible to find different solutions-Process mapping in order to understand effective issues and forces and surroundings
		-Systematic analysis of the causes of a problem
Find the root causes	-Cause and effect tree - Five Whys technique -Fault tree analysis-Scatter chart-Problem concentrationdiagram -Pareto analysis-Histogram	-Assisting analyses of different paths of problem occurrence in the system-Identifying the causes of each level from the previous level to reach the main causes-Demonstrating the connection between causes and problems -Showing the relationship between two reasons-Help revealing the problem patterns and link the problem to physical locations-Representing a graphic display as a quantitative display of information-Demonstrating data distribution, changes and resolution
Provide a solution(s)	-Flowchart-Survey -Interview- Brainstorming-Benchmark -The "Why Not" principles	-Capturing the flow of activities in a process-Collecting data related to the attitudes, feelings, and opinions of respondents-Adopting a powerful approach in gathering verbal information from people involved in the event-Creating as many ideas as possible to find different solutions -Determining the criteria for processing and comparing with other modeling -Identifying behaviors that have more external harm than internal benefit
Implement the solution/ Take action	-Impact effort matrix-Force field analysis	-Identifying and applying simple and effective decision solutions-Conducting performance appraisal of planned settings by confronting opposing forces or increasing desirable forces
Measure and evaluate	-Pilot study	-Conducting a pilot study to implement a complete solution to realize the effects of a proposed solution

Source: Andersen et al., 2013

effective tools for representing the causes of problems (Suárez-Barraza and Francisco, 2019). X-Mind software was utilized to design mind maps based on the fishbone technique.

Step 3: Find the root causes

The purpose of this step is to delve deeper into the direct reasons and uncover the root cause. A combination of the Five Whys technique, recognized as one of the most basic and effective tools, along with Pareto analysis, was employed to identify the root causes of the problem (Andersen et al., 2013). Twenty-one days after the third session, the authors visited the RCA group and presented the fishbone diagram derived from the second step, along with a list of all direct causes (19 causes of the first level categorized into six categories). The group members were instructed to identify the causes at the second and third levels through a deductive process, gradually tracing the causes back to their roots (Ishikawa, 1985). In this way, the causes at the second level were determined to originate from those at the first level. Subsequently, by identifying the causes at the third level, which were the outcomes of the second-level causes, the question "why" was repeatedly posed until no new insights could be gained (Figure 2).

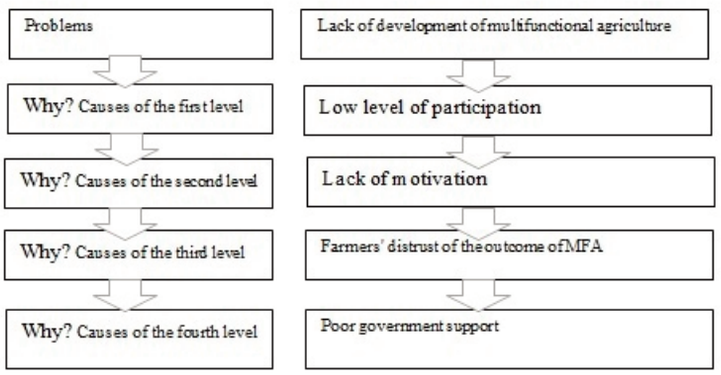

Figure 2. The Protocol for identifying root causes with example

In total, after conducting four rounds of interviews and identifying the superficial and root causes of the problem, using the GUT decision matrix (Gravity, Urgency and Tendency) with a score of 1 to 5, the root causes were ranked and prioritized by the RCA group. The causes would be solved based on their priority (de Souza, 2010). The GUT matrix score (1 to 5) were interpreted as follows:

1. This is not an important and urgent cause, and over time, if not addressed, it will not make the problem worse.
2. This is a slightly important and slightly urgent cause that only makes the problem worse in the long run.
3. This is an important and urgent cause that makes the problem worse in medium term.
4. This is a very important and very urgent cause that makes the problem worse in a short time.
5. This is an extremely important and extremely urgent cause which, if not addressed in time, will quickly worsen the situation.

Then, Pareto diagram was used to understand the prioritization of root causes (Rosenfeld, 2014). Pareto diagram with information categorization and prioritization show decision makers where to focus their efforts and for what reasons (de Souza, 2010).

RESULTS

Step 1: During an interview with the RCA group to solicit their opinion on the problem, consensus was reached regarding the issue of "multifunctional agricultural limiting factors in Dehloran."

Step 2: Following an analysis of the data collected from interviews with the RCA group, 19 initial codes were identified and categorized into six groups. The table (Table 2) displays the frequency and percentage of codes provided by the interviewees.

Based on the findings, among the six categories of infrastructural, social, individual, economic, climatic, and cultural causes, the infrastructure category had the highest impact, accounting for 26.80 percent of the total scores. It was followed by the social, economic, and personal categories with 24.74, 18.56, and 17.53 percent, respectively, as the most important reasons affecting the limitation of multifunctional agriculture in Dehloran. Although the climatic and cultural categories also had a direct impact on the problem, their contributions were 10.31 and 2.06 percent, respectively, which were relatively minor.

Moreover, out of the 19 reasons at the first level, five reasons ("poor access of farmers to services, facilities, and new agricultural technologies," "failure to address farmers' demands," "low level of participation," "low personal awareness," and "lack of equipment and machinery") were identified as the most significant direct causes of the problems (Table 2). Other causes were also identified with varying degrees of influence on the problems. According to the results, farmers'

Table 2

Frequency of Codes That Refer the Concepts of Direct Causes of the Problem

Factor	Percentage of each factor	code	Direct causes	Frequency	Percentage
Infrastructure	26.80	Infrastructure1 Infrastructure2 Infrastructure3 Infrastructure4	Poor accessAbsence of related industriesLack of equipment and machineryInadequate land conditions	1,2,3,5,6,7,8,10,12 1,2,4,51,3,4,6,7,8, 92,3,6,9,10,12	9.286.194.127.22
Climatic	10.31	Climate 1 Climate 2 Climate 3	Natural hazards-DroughtDifferences of climatic conditions	4,7,91,3,4,9,109,10	3.09 5.152.06
Individual	17.53	Individual1 Individual2 Individual 3	Low level of individual skillsLow individual cognition Low Mutual understanding between Farmer and Responsible	1,5,6,9,10,113,4,7, 9,10,11,121,2,4,6	6.197.224.12
Social	24.74	Social 1 Social 2 Social 3 Social 4	Low level of participation Low Welfarelack of belief in Abilityfailure to pursue demands	2,3,4,7,8,10,111,3, 122,3,7,8,9,112,3, 5,6,7,9,10,12	7.223.096.19 8.25
Economic	18.56	Economic 1 Economic 2 Economic 3 Economic 4	Low financial efficiencyLow capitalInefficient marketing-Low pricing / high inflation	1,2,5,7,8,9 3,4,6,72,3,5,7,103, 6,8	6.194.125.153.09
Cultural	2.06	Cultural 1	culture	7,8	2.06

customs affected the execution of multifunctional agricultural processes; however, compared to other direct causes, it had a smaller impact on the problem. To illustrate the most and least significant direct causes, a radar graphic diagram (spider diagram) was utilized. This diagram integrates various concepts across different dimensions (Wong, 2006) (Figure 3).

At the end of the second step, to understand the relationships between the causes, Figure 4 was drawn.

Step 3: After examining the causes of the direct reasons, 234 causes (19 direct causes at the first level, 58 causes at the second level, 82 causes at the third level, 51 causes at the fourth level, 18 causes at the fifth level, two causes at the sixth level, and four causes at the seventh level) were diagnosed. The RCA group categorized the causes into 12 root causes and four main categories: extension, education, research, and management. These 12 root causes represent the same limiting factors of multifunctional agriculture. If they are removed or corrected, not only will other superficial causes be rectified, but it will also aid in resolving the problems and advancing the development of multifunctional agriculture. However, each of them differs in terms of gravity, urgency, and tendency (Table 3).

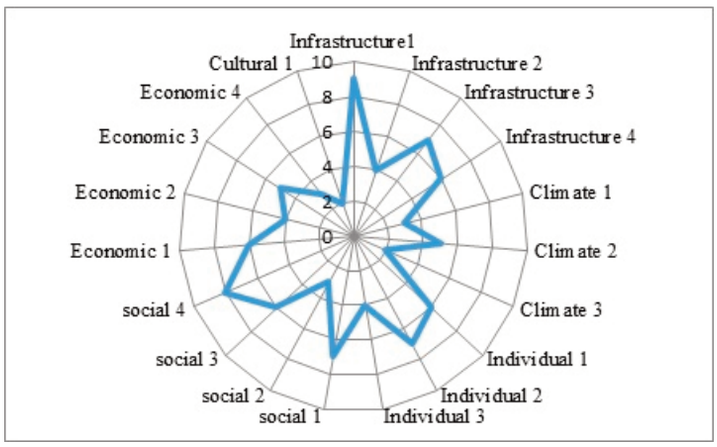

Figure 3. Radar Frequency of Reference Codes to the Direct Causes of the Problem

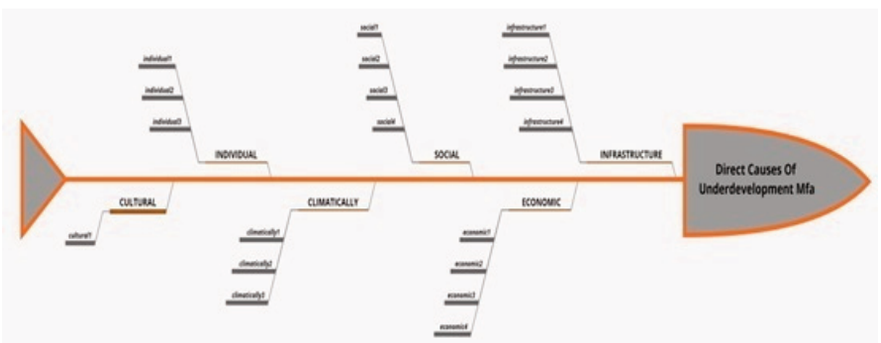

Figure 4. Direct Causes of the Problem (Fish Bone Diagram)

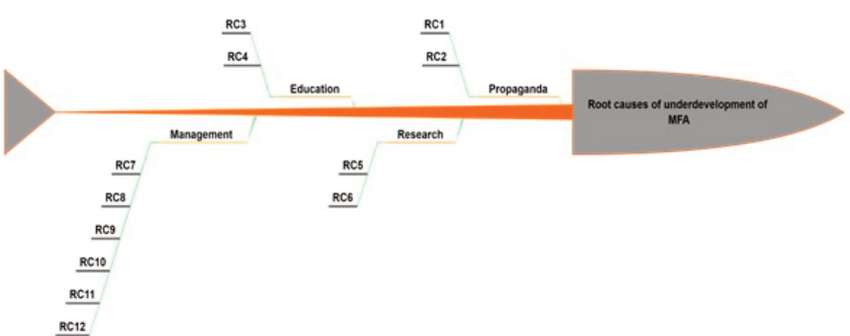

Figure 5. Root Causes of the Problem (Fish Bone Diagram)

According to Table 3, "absence of research laboratory" with 100 points is the first priority for problem-solving, followed by "Inefficient supervision of the agricultural process" with 80 points, and "Lack of guaranteed support for all agricultural products in the region" with 64 points. Thus, these mentioned reasons are crucial for the development of multifunctional agriculture. If no immediate action is taken to eliminate or correct them, the problems will worsen quickly, or at least in the short term. Figure 5 illustrates the relationships between the root causes.

To make a distributive comparison and to better understand the selected root causes according to the GUT criteria, the results are

Table 3
Assess the Gravity, Urgency and Tendency of the Root Causes of the Problem

Root causes	Code	Gravity	Urgency	Tendency	Assessment G * U * T	Ranking
Inefficient public information work	RC1	3	4	1	12	11
Failure to introduce multifunctional agriculture	RC2	4	3	5	60	4
Lack of attention to teaching multifunctional agricultural concepts in vocational schools and universities	RC3	2	2	2	8	12
Poor performance of the agriculture extension system	RC4	2	3	3	18	9
Paucity of applied researches in the field of multifunctional agriculture	RC5	2	2	4	16	10
Absence of research laboratories	RC6	5	4	5	100	1
Inefficient policies to train multifunctional agricultural experts	RC7	5	3	2	30	6
Failure to formulate strategic policies according the region status	RC8	4	4	3	48	5
Poor policy-making to support multifunctional farmers	RC9	4	3	2	24	8
Lack of guaranteed support for all agricultural products in the region	RC10	4	4	4	64	3
Inefficient supervision of agricultural process	RC11	4	5	4	80	2
Lack of targeted support plans	RC12	3	3	3	27	7

shown in the Pareto diagram (Figure 6).

As shown in Figure 6, after determining the breaking point (where the cumulative frequency percentage on the graph levels off), eight important root causes with the greatest impact on the problem were identified. These causes are as follows: 1) Absence of research laboratories; 2) Inefficient supervision of the agricultural process; 3) Lack of guaranteed support for all agricultural products in the region; 4) Failure to introduce multifunctional agriculture; 5) Failure to formulate strategic policies according to the region's status; 6) Inefficient policies for training multifunctional agricultural experts; 7) Lack of targeted support plans; and 8) Poor policy-making to support multifunctional farmers. The stages of root analysis of multifunctional agricultural limiting factors in Dehloran Township, after performing the three main steps of RCA, are shown in Figure 7.

DISCUSSION

Based on the results, despite the long history of agriculture in the region and the existing potentials, farmers do not have access to basic services and facilities such as healthy agricultural inputs, laboratories, suitable seed varieties, and product marketing. As mentioned by Peng et al. (2017), the lack of infrastructure and access to facilities and services have been effective reasons for the lack of development of multifunctional agriculture. There is also evidence that farmers have failed to pursue their demands, such as access to the latest equipment and technologies, which has a direct impact on exacerbating the problem.

Farmers' poor knowledge of the concept and benefits of multifunctional agriculture, as emphasized by Wilson (2009), has led to a lack of development of various agricultural functions. Eliminating or correcting these

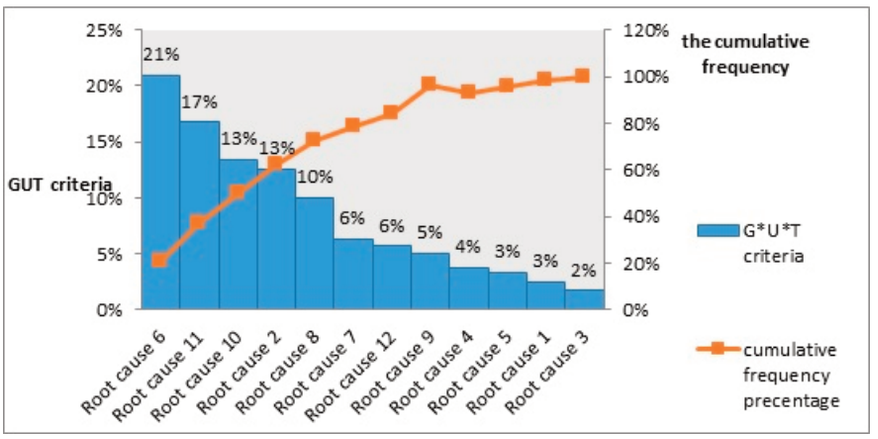

Figure 6. Descending Ranking of the Root Causes of the Problem (Pareto Diagram)

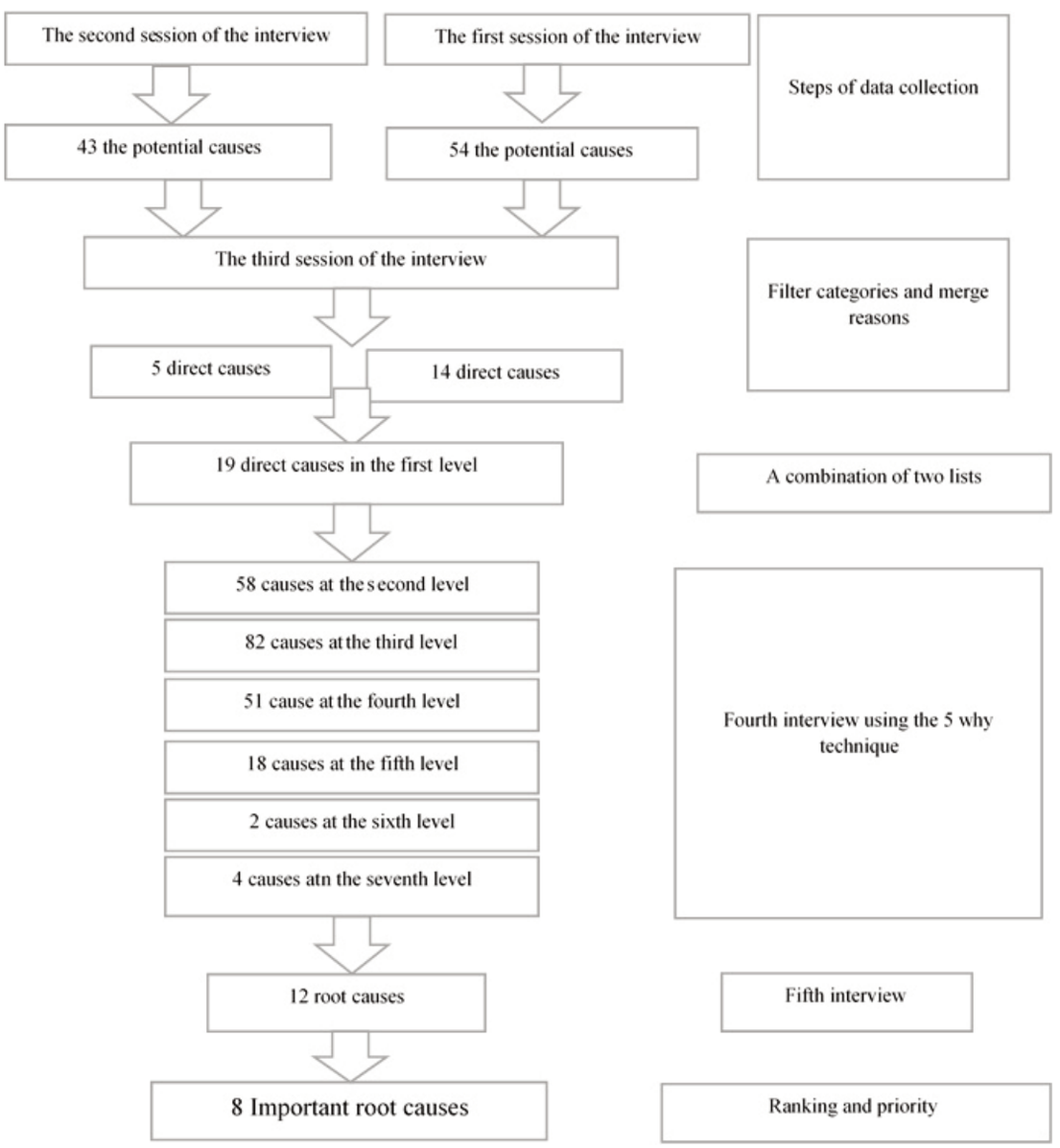

Figure 7. The Process of Analyzing the Root Causes of the Problem

reasons can prevent future problems to some extent, but the solutions will be temporary. Therefore, an appropriate structure should be created to focus on addressing the root causes of the problem.Based on the results, the well-known root causes included four categories of causes: inefficient extension, inefficient education, inefficient management, and inefficient research works. In this regard, various studies such as Hodbod et al. (2016), Li et al. (2021), Spataru et al. (2019), Renting et al. (2009), Peng et al. (2017) have confirmed the effect of these causes, although superficial, on the failure of multifunctional agriculture development.

Among the root causes of limited multifunctional agriculture in the west of Iran are the lack of appropriate programs to introduce various agricultural functions, unique climatic conditions, regional potentials, customs, and natural capacities for agricultural tourism in the east and west of the region. By addressing these root causes, implementing a strategy to educate and inform farmers, introducing supportive policies, and encouraging investment in multifunctional agriculture, it is possible to motivate farmers to expand their engagement in other non-food functions of agriculture.

Another root cause of limited multifunctional agriculture is the lack of attention to it in educational centers. Although the gravity and urgency of this cause are lower than the other root causes, it should still be addressed in the mid-term. Education plays a crucial role in achieving sustainable development (Barani et al., 2018). Without proper education, the knowledge and attitudes of farmers and other stakeholders toward multifunctional agriculture may not change. While the expanding education system has a significant role in disseminating knowledge and changing attitudes in this field, the implementation of inappropriate educational policies for training change agents in the field of multifunctional agriculture has contributed to the existing problems.

Additionally, unfavorable land conditions, land fragmentation and lack of land integrity, collective ownership, low rainfall, strong monsoon winds, high temperatures, extensive desert lands, an incoherent agricultural market, poor access to finance, poverty, and a lack of trust in officials have indirectly affected the limitations of multifunctional agriculture and the continuation of productivism. Implementing coherent management practices can empower farmers, facilitate capital attraction, and prevent the loss of natural and human resources in agriculture.

Inefficient management, identified as the root cause of the problem, has resulted in inconsistencies between various relevant organizations, such as the Environmental Protection Agency, the Natural Resources Organization, and the Agricultural Organization. Each organization tends to prioritize its individual interests through traditional actions. For instance, the Environmental Protection Agency has jeopardized agricultural land through the poor implementation of desertification plans. Similarly, the Agricultural Organization has introduced a top-down strategy that does not consider regional conditions, focusing solely on increasing the production of wheat, corn, and canola in the region. This approach has created an unsustainable agricultural experience, neglecting the diversity of production and the conservation of natural resources.

These inefficient practices have contributed to risk aversion among farmers, leading them to concentrate on producing only a few crops to maximize profits. The lack of coordination among different organizations is a critical issue. Without an effective solution, farmers and relevant organizations, disregarding collective benefits, may perpetuate unsustainable farming practices for future generations. Therefore, as emphasized by Hodbod et al. (2016), effective management can incentivize farmers to take calculated risks, diversify their agricultural production for optimal yields, and embrace various non-productive functions to protect natural resources and foster entrepreneurial prosperity.

Agricultural research plays a pivotal role in the agricultural innovation system (Aksoy and Öz, 2020). However, activities related to agriculture, the environment, and natural resources in the study area lack a foundation in applied research. By expanding agricultural research tailored to local needs, not only can production be improved, but also other desirable functions can be facilitated. Therefore, the scarcity of research initiatives and the repercussions of lacking research laboratories in the multifunctional agriculture domain were emphasized more strongly than other root causes. Interestingly, this issue was not even mentioned as a superficial reason in previous comprehensive studies. However, the study population regarded it as a fundamental issue, ranking it at the top among the root causes. They believed that if no solution is found to develop agricultural research laboratories, stakeholders will persist in conventional agriculture practices, unaware of the benefits of multifunctional agriculture. Hence, addressing the issue of inefficient communication between research centers, both regionally and nationally, and farmers requires further attention.

CONCLUSIONS

Multifunctional agriculture is a multifaceted, complex, and dynamic subject, with several reasons contributing to its inefficient development. These reasons can be categorized into inefficient extension, inadequate education, ineffective management, and insufficient research efforts. Multiple factors have hindered the development of multifunctional agriculture in the western region of Iran. A key finding of this study underscores the importance of root causes, as addressing and rectifying them will, in turn, resolve other superficial issues. Consequently, it is advisable to incorporate three additional stages into the RCA technique: "providing solutions," "implementing solutions," and "evaluating the implemented solutions," to propose more effective remedies. Considering that Iran, like other developing nations, faces various challenges in the agricultural sector, the insights gained from this study can contribute significantly to the advancement of multifunctional agriculture. The comprehensive list of limiting factors identified in this study can serve as a valuable reference for farmers, managers, and agricultural experts in the region who wish to delve deeper into multifunctional agriculture. This, in turn, can lead to improvements in the economic and social well-being of rural communities, environmental crisis mitigation, and the safeguarding of living beings' health.

While this study focused on identifying limiting factors in multifunctional agriculture within the western region of Iran (Dehloran Township), it is crucial to acknowledge that these reasons may not be universally applicable to other areas. Future research endeavors should expand their scope to encompass various geographical regions. Through meticulous planning and strategic interventions, the development of multifunctional agriculture can be expected.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

AUTHORS' CONTRIBUTIONS

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by [Mahbubeh Kheirollahi], [Amirhossein Alibaygi] and [Farahnaz Rostami Ghobadi]. The first draft of the manuscript was written by [Mahbubeh Kheirollahi] and all authors com-

mented on previous versions of the manuscript. All authors read and approved the final manuscript.

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