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ICARDA
Science for resilient livelihoods in dry areas

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INITIATIVE ON
Fragility to Resilience in Central and West Asia and North Africa

L.A.R.I Lebanon

Technical Report

Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA) - Innovations in Partnerships, Policies and Platforms for the Effective, Inclusive and Climate-Resilient Transformation of Agrifood Systems

Effectiveness of Innovation Platforms in Enhancing the Viability of the Wheat Seed Sector in Terbol Station, Lebanon

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TABLE OF CONTENT

Abstract

The objective of this research was to assess the effectiveness of the innovation platform (IP) (Terbol Station) on the wheat seed sector in Lebanon. Data were collected from 16 seed producers after identifying and mapping the key stakeholders in the seed sector. Descriptive statistics was used to categorize and evaluate the efficacy of the innovation platform by identifying six groups: seed availability and access, knowledge and training, seed production and market impact, incentives, joint planning, and the situation of the seed sector in Lebanon. Incentives and joint planning were found to be the primary groups of the IP that the farmers emphasized their importance. The correlation between different groups was found to be statistically significant. Farmers noted that the wheat seed sector is non-profitable and, therefore, needs financial support and joint planning of the value chain. The study recommends the intervention of the government and the Ministries of Agriculture and Economy & Trade by customizing governance strategies and policies. In addition, the adaptation of regulatory measures of the wheat seed sector and agricultural guidance can provide essential information, recommendations, and expertise to optimize the production, distribution, and utilization of seeds in Lebanon.

Key words

Innovation platform, wheat seed sector, stakeholders, mapping, regulatory measures.

1. Introduction

Farmers consistently strive to enhance their agricultural operations, aiming to boost both food security and income by optimizing the utilization of their resources (Teno, 2017). Farmers need to enhance the efficiency of their production methods and adjust to ongoing, sometimes unexpected, and abrupt shifts in their production and market conditions. This requires constant adaptation inherently involving the necessity for ongoing innovation. Innovation stands as a cornerstone for progress and sustainability in the context of agricultural development. The utilization of Innovation Platforms (IPs) has emerged as a promising strategy to foster collaboration, knowledge sharing, and technological advancements within various agricultural sectors. IPs play a central role by fostering collaboration among various stakeholders and driving collective efforts to achieve agricultural development goals (Oluwole *et al.*, 2016). The wheat seed sector, vital to Lebanon's agricultural landscape (Tawk *et al.*, 2019), is no exception to this trend. Lebanon, with its diverse agro-climatic regions and historical significance in agriculture, has long relied on wheat production to meet its food security needs (Gandour *et al.*, 2022).

However, the agriculture sector faces multifaceted challenges such as climate variability, limited arable land, and changing market dynamics. In response, IPs have gained prominence as collaborative spaces where stakeholders including farmers, researchers, policymakers, and agribusinesses converge to collectively address these challenges (Tenywa *et al.*, 2011). Due to insufficient support from policies and institutions, farmers in the region struggle to access new agricultural innovations and technologies and manage risks. In contexts of fragility within the region, public institutions face limitations in their capacity to effectively meet on-ground needs (Dhehibi *et al.*, 2023). As IPs become increasingly popular on a global scale, their implementation within Lebanon's wheat seed sector presents significant opportunities. These platforms have the potential to facilitate the sharing of knowledge, adoption of technology, and collaborative decision-making, potentially providing solutions to critical challenges such as decreased yields, disease occurrences, and market instability. By systematically assessing the efficacy of these platforms, valuable insights can be obtained regarding how they influence the sector's overall ability to endure, remain sustainable, and stay competitive. To bridge the disparity, the assessment of the IPs' impact on the wheat seed sector, commencing with a meticulous stakeholder analysis and mapping, ensures a well-founded initiation where the pivotal stakeholders encompass decision-makers.

1.1 Definition of Innovation Platforms or Multi-Stakeholder Platforms

Innovation encompasses the actions and processes connected with the creation, dissemination, and use of new knowledge, which might be technical, organizational, or institutional in nature (Swaans *et al.*, 2014). In agriculture, technological innovation refers to all biotic and abiotic artifacts and practices (e.g. new seeds, animal breeds, machinery, cultivation techniques), whereas organizational and institutional elements include novel social arrangements (e.g., new forms of labor organization, marketing arrangements, community action, and new or revised institutional setups, legal arrangements, and policies) (Nederlof *et al.*, 2011).

The use of multi-stakeholder platforms emerged in the agricultural sector, mainly to have a space for deliberation, negotiation, and learning to solve complex natural resource management issues (Swaans *et al.*, 2014). This concept has been broadened to bring together stakeholders in various sectors and from different levels of the innovation system, acknowledging and using the diversity in capacity (knowledge, skills, capabilities, and resources). By connecting diverse actors from the public and private sectors such as farmers, agricultural input suppliers, traders, food

processors, researchers, and government officials, who regularly come together to develop a common vision and find ways to achieve their goals, IPs enable and orchestrate co-evolution between technological development and social and institutional changes (Kilelu *et al.*, 2013).

Social exchange theory postulates that all human relationships are formed through subjective cost-benefit analysis and comparison of alternatives. The person chooses to continue the relationship if the benefits outweigh the costs. The cost of participation in terms of time, effort, and resources is a factor that influences participation. The continuous exchange of goods and services regulates social interactions and enables the development of network relationships and group structures (Robert, 2016).

1.2 Innovation Platform process, operation, and function

The process of creating an innovation platform is known in several ways. IP can pursue seven steps. Starting with the identification of a research and development problem, location selection, consultation, and scoping study, visioning and stakeholder analysis, action plan formulation, and lastly action plan implementation (Tenywa *et al.*, 2011) (Figure 1).

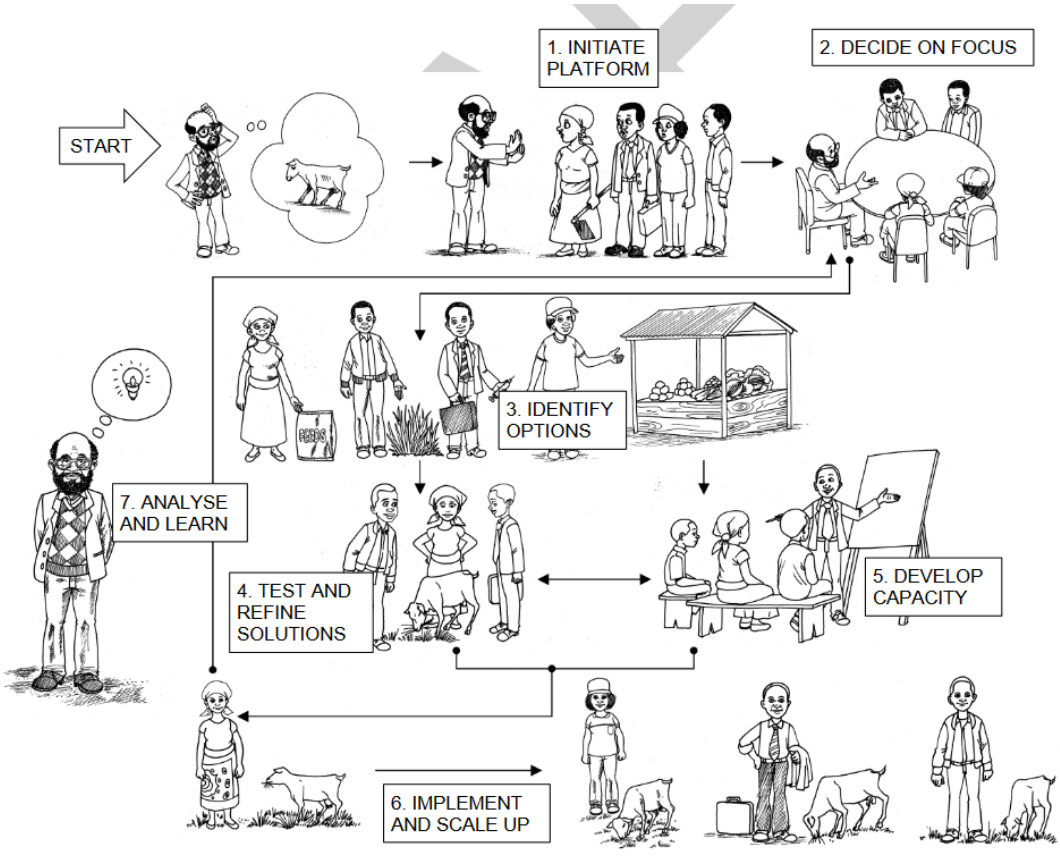

Figure 1. Detailed process of Innovation Platforms. Source: Mundy, 2013.

At least three tiers may be developed for IPs: operational (local), intermediary/regional, and national (Tenywa *et al.*, 2011). They could work in various industries, including agriculture, horticulture, aquaculture, forestry, and cattle. All platforms, however, address widespread issues that are present in a certain sector or sub-industry and for which more than one actor is required for both the

development and implementation of solutions (Makini *et al.*, 2013). Stakeholders may have divergent interests, yet they all work toward the same goal and rely on one another to address the possibilities and problems they face.

By connecting local farmers to markets and other stakeholders, platforms frequently search for possibilities or workable solutions to a local issue at the community level. By doing this, they offer support for practical ideas and policy areas that may be adopted at a higher level. Platforms at a higher level provide information to policymakers, who then create policies that will affect activity at the local level (Makini *et al.*, 2013).

A facilitator, promoter, or accelerator is frequently needed to persuade powerful members to collaborate, learn, and develop (Tennyson, 2004). Linking the regional allies for organizational needs and associating them with frameworks at elevated amounts is the duty of an innovation platform facilitator or advocate (who may be an individual or a group) (Cullen *et al.*, 2014). Higher-level platforms, such as nationwide or regional platforms, lean further toward conceptual than technical risks. The facilitator also includes suggestions, and in scenarios where this is delivered by an external, eventually helps fund stakeholders, such as a local agent or a local advisory board stakeholder, taking over this responsibility (Tennyson, 2004).

1.3 The seed system in agriculture

Seeds play an important role in attaining agricultural production challenges and achieving food security. To comprehend the seed system, the type and nature of agreements required for growing crops should be achieved (FAO, 2011). The distribution of seeds to farmers is done by two methods, namely, formal, and informal seed supply systems.

The formal seed system is the production of officially certified seeds organized by the government by public and private seed companies or NGOs. Whereas, the informal seed system is the local system of seed production also known as the farmers' system (Atilaw and Korbu, 2011).

The main emphasis of the formal seed system is high-quality seed production that will increase the yield (Biemond, 2013), on the other hand, the informal seed system is the maintenance of regional varieties by farmers, which have been chosen through time and produced in the region (Wekundah, 2012). Nevertheless, both systems exist in parallel (Kuhlmann and Dey, 2021). Many farmers in the developing and developed world rely on informal systems of seed exchange among farmers, rather than the formal seed sector. The use of improved varieties is closely linked to the development of the agriculture sector, including the adoption of modern agronomic practices by farmers. Several developing countries have undertaken policy and regulatory reforms to strengthen the formal seed market, and such efforts have been supported by the private sector, developed country governments, and aid organizations. These reforms encourage investment by plant breeding companies and can improve farmers' access to new varieties in developing countries (OECD, 2021).

The development of a national seed sector will require that capacities are in place at individual, institutional, and policy-enabling environment levels. The production of quality seed is done by a range of skills and capacities at various levels from planning and management of seed production to skilled farm operations. This requires recruitment of skilled and knowledgeable people at all levels in the seed 'chain', and therefore training at all levels, from farmers to scientists and policy makers. Moreover, the training of farmers to strengthen their skills and knowledge in seed storage, seed quality management,

marketing, accounting, and accessing new varieties could enhance the uptake and spread of new varieties and improved practices (Guei *et al.*, 2011).

1.4 Seed production sector in Lebanon

Around 10% of the nation's annual wheat supply is grown by Lebanese farmers, along with a defined share of the nation's yearly food requirements for other crops including barley, chickpea, faba bean, and lentil. In the past, the government agricultural services and legal and unofficial seed markets each contributed a portion of the seed supply for the nation's wheat output. Before 2010, many farmers had recurring concerns about the availability and quality of seeds. They frequently had to pick between overpriced imported types, low-yielding stock of undetermined provenance that was unsuitable to the local soil and climate, or seed from a stock exchange that presented a disease threat. Some international varieties were not usually resistant and not suitable to Lebanon's climate, in addition to being expensive, costing the farmer three times as much as the seeds purchased through the national seed system (i.e., imported from Europe). At the time, Lebanon lacked a structure or seed regulation to control the distribution of high-quality seed to farmers. Around 1000 tons of wheat were made available through the national seed multiplication program each year, which was a contribution but was not enough to satisfy all the demands of wheat producers. Once the new seed legislation and policy were adopted in 2010, the LARI was given the responsibility of leading a national program to improve access to high-quality seed, beginning with wheat. Over the past 8 years, national wheat seed reserves have increased though not in a consistent manner, from 1000 to 8000 tons (in 2014) or almost 200% of what is required for farmers who cultivate wheat in the country. Lebanon is a small country with a diverse range of agricultural biodiversity and agroecosystems, therefore maintaining the nation's seed system calls for a team that can adapt to the individual requirements of farmers. The region has three agro-climatic zones, from very dry regions to those with significant rainfall and high humidity. This range of soil types emphasizes the need for a seed breeding program and information that is inclusive to all farmers.

Like any sector in Lebanon, the seed sector has several constraints and challenges that limit its activities. Primarily, the absence of a national seed policy is a critical aspect that leads to misguided development in the sector. It is caused by the lack of organization and planning from the government side. This affects seed regulation on the national and international level such as the import and export activity. Secondly, the lack of knowledge and expertise in the seed sector emphasizes the importance of organizing training and field visits for the farmers. Lastly, the seed sector is not very profitable, which makes it less attractive to farmers facing high input costs. The severe economic and financial crisis in the country since 2020 has made it very difficult for the government to secure sufficient funding for seed dissemination.

2. Methodology

2.1 The study area

This study was conducted in the East region of Lebanon, precisely in the West Beqaa area which includes the most productive agricultural area “The Beqaa Valley”. It covers 1413 km^2 with alluvial soil and copes with various challenges such as small farms, lack of standardization, and absence of agricultural policy (Caiserman *et al.*, 2019). The primarily produced crops are cereals and pulses (57%), vegetables (57%), and fruit trees (36%), in addition, to other agricultural practices livestock such as sheep (38%), goats (29%), cattle (26%) and dairy (44%) (Jalkh *et al.*, 2020). The Bekaa Valley is

surrounded by Mount Lebanon (west) and the Anti-Lebanon mountain range (east) (Figure 2) (Caiserman *et al.*, 2019) due to socioeconomic pressure in the local community caused by limited access to rangeland on the eastern mountain chain and unproductive lands in poor forest areas, the semi-arid area has witnessed a decrease in annual precipitation to less or equal to 300 mm (Darwich, 2009).

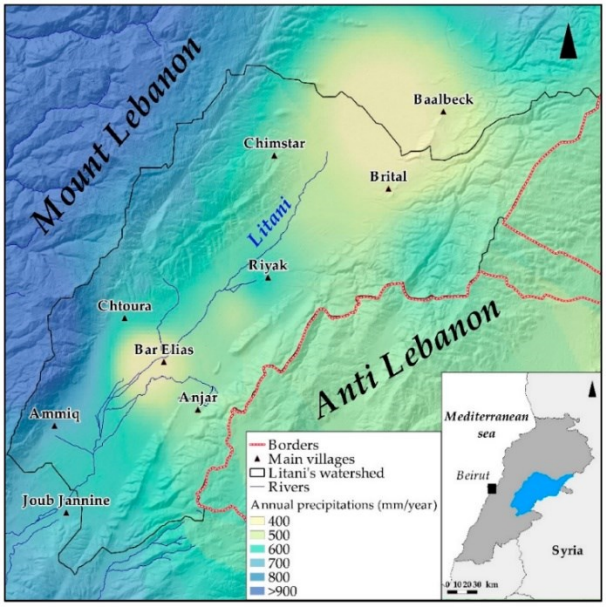

Figure 2. Bekaa Valley. Source: MDPI 2019.

2.2 Stakeholder analysis

This research used a case study approach. Data has been collected through observation and interviews with all stakeholders. Observation activities are intended to obtain an overview of the stakeholders working in the seed sector. Meanwhile, the interview was intended to obtain an explanation of the interests and power of stakeholders. The instruments used were interview guidelines and stakeholder influence and interest assessment sheets. The types of data collected in this study were primary and supporting data. Primary data are the information about the stakeholders involved, the role of stakeholders, as well as the interests and influence of stakeholders in development.

The selection of stakeholders was based on the National Stakeholders Alliance (NAS) done by ICARDA under the CGIAR Initiative on Fragility to Resilience in Central and West Asia and North Africa (F2R-CWANA). NAS included primarily ICARDA, LARI, farmers (smallholders and seed producers), the Ministry of Agriculture, Ministry of Economy& Trade, researchers and scientists, private sector, universities, and NGOs involved in this field.

The Stakeholder analysis includes three steps: Identifying stakeholders, mapping, and classifying stakeholders, and analyzing relationships between stakeholders. This analysis used a scoring methodology to compute the level of interest and influence of each stakeholder.

2.3 Farmer surveys

To go in-depth into the seed sector, it was evident that the key stakeholders were the seed-producing farmers who worked with LARI. Before 2010, the total number of seed producers in the Beqaa area

was 30 farmers, this number increased to a total of 40 farmers where the aim was to reach 8,000 tons of wheat produced per year. The farmers interviewed were 16 out of 40 from different areas in the Beqaa (Terbol, Rayak, Bar Elias, Nasrieh, Ammiq, Baalbeck and Zahle). The common characteristic of all interviewed farmers was the period of contract between them and LARI which was between 15-25 years, long before the start of any program related to seed production. The survey was divided into two parts: the first focused on the socioeconomic characteristics of the farmers followed by the measurement of the agreement level on key factors affecting the seed sector by using the Likert scale (Teno, 2017).

3. Results and discussions

3.1 SWOT analysis of the IP for the seed production sector

The major strength of the IP is the availability of seed producers and the rules and regulations that guide the activities of the IP (F2R agreement). Through the IP, farmers have access to training, field visits, and high-quality seeds which direct them towards the formal seed sector. The stakeholders' willingness to engage and be part of the IP is also a strength.

The IP lacks protection of the property rights of new varieties due to the absence of a clear system, missing policies related to the seed sector, and lack of a well-defined management structure of the IP. These are weaknesses of the IP that in addition to the absence of key actors in the IP such as seed companies and flour mills, the insufficient funds to run IP effectively, and efficiently lead to a lack of consistency. Lastly, the need for incentives for the stakeholders to attend the IP's meetings affects the consistency of the meetings held by the IP, affecting its progression. With its weaknesses and strengths, the political instability and absence of government support, the economic crisis affecting the work progress of the IP, and the high cost of research and development that requires constant financial support.

In addition, the absence of farmers' cooperative that tackles the farmer's problems, climate change, and environmental factors all are threats that risk the status of the IP. Finally, the opportunity that is ahead of the IP is the Ukrainian War which shifted the focus on bread wheat increasing its demand worldwide. Regardless of the war, farmers always show interest in new varieties and learning new technologies to adapt to agriculture that would enhance their productivity and strengthen their revenue.

3.2 Mapping and classifying stakeholders in the seed sector

Table 1 presents the results of the evaluation of the influence and interest of the main stakeholders identified in the wheat seed sector. For the following stakeholders: ICARDA, LARI, and Ministries a theoretical (black font) and real-life evaluation (red font) was done, considering the seed producers, smallholders, and researchers they have a stable interest and influence. The results are also represented in Figure 3 showing the interest level of each stakeholder. The scoring used a five-tiered (Adil *et al.*, 2022) measurement of the influence and interest based on key indicators for each aspect that enable the classification of the stakeholders. A score of 5 means very high, a score of 4 means high, a score of 3 means relatively high, 2 means less high, and 1 means low. The next step was stakeholder mapping by adding up the scores of interests and influences of each stakeholder, by forming coordinates with the position of the stakeholder roles (Figure 2). Quadrant 1 was occupied by stakeholders with a score of interest and influence of >12.5. Quadrant 2 was occupied by stakeholders

with an interest score of >12.5 and an influence of <12.5. Quadrant 3 was occupied by stakeholders with an interest score of <12.5 and an influence of >12.5. Quadrant 4 was occupied by stakeholders with an interest score of <12.5 and an influence of <12.5. Stakeholder classification uses an influence and interest matrix by classifying stakeholders into key players, context setters, subjects, and crowds. The results of the mapping of stakeholders based on their influence and interests are divided into four groups, namely key player, subject, context setter, and crowd (Figure 3). Key actors are stakeholders who have a high interest and influence in seed production. Subjects are stakeholders with high interest but low influence in seed production. Context setters are stakeholders with a strong influence but low interest in seed production. Crowds are stakeholders who have low interest and influence in seed production (Ginige *et al.*, 2018).

Table 1. The level of stakeholder interest and influence in seed production.

No.	Stakeholder	Value of interest					Total	Influence					Total
		K1	K2	K3	K4	K5		P1	P2	P3	P4	P5	
1	ICARDA	2	5	5	5	1	18	3	1	5	4	3	16
		5	**3**	**2**	**5**	**1**	**16**	**2**	**2**	**4**	**4**	**2**	**14**
2	LARI	5	4	4	5	2	20	5	4	5	5	5	24
		5	**5**	**5**	**5**	**1**	**21**	**2**	**2**	**1**	**5**	**2**	**12**
3	Smallholder Farmers	1	1	1	1	1	5	1	1	1	2	1	6
4	Seed producing farmers	5	2	1	5	3	16	1	3	3	3	1	11
5	Ministry of Agriculture and Economy	1	2	5	1	1	10	5	4	5	5	5	24
		5	**5**	**3**	**1**	**1**	**15**	**2**	**1**	**3**	**4**	**3**	**13**
6	Researchers and universities	1	1	1	1	1	5	1	1	1	3	1	7

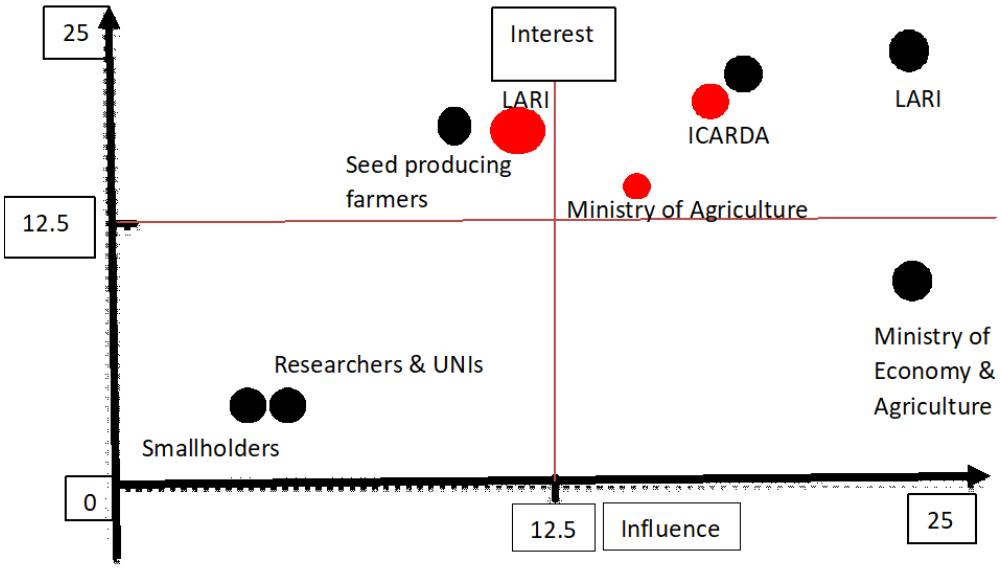

Figure 3. Mapping of stakeholders by level of influence and interest.

The IP of the Terbol station is based on a group of stakeholders that communicate and exchange knowledge with each other to achieve their common goal which is enhancing the seed sector in Lebanon. The Terbol research station situated in central Beqaa is operated by ICARDA since 1987 (Breeding, genetic resources conservation and seed exchange or International Nurseries) and LARI (Sheep and goats improvement). The Station contains various innovations and technologies such as the gene bank and international nurseries, and therefore it is in their interest to focus on seed multiplication. ICARDA works in close collaboration with LARI, which is the frontier of the public sector and has an explicit connection with the farmers of the Terbol region. LARI collaborated with the seed-producing farmers under a contract that supports the farmers financially and identifies the varieties, quantities, and standards of the seeds to be produced. Due to its public and scientific identity, LARI is the link with the Ministry of Agriculture and the Ministry of Economy & Trade which supports them financially and establishes the plans and regulations for the seed sector. Therefore, LARI is an important junction in this platform. Researchers and universities play a role in conducting research and community service related to the seed sector so that seed multiplication is based on relevant and comprehensive study results. The ultimate impact of the IP is beyond "the seed", it is the dryland smallholders. Smallholders face agricultural challenges that make them a vulnerable stakeholder in the IP. From a wider perspective, the IP focuses on achieving seed security for all the farmers without exclusion.

The mechanism of the IP works as shown in Figure 4. ICARDA provides promising seed lines to LARI for evaluating, releasing and multiplication (1), and LARI will transfer them to the seed producers (2) according to a plan that is regulated by the Ministry of Agriculture and Economy (6). After multiplication, the produced seeds are returned to LARI (3) to validate and verify if they meet the standards agreed on. LARI in return will make these seeds available for the Ministries (4) and (6). The role of the researchers and universities is a minor role that is essential for the dynamic of the IP to be

supported scientifically and therefore (7), they are linked to the research center ICARDA and the agricultural institute LARI where they can share their analysis and partially direct the planning.

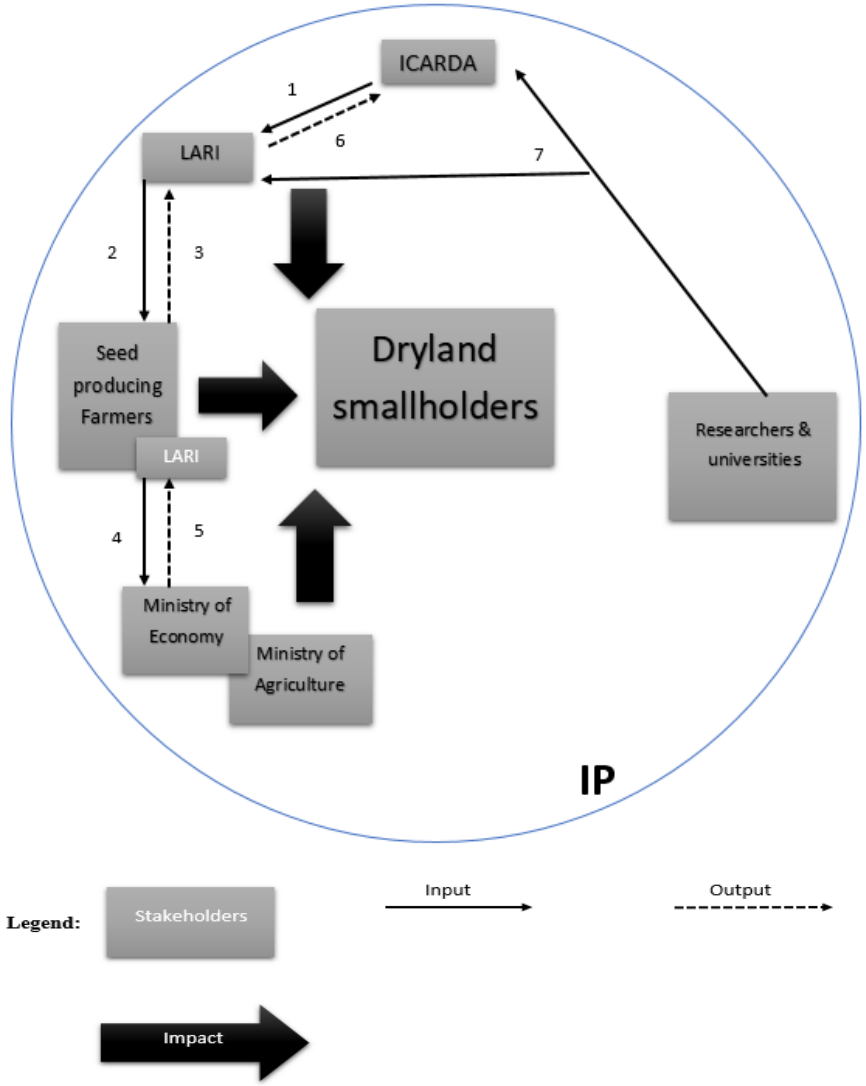

Figure 4. Interaction between the stakeholders in the IP.

3.3 Perception of farmers to the wheat seed sector

The attitude of the farmers towards the IP was interpreted by the descriptive analysis. Concerning the *"Seed availability and access"* group of variables, the farmers had low perception which indicated the lack of seeds in the community where they can't obtain them easily. This reflects a major seed problem that the farmers are facing. However, all the farmers had a positive attitude towards the "*Knowledge and Training"* group received from LARI but a low perception of any training from ICARDA's Terbol station. This indicates that according to the farmers they are being trained by LARI and not by ICARDA's Terbol station. The *"Seed production and Market impact"* group of variables showed that the perception of the production rate was positive, but the farmer's problem lay in the price. According to the farmers, they have access to agricultural and testing services from LARI, but they lack any financial incentives that would support them. Finally, all farmers agree that the *"Situation of the seed sector in Lebanon"* is bad and is being affected by the economic crisis. Moreover, they showed a clear low

perception of the informal seed sector knowing it is the main sector used and the regulations from the Ministry of Agriculture which are to be focused on in the future.

The results also indicate that the achievement of an effective IP relies primarily on the incentives, followed by joint planning: value chain management and seed availability and access. According to seed producers, the seed sector needs more farmers to engage in this sector to increase the availability of seeds in the community, in addition, they need to have access to seeds in case they cannot on their own which highlights the importance of having a strong farmers cooperation.

3.4 Correlation between different groups of surveys

The seed availability and access (market information) showed a correlation with a positive coefficient of correlation 0.45 with a 10% significance (Table 2). This indicates that training exposes farmers to building a network and will affect the access and availability of seeds positively. The joint planning and seed production and market impact has a positive correlation coefficient of 0.431 and is statistically significant at 10%. This indicates that when there is planning between value chain members, this will affect the production of the farmers positively due to their knowledge of demand and supply. The situation of the seed sector in Lebanon and the seed production and market impact are strongly correlated at 0.716 with a statistical significance of 5%. This indicates that all farmers agree that the economic crisis affected seed production negatively which is due to a lack of incentives, joint planning, and seed availability and access.

Overall, the Policies of the Ministry of Agriculture and Economy should focus on the prices of wheat seeds and work on farmer protection or subsidies. Farmers can create a cooperation (cooperative, community-based organization, etc.) between them that addresses their needs and helps them create a strong network that allows access and exchange to market information. Moreover, LARI can enhance their contracts with farmers and regularize incentives that could be financial or in-kind such as production factors (fertilizers, pesticides, etc.).

Table 2. Correlation between different groups.

Groups	1	2	3	4	5	6
1: Seed availability and access		0.45(*)	0.41	0.185	0.232	-0.052
2: Knowledge and training			0.214	0.388	0.236	0.18
3: Seed production and market impact				0.308	0.431(*)	0.716(**)
4: Incentives					-0.123	0.238
5: Joint planning						0.132

4. Conclusions and Future Perspectives

The objective of this research was to assess the effectiveness of the innovation platform (IP) (Terbol Station) on the wheat seed sector in Lebanon. Data were collected from 16 seed producers after identifying and mapping the key stakeholders in the seed sector. The key findings indicate that the role of IP is essential for a functional wheat seed sector. The results highlight the important aspects of the IP functions such as incentives and joint planning between the members of the value chain. The

findings also indicate that the IP is essential for the viability and growth of the wheat seed sector in Lebanon. The analysis of the efficiency of the IP contributed valuable insights to both theory and practice. Our results indicate that the integration of an IP with its different components has a positive impact on the operational efficiency of Lebanon's wheat seed sector. The results verified that the identification and mapping of the stakeholders facilitate the operation of IP, having a clear perspective on the contribution of the sector as decision maker where they can share their knowledge and insights leading to beneficial outputs that serves the overarching goal which is ensuring food security. Furthermore, the analysis from the farmers' surveys highlighted the main components of the IP "Incentives, joint planning and the availability and access of seeds" to enhance the effectiveness and performance of the wheat seed sector in Lebanon. However, the absence of policy insights due to the economic crisis that Lebanon is encountering also influences the IP and its potential impact.

The results will contribute to the F2R initiative in the CWANA region design action plans and road maps according to farmers' vision and aspirations which are the main actors in the Lebanese IP and without them, the 'seed producers' there is no wheat seed sector. Based on our results, the wheat seed producers need agricultural guidance that focuses on legalizing wheat policies that enhance the vision and strategy of the sector and increase the quality of the produced seeds. It is the responsibility of the Ministry of Agriculture to offer this guidance.

Nevertheless, the ministry must have official data about the wheat seed sector from producers, seeds produced, land available, and important economic indicators that can weigh the evolution of the sector. The lack of this data creates a threat to formulating policies and redirecting the wheat seed production from durum wheat to bread wheat due to the Ukrainian war and the lack of indispensable information. In addition, the absence of a certification and adoption policy makes abiding by the rules and regulations harder, therefore the production of seeds according to specified standards is not fulfilled. These findings highlight the following strategic actions:

- Enabling a political environment that promotes the adoption of sustainable farming practices in the wheat seed sector by providing training to farmers on sustainable farming practices.
- Enhancing regulations to ensure support and incentives for farmers who are transitioning to sustainable farming practices.
- Boosting investment in research and development to develop new resilient varieties of wheat that are more yielding, more nutritious, and resistant to pests and diseases.
- Promoting policies to encourage and regulate the informal seed sector in Lebanon. This can be achieved by providing incentives for informal seed producers to register their activities and comply with regulations. This can help improve the quality of seeds and ensure that they meet the standards.

To achieve agricultural guidance and develop policies essential for the wheat seed sector through the Terbol station and the F2R-CWANA initiative, the CGIAR aims to upgrade Terbol station into national innovation platform (NIP) by engaging diverse partners and stakeholders, including the private sector and marginalized groups. The NIP can provide a conducive space for co-design and testing innovations to address complex challenges communities face in their agricultural production, business development, marketing, and natural resources management for sustaining resilient livelihoods for farmers. Improved varieties of cereals could be entry points to set up the NIP in Terbol station. The improved wheat varieties must have a high yield as well because the wheat seed production is not

profitable to farmers. That is why our finding highlights that the primary motive for farmers in wheat production is incentives. The results also indicate that an indispensable step is the joint planning between the Ministry of Agriculture and the flour mills to know the demand and supply and consequently address the Ministry of Economy to adjust the prices of seeds accordingly.

LARI may characterize and assess the possibility to upgrade Terbol research station to an IP with the involvement of key stakeholders, including policymakers and the private sector who have a stake in the research for development constraints and solutions.

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