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Research Article

IDENTIFYING THE CONSTRAINTS AND OPPORTUNITIES FOR INCREASING PULSES' PRODUCTION AND VALUE CHAIN DEVELOPMENT IN PAKISTAN: A DELPHI APPROACH

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Abstract

Pulses are rich source of protein and linked to countless positive effects on human health as well as plant health because these are nitrogen fixing crops. Likewise, pulse centric meals are widely adopted as a better source to overcome acute malnutrition. In Pakistan, decreasing trend in pulses' production and continuous rise in pulses' prices reduced the people's economic access to pulses particularly of that population which fall below the line of poverty. Pulses are grown in the rain-fed areas of Pakistan. The unusual rainfall and climatic conditions highly affect pulses' crop; therefore, farmers face a high risk of getting attractive prices consistently. Marketing of Pulses is mainly in private hands and farmers usually sell to village dealers or in primary markets without any value addition after harvesting. Hence, farmers have weak linkages with the markets and other chain actors indicting that value chains for pulses are not properly developed. This research is designed to identify the constraints and opportunities for enhancing pulses production and value chain development in Pakistan through employing Delphi Approach which is based on experts' opinion. The results revealed that lack of availability of improved varieties/good quality seeds of pulses is identified as the most critical barrier in increasing the production and cropped area under the pulses. In addition, no policy support from the government, poor marketing, and nonexistence of value chain result in low prices received by farmers are also considered as source of the decline in farmers' interest in the pulses' production. The findings of this study highlight that development of pest, disease, and climate change-resistant varieties and development of competitive pulses value chains could play vital role in making Pakistan self-sufficient in the pulses. The findings identified important set of barriers and opportunities for the industry and policymakers. Hence these indicators should help farmers and relevant stakeholders to monitor pulses production sustainability and guide decision makers to make appropriate policies for pulses sector in Pakistan.

Keywords: Delphi approach, Pulses production, Drivers & Barriers, Pakistan

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1. INTRODUCTION

Pulses are considered a great source of nutrition and possible solution to overcome protein energy malnutrition for people in developing countries like Pakistan. However, pulses are a commonly consumed food in the Asian countries as a culinary staple since ancient time. Moreover, pulses contains almost 12-40 % protein content, therefore pulses having 60% share in total global protein

consumption and remaining 40% is fulfilled through animal protein sources (Parveen et al. 2022). In recent years, there is increase in trend reported about consumers shift from animal based protein source to plant based protein source such as pulses for overcoming the protein energy malnutrition (Päivärinta et al. 2020; Langyan et al. 2022; Pellinen et al. 2022). Also, importance of nutrition and no carbon footprints or CO_2 emission in pulses production making it more suitable from both environment and consumers' health perspective (Singh 2017; Teferra 2021). Therefore, attention has been diverted to produce the best quality pulses and increase the supply of pulses for meeting the demand of the consumers (Rizwan et al. 2019).

Despite this potential of pulses, decreasing trend in production, increasing trend in imports and continuous rise in pulses prices reduced the economic access of the people particularly of people falling under poverty and affects their nutritional uptake (Rani et al. 2012; Vanzetti et al. 2017). The main reasons of this decreasing trend in production of pulses in Pakistan include lack of good quality seed and seed distribution mechanism, abiotic stresses, biotic stresses, low moisture level, low organic matter and marginal land devoted for pulses cultivation. Moreover, pulses are considered minor crops in Pakistan and are substituted with major cash crops which results in decrease in area under pulses and the total production. Furthermore, climate change, post-harvest losses, lack of farm machinery, negligible market support and absence of value chains are also bottlenecks in making pulses competitive with other cash crops (Vanzetti et al. 2017; Abro and Awan 2020; Ullah et al. 2020).

On the other hand, efforts have been made to improve smallholders production and marketing performance of the pulses by introduction of new technologies, and provision of good quality seeds (Mirza 2021; Ali et al. 2021). The governments, agribusiness firms and nongovernmental organizations (NGOs) have continuously made efforts in facilitating resource poor farmers to transform from subsistence to market oriented farming through rural transformation and investments (Rao et al. 2012; Abdul-Rahaman and Abdulai 2020; Mossie et al. 2021). These investments spun out by adopting agri-value chain approaches in the form of development interventions to resolve these multiple constraints and utilize these opportunities in the smallholder agricultural sector. Therefore, many studies have proved that agri-value chain played a vital role in the rural transformation in developing and emerging economies (Abdul-Rahaman and Abdulai 2020; Ma et al. 2022; Tian et al. 2022; Ndlovu et al. 2022). For instance, (Gelli et al. 2020; Branca et al. 2021) reported the development of the pulses/legumes value chains for improving the diets and nutrition security in Malawai. Likewise, (Ganguly and Gulati 2022) in India revealed that pulses value chains development was helpful in addressing the observed protein gap in the diets and also improve the livelihood of the smallholder farmers. However, Smadja and Muel (2021) contended that in developing countries structural bottlenecks regarding pulses value chains development varied along with regions and countries. Thus, country specific or region-specific investigation is required for effective and robust value chain development.

Recent studies on pulses (e.g., Rani et al., 2012; Vanzetti et al., 2017; Ullah et al., 2020) highlighted mainly production side and price instability constraints in Pakistan. That means, only production and market instability related issues are reported. Despite the significant contributions of the agri-value chains approach in improving the livelihood of millions of smallholder's farmers in the Pakistan (Malik et al. 2016; Mazhar et al. 2022), this have not been given the research attention. Therefore, understanding the constraints and drivers related to pulses market and value chain

development can be an effective and robust step towards encouraging farmers to grow more pulses and increasing the land allocated to pulses production.

For this purpose, Delphi method is employed in this study which is a systematic method in management research to get feedback from the panel of experts on a research problem through series of questionnaire rounds (Samizadeh and Firouzi 2017). The main components of the Delphi technique are iteration, questionnaire, experts, controlled feedback, and anonymity of technical panel, etc. (Keeney et al. 2001). The results of this method are based on the non-informed but organized consensus of the experts in a specific field. As such, unlike other methods, the validity of its results does not depend on the number of participants rather depends on the expertise of the research panel. According to previous works, the participants of the Delphi method would be between 5 to 80 people (Mahdavi et al. 2020).

Focusing on the pulses production and effective value chain development in developing country context, the present exploratory study followed three main objectives. First, it aimed to identify constraints and opportunities related to its market and value chain development. The second aim was to get a prediction of the possible course of future development based on the assessments of various experts. The third aim was to explore the possible political, institutional, and infrastructural measures that can assist in increasing the market share of the small farmers and to support land managers and national policymakers in planning and management strategies for pulses sector of Pakistan.

The paper is organized as follows: Section 2 describes research methodology, data and methods ; Section 3 consist of the analysis and results; Section 4 comprised on the discussion of the results finally, Section 5 presents conclusion and practical implications.

2. Research methodology

As described earlier that a Delphi approach is used in this study to identify the constraints in increasing pulses production and value chain development, the data are collected by three rounds of questionnaire distribution among the panel of experts during the months of September-December 2020.

Data

In this study, 70 experts from the research, academics and extension departments of the three provinces, Punjab, Sindh and Khyber Pakhtunkhwa (KPK), were chosen purposefully (following theory of purpose sampling technique) (Sherriff 2014; Mahdavi et al. 2020). All the experts have prior knowledge about the pulses related activities such as research, extension, and marketing. Therefore, participants in this study were very aware of the different pulses related activities which indicate high levels of knowledge on the topic examined. In this regard, the factors examined in this study were derived from analysis of the data collected through questionnaires from participants to identify the common issues related to pulses.

2.1 Methods

As described earlier that a Delphi approach is used in this study to identify the constraints in increasing pulses production and value chain development, the data are collected by three rounds of questionnaire distribution among the panel of experts. In initial round 0, researcher briefed experts about the study's objectives and purpose of the survey. In the first round of data collection of the Delphi study, open-ended questions, opinion polls were asked from the experts. Responses of the respondents of the first round of Delphi survey were analyzed and summarized in the form of major constraints and opportunities in developing the pulses (chickpea, lentils and mung beans) value chains in Pakistan.

In the second round, a structured questionnaire, comprising 32 questions formulated on 5 points Likert scale, was sent to the respondents. In the 5-point

Likert scale, 5 is used for highly important, 4 for important, 3 for moderately important, 2 for least important and 1 is used to represent response of not important. The items in the questionnaire were ranked using a weighted score which was calculated according to the equation of Mahdavi et al., (2020) given as follows:

$$Weight\ score = HI(5) + I(4) + MI(3) + LI(2) + NI(1) \quad (1))$$

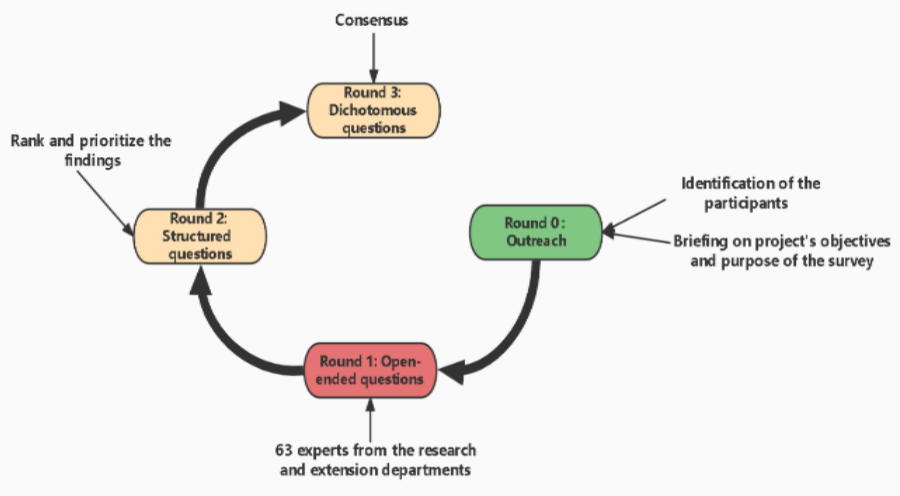
Where HI(5) represents the number of respondents who ranked an item to highly important, I(4) denotes the number of respondents ranking as important, M1(3) exhibits the number of respondents ranking moderately important, LI(2) shows the number of respondents ranking an item as least important and NI(1) depicts the number of respondents who ranked an item as not important. Based upon the calculations using equation 1, the weighted score of each item varied between 1 to 189.

In third round, a questionnaire was designed in which the factors and items that failed to acquire 80% of the panels' opinion were omitted. The experts' opinions about the items were then assessed through a questionnaire having dichotomous questions with two choices: 1 = I agree and 0 = I disagree. Data collection procedure is depicted in figure 1.

The selection of a suitable panel of specialists is a critical part of any Delphi based study as well as identifying the subsets of knowledge based inputs that an expert add to the study (Okoli and Pawlowski 2004). To conduct the present study, in round 1 a questionnaire was sent to about 70 experts and responses were received from 63 experts. Frequency and percentage distribution of these experts' job profile is provided in the Table 1. Most of the experts, almost 84.1 percent, were researchers either working in research institutes or universities, whereas 16% of respondents belonged to the department of extension. The experience of the participants was distributed in two categories, less than 10 years and more than 10 years in research, is given in Table 1. About 59% researchers had less than 10 years of experience while 41% of the respondents possessed more than 10 years of experience.

3.1. Round 1

In the first round of the Delphi method, the respondents were provided with the questionnaire with open-ended questions about the constraints in production and developing pulses (chickpea, lentils, and mung beans) value chains in Pakistan. Respondents were asked to briefly share



3. Results

Figure 1: Stages of the Delphi study in the context of the Pulses

Table 1: Respondents' Job Profile

Experts	**Numbers**	**Percentage**
Researcher	53	84.1%
Extension worker	10	15.9%
Total	**63**	
Experience (Years)		
Less than 10 years	37	58.7
More than 10 years	26	41.3

Table 2: Constraints in Pulses production (Round 1)

Constraints	**Number of responses**	**Percentage**
Lack of Improved varieties of pulses	38	60.3
Lack of awareness among farmers about the advanced production technologies	37	58.7
Marginal land devoted for pulses crop	24	38.1
Lack of innovative crop improvement programs and seed distribution systems (Biotic and a-biotic stress constraints)	22	34.9
Un-predictable weather conditions	20	31.7
Lower yield as compared to other cash crops	20	31.7
Lack of proper machinery to harvest and cultivate to overcome labor shortage and cost	17	27.0
low soil fertility due to sandy soils	16	25.4
low moisture availability	7	11.1
Non-availability of Insurance for Crop damage	3	4.8

their opinions and understanding based on their research and experiences. The results were extracted from the analysis of the responses.

Constraints in production of pulses in Pakistan

The important constraints in the production of pulses in Pakistan identified by the experts are presented in Table 2. Among these constraints "The lack of improved varieties of pulses" received highest number of responses (almost 63%) and was a top concern of the participants as contributing factor in production of pulses.

However, lack of awareness among farmers about the advanced production technologies received about 58% of responses as it is considered prerequisite for sustainable management of inputs, marginal land devoted for pulses crop received almost 38% of responses, lack of innovative crop improvement programs and seed distribution systems (Biotic and a-biotic stress constraints) received almost 34% of responses, and un-predictable weather conditions received the 31% of responses. Likewise, lower yield as compared to other cash crops received 31.7% of responses which is also a major cause in declining the area under pulses cultivation. Because pulses are noncompetitive to other cash crops and on the other hand pulses are very labor-intensive crops therefore, lack of proper machinery for harvesting and cultivation hindering its cultivation and more than 25% of the participants agreed with it. Whereas, other frequently emphasized constraints are given in Table 2.

Constraints in developing pulses value chains in Pakistan

The important constraints identified by the experts in the development of value chains of pulses in Pakistan are presented in Table 3. Among these constraints "Poor marketing and non-existence of proper value chain" was a top constraint in the development of value chains of pulses in Pakistan identified by 22% of the respondents. About 24% experts reported that unstable domestic market prices is an important factor behind the lack of interest of farmers to involve in the development of pulses value chain as well as for the stakeholders in the market and encourage the businesses to buy the pulses from the international market where prices are relatively stable. From the last few decades less research & development work done on the pulses as compared to the cash crops. Among the respondents, about 22% supported this argument. About 21% experts supported the fact that government focus is mainly on the cash crops and lack of policy support to pulses sector is leading to lack of interest of farmers in involving in value chain development process. Results in table 3 also indicate that about 14.3% of experts believed small landholdings and poor financial conditions of farmers are important constraints in the development of pulses value chain. Because of low quantity of produce, farmers are not motivated to bear the transaction costs to bring to the main markets and it is also very hard to find a wholesaler or processor interested in buying in low quantity. Moreover, majority of the small farmers take loan or receive advance payments from the village dealers at the time of sowing and are supposed to sell to the same dealer. Another reason is the need of urgent cash.

Opportunities for increasing production and developing pulses value chains

The opportunities for increasing production and developing pulses value chains identified from the analysis of the data collected through Delphi approach are presented in Table 4. About 41% respondents were of the opinion that the development of pest, disease and climate change resistant varieties with high yields is an opportunity as per acre yield of pulses is less than the world average and blight disease is one of the main problems in production of pulses particularly of Chickpeas. Researchers in the universities and research organizations involved in research on pulses are trying to develop high yielding as well as pest and climate resistant varieties as per need of the time. Training on production technology and efficient management of resources is ranked as second important opportunity for

increasing production and developing value chains of pulses as almost 33% of responses are received in its favor. The 3rd opportunity identified by 29% of the respondents is the generating awareness about the dietary benefits particularly of quality pulses among the consumers as pulses are major source of protein and could be used as substitute of meat. This awareness can lead to motivate consumers to pay a premium for good quality pulses The focus on the satisfaction of end consumer is a core part while designing sustainable value chains (Godsell et al. 2011), The term consumer driven or customer oriented means that the end-customer have to be satisfied with value associated with either product or service. Consequently, the formulation of production strategy must be focused on customer needs. About 25% of respondents were of the opinion that availability of proper storage facilities is an opportunity for pulses crops. Usually, prices remain low at the harvesting of crop and after few months it trends upward, and farmers could enhance their margins by properly storing the pulses. Likewise, training of stakeholders to improve grading, packaging and labeling received almost 23.8% of

Table 3: Constraints in developing pulses value chains (Round 1)

Constraints	Number of responses	Percentage
Poor marketing and no value chain	21	33.3
Unstable market rates	15	23.8
Less Research & Development work on pulses	14	22.2
No policy support from government	13	20.6
Small land holdings and poor financial conditions of farmers	9	14.3
Negligence of pulses sector in agricultural policy formulation	4	6.3

responses and fixation of floor price for financial security of farmers received almost 22.2% of responses as evident from Table 4.

Round 2

In round 2, structured questionnaire was used to collect the data from the panel of experts. The results of the data analysis are compiled in the form of ranking of major constraints and opportunities in increasing production and developing value chains of pulses in Pakistan.

Ranking of constraints in increasing production and developing pulses value chains

The results of the constraints received the highest scores, are presented in table 5. The results revealed that lack of availability of improved seeds termed as the most important constraint and received the rank 1 according to the respondents. Likewise, lack of effective policy support from government was ranked 2 as policies strongly affect the decisions taken by stakeholders. Moreover, experts ranked

Table 4: Opportunities for increasing production and developing pulses value chains (Round 1)

Drivers/Opportunities	Number of responses	Percentage
Development of pest, disease and climate change resistant high yielding varieties	26	41.3
Training on production technology and efficient management of resources	21	33.3
Promotion of good benefits of pulses among consumers	10	28.5
Transportation and Storage facility	16	25.4
Training of stakeholder to improve grading, packaging and labeling	15	23.8
Fixation of floor price for financial security of farmers	14	22.2
Huge Supply demand gap in domestic market for pulses	13	20.6
Provision of marketing information facility to farmers	13	20.6
Availability of good variety seeds	12	19.0
Availability of durable and low-cost packing material	11	17.5
Strength of linkages among producers and other value chain actors	11	17.5
Access to pulses processing units in pulse producing areas for farmers	9	14.3
Access to Financial Facilities	9	14.3
Reduce role of middleman and provide direct access to market for sale of produce	9	14.3
Zoning the Agro-ecological niches, support to farmers cultivating restorative/nitrogen	8	12.7
Potential for export in international market	9	14.3
Establishment of farmers field schools for the trainings in different production and post-harvest management practices	4	6.3
Provision of weather intelligence to farmers so that they can make their planting and input is decisions	2	3.2

poor marketing and lack of established

value chains as third (3) most important constraint in attaining the sustainable pulses production in Pakistan. Whereas other constraints with their ranks are given in Table 5.

Non-availability of sustainable input resources and effects of different climatic factors results in lower yield (ranked 4), lack of awareness among farmers about the advanced production technologies received the rank 5.

Table 5: Ranking of constraints in increasing production and developing pulses value chains (Round 2)

Number	Constraints	Score	Rank
1	Lack of availability of Improved varieties/ seed of pulses	181	1
12	No policy support from government	176	2
5	Poor marketing and no value chain	173	3
7	Lower yield as compared to other cash crops	172	4
2	Lack of awareness among farmers about the advanced production technologies	172	5
13	Small land holdings and poor financial conditions of farmers	172	6
8	Lack of proper machinery to harvest and cultivate to overcome labor shortage and cost	171	7
11	Less Research & Development work on pulses	171	8
15	Negligence of pulses sector in agricultural policy formulation	166	9
10	Unstable market rates	162	10
4	Lack of innovative crop improvement programs and seed distribution systems	162	11
16	Non-availability of Insurance for Crop damage	158	12
14	low moisture availability	154	13
9	low soil fertility due to sandy soils	153	14
3	Marginal land devoted for pulses crop	151	15
6	Un-predictable weather conditions	148	16

Source: Author's own compilations (Delphi survey, 2021)

Opportunities in increasing production and developing pulses value chains

Opportunities quoted by experts' panel were also prioritized and results of the opportunities are given in Table 6. The experts ranked the most important opportunity (Ranked 1) is the development of pest, disease and climate change-resistant high yielding varieties as these varieties will act as major driver by increasing the supply from domestic markets contributing to growth of pulses sector. Moreover, training of farmers on production technology second highest (ranked 2) opportunity because it may help building their capacity on modern lines. Average farm size is low in most of developing countries including Pakistan and farmers rely on loans to meet their production expenses and some receive in-kind payments, in response, they are compelled to sell their produce at lower rates than market. Consequently, lack of access to financial facilities/ support from

government and other agencies was ranked third (3) by experts. Agribusiness value chains are consumer driven or under compliance by high-end stores in developed countries whereas, middlemen act as main driver of the chain in developing countries like Pakistan. Therefore, reducing the role of middleman by providing direct access to market for sale of produce and strengthening the linkages among producers & other value chain actors were ranked fourth (4) and fifth (5) respectively.

Table 6: Opportunities in increasing production and developing pulses value chains (Round 2)

Number	Opportunities	Score	Rank
1	Development of pest, disease, and climate change resistant high yielding varieties	189	1
2	Training of farmers on production technology	179	2
11	Access to Financial Facilities/ support from Government and other agencies	175	3
12	Reduce role of middleman and provide direct access to market for sale of produce	174	4
9	Strengthen the linkages among producers and other value chain actors	172	5
10	Access to pulses processing units in pulse producing areas for farmers	170	6
5	Training of stakeholder to improve grading, packaging and labeling	167	7
6	Fixation of indicative price of pulses for the farmers	165	8
15	Establishment of farmers field schools for the trainings in different production and post-harvest management practices	164	9
7	Provision of marketing information facility to farmers	162	10
13	Zoning the Agro-ecological niches, support to farmers cultivating restorative/nitrogen	160	11
14	Potential for export in international market	158	12
8	Ensure availability of durable and low-cost packing material	154	13
4	Transportation and Storage facility for the growers	153	14
3	Promotion of use of pulses in daily diet among consumers	151	15
16	Provision of weather intelligence to farmers so that they can make their planting and input decisions	147	16

Source: Author's own compilations from Delphi survey, 2021

Table 7: Constraints in developing pulses value chains (Round 3)

Constraints	Consensus (%)
Poor marketing and no value chain	95
Lack of availability of Improved varieties/ seed of pulses	90
No policy support from government	90
Lower yield as compared to other cash crops	90
Small land holdings and poor financial conditions of farmers	90
Lack of proper machinery to harvest and cultivate to overcome labor shortage and cost	90
Lack of awareness among farmers about the advanced production technologies	85
Un-predictable weather conditions	85
Negligence of pulses sector in agricultural policy formulation	85
Less Research & Development work on pulses	80
Marginal land devoted for pulses crop	80
Unstable market rates	80
Lack of innovative crop improvement programs and seed distribution systems	80
low moisture availability	80
Non-availability of Insurance for Crop damage	70
low soil fertility due to sandy soils	70

3.2.Round 3

The results of the consensus among the panelists about the constraints given in the Table 7. The barriers of these pulses value chains were also identified in round three. During this round, about 95 % of the respondents agreed on the poor marketing and non-existence of proper value chain resulting in lack of incentive for farmers to focus on pulses production as the major barrier in the enhancement of the pulses production in Pakistan. Moreover, 90% of the respondents agreed on that 'lack of availability of improved varieties/seed of pulses', 'no policy support from government', 'lower yield as compared to other cash crops', 'small land holdings and poor financial conditions of farmers', and lack of proper machinery to harvest and cultivate to overcome labor shortage and cost are the major constraints for developing pulses (chickpea, lentils, and mung beans) value chains in Pakistan. However, Non-availability of insurance for crop damage and low soil fertility due to sandy soils failed to acquire 80% level of the consensus among the respondents, therefore, they were removed from the list of constraints (Table 7).

The results of the consensus among the panelists about the opportunities given in the Table 8. About 80% of the consensus was found on the following drivers for developing pulses (chickpea, lentils, and mung beans) value chains in Pakistan:

- Development of pest, disease and climate change resistant high yielding varieties
- Lack of availability of improved varieties/ seed of pulses
- Training of farmers on production technology

- Strengthen the linkages among producers and other value chain actors
- Provision of weather intelligence to farmers so that they can make their planting and input decisions

During this round of the Delphi method, 'promotion of use of pulses in daily diet among consumers' and 'potential for export in international market' was omitted from the list of drivers because it failed to achieve 80% agreement of the expert panel responses.

Table 8: Opportunities in developing pulses value chains (Round 3)

Drivers/Opportunities	Consensus (%)
Development of pest, disease, and climate change resistant high yielding varieties	100
Training of farmers on production technology	100
Strengthen the linkages among producers and other value chain actors	100
Provision of weather intelligence to farmers so that they can make their planting and input decisions	100
Reduce role of middleman and provide direct access to market for sale of produce	95
Training of stakeholder to improve grading, packaging, and labeling	95
Zoning the Agro-ecological niches, support to farmers cultivating restorative/nitrogen	95
Fixation of indicative price of pulses for the farmers	90
Establishment of farmers field schools for the trainings in different production and post-harvest management practices	90
Provision of marketing information facility to farmers	85
Access to Financial Facilities/ support from Government and other agencies	85
Access to pulses processing units in pulse producing areas for farmers	80
Ensure availability of durable and low-cost packing material	80
Transportation and Storage facility for the growers	80
Promotion of use of pulses in daily diet among consumers	70
Potential for export in international market	70

4. Discussion

A three-stage Delphi method was employed to identify the opportunities and barriers for pulses' production and value chains development in Pakistan. The results of this exploratory study reveal that poor marketing and non-existence of appropriate value chain is the major barrier in promoting the pulses farming. Furthermore, increasing the practical relevance emerged as a promising measure to enhance pulses' production. In that regard, this research is in line with previous findings, but it adds important insights which can help to tailor policy and training measures aiming at promoting value chains development of pulses. In particular, the experts identified a pronounced demand for indicative price to overwhelm the cost barriers. Specific training, come with advisory support, would be helpful in building more practical relevance and support smallholders' farmers in pulses production.

Synthesizing the experts' responses on the opportunities to enhance the pulses production and value chain development and their benefits divulges a scenario that covers social, economic and environmental aspects. The development of pest, disease, climate change resistant and high yielding varieties can increase the economic and social status of the farmers. The training on technology, strengthening the linkages among producers and other value chain actors, and provision of weather intelligence can improve farmers economic situations. Therefore, some targeted actions needed to be formulated to enhance pulses cultivation. For instance, some training program regarding better agronomic practices, post- harvest management such as cleaning, grading, and storing, and connecting with the markets should be introduced. These trainings materials should be disseminated via print as well as electronically with the farmers which will enhance their participation and make it easy to access. The government should consider providing direct incentives to pulses farmers, and marketing services should support pulses to maintain and enhance pulses yields. Moreover, promotion of pulses cultivation also ensures the less carbon footprints and zero CO_2 which also be good for environmental aspect.

The conclusion of this research brings a significant scientific perspective to the policy makers for developing value chains at local and regional level, especially for those crops which are vulnerable to climate change and farmers struggling to make it viable. Therefore, creating a viable framework and incentivizing policies are required to tackle this low production issue by motivating farmers to grow more pulses ultimately can lead to minimize the imports. Hence, capitalizing on these opportunities can be vital in mastering these future challenges.

The findings have particular limitations that can be extended in different ways. Even though, we involved all the stakeholders from research, extension and academia, our results represent their perspective. Though, this was our deliberate focus, future studies in this regard can be included farmers perspective because they are the most important part of the pulses value chains. It also helps to widen the scope of the Delphi method from its traditional implication to conclude comprehensive and concrete recommendations.

The support to the pulses growers can be provided via Kissan Card. There is an opportunity to reduce the role of the middleman and provide direct access to the market for the sale of produce. This opportunity can be capitalized by strengthening the linkages among small farmers and other value chain actors. This is a big opportunity in the developing country context to address market access issues and provide farmers direct access to the market by developing the linkages between the stakeholders. Overall, information from the Delphi study could assist policymakers, research institutions, and international funding agencies in planning efficient interventions and

strategies to uplift pulses production and ensure food nutrition security in Pakistan.

5. Conclusion

A three-stage Delphi method was employed to predict the future development of pulses sector in Pakistan, to identify the opportunities and barriers for pulses' production and value chains development. The results of this exploratory study revealed that poor marketing and nonexistence of value chain is a major barrier in promoting the pulses farming. Furthermore, increasing practical relevance emerged as a promising measure to enhance pulses' production. In that regard, this research is in line with previous findings, but it adds important insights which can help tailor policy and training measures aiming to promote the agri-value chains development. In particular, the experts identified a pronounced demand for indicative price or support price to overwhelm the cost barriers. Specific training, come with advisory support, would be helpful in building more practical relevance and support smallholders' farmers in pulses production.

Synthesizing the experts' responses on the opportunities to enhance the pulses production and value chain development and their benefits divulges a scenario that covers social, economic, and environmental aspects. The development of pest, disease, and climate change resistant high yielding varieties increase the social status of the farmers. The training on technology, strengthen the linkages among producers and other value chain actors, and provision of weather intelligence improve farmers economic situations. Therefore, some targeted actions needed to be formulated to enhance pulses cultivation. For instance, some training program regarding post-harvest management, storage and marketing related should be introduced. These trainings materials should be disseminated via print and electronically with the farmers which will enhance their participation and make it easy to access. The government should consider providing direct incentives to pulses farmers, and marketing services should support pulses to maintain and enhance pulses yields. Moreover, promotion of pulses cultivation also ensures the less carbon footprints and zero CO_2 which also be good for environmental aspect.

The conclusion of this research brings a significant scientific perspective to the policy makers for developing value chains at local and regional level, especially for those crops which are vulnerable to climate change and farmers struggling to make it viable. Therefore, creating a viable framework and incentivizing policies required to tackle this low production issue by motivating farmers to grow more pulses. Undoubtedly, formulating value chain development enabling policy and incentivizing policies further to help in minimizing the pressure on imports. Hence, capitalizing on these opportunities can be vital in mastering these future challenges.

The findings have particular limitations that can be extended in different ways. Even though, we involved all the stakeholders from research, extension and academia, our results represent their perspective. Though, this was our deliberate focus, future studies in this regard can be included farmers perspective because they are the most important part of the pulses value chains. It also helps to widen the scope of the Delphi method from its traditional implication to conclude comprehensive and concrete recommendations.

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