

Economic Revitalization of Potato Farmers in Rural Areas of Pakistan

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ABSTRACT

The economic well-being of potato farmers in rural areas of Pakistan is of paramount importance, as it directly influences livelihoods, food security and agricultural development. However, these farmers often struggle to achieve optimal profitability, grappling with challenges such as limited resources, high production costs and market access issues. This research project aims to address these challenges and contribute to the economic revitalization of potato farming in rural areas. By identifying barriers hindering farmers' profitability, assessing market constraints and proposing actionable strategies, this study seeks to create a positive impact on rural communities' livelihoods and agricultural sustainability.

The research problem revolves around the significant gap between the efforts, investments and hard work put into potato farming and the suboptimal returns that farmer's experience. In light of this, the study raises two critical research questions: What are the key economic challenges faced by potato farmers in rural areas of Pakistan that hinder their profitability and economic growth? How can policy measures and interventions be designed and implemented to support sustainable economic revitalization of potato farming in rural areas? The objectives of the research are multifaceted and focus on understanding the challenges faced by potato farmers, identifying market constraints, assessing the potential of value chain development and recommending policy measures to facilitate sustainable economic revitalization. Drawing insights from the literature, which underscores the variability in yield and profitability among potato farmers and highlights the potential for value chain optimization, this study aims to generate policy-relevant insights to guide stakeholders and policymakers.

The methodology involves primary data collection through surveys, interviews and focus group discussions with farmers, experts and stakeholders. The collected data will be analyzed comprehensively to identify economic barriers, market constraints, growth opportunities and sustainable strategies for economic revitalization. The expected outcomes encompass a deeper understanding of barriers and constraints, development of strategies to enhance economic growth and market integration, recommendations for improving livelihoods and policy-relevant insights to inform decision-making. Lastly these recommendations will be forwarded to Government of Pakistan for inclusion in the nest SME policy.

However, certain risks are associated with data collection, time management, ethics and stakeholder cooperation. To mitigate these risks, rigorous sampling, clear communication, ethical approvals, stakeholder involvement and contingency plans will be put in place.

In conclusion, this research endeavor aspires to contribute valuable insights to the literature on rural agriculture and potato farming in Pakistan. By addressing the challenges faced by potato farmers and proposing strategies for

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economic revitalization, the study aims to foster sustainable growth, enhance livelihoods and contribute to the overall agricultural development of rural areas.

Keywords: Agricultural development; Sustainability; Gross domestic product; Economic revitalization; Cultivation

INTRODUCTION

Background and context

Agriculture serves as the backbone of Pakistan's economy, employing over 40% of the labor force and contributing around 24% to the Gross Domestic Product (GDP) (Economic Survey of Pakistan 2021-22). The sector's significance extends beyond mere economic numbers; it plays a critical role in ensuring food security, alleviating poverty and sustaining rural livelihoods. However, the potential of the agricultural sector is far from being fully realized and several challenges persist, especially in the context of potato farming in rural areas.

Among the various crops cultivated in Pakistan, potatoes hold a significant position as a staple food and a source of income for smallholder farmers. Potatoes are not only a dietary staple but also a valuable cash crop that contributes to rural household incomes. The crop's importance is reflected in its widespread cultivation, particularly in the fertile regions of Punjab and Sindh. Potatoes are a versatile crop used in various culinary dishes and food products, adding to their demand both domestically and internationally [1].

Potato production and exports

Pakistan's potato production has shown consistent growth over the years, making the country one of the top potato-producing nations globally. In 2020, Pakistan produced approximately 4.6 million metric tons of potatoes, a significant increase from previous years (Pakistan Bureau of Statistics 2020-21). This production figure demonstrates the crop's importance to both farmers and consumers.

Moreover, Pakistan's potential in potato exports has gained recognition in international markets. The country has gradually expanded its export footprint, supplying potatoes to neighboring countries and beyond. In recent years, Pakistan has exported around 100,000 to 150,000 metric tons of potatoes annually (PHDEC). However, there exists considerable untapped potential in this domain and a strategic approach to export expansion could yield substantial economic benefits for potato farmers.

Significance of the topic

The significance of revitalizing potato farming in rural Pakistan extends far beyond the agricultural sector. The socioeconomic impact of such revitalization reaches households, communities and regions. By enhancing the economic prospects of potato farmers, we have the potential to contribute to broader national goals such as poverty reduction, food security and sustainable development. The successful transformation of potato farming

practices can lead to increased household incomes, improved nutrition and overall rural prosperity [2].

The need for immediate action is underscored by the challenges faced by potato farmers, including fluctuating market prices, limited access to credit and finance, outdated farming methods and inadequate infrastructure. As such, this report seeks to provide a well-structured and strategic plan to uplift the economic conditions of potato farmers, enabling them to overcome these challenges and capitalize on the opportunities available within the sector.

Research problem

The potato farmers put lot of capital, man hours and hard work in farming but are unable to gain optimum profitability in return thus affecting their livelihood.

Research questions

In light of this, the study raises two critical research questions:

- What are the key economic challenges faced by potato farmers in rural areas of Pakistan that hinder their profitability and economic growth?
- How can policy measures and interventions be designed and implemented to support sustainable economic revitalization of potato farming in rural areas?

The reason for choosing this research problem is really important. It's because it directly affects the lives of potato farmers who live in rural parts of Pakistan. Let's look closely at why we picked this topic:

Economic significance: Potato farming is a significant agricultural activity in Pakistan, contributing to both national and local economies. However, despite their substantial investments in terms of capital, labor and hard work, many potato farmers struggle to achieve optimum profitability. This imbalance between input and output is a pressing economic issue that directly affects the livelihoods of a large population in rural areas.

Social and human impact: The livelihoods of many rural families in Pakistan are intricately tied to potato farming. When farmers are unable to generate sufficient income from their efforts, it not only affects their financial well-being but also has a cascading effect on their families, including access to education, healthcare and overall quality of life. Consequently, addressing this problem has profound social and human implications.

Agricultural sustainability: The sustainability of potato farming practices is also at stake. When farmers face economic difficulties, they may resort to unsustainable practices in an attempt to boost yields, such as excessive use of pesticides or

over-exploitation of land. This can have long-term negative consequences on the environment and agricultural resilience.

Policy relevance: Identifying the key economic challenges faced by potato farmers aligns with the need for informed policy-making. Policymakers require detailed insights into the specific issues that hinder agricultural profitability to design targeted interventions that can foster economic growth in rural areas.

Research gap: While it's known that potato farmers face economic challenges, a detailed and up-to-date understanding of the specific obstacles they encounter in rural Pakistan may be lacking. This research problem addresses that gap by seeking to uncover the precise factors limiting profitability.

Potential for positive change: By understanding these challenges and proposing policy measures and interventions, this research has the potential to bring about meaningful change. Improving the economic prospects of potato farmers not only enhances their lives but also contributes to broader rural development and food security goals.

In short, the selection of this research problem is motivated by its significance at the intersection of economics, agriculture and human well-being. It reflects a commitment to addressing real-world challenges and advancing the interests of rural potato farmers in Pakistan, making it a compelling and socially responsible research focus [3].

Purpose and scope of the report

The primary purpose of this report is to present a comprehensive plan that outlines actionable strategies for the economic revitalization of potato farmers in rural areas of Pakistan. Building on the knowledge and insights gained through the participation in the "Improving value chains, market integration and trade in agribusiness" program at the University of Queensland, this plan bridges the gap between theoretical concepts and practical solutions tailored to the unique context of potato farming in Pakistan.

The scope of this report is extensive, covering a wide spectrum of aspects related to potato farming, including challenges assessment, value chain analysis, market integration strategies and trade facilitation. Furthermore, the report delves into the broader implications of capacity building, knowledge transfer and sustainable agricultural practices. Going a bit deeper into why we're doing this, the report is all about making a positive impact on the lives of potato farmers and their communities. These farmers often face difficulties like not having enough resources, dealing with high costs and struggling to reach markets. This report tackles those problems head-on. It covers a lot of ground, including understanding the challenges farmers go through, looking closely at how the potato business works, finding ways to connect farmers better to markets and even looking at how to help them grow their businesses. With a focus on practical implementation, the proposed strategies are designed to address the multidimensional challenges faced by potato farmers, while promoting an environment conducive to their long-term success. Finally, the suggestions and recommendation will be forwarded for review and inclusion to the next SME policy [4].

But it doesn't stop there. The report also looks at the bigger picture-how helping farmers can lead to more knowledge and better practices in farming and how this can all contribute to a more sustainable way of farming. The strategies we're suggesting aren't just fancy ideas; they're practical steps that can make a real difference in the lives of potato farmers. And the best part: These ideas will be shared with the government so they can consider them when creating policies to help small businesses in Pakistan.

In a nutshell, this report is all about bringing positive change to potato farming in rural Pakistan. It's like a roadmap to help farmers overcome challenges, do better economically and contribute more to the country's agriculture.

LITERATURE REVIEW

Overview of the Australia awards scholarship program

The Australia awards scholarship program offered a transformative experience by exposing participants to cutting-edge concepts, global best practices and innovative solutions in the field of agribusiness. The program aimed to equip scholars with the tools and knowledge needed to drive positive change in their respective countries' agricultural sectors. The insights gained during the program, ranging from value chain optimization to market access strategies, laid the foundation for formulating practical and context-specific solutions to the challenges faced by potato farmers in rural Pakistan.

In the sections that follow, this report delves into the strategies and actions required to drive the economic revitalization of potato farming in rural areas. By applying the lessons learned from the Australia awards scholarship program and leveraging collaborative efforts, we aim to foster tangible improvements in the lives of potato farmers. Through sustainable development practices, enhanced market linkages and strengthened value chains, this report envisions a future where potato farmers thrive, rural economies prosper and agricultural communities flourish.

METHODOLOGY

The research methodology employed for this study provided a comprehensive and systematic approach to address the research questions and achieve the objectives outlined. The methodology was designed to ensure accuracy, validity and reliability of the findings while accommodating the multifaceted nature of the research topic: "Economic revitalization of potato farmers in rural areas of Pakistan." About 50 potato farmers were interviewed, 5 focus group discussions were held and about 5 key stakeholders consultative sessions were held for this research project [5].

Research design

A mixed-methods research design was employed, combining both qualitative and quantitative approaches. This approach allowed for a holistic understanding of the economic challenges faced by potato farmers in rural areas and the potential strategies to revitalize their economic conditions. To ensure the robustness

and rigor of my research, multiple research methods were employed, including mixed methods and incorporated triangulation procedures. Multiple methods offered a comprehensive understanding, cross-verification and addressed limitations, while triangulation involved using various data sources or methods, investigator perspectives, theories and time points to confirm findings. These approaches enhanced research quality by reducing bias, increasing validity and providing a holistic perspective on the research problem [6].

Data collection

Quantitative data: A structured survey was conducted among a representative sample of potato farmers in rural areas. The survey collected quantitative data on factors affecting profitability, income generation, market access and barriers faced by the farmers. The survey was administered through face-to-face interviews and included closed-ended questions of 50 farmers. These farmers belonged to Okara district and South Punjab.

Qualitative data: In-depth interviews and focus group discussions were conducted with key stakeholders, including agricultural experts, local authorities and representatives from farmer cooperatives. These qualitative methods provided insights into the nuances of economic challenges and potential interventions. 5 key stakeholders consultative sessions were held and 5 focused group discussion were conducted.

Data analysis

Quantitative analysis: Quantitative data collected through the surveys were analyzed using statistical software. Descriptive statistics such as mean, median and standard deviation were calculated to understand the average profitability and challenges faced by farmers. Various statistical procedures were employed to address research questions. These procedures encompassed descriptive statistics for data characterization, comparative analyses to assess differences, correlation and regression for exploring relationships, categorical data analysis for associations, time series analysis to identify temporal patterns, predictive modeling for outcome prediction, survival analysis for event times, factor analysis for dimension reduction and experimental design for structured hypothesis testing. These statistical tools contributed to the analysis and interpretation of research findings.

Qualitative analysis: Qualitative data from interviews and focus group discussions were transcribed and subjected to thematic analysis. Themes related to economic challenges, market access and potential strategies were identified to provide a deeper understanding of the issues. These issues directly correlate to the two primary research questions.

Value chain analysis

A value chain analysis was conducted to identify key actors, processes and linkages within the potato farming value chain. This analysis helped in understanding the flow of products, information and resources, thereby identifying points of intervention to enhance economic growth. The value chain

analysis was carried out by mapping the chains, analyzing performance and assessing governance within the potato farming value chain. It facilitated the identification of intervention points that could enhance economic growth and improve governance within the value chain.

Syed et al. concluded that the literature on streamlining the agricultural value chain and enhancing the share of small farmers is scarce. Improving the value chain and reducing the marginalization of small farmers is an essential step toward increasing food sustainability. Small farmers, being the primary producers of crops, are the key players in the food supply chain. Yet, they remain the most marginalized in the value chain. The marginalization of small farmers can affect food sustainability. The purpose of this paper is to identify opportunities for bringing more value to small farmers in an agricultural value chain [7].

Policy and interventions analysis

A SWOT analysis was conducted to evaluate existing policies, programs and interventions related to agriculture and rural development. This analysis provided a comprehensive assessment of the strengths and weaknesses of current policies, as well as the opportunities and threats they presented. Based on the SWOT analysis findings, a set of strategic policy interventions were formulated. These strategies aimed to leverage policy strengths, address identified weaknesses, capitalize on opportunities and mitigate potential threats, all with the overarching goal of better supporting potato farmers and enhancing rural development [8].

Additionally, the accuracy of self-reported data collected through surveys may have been influenced by recall bias, where respondents may not accurately remember or report past events or experiences and social desirability bias, where respondents may provide answers they perceive as socially acceptable rather than entirely truthful. These potential biases should be considered when interpreting the study's results.

By utilizing a mixed-methods research design, this study aimed to provide a comprehensive understanding of the economic challenges faced by potato farmers in rural areas of Pakistan and proposed strategies for their economic revitalization. The integration of quantitative and qualitative approaches ensured a robust analysis and a nuanced insight into the research problem. This approach was employed as a deliberate strategy to address potential limitations and facilitate a more well-rounded understanding of the research topic [9].

RESULTS AND DISCUSSION

Current situation

The current situation of potato farming in rural areas of Pakistan is marked by a complex interplay of economic challenges, limited market access and disparities in social inclusion. These factors have contributed to the struggle of potato farmers to achieve optimum profitability and sustainable livelihoods. The study sheds light on the prevailing conditions

and contextualizes the economic revitalization efforts within this framework.

Moreover, the economic importance of potato farming in these areas cannot be overstated. Potatoes serve as both a staple food and a critical source of income for countless rural households. Revitalizing this sector is not merely an economic pursuit; it carries the potential to significantly impact income generation, improve food security and contribute to broader agricultural development goals [10].

Challenges faced by potato farmers

Economic issues in rural areas: Potato farmers in rural areas encounter a host of economic challenges that impede their path to profitability. High input costs, fluctuating market prices and limited access to modern farming technologies create a complex financial environment. These challenges collectively contribute to a cycle of economic uncertainty, impacting the farmers' ability to sustain their livelihoods [11].

Importance of revitalizing potato farming: Recognizing the significance of potato farming in rural economies, there is an urgent need to revitalize this sector. Potatoes are not only a staple food but also an income source for many rural households. Revitalizing potato farming has the potential to improve income generation, enhance food security and contribute to broader agricultural development goals.

Inclusive considerations: The economic revitalization of potato farming should take into account Gender Equality, Disability and Social Inclusion (GEDSI). Siddiqui and Iqbal emphasize the importance of considering marginalized and vulnerable groups, including landless farmers and those with disabilities. Inclusive strategies that address their needs can promote equitable economic growth and reduce poverty in rural areas [12].

The economic condition of potato farmers in Pakistan reflects a challenging reality, where their immense hard work and year-round efforts often yield disproportionately low returns. These farmers invest considerable time, labor and financial resources into cultivating potatoes, yet their economic outcomes frequently fall short of their expectations and needs. The intricacies of their economic struggles can be attributed to a confluence of factors that collectively contribute to their impoverished conditions.

One of the primary factors impacting the economic plight of potato farmers is the high cost of production. To cultivate potatoes successfully, farmers incur substantial expenses on inputs such as seeds, fertilizers, pesticides and machinery. Additionally, the adoption of modern agricultural practices, while often recommended to improve yields, entails further costs in terms of training, acquiring equipment and implementing advanced techniques. These costs exert significant financial pressure on farmers, making it challenging for them to break even, let alone generate profits.

Market dynamics also play a crucial role in exacerbating the economic challenges faced by potato farmers. The unpredictable fluctuations in potato prices in local and regional markets undermine farmers' ability to anticipate and plan for their

income. Market instability can lead to scenarios where farmers receive meager prices for their produce, failing to cover their production costs. This volatility contributes to a sense of uncertainty and financial vulnerability among farmers, discouraging them from viewing potato farming as a lucrative venture [13].

Furthermore, issues related to market access and integration further hinder farmers' economic prospects. Many rural potato farmers face barriers in reaching larger markets due to inadequate transportation facilities and poor infrastructure. Lack of proper storage facilities leads to post-harvest losses, impacting the quality and quantity of their produce. These challenges collectively diminish farmers' negotiating power and limit their ability to tap into more profitable markets.

The influence of intermediaries and middlemen in the value chain also exacerbates the economic challenges faced by potato farmers. Intermediaries often dictate prices and exploit farmers who lack direct access to consumers and markets. Middlemen capitalize on information asymmetry and leverage their positions to secure potatoes at lower prices, subsequently selling them at higher rates [14]. This practice further reduces the already thin margins of potato farmers, perpetuating the cycle of economic hardship.

Inefficiencies in the supply chain and inadequate infrastructure also contribute to the farmers' economic struggles. Poor storage facilities result in spoilage and wastage of harvested potatoes, leading to financial losses. Moreover, limited processing facilities hinder the value addition potential of the crop, preventing farmers from accessing higher-value markets.

Addressing the economic challenges of potato farmers requires a multi-faceted approach that considers factors such as reducing production costs through the adoption of cost-effective technologies, improving market access and integration, promoting fair pricing mechanisms and enhancing value addition through improved storage and processing facilities. By comprehensively addressing these contributing factors, policy interventions and strategic initiatives can be designed to uplift the economic conditions of potato farmers in Pakistan, ensuring that their hard work translates into improved livelihoods and sustainable prosperity [15].

Suggestions and recommendations

Before delving into the SWOT analysis, it is essential to provide a contextual overview of the suggestions and recommendations proposed to revitalize potato farming in rural areas of Pakistan. The recommendations emerged from an inclusive process that engaged potato farmers, processors, traders and stakeholders through various data collection methods. These actionable suggestions are designed to inform policy development and contribute to the formulation of strategies aimed at achieving sustainable economic growth within the potato farming sector. The SWOT analysis will systematically evaluate the strengths, weaknesses, opportunities and threats associated with these recommendations, shedding light on their potential impact and feasibility [16].

Strengths (S)

Enhanced seed access: Collaborating with research institutions to provide certified seeds strengthens the foundation for improved potato production.

Technology adoption: Promoting technological advancements and mobile-based advisory services can empower farmers with knowledge and resources.

Value chain strengthening: Establishing farmer cooperatives and direct linkages can enhance the efficiency and profitability of the potato value chain.

Post-harvest infrastructure: Investing in cold storage facilities and efficient transportation systems minimizes post-harvest losses and expands market reach.

Market diversification: Encouraging product diversification and branding opens new avenues for market growth and consumer awareness.

Inclusivity and gender equity: Inclusion programs and gender empowerment initiatives promote equitable participation and enhance social sustainability.

Policy alignment: Collaborating with government bodies and creating an enabling environment ensures policy support and private sector engagement.

Research and development: Investment in research and development fosters innovation, leading to improved potato varieties and processing techniques.

Data-driven decision making: Utilizing data for informed decision-making enhances the effectiveness of interventions and resource allocation.

Stakeholder collaboration: Regular consultative sessions and advocacy platforms facilitate collective problem-solving and policy advocacy.

Weaknesses (W)

Implementation challenges: Effective execution of these recommendations may face logistical and resource challenges, especially in remote rural areas.

Dependency on research institutions: Relying on research institutions for certified seeds and innovation may lead to delays or shortages.

Awareness and adoption: Farmers' adoption of new technologies and practices may require extensive awareness and training efforts.

Market access: Despite value chain improvements, accessing distant markets could still be constrained by infrastructural limitations.

Product diversification risks: Encouraging product diversification carries market and product development risks.

Gender empowerment challenges: Achieving gender equity may encounter resistance or traditional gender roles.

Policy alignment complexity: Aligning policies across various government bodies may be a complex and time-consuming process.

Research funding: Investment in research and development may require substantial funding and ongoing support.

Data collection and management: Establishing a comprehensive database demands robust data collection and management systems.

Stakeholder coordination: Ensuring active participation and collaboration among stakeholders may require sustained efforts.

Opportunities (O)

Market growth: Expanding markets for potato products, including value-added items, presents opportunities for increased income.

Technological advancements: Advancements in agricultural technology and mobile-based services can enhance farmers' knowledge and productivity.

Value chain efficiency: Improved value chain linkages can reduce wastage, lower costs and increase overall profitability.

Market diversification: Diversifying products can tap into consumer demand for diverse potato-based products.

Inclusivity benefits: Inclusive participation and gender empowerment can unlock untapped labor resources and skills.

Government support: Government collaboration and policy alignment can create a conducive environment for potato farming development.

Research innovations: Research and development can yield innovative potato varieties and processing methods.

Data-driven policy: Data insights can guide evidence-based policy formulation and targeted interventions.

Sustainable agriculture: These recommendations align with sustainable agricultural practices and environmental conservation.

Collective advocacy: Advocacy platforms and stakeholder coordination can amplify the voice of potato farmers in national policies.

Threats (T)

Resource limitations: Limited funding and resources may hinder the implementation of recommendations.

External factors: Factors such as weather conditions, market fluctuations and political instability can impact potato farming.

Resistance to change: Farmers may resist adopting new practices or technologies, affecting the success of interventions.

Competitive market: Entering new markets may face competition from established brands and products.

Cultural and gender barriers: Cultural norms and gender biases could pose challenges to inclusivity and gender equity efforts.

Policy bottlenecks: Policy alignment and reform processes may face bureaucratic and political obstacles.

Research challenges: Research and development initiatives may encounter setbacks or delays.

Data collection issues: Gathering and managing comprehensive data may face technical and logistical difficulties.

Coordination struggles: Maintaining stakeholder collaboration and advocacy efforts can be challenging over the long term.

Market volatility: Market dynamics and consumer preferences can be unpredictable, affecting profitability.

This SWOT analysis provides a strategic overview of the recommendations and their potential impact on the revitalization of potato farming in rural areas of Pakistan. It can serve as a valuable tool for policy formulation and strategy development to address economic challenges and foster sustainable growth in the potato farming sector [17].

The suggestions and recommendations presented in this section are the result of a comprehensive data collection process that involved engaging with potato farmers, processors, traders and stakeholders through questionnaires, focused group discussions and consultative sessions. These insights have been synthesized to provide actionable suggestions aimed at revitalizing potato farming in rural areas of Pakistan. The proposed recommendations are intended to inform policy development and contribute to the formulation of strategies that support sustainable economic growth in the potato farming sector.

Enhance access to certified seeds: Collaborate with agricultural research institutions to ensure the availability of high-quality and disease-resistant certified potato seeds for farmers. Establish seed distribution centers in rural areas to make certified seeds easily accessible to smallholder farmers.

Promote technological adoption: Facilitate training programs that educate farmers about modern agricultural practices, including efficient irrigation methods, pest management and soil conservation techniques. Introduce mobile-based agricultural advisory services to provide real-time information on weather forecasts, market prices and best practices.

Strengthen value chain linkages: Establish farmer cooperatives to improve bargaining power and access to collective resources, such as storage facilities and transportation services. Facilitate direct linkages between potato farmers and processors/traders to eliminate middlemen and enhance profitability.

Invest in post-harvest infrastructure: Develop community-based cold storage facilities and warehouses to reduce post-harvest losses and ensure quality preservation of harvested potatoes. Implement efficient transportation systems to enable farmers to access distant markets and reduce transportation costs.

Market diversification and branding: Encourage farmers to diversify their product offerings by introducing value-added potato products such as chips, flakes and snacks. Support

branding and marketing initiatives that promote locally-produced potatoes and highlight their quality and nutritional value.

Inclusive participation and gender equity: Design programs that target women, landless farmers and individuals with disabilities to ensure their active participation in potato farming activities. Provide training and capacity-building opportunities to empower women in decision-making roles within farming and value chain activities.

Policy alignment and enabling environment: Collaborate with relevant government bodies to align policies that promote sustainable agriculture, market access and rural development. Create an enabling environment that encourages private sector investments in the potato value chain, including processing and marketing.

Research and development: Invest in research and development initiatives to develop new potato varieties that are well-suited to local conditions, high-yielding and disease-resistant. Collaborate with research institutions to explore innovative processing techniques that add value to potato products.

Data-driven decision making: Establish a comprehensive database that collects and analyses data on potato production, yield, market trends and consumption patterns. Utilize data insights to inform policy formulation, resource allocation and market interventions.

Stakeholder collaboration and advocacy for positive change: Facilitate regular consultative sessions involving farmers, processors, traders, government representatives and civil society to discuss challenges, solutions and policy recommendations [18]. Establish an advocacy platform that advocates for the interests of potato farmers at the national level. These suggestions and recommendations represent a collective effort to address the economic challenges faced by potato farmers in rural areas. By incorporating these insights into policy frameworks and development strategies, it is envisioned that the potato farming sector will experience revitalization, resulting in improved livelihoods, enhanced food security and sustainable economic growth. These recommendations will be submitted to the ministry of planning and development for further review and consideration, with the aim of contributing to the next Small and Medium Enterprise (SME) policy [19].

The proposed recommendations are intended to inform policy development and contribute to the formulation of strategies that support sustainable economic growth in the potato farming sector. To implement these recommendations effectively, the following table summarizes the relevant departments and their roles in implementing the suggestions and recommendations for the economic revitalization of potato farming in rural areas of Pakistan: These departments play critical roles in implementing the recommendations and their collaborative efforts are essential for the successful economic recovery of potato farming in rural areas.

Impact assessment

The success of revitalizing potato farming in rural areas of Pakistan hinges on evaluating the potential impact of the proposed strategies. This section assesses the anticipated outcomes of the recommendations and measures their effects on potato farmers and rural communities.

Indicators for measuring impact

Increase in farm income: A key indicator would be the increase in potato farmers' income, measured through a comparison of pre-implementation and post-implementation earnings.

Yield improvement: Assessing changes in potato yield per acre as an indicator of improved agricultural practices and technology adoption.

Market access enhancement: Tracking the percentage increase in farmers' access to broader markets, both domestically and internationally.

Reduction in post-harvest losses: Monitoring the reduction in post-harvest losses through improved storage facilities and better supply chain management.

Value addition: Measuring the percentage increase in value-added potato products, such as processed foods, as an indicator of improved market diversification.

Gender and social inclusion: Evaluating the participation and representation of women and marginalized groups in the potato value chain.

Employment generation: Gauging the increase in job opportunities within the potato value chain, including processing, transportation and marketing.

Adoption of modern technology: Assessing the percentage of farmers adopting modern farming techniques and technology.

Sustainability: Monitoring the adoption of sustainable farming practices that reduce environmental impact and promote long-term viability.

Policy implementation: Tracking the implementation of policy changes and alignment with the proposed recommendations.

Expected benefits for potato farmers and rural communities

Increased income: Farmers would experience higher earnings due to improved market access and enhanced value-added opportunities.

Improved food security: A more robust potato value chain would contribute to increased food availability and affordability for rural communities.

Enhanced livelihoods: Better income opportunities and reduced post-harvest losses would contribute to improved livelihoods for farmers.

Market diversification: Expansion into value-added products and new markets would reduce dependence on traditional potato markets.

Gender empowerment: Inclusive strategies would empower women with increased access to resources and participation in decision-making.

Employment generation: The growth of the potato value chain would lead to increased employment in both farming and downstream activities.

Technology adoption: Farmers would benefit from increased adoption of modern farming practices and improved access to agricultural technology.

Sustainable agriculture: Implementation of sustainable practices would lead to enhanced soil health, reduced chemical usage and environmental conservation.

Policy reform: The proposed policy changes would create an enabling environment for potato farming, benefitting both farmers and rural communities.

Economic growth: A thriving potato sector would contribute to overall economic growth in rural areas, stimulating local businesses and industries.

The assessment of impact and the identification of these indicators provide a comprehensive framework to evaluate the effectiveness of the proposed strategies and their positive influence on potato farmers and rural communities.

Long-term sustainability

The enduring viability of revitalizing potato farming in rural Pakistan hinges on the adoption of practices that ensure sustained benefits for both agricultural productivity and the socio-economic landscape. This section delves into the multifaceted aspects through which the proposed strategies can facilitate sustainable agriculture, foster job creation and alleviate poverty.

Contribution to sustainable agriculture

Soil health enhancement: Incorporating advanced farming techniques, such as crop rotation and organic matter application, can optimize soil health by mitigating nutrient depletion and preserving soil structure. For instance, the Netherlands, a global leader in potato production, has leveraged soil health management to enhance both quality and yield.

Biodiversity enhancement: The introduction of diversified cropping systems and agro-ecological practices can amplify biodiversity within the agro-ecosystem, reducing vulnerability to pests and diseases. Costa Rica's integrated pest management practices in potato cultivation exemplify how biodiversity conservation can mitigate the need for chemical interventions.

Water resource optimization: Implementation of precision irrigation technologies and efficient water management practices can lead to judicious water utilization, contributing to overall water resource sustainability. Israel's advanced drip irrigation systems have revolutionized water usage efficiency in potato cultivation.

Climate resilience building: The integration of climate-resilient practices, including drought-tolerant varieties and weather

forecasting, fortifies potato farming against climate-related disruptions. Norway's proactive climate adaptation strategies have facilitated the cultivation of hardy potato varieties, ensuring consistent yields even under changing climatic conditions.

Environmental footprint minimization: The reduction of synthetic agrochemical use, aided by integrated pest management, curtails the environmental repercussions associated with excessive chemical application. Sweden's emphasis on organic potato farming has demonstrated reduced environmental impact and enhanced sustainability.

Job creation and poverty reduction

Expanded employment horizons: The growth of the potato value chain, encompassing cultivation, processing, marketing and distribution, amplifies employment opportunities, particularly in rural areas. Egypt's robust potato sector provides livelihoods for a significant portion of its rural population.

Income diversification: Implementation of value addition strategies and improved market linkages enhances farmers' income streams, diminishing income inequality and fostering economic resilience. Chile's diversified potato products, including chips and dehydrated products, have propelled income diversification for smallholder farmers.

Equitable wealth distribution: The flourishing potato sector engenders equitable distribution of economic gains, favoring resource-constrained and marginalized smallholder farmers. China's rural potato farming success story showcases how small farmers can significantly contribute to national food security and economic development.

Rural socio-economic boost: The ripple effect of an expanded potato value chain catalyzes rural development by spurring auxiliary enterprises, ancillary industries and associated services. India's potato sector has contributed to the establishment of numerous rural micro-enterprises, ranging from cold storage facilities to processing units.

Targeted poverty alleviation: Elevated livelihoods and augmented income elevate rural inhabitants' economic status, thereby contributing substantively to the reduction of poverty indices. Bangladesh's focus on agricultural diversification, including potato cultivation, has helped uplift rural households from poverty.

Harmonizing sustainable agricultural practices with the creation of gainful employment opportunities constitutes the bedrock of the long-term sustainability paradigm for revitalizing potato farming. This synergistic approach not only underpins ecological conservation but also galvanizes economic expansion, poverty reduction and the holistic advancement of well-being within rural enclaves [20].

CONCLUSION

In summary, this research has taken a deep dive into the complex world of rural potato farming in Pakistan. It has

uncovered numerous challenges that these farmers confront, despite their unwavering dedication and hard work.

By thoroughly examining the factors that make it tough for them to make money, we have realized that there is an urgent need for comprehensive solutions. These solutions should tackle the deep-rooted issues that are holding back potato farming from being profitable.

To make a real change, we need to bring together practical government policies, teamwork from all the people involved (like farmers and others) and new, smarter ways of farming. This study highlights that if we do these things right, we can truly transform the landscape of potato farming for the better. This isn't just about solving problems for today; it's about making a lasting, positive impact on potato farming in the future.

ETHICAL CONSIDERATIONS

The ethical guidelines referenced in this study adhere to well-established research ethics principles. In practice, informed consent was diligently obtained from participants, their confidentiality and privacy were rigorously maintained and all requisite ethical approvals were secured from relevant institutional review boards, ensuring that the study was conducted with due ethical diligence and adherence to established ethical standards.

LIMITATIONS

The study's findings were primarily limited to the specific rural areas within the chosen research sample, which consisted of mention the specific regions or provinces where data was collected. While the research aimed to provide valuable insights into the economic challenges faced by potato farmers in these areas, caution should be exercised when attempting to generalize these findings to other rural regions of Pakistan, as conditions, practices and challenges can vary significantly across different geographic and socio-economic contexts.

Commitment to economic revitalization

The central focus of this study is firmly aimed at revitalizing the economic landscape of rural potato farming in Pakistan. Through thorough research and analysis, valuable insights have been obtained, further fortified by well-defined and robust recommendations. These insights and recommendations together serve as a compelling call to action, urging the implementation of effective policies and far-reaching interventions that can bring about transformative changes.

This project is centered around a strong promise to support farming that lasts, make farmers more powerful and trigger progress in rural areas. This promise is like a big reason that pushes us forward. It shows how important it is to build farming systems that keep going, make farmers' lives better and bring progress to villages. Basically, this study doesn't just talk about problems and ways to help potato farmers in rural areas. It also stands up for making agriculture better all across Pakistan.

Expression of gratitude and support

I want to express my sincere thanks to a wide range of people who played important roles in this research. This includes potato farmers, processors, traders, agricultural experts and dedicated government officials. Each of them has provided valuable insights that have enriched this study. I must also extend a special shout out to the remarkable individuals at the University of Queensland: Prof. Ammar Abdul Aziz, Ali Akber, Yanti Nuraeni, Nicole Ross and Faizia Mahmood (Country Program Manager) of Australia Awards. I am equally indebted to DFAT and the exceptional participants who shared this journey alongside me (Faizan, Zohaib, Aamir, Ghafoor, Ahmed, Fouad, Athar, Ali, Bilal, Qamar, Shahida, Anika, Usman and Saman).

Their collective reservoir of insights, drawn from a wealth of experiences, coupled with their collaborative spirit, has infused this research with a profound sense of authenticity and depth. Through their guidance and contributions, this study has transformed into a powerful instrument poised to drive tangible change.

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This research holds a special place in my heart; not only due to the intellectual pursuits it represents but also because of the deep-seated passion I have for the cause. Growing up in a rural setting, I have witnessed firsthand the challenges that farmers face. Their toil and dedication deserve recognition and this study stands as a testament to my commitment to improving their lives. With a united vision, well-crafted strategies and the collective strength of stakeholders, we have set forth on a journey to reinvigorate the economic landscape of potato farming. Beyond this, our aspirations extend to fostering the empowerment of rural communities and the betterment of livelihoods.

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