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Improving Vegetable Value Chains in Pakistan for Sustainable Livelihood of Farming Communities

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Abstract: About 60% of Pakistan's population live in rural areas where multidimensional poverty is much higher than it is in urban centres. The majority of the rural population depends on agriculture for their subsistence. Many farmers operate family smallholdings - comprising less than 5 acres of land where vegetables are often a major, but highly variable, source of household income. This study was conducted to investigate options to improve the livelihood of these communities, particularly women and youth, on a sustainable basis. Four major vegetables (onion, potato, tomato, chillies) were selected to identify potential interventions at all stages of the value chains. A survey was conducted in major production areas in Sindh and Punjab. This included structured interviews with value chain participants; data validation by focus group discussions and a consultative workshop; and data analysis. The findings confirmed the inconsistent quantity and quality of vegetables supplied to the market. If addressed, this represents significant potential for improved financial returns for small-scale vegetable producers and other value chain participants. Challenges include production constraints (such as seed quality, price of inputs, and pests and diseases) and economic constraints (such as mechanism of access to capital, credit, tenancy/land).Overarching socio-cultural factors include the lack of knowledge to address these constraints (including inadequate extension services), restricted agency for women and youth, and barriers to working collaboratively within some communities. Based on these findings, a multidisciplinary 'whole-of-the-value-chain' approach addressing the abovementioned constraints has been developed for improving the livelihood of the target communities, with special attention to women and youth. Partnerships with public and private institutions throughout the testing and application of value chain interventions are considered vital to sustain impacts.

Keywords: Gender, pro-poor, quality, safety, women, youth.

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1 Introduction

Pakistan is an agricultural economy with about 26% GDP contributed by the agriculture sector. About 60% of Pakistan's population of ~208 million lives in rural areas where multidimensional poverty is much higher (54.6%) than it is in urban centres (9.4%) (Government of Pakistan, 2016). The majority of the rural population depends on agriculture either directly as farmers, or indirectly as farm laborers and service providers. Over two third of the farmers operate family smallholdings - comprising less than 5 acres of land (Hussain and Thapa, 2012; Hussain and Thapa, 2016).

Vegetable farming is an integral part of the agricultural production systems of Pakistan, helping

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to provide essential nutritional requirements (Butt and Sultan, 2018; Van der et. al, 2002). Particularly the smallholder farmers rely more on intensive vegetable farming for growing three crops every year in an attempt to earn higher income from their limited lands (Zulfiqar and Thapa, 2017; Rai et al., 2018; Mariyono, 2017). However, the existing vegetable supply chain systems at all the stages of production, postharvest handling, and trading are poorly structured (Aujla et al., 2011; Gardas et al., 2018; Raut et al., 2018). These systems do not support the smallholder vegetable farmers and other relevant supply chain stakeholders (Gardas et al., 2017). The complex nature of issues at each stage of the supply chain poses a major constraint in improving livelihood of the small scale vegetable supply chain stakeholders (Hussain and Thapa, 2012; Zulfiqar and Thapa, 2017).

Potato, onion, tomato, and chillies are the four major vegetables of Pakistan (Damalas and Khan, 2017). According to statistics gathered by Khokhar (2014), Punjab and Sindh have the highest contribution in vegetable production with 63% and 14%, respectively. Punjab produces ~ 88% production of potatoes. The contribution of Punjab in onion production is ~ 46%, while ~ 25% onion is cultivated in Sindh. About 84% production of chillies is cultivated in Sindh. Both provinces produce about equal quantity of tomato.

The vulnerable livelihood conditions of the farmers engaged in production of these vegetables are repeatedly reported from Pakistan and other developing countries (Abid et al., 2016; Bryan et. al., 1992; Gioli et al., 2019; Luqman, 2019). A key factor affecting livelihoods is the price variability of vegetable crops including potato, onion, tomato, and chilli (Fatima et. al., 2015; Vicole, 2019). Apart from some limited research into the vegetable value chains in Sindh (Mari, 2009), the specific issues of the value chains of these four commodities in the context of Pakistan, it is rarely addressed and reported in the literature. While the important role that women are playing in agriculture sector in general (Samee et. al., 2015) and in these value chains in particular has been recognized (Taj et. al., 2009), the social, cultural and economic context relating to effective gender-inclusive interventions has not been extensively reported (Spriggs et al., 2017).

The Australian Centre for International Agricultural Research (ACIAR), together with the Government of the Islamic Republic of Pakistan recognized the need to improve the livelihood of small scale vegetable farmers by improving the status of the value chains of these four vegetables (Spriggs, 2016). However, more evidence was required to establish the key challenges and derive researchable questionsto be addressed by interventions.

This paper describes the field surveys, focus group discussions (FGDs), and a national consultative workshop conducted to collect and validate data to inform interventions for the improvement of potato, onion, tomato, and chilli value chains in Sindh and Punjab. Results of the surveys, FGDs, and national consultative workshop guided the genesis of the project 'Strengthening vegetable value chains in Pakistan (SVVCP) for greater community livelihood benefits'.

2. Methodology

2.1. Field Surveys and FGDs

Villages in the production areas of potato, onion, tomato, and chillies in Punjab and in the production areas of onion, tomato, and chillies in Sindh were selected through consultation with the district directorate of the provincial Department of Agriculture Extension. The selection of villages was based on the production of selected commodities in target villages. Participating villages in Punjab involved in production of potatoes included 'Chak Number 23 GB', 'Peer Di Hatti', and 'Chak Fazal Shah' in district Okara (30° 48′ 32.9″, 73° 26′ 57.6″) and 'Chak Number 20 SP', 'Mohalla Eid Ghah', and 'Chak Number 36 SP' in district Pakpattan (30° 20′ 32.1″, 73° 23′ 21.1″). The villages involved in onion, tomato, and chillies production in Punjab included 'Basti Ghulam Muhammad (Mudwala)' and 'Hajiwa (Jagatpur)' in district Muzaffargarh (30° 4′ 40.1″, 71° 11′ 19.7″) and 'Bhikhi', 'Jandiala Sheikhan', and 'Tibbi Hambo' in district Sheikhupura (31° 42′ 30.6″, 73° 59′ 11.1″). The villages from Sindh involved in production of onion, tomato, and chillies included 'Veesro' from district Tando Muhammad Khan (25° 7′ 24.9″, 68° 32′ 0.7″), 'Loang Khan Soomro' from district Khairpur (27° 31′ 46.3, 68° 45′ 48.3″), and 'Hot Khan Laghari' from district Mirpur Khas (25° 31′ 34.7″, 69° 0′ 39.9″).

Small scale farmers, with ≤ 5 acres land holding, of the target crops were identified through referral method and potential respondents were approached with a structured interview developed by a team of value chain and social science professionals. The interview questions included personal information - coded for data interpretation, analysis, and reporting;

and questions pertaining to technical, financial,and social perspective from all stages in the value chains of the target commodities.

Respondents (n = 31; all men) were advised the scope of the data collection and they were offered volunteer participation in the in-depth interview. The consenting participants were taken through the interview questionnaire by experienced data enumerators. The data enumerators were extended adequate training by an expert social scientist before conducting the interviews.

The data collected, after Hailu, (2016); and Wong and Wai 2013, from individual in-depth interviews was subjected to verification in 15 FGDs conducted at least one at each site of the project interest. Each focus group was comprised of 5 to 8 participants and all the participants of all FGDs were male farmers. Some of the participants of FGDs were the individual respondents of the in-depth interviews as well.

The data of the in-depth interviews and FGDs, collected from November 2016 to December 2017, were subjected to quantitative and qualitative analysis to interpret the potential issues of the four target vegetable value chains.

2.2. Research and Development Prioritization

A national consultative workshop, involving opinion leaders from all stages of the target value chains from Sindh and Punjab, was conducted by social science experts from Australia and Pakistan for generating and prioritizing contextual background information (Spriggs, 2016). During the workshop, participants were asked to identify and prioritize the main issues being faced by the small-scale farmers involved in vegetable farming in Pakistan in two stages. In the first stage, the participants (n = 43; males = 36 and females = 7), representing different stages of the value chains and small-scale farmers of the target vegetables, were divided in groups of equal numbers and offered an opportunity of brainstorming to develop a list for the potential improvement of target vegetable value chains. Each group produced a summary of potential interventions and shared with the other workshop participants.

In the second stage, each of the workshop participants was given four tags and was asked to rank the priorities of their desired areas of improvement. Each participant was allowed to use any number of given tags for any specific area of potential improvement identified by all groups. The numbers of scores received by each proposed intervention were counted to identify the priority list of potential interventions for improvement of the target vegetable value chains.

3. Results and Discussion

3.1. Field surveys and FGDs

The results of the in-depth interviews and FGDs; and need based follow on validation process; revealed the following general facts and potential opportunities for the target vegetable value chains in both provinces, nonetheless, with some cultural and social differences in two provinces.

3.1.1. Technical perspective

Crop specific technical perspective captured in the in-depth interviews and FGDs and potential areas of interventions for possible improvement of each target vegetable value chain is provided below.

Onions: Only two varieties dominate onion production in participating villages. Quality and availability of seed are major issues. Yields are below regional and world averages (Rana, 2018). Cost of production is higher compared with that in neighboring countries, suggesting existing yield gap, which can be improved (Hafeez et al., 2016). Major constraints to production include poor weed management and damage from thrips, purple blotch and downy mildew (Barla and Upasani, 2019; Brown et al., 2019; Grode et al., 2019; Maude, 2018). There are significant post-harvest handling issues, which lead to rapid deterioration of onions after they leave the field. These issues could be addressed by varietal evaluation, standardizing crop management and on-farm handling, as well as introducing new approaches and methods for drying and storage (Ji et al., 2018; Petropoulos et al., 2017; Thirusendura Selvi and Saraswathy, 2018). Pest management is possible as demonstrated by Gajendran et al (2016) in the other countries in the region. Onion marketing system in participating sites follows a very traditional pattern dominated by middlemen (contractors and commission agents) upon whom farmers traditionally rely for finance to pay for production inputs and to tide them over from one season to the next (Ahmad et al., 2013; Hassan et al., 2012; Manan et al., 2013). Improved quality of fresh and value added onion products by forming small scale rural enterprises, involving women and youth, and introducing innovative marketing options can help improve this value chain significantly.

Potatoes: Primary issue of potato growers is the availability of healthy and certified seed o planting material (Beissinger et al., 2018; Naik and Beckseth, 2018; Thomas-Sharma et al., 2016). Yield in Punjab (~20 ton ha^{-1}) is comparable to those in China (FAO, 2019), but well below those of > 40 $tonha^{-1}$achieved in Europe, North America and Australia (FAO, 2019). Inferior quality of inputs and pests hamper potato production (Majeed and Muhammad, 2018). Storage is a major issue; the main autumn potato harvest occurs from January to March; the bulk of the crop is stored and then sold from June onwards. Poor handling, storage and transport systems result in significant postharvest losses leading to reduction in consumption quality (Anwar et al., 2015). Similar to the other agricultural value chains, potato marketing system is dominated by middlemen particularly those accessed by smallholders, who traditionally rely on them to finance production inputs (Rani et al., 2018; Rana, 2018). Close relationships between large farmers and large commission agents are used to control supplies to the market, to the disadvantage of smallholders. Price volatility is an issue of on-going community concern for consumers as well as for farmers. The consistency of availability of fresh potatoes to consumers and the industry at competitive prices are areas where interventions need to be planned so that the farmers can get a better price. Understanding of consumers' needs and demands is particularly important to decide potential interventions for application in target communities. For instance, the high-end markets want on-farm potato washing and grading, which can be addressed through technological interventions. These can help improve the value chain significantly.

Chillies: Fungal and viral diseases have been identified as major problems of chilli value chains (Hussain and Abid, 2011). Chillies are also prone to aflatoxin contamination, which has restricted its export potential (Mazhar et al., 2017; Ozkan et al., 2015). The vast majority of chili producers are smallholder farmers who do not have access to inputs including adequate advice on production and postharvest handling procedures (Mallawaarachchi and Ahmad. 2018). More than 90% of all chillies are sold through village merchants (Buopari) acting on behalf of merchants or commission agents (green chillies), or direct to commission agents (red chillies). Most chilli is consumed in powdered form so large local food processors play an important role (Singh et al., 2018). The prices smallholder farmers receive for their produce could be improved if they had better quality product, as well as bargaining power supported by market information and direct access to the market place through use of various marketing tools. Introducing chili value chain protocols especially for agronomy, nutrition, postharvest handling, value addition, and mycotoxin testing and control, can help the farmers get better prices through 'buy-backs' with processors and also with exporters.

Tomatoes: Major constraints to production of tomatoes are diseases caused by fungi, bacteria and viruses (Jones et al., 2016; McGovern, 2015; Salim et al., 2017). A further important issue is that certified seed of local high-yielding varieties is not available (Kashif et al., 2016). High temperatures limit summer production in many areas. The parasitic plant Orobanche has been identified as a problem in some localities. Small growers in participating communities market their produce in local fruit and vegetable markets through commission agents by open auction. Prices are very sensitive to supplies from within the country and imports from neighboring countries, and sales in the market are subject to heavy commission charges. There is apparently little or small-scale processing and marketing of value-added tomato products (Tahir et al., 2012). However, small scale rural enterprises for adding value to tomato can benefit farmers and rural communities by offering alternative marketing channels when prices in the fresh market are unattractive.

3.1.2. Financial perspective

The results of surveys informed that in some instances the cost of production of target vegetables went higher than the economic returns. Even if the farmers were receiving three crops per year, the net economic returns were not encouraging. Major cost was made of lease of land, seed, pest control, irrigation, and fertilizers. About 73% of the respondents of the surveys did not have an understanding of price mechanism of inputs as well as availability at local level. The farmers also do not have an understanding of the reasons of price fluctuations (Athar and Bokhari. 2006). They consider the price at the time of sale of their product 'a chance' - good or bad. Good chance takes place once after many years while 'bad' chance happens quite regularly. Labor costs are different in different regions, in different seasons, and for different gender. Marketing of the target commodities is mostly through middleman, who charges up to 6% commission on selling the produce. The commission is even higher if the grower has borrowed money or inputs from the commission agent.

Fig. 1. Summary of various potential interventions proposed for improvement of onion, potato, tomato, and chilies value chains in Pakistan.

To make these value chains profitable, the need was realized to, serially, strengthen the infrastructure of the target value chains, provide soft loans with crop insurance to the small-scale farmers, and create the environment conducive for direct or facilitated marketing of ready produce that can help farmers get better financial returns.

3.1.3. Social perspective

Although both women and men equally contribute in vegetable farming in terms of farm labor effort, financial decisions in the household are often made by men. Gender issues also include the division of labour. Males mostly perform activities like ploughing, irrigation, spraying etc. and females engage in chores like picking, packing, hoeing etc. Significant differences have been reported in the daily wages: daily wages rates for women range from PKR 150-250 whereas for men from PKR 350-500. In some areas, women perform the farm work only half the day. Also, marketing largely remains the domain of men while women are confined to small-scale trading. Lack of infrastructure for transportation of produce and mobility prevents women's participation. In various regions, women have less access to information and technology as most extension workers are men and women are not allowed to interact freely with men. Among the social issues, in some areas, certain clans have limitation of not engaging with other clans. Even involvement of children in the farm related decisions is not a regular practice.

A gender focus throughout the target value chains, with particular focus on strengthening women and youth, has the potential to strengthen the position of women and youth through collective action impacting various points along the value chain. These begin with identifying the market opportunity and risks attached, and sourcing and financing inputs; they continue with sowing of seeds and other cultural practices, through the production cycle of onions, potatoes, tomatoes, and chillies; then harvesting the commodities, adding value, and eventually marketing of the fresh and processed products.

3.2. Research and Development Prioritization

A summary of the potential areas of improvement in the four selected vegetable value chains as reported by the participants of the national consultative workshop is provided in Fig. 1. Briefly, as proposed by Rich et al (2011) and Bajwa et al (2016), it was determined that a value chain involving all the stakeholders, and effectively delivering their roles from inputs supplies to the consumption of any commodity or a service can bring a change in the livelihood of small landholders. For the four target vegetable value chains, policy reforms, strict regulation, and competitive availability of farm inputs and machinery was identified at the initial stage of the value chains. Initiatives and support for increasing farm productivity was realized at farm level. Capacity building, and community development was realized as a necessary requirement for small scale vegetable value chains from farmers onwards. Potential interventions in postharvest handling, processing and marketing were also identified at different stages of the value chains. Women empowerment and access of easy finance were determined 'through the chain' interventions for improvement of the target vegetable value chains.

In prioritization; capacity building received 25% of total scores. The other areas of interventions were in the following order of priority with scores received, marketing (16%), postharvest handling (13%), inputs and machinery and farm production (11%), finance (8%), women engagement and processing (5%), and community mobilization and development of agriculture zones (3%).

4. Conclusion

Findings of the field surveys and FGDs, and outcomes of the national consultative workshop guided the development of a multidisciplinary 'whole-of-the-value-chain' project called SVVCP. This project follows the approach addressing the production, processing, marketing, and socio-cultural constraints identified in the needs analysis for improving livelihood of the target communities, with a special attention to women and youth. Strong partner linkages have been designed to perform the specific roles while embedded in the function of creating value within the target chains. In a particular value chain, the focus might be on training smallholders, particularly women and youth, in dealing with the last part of the value chain i.e., marketing linkages by forming small marketing groups (Taj et. al, 2009). However, in some cases, all segments of a value chain may need attention at the same time, including at production, harvest handling, postharvest handling, storage, or at intermediary transactions (Masamha et. al., 2018). The project will focus in an integrated fashion to maximize the efficiency and return on investment by considering both the social, financial and technical aspects of improving livelihood of participating communities through improving the selected value chain.Partnerships with both public and commercial institutions throughout the testing and application of value chain interventions are considered vital to sustain ongoing impacts.

List of Abbreviations: FGD, focus group discussion; SVVCP, strengthening vegetable value chains in Pakistan.

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Author's Contribution: This article has been structured and drafted by MSM. All authors have critically reviewed the draft of manuscript and provided feedback and inputs on chain governance, social, and financial aspects of the value chain analysis as well as on the quality of the article.

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