

The Tomato Flagship Initiative: A case study in the application of value chain principles in a developing country context



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Introduction

In 2018, the Australian Centre for International Agricultural Research (ACIAR) commissioned CAB International (Central and West Asia) to undertake a research for development project, *Strengthening vegetable value chains in Pakistan for greater community livelihood benefits* (SVVCP).

The SVVCP project had 4 objectives:

Objective 1 To identify opportunities for increasing community engagement and developing rural entrepreneurship.

Objective 2 To establish sustainable production and marketing opportunities for small-scale vegetable farmers and traders.

Objective 3 To test and develop technical innovations for selected vegetable value chains.

Objective 4 To scale-out improvements in vegetable value chains and sustain, and maximise, community benefits.

To achieve these objectives, the value chain strengthening interventions were designed within a participatory action research framework and implemented through a *whole-family* extension model. This case study describes this process and evaluates its outputs in the context of the tomato value chain opportunities available to smallholder farmers in Village Baili Janobi, District Muzaffargarh, Punjab, Pakistan.

This case study is presented in 5 parts:

- Part 1 describes the background to the case an analysis of the village's traditional value chains and the community engagement process.
- Part 2 describes the Tomato Flagship Initiative (TFI) and its activities that were designed and implemented to strengthen the village's traditional value chains for tomatoes.
- Part 3 documents, analyses and discusses the outcomes of the TFI activities in the 2020-21 tomato season.
- Part 4 draws conclusions and offers recommendations for improvement of the TFI as a value chain strengthening process that can deliver benefits to smallholder farmers, their families, and their communities.

Part 1 Background

Value Chain Strengthening

Value chain strengthening can be interpreted in many ways - for example, improving the regulatory environment, improving operational efficiency, or improving participation by chain members. But in most cases, from a smallholder farmer perspective strengthening means increasing their ability to sell more of, and to receive higher prices for, their produce. Therefore, the relevant value chains that need to be strengthened are those in which the tomato farmers in Baili Janobi are participating, or potentially can participate.

A value chain can be defined as a pathway that links consumers with producers, managed by its participants (retailers, wholesalers, processors, farmers and input suppliers) who interact to

form a system capable of profitably creating and delivering products that are valued by customers and consumers.

The farmers in Baili Janobi participate in 3 principal value chains (Figure 1):

- 1. The 'Peshawar' value chain a strong market for early season tomatoes with an emphasis on export to neighbouring countries such as Afghanistan.
- 2. The 'Islamabad' value chain a strong market for early season quality tomatoes because of its more affluent population.
- 3. The 'Muzaffargarh' value chain a local residual market.

A simple analysis of these chains indicates:

- 1. Product flows the focus on distant markets predisposes tomatoes to physical damage due to compression from overpacking of individual crates and overloading of trucks.
- 2. Financial flows selling on consignment in wholesale markets, combined with asymmetric market power, results in farmers being price takers.
- 3. Information flows there is no market feedback from commission agents or middlemen to farmers.
- 4. Relationships the relationships between farmers and commission agents/middlemen are transactional.

The Training Needs Assessment activity conducted in Baili Janobi indicated that smallholder farmers identified *better market linkages to fetch good prices* as their #1 priority - a clear indication of their dissatisfaction with the functioning of their existing value chains.



Figure 1 The traditional Baili Janobi tomato value chains

The focus of the value chain strengthening activities was the examination of these existing value chains to see if, from a smallholder farmer perspective, they could be improved or alternatively, if new value chains could be identified and developed.

Consequently, the value chain strengthening activities were design to address 3 questions:

- 1. How can the creation of consumer value be increased? understanding what consumers want and are willing to pay for.
- 2. How can the present system become more efficient? increased yield, reduced waste and improved co-ordination.

3. How can rewards be distributed more equitably? – lessening the power imbalances that exist within the existing systems.

Community Engagement

In the initial scoping of the SVVCP project, the village of Baili Janobi was identified as a potential focal village because of its reputation as a progressive community located in the heart of the Muzaffargarh District.

Baili Janobi is a relatively small village of approximately 2,500 residents located nearby the city of Muzaffargarh. The village consists of 300 households, of which 280 are farm households. Most smallholder farmers are tenant farmers.

In 2018, a Training Needs Assessment was conducted in the village. This assessment, which involved both male and female smallholder farmers, identified 3 major training needs:

- 1. Nursery management.
- 2. Pest and disease management.
- 3. Better linkages with markets.

In preparation for the 2019-20 tomato season, a community meeting attended by 30 smallholder farmers was held to discuss proposed SVVCP activities and recruit farmers to participate in these activities. Subsequently, 6 farmers were selected to be directly involved in SVVCP activities based on their motivation, willingness to include females, and involvement in previous production training.

The planned SVVCP activities were impeded by the emergence of COVID-19 in early 2020. However, there was sufficient evidence from the trial 'best practice' consignments to the Peshawar Wholesale Market to indicate that the SVVCP approach to strengthening value chains could deliver improved returns to smallholder farmers. When compared to tomatoes grown under traditional practices. 'best practice' tomatoes delivered:



Community Engagement: Baili Janobi

- Higher yields 21.3tonnes/acre v 15.0 tonnes/acre (+42%).
- Lower costs Rps10.4/kg v Rps15.9/kg (- 52.8%).
- Higher revenues Rps216,970/acre v Rps179,296/acre (+21%).

The outcomes from the 2019-20 season value chain strengthening activities encouraged other smallholder farmers in Baili Janobi and the nearby village of Haijiwah to engage in SVVCP activities.

In response to a review of the 2019-20 activities, the SVVCP management team developed the Tomato Flagship Initiative (TFI) with the objective to *demonstrate, at the level of best practice, how a value chain approach, facilitated by an integrated multi-disciplinary team, can deliver community-wide benefits for smallholder farmers and women.*

Due to resource limitations, the 2020-21 season value chain strengthening activities under the TFI were restricted to Baili Janobi and focused on the group of farmers and their families, the *foundation* group, that had been involved in the 2019-20 season activities. A second group from the village, the *apprentice* group, was encouraged to be involved in any training activities as preparation for them to become the focal group for the 2021-22 season activities (Figure 2). The TFI concept was discussed with, and accepted by, the village community prior to commencement of the 2020-21 season.



Figure 2 Baili Janobi Community Engagement Model

The SVVCP team then consulted with the *foundation* group families (males, females, and youth) to explain and discuss detail of the proposed TFI activities and gain their commitment to being involved. All 5 families made a commitment to engage in the training activities and implement nursery, production, harvest, and postharvest *best practice*. Three of the families agreed to adopt marketing *best practice* and jointly sell their crop. Details of the *foundation* group and their tomato crop areas are presented in Table 1.

FAMILY	AREA (acres)	TENURE			
1 Male	1.25	Owned			
Female	0.50	Share farmer			
2 Male					
Female	0.50	Share farmer			
3 Male	1.00	Share Farmer			
Female					
4 Male	0.75	Share farmer			
Female					
5 Male	0.25	Owned			
Female					

Table 1: The Foundation Group

Part 2 The Tomato Flagship Initiative (TFI)

The TFI involved a structured process, facilitated by members of the SVVCP project team, to build the capacity of the *foundation* group to identify, evaluate and capture market opportunities that had the potential to increase their household incomes.

This capacity building process had 5 phases (Figure 3):

Phase 1: Understanding and examining existing and potential value chains.

Phase 2: Analysis of value chain data.

Phase 3: Training, implementation and monitoring of *best practice* nursery management.

Phase 4: Training, implementation and monitoring of *best practice* production, harvest, and postharvest crop management.



Phase 5: Training, implementation and monitoring of *best practice* marketing.

Figure 3 The value chain 'strengthening' process

The capacity building process was facilitated by a multi-disciplinary team drawn from SVVCP project partner organizations and overseen by an Australian-based advisory team (Table 2).

SVVCP Partner Organization	Role
Centre for Agriculture & Bioscience International	Research Officer, Team Co-ordinator
(CABI)	Social Mobilizer
University of Agriculture, Faisalabad (UAF)	Horticulture Production Specialist
	Harvest & Postharvest Specialist
Department of Horticulture Extension (Punjab)	District Extension Officer
Engro Foundation	Female Training Officer
National Agricultural Research Centre	Community Engagement
The University of Queensland	TFI Leader/Marketing Specialist
	Value Chain Specialist
	Gender Specialist

Table 2: The Multi-disciplinary Facilitation Team

In each phase of the capacity building process, the facilitation team co-ordinator consulted with members of the *foundation* group with respect to the timing, content and delivery of the planned activities (Figure 4).



Figure 4 Participatory Action Research Process

Phase 1: Understanding and examining existing and potential value chains.

Understanding what consumers and customers value and are prepared to pay for is the basic principle on which the value chain approach to strengthening outcomes for smallholder farmers rests. The process adopted in the TFI was a rapid value chain analysis that involved *walking the chain* and gathering data from a cross-section of consumers, retailers, and middlemen (wholesalers and commission agents). As a result, the *foundation* group decided that the value chains associated with the Peshawar and Islamabad markets were their priority for this activity.

Training activity: The Foundation farmers were given training in market research and interview techniques associated with qualitative data collection prior to participating in the 'walking the chain' activity. In-market support was provided by the facilitation team.

This interaction with value chain participants indicated that consumers, in both markets, valued tomatoes that were:

- Red colour (not over ripe)
- Tough skinned
- Medium size (>80gms)
- Clean
- Free of physical damage

In contrast to what consumers valued, tomatoes delivered to the wholesale markets were:

- Different stages of maturity (colour)
- Poorly sorted
- Ungraded
- Physically damaged due to compression and abrasion
- Wastage rates of up to 25%



Retailer Interview - Peshawar

While prices varied considerably in both markets depending on supply, the farmers were informed that a price premium was paid for 'quality' tomatoes. In addition, wholesalers indicated that there was a 17-day window of opportunity in early April where the supply of new season tomatoes was low.

The *walking the chain* activity was extremely valuable to the male *foundation* farmers as it was the first time that they had visited these markets and interacted with value chain participants.

We grow tomato since 25 years but we don't have idea about the consumer preferences in targeted markets and we randomly selected variety each year. But this year, we conducted meetings with retailers, wholesalers and commission agents (and) became to know what market wants in term of size of tomato, colour, blemish free, long shelf life, grading, packing type and size of packing (foundation group male farmer).

Female members of the *foundation* group were not able to participate directly in this activity for socio-cultural reasons. This limitation was partly addressed by the production of a short video that highlighted the main interactions between the male farmers and the value chain participants. This video, when viewed by the females during one of the later training sessions, was extremely well received.

We did sorting only to remove the insect/ disease infected tomatoes or rotten tomatoes but this year we (women) have seen the walking the chain video of our male farmers and we got to know that grading is an important step and we received better price of grade A and grade B than the non-graded tomato (foundation group female farmer).

Phase 2: Analysis of value chain data.

The objectives of the analysis of value chain data were to identify where existing value chains could be strengthened, or where new value chains could be established.

Training activity: The foundation farmers were given training in data analysis – Gross Margin analysis and Scenario analysis, and basic marketing planning principles.

The first stage in this process was for the *foundation group* to calculate their estimated cost of production for target markets in Peshawar or Islamabad (Table 1). This estimated cost of production was arrived at through group consensus based on their experience.

Variable Cost Component	Rs/Acre
Seedling Production	17,800
Land Preparation	8,000
Irrigation	7,500
Input Cost (seed, fertilizer, insecticide)	42,000
Harvest (labour, packing)	76,000
Marketing (transport, Commission Agent)	58,250
Total Variable Cost of Production	209,550

 Table 1: Estimated Cost of Production (Rs/Acre)

The analysis clearly identified packaging (wooden boxes) and transport as being the major costs.

The second stage was for them to calculate their estimated Gross Margin (Table 2). Again, this estimate was based on their collective experience/expectations of saleable yield (85%) and market prices.

Gross Revenue	
18,000kg @ Rs12/kg	Rs216,000
Total Variable Costs of Production	Rs209.550
Gross Margin/Acre	Rs 6,450
Gross Margin %	3%

Table 2: Estimated Gross Margin (Rs/ Acre)

The estimated Gross Margin of 3% per acre is marginal and was used by the facilitation team to emphasize the importance of adopting *best practice* to increase saleable yield (increase yield and reduce waste), reduce cost of production and improve quality. The potential impact of adopting *best practice* was demonstrated though the Scenario Analysis shown in Table 3.

Scenario	Gross Revenue	Cost of Production	Gross Margin	Gross Margin %	
Baseline	216,000	209,550	6,450	3	
1. Cost of Production -10%	216,000	188,595	27,405	14.5	
2. Saleable Yield +5%	226,800	209,550	17,250	8	
3. Price +25%	270,000	209,550	60,450	28.8	
Scenarios 1+2+3	283,500	188,595	94,905	50	

Table 3: Best Practice Scenario Analysis (Rs/Acre)

Through this evaluation process the *foundation* group was able to assess the potential benefits and risks that were associated with the opportunities they had identified during the *walking the chain activity*. The outcomes from this evaluation were that the potential benefits from engaging with a new market opportunity were sufficient to compensate for the risks involved. As a result, they collectively developed a rudimentary marketing strategy to capture this opportunity:



Analysing Market Research Data

- 1. The target market would be the Peshawar Wholesale Market. However, a final decision would be made after a follow-up visit to Peshawar and Islamabad towards the end of the season (mid-March).
- 2. There was sufficient detail of the customers' requirements for them to commit to meeting these requirements through the adoption of nursery, production, harvest, postharvest and marketing *best practice*.
- 3. Variety 1525 was the preferred variety in the Peshawar market because it met consumers' needs, therefore 1525 seed would be purchased to produce seedlings in the nursery tunnel.
- 4. Agreement of all *foundation* group males, females, and youth was reached to participate in the *best practice* training activities.
- 5. An agreement was made to adopt a physical and financial record keeping system that would allow them to accurately record and monitor their cost of production.
- 6. The *foundation* group leader was given the responsibility of communicating with potential customers and sharing information with other *foundation* group members.

As agreed, 2 members of the *foundation* group revisited Peshawar and Islamabad in mid-March. Although the Peshawar Wholesale market remained the target market for the *foundation* group, a potential opportunity with a wholesaler in Islamabad had also been identified.

> Training activity: The foundation farmers were given training in marketing principles and the development of a marketing strategy to capture a potential market opportunity. A marketing manual was developed and distributed.

This opportunity proved to be very attractive. The wholesaler was innovative, he provided detailed product specifications (Table 4), he offered to pay transport costs, he was willing to place an initial trial order, he committed to pay within 2-3 days of delivery, and he was prepared to negotiate price based on current wholesale market prices plus a premium for quality.

Grade	Description	Packaging
А	Colour –	Wooden
	turning/pink	Crate:
	Size – 80-100+ gm	13kg
	Unblemished	
	Undamaged	
В	Colour –	Wooden
	turning/pink	Crate:
	Size – 60-80gm	13kg
	Slightly blemished	
	Undamaged	

Table 4: Wholesaler Customer Specifications

In addition, customer specifications were confirmed for the Peshawar Wholesale Market, the Muzaffargarh Wholesale Market, and the Muzaffargarh Fair Price Shop, controlled by the Department of Agriculture.

This phase, and its outcomes, was critical to the on-going development of the *foundation* group as it consolidated their motivation and commitment to change. The key success factor was the active involvement of the *foundation* group in the collection and interpretation of the market data.

Phase 3: Nursery Best Practice.

The efficient production of healthy, robust seedlings is the foundation for growing a productive tomato crop. The initial success in raising seedlings in trays in a nursery tunnel in the 2019-20 season encouraged the *foundation* farmers to invest further in this new technology. An additional incentive was that raising seedlings in a tunnel provided further opportunities for females and youths to be involved.

Training activity: The foundation farmers were given hands-on training in seed planting and further instruction in nursery management. A best practice nursery manual was developed and distributed.

To demonstrate this point, 2 female members of the *foundation* group committed to raising seedlings for their own tomato production and for sale to other farmers.

The training session was made available to other interested male and female farmers from the village. As a result, an additional 26 persons (11 males and 15 females) participated in this training. The outcomes from the nursery *best practice* activities were communicated to the wider community through a field day that was attended by 52 male farmers, 8 female farmers and 14 youth.



Training – Nursery Best Practice

Training activity: Females from the foundation and apprentice groups received hands-on training on preparing seedlings for transplanting and participated in field planting demonstrations

The transplanting training activity was a female focused activity since female field workers traditionally undertook this task. This focus demonstrated two key points:

- 1. The importance of directing the training to the persons involved in the activity, and
- 2. The critical importance of having an experienced female trainer available to conduct gender specific activities such as this.



Training – Transplanting Best Practice

The combination of adopting nursery and transplanting *best practice* resulted in the *foundation* farmers being able to transplant their seedlings 2 weeks earlier than the control farmer and with a high level of seedling survival in the field.

Phase 4: Production, Harvest and Postharvest *Best Practice*.

Training activity: Foundation group farmers were provided with in-field training in irrigation scheduling and fertilizer application. Advice on disease and insect control was given and a production best practice manual was distributed.

The production *best practice* training activity was supplemented by regular monitoring of the *foundation* farmers' crops. This support enabled the *foundation* farmers to identify and manage issues associated with plant disease and insect infestation. In some cases, tenant farmers were unable to control disease and insect problems in a timely manner due to their dependence on their landlord to provide the relevant chemicals.

The outcomes from adopting production *best practice* were demonstrated, and compared with neighbouring crops grown under traditional practices, to the wider community through a Farmer s' Field Day attended by 85 males, 23 females and 8 youths

Training activity: Foundation group farmers were provided with in-field training in harvest and postharvest best practices. A best practice manual was distributed.

This training activity centred around the preparation of the first consignment of the 2020-21 season and was conducted in the field of one of the *foundation* group members. As the consignment was to be sent to the Muzaffargarh Wholesale Market, the content of the training session was focused on meeting the harvesting, sorting and grading specifications previously determined for that market.



Training – Harvest Best Practice



Training – Postharvest Best Practice

Details of this consignment are shown in Table 5.

	Total	A Grade	B Grade	Waste
Tomatoes harvested (Kg)	433	320	108	5
Price (Rs)		550/16kg box	350/12kg bag	
Total Revenue (Rs)	14,150	11,000	3,150	0
Average Price (Rs/kg)	32.68	34.37	29.17	

 Table 5: Initial Consignment Outcomes

When compared to other tomatoes sold in the Muzaffargarh Wholesale market on that day, the *foundation* farmer received a price premium of approximately Rs6.8/kg (28%).

The outcomes from this initial consignment demonstrated that the adoption of nursery, production, harvest, postharvest and marketing *best practice* could be rewarded in the market for the consumer value that was created.





Traditional Practice Tomatoes (Rs430/box)

Phase 5: Marketing Best Practice.

The training in, and adoption of, marketing *best practice* commenced in Phase 1 and as a result, the *foundation* group had identified 4 target value chains and their potential customers within each of these chains (Figure 5).



Figure 5 Foundation Group's Target Value Chains

Consignments to each of these markets were graded and packed to meet the customers' specifications. The 4 male members of the *foundation* group took individual responsibility for the preparation and selling of each consignment. Due to socio-cultural reasons, the 2 female members of the *foundation* were unable to engage in the selling process, which was undertaken by a male relative in the *foundation* group.



Loading a market consignment

Part 3 Analysis and Discussion of TFI Activity Data

Detailed physical and financial records were kept by individual member of the *foundation* group. A key feature of the record keeping system was the involvement of youths who had received training in the recording process. The records were monitored by the coordinator of the facilitation team and the social mobilizer in the village. These data were supplemented by data from comprehensive post-season semi-structured interviews with all participating stakeholders in the TFI.

In addition, similar records were kept by a neighbouring smallholder farmer who used traditional practices and was being used as a benchmark. A comparison of the records was used to identify any advantage gained by the *foundation* group from the adoption of nursery, production, harvest, postharvest, and marketing *best practices*. It is recognized that this approach has limitations since the neighbouring farmer may not be representative of all traditional smallholder farmers in the village.

Several of the *apprentice* group farmers also kept detailed physical and financial records. These records were utilized to compare farm-gate returns from different markets. The focus of the analysis was to determine if the value chain approach, which incorporates a participatory action research methodology within a whole family context, delivers benefits for smallholder farmers, women, and youth.

The data analysis was conducted in 2 stages:

- 1. An analysis of the *foundation* group quantitative data that examined the comparative physical and financial performance of each *foundation* group member with that of the benchmark (traditional practice) farmer.
- 2. An analysis of qualitative interview data to determine the benefits generated for males, females and youths.

Foundation Group Benefits: Quantitative Analysis

1. Nursery: *Best Practice* Seedling Production and Sales Analysis

As previously mentioned, the *foundation* group raised seedlings for their own use. This initiative was very successful. There was a significant increase in the number of healthy seedlings produced per 100 seeds (95% v 75%) and a lower cost of production/seedling (41%) when compared with traditional seedling production practices (Table 6).

	Foundation Farmers	Traditional Practice Farmer
Seeds planted	35,328	15,000
% Germination	95	75
Healthy seedlings transplanted or sold	33,500	9,560
Cost of Production (Rs)	56,700	24,300
Cost of Production	1.69	2.54
Rs/healthy seedling raised		

Table 6: Comparative Seedling Production

On average, the *foundation* group farmers raised their seedlings in 5 weeks compared to the 7 weeks reported for the control farmer. Ultimately, the reduction in the seedling production time allowed the *foundation* group to begin harvesting their crops in early April when market prices were high.

The 2 female members of the *foundation* group sold their surplus seedlings to local farmers which delivered an additional Rs5,928 to their household income (Table 7).

	Foundation Farmers
Gross Revenue/seedling sold	Rs2.50
Cost of Production/seedling sold	Rs1.69
Gross Margin/seedling sold	Rs0.81
% Gross Margin/seedling sold	32.5%

 Table 7: Gross Margin Analysis – Seedling Sales

The feedback from seedling customers was positive – the seedlings were healthy; they had uniform growth and good root development and there was a low incidence of mortality post-transplanting. Both females expressed an interest in expanding this as a business opportunity in the 2021-22 season.

2. Tomato Crop: Best Practice Production Analysis

Each of the *foundation* group farmers had planted different areas of crop. Therefore, in comparing their yields and cost of production their individual data were converted to a common per acre basis as shown in Table 8.

	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6	Benchmark
Area (acre)	1.25	0.75	0.5	0.5	0.25	1.0	1.0
Harvested Yield (kg)	13,793	7,850	2,940	2,384	2,343	14,410	7,587
Harvested Yield							
(kg/ac)	11,034	10,467	5,880	4,768	9,372	14,410	7,587
Cost of Production							
(Rs/ac)	126,719	108,745	70,194	62,970	75,654	152,137	112,507
Cost of Production							
(Rs/kg harvested)	11.48	10.39	11.93	13.21	8.07	10.56	14.83

 Table 8: Comparative Tomato Production Performance

A major point of interest is the significantly lower harvested yield per acre when compared to the projected yield presented in Table 2. There were 2 main reasons for this difference:

- A shortened harvest window due to adverse weather conditions that reduced flowering and increased the incidence of disease and insect damage.
- A reduction in the wholesale market price due to COVID-19 lockdowns caused farmers to cease harvesting their crops.

When the budgeted cost of production is compared to the weighted average cost of production for the *foundation* group there is minimal difference because the reduced yield this season was offset by lower harvest and marketing costs (Rs11.64 v Rs10.93 per kg).

The reasons for the variation in harvested yields among members of the *foundation* group are complex. They include experience, timeliness of operations (disease and insect control), and dependency on landlords. Never-the-less, their costs of production are similar.

When compared to the data recorded for the benchmark farmer, the *foundation* group farmers had:

- A weighted average cost of production that was 26% lower (Rs10.93/kg v Rs14.83)
- A weighted average harvested yield per acre that was 37.5% higher (10,432kg v 7587kg)
- A higher saleable yield (97% v 80%) due to a reduction in diseased and/or damaged fruit.

These outcomes indicate that the adoption of nursery, production, and harvest *best practices* can deliver significant production benefits to smallholder farmers.

3. Tomato Crop: Best Practice Financial Analysis

When complemented by the adoption of postharvest and marketing *best practices*, the production benefits translated into significant financial benefits in terms of average price per kg and Gross Margin for the *foundation* group farmers (Table 9).

	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6	Benchmark
Sales (kg)	13,637	7,512	2,803	2,335	2,289	13,956	6,115
Revenue (Rs)	211,109	146,155	35,530	32,115	33,830	233,364	60,835
Variable Cost of							
Production (Rs)	158,399	81,559	34,312	29,560	18,914	152,137	110,508
Gross Margin (Rs)	52,710	64,596	1,128	2,555	14,916	81,227	-49.673
Gross Margin %	24.97	44.20	3.2	8.0	44.1	34.80	
Average Price (Rs/kg)	15.48	19.46	12.68	13.75	14.77	16.72	<mark>9.</mark> 95

 Table 9: Comparative Gross Margin and Price Analysis

The financial outcomes recorded by the *foundation* group can be attributed to several factors:

• Their ability to sell their tomatoes in early April, 1-2 weeks before the benchmark farmer. As shown in Figure 6, the tomato price per kg fell steadily during April. The ability of the *foundation* farmers to enter the market early was a result of the shorter seedling production cycle and the vigour of the seedlings.



Figure 6: Consignment Price Data

- The multiple market opportunities available to them. The market research and evaluation undertaken by the *foundation* farmers identified 5 potential market opportunities and detail the tomato specifications demanded by customers in these markets (Table 10).
- The harvest and postharvest skills that allowed them to deliver consignments to these markets that met their customers' specifications (Tables 11 and 12).

4. Tomato Crop: Postharvest and Marketing *best practice* – comparative market returns The diversity of the markets targeted by the *foundation* group, the *apprentice* group and the benchmark farmer provided an opportunity to analyse the on-farm price per kg that individual farmers received from sending consignments to these markets (Table 10).

	Farmer 1	Farmer 2	Joint	Farmer 5	Farmer 6	Benchmark	Apprentice 1	Apprentice 2
			Consignment*					
	MUZ	Fair Price,	Wholesaler	Multan	Peshawar	MUZ	Mardan	Mardan
Main Market	Market	MUZ	Islamabad	Market	Market	Market	Market	Market
Sales (Kg)	12,974	6,225	3,081	2,289	5,967	6,115	2,223	7,592
% Total Sales	95	63		100	43	100	68	86
Average Market								
Price (Rs/kg)	15.38	17.85	17.1	14.78	16.20	9.95	13.68	16.86
Gross Revenue (Rs)	119,591	84,481	52,685	33,830	96,665	60,835	30,420	128,040
Selling Costs (Rs)	22,790	5,460	2,960	3,855	21,560	13,910	15,338	48,297
Net Revenue (Rs)	176,801	79,021	49,725	29,975	75,105	46,925	15,082	79,743
On-Farm Price								
(Rs/kg)	13.63	16.70	16.12	13.10	12.59	7.67	6.79	10.50

Table 10: Comparative On-Farm Prices

(* Due to supply constraints, *foundation* and *apprentice* farmers contributed to this joint consignment)

The main outcomes from this analysis are:

- The highest on-farm price per kg was received by Farmer 2 who had access to consumers through a Fair Price Shop in Muzaffargarh. There were several advantages associated with this market
 - Transport costs were minimal since it is a local market.
 - Packaging costs were lower by using plastic bags rather than wooden boxes.
 - No commission agent/wholesale market fees.

He built a good relationship and trust with us because he fulfilled his commitment. He delivered quality of tomato according to our specifications committed with us on the first day (Manager, Fair Price Store).

- Farmer 1 who sold through the Muzaffargarh Wholesale market had higher selling costs per kg because of the cost of packaging (boxes) and commission agent/wholesale market fees.
- The benchmark farmer also sold through the Muzaffargarh Wholesale market but later than Farmer 1. This outcome clearly demonstrated the advantage of accessing the market early in the season when prices were higher.
- The joint consignment to the wholesaler in Islamabad returned the second highest on-farm price per kg because:
 - The wholesaler paid for transport.
 - There were no commission agent/wholesale market fees.
 - The farmers had the ability to negotiate price.
- The markets of Mardan and Peshawar in KPK Province are large wholesale markets and therefore have the capacity to absorb large quantities of produce. While the average market price may seem attractive, the significant transport costs impact on the on-farm price. This was evident when Farmer 6 switched consignments to the Muzaffargarh Wholesale market in early May due to falling wholesale market prices.

5. Tomato Crop: Postharvest and Marketing *best practice* price premiums

One component of postharvest *best practice* adopted by the *foundation* group was grading their crop based on weight and degree of blemish. The farmers reported that the adoption of this practice did not increase the time taken to sort and pack their crops, but it generated a significant price differential between Grade A and Grade B tomatoes (Table 11).

Farm	er 1	Farm	er 2	Farm	er 3	Farm	er 4	Farm	er 5	Farm	er 6
А	В	А	В	А	В	А	В	Α	В	А	В
11,817	1,820	7,226	286	2383	420	1,891	444	2,289		10,994	3,012
87	13	96	4	85	15	81	19	100		78	22
16	11	26	15	14	7	15	9	15		18	12
	Farm A 11,817 87 16	Farmer 1 A B 11,817 1,820 87 13 16 11	Farmer I Farm A B A 11,817 1,820 7,226 87 13 96 16 11 26	Farmer 1 Farmer 2 A B A B 11,817 1,820 7,226 286 87 13 96 4 16 11 26 15	Farmer I Farmer 2 Farm A B A B A 11,817 1,820 7,226 286 2383 87 13 96 4 85 16 11 26 15 14	Farmer 1 Farmer 2 Farmer 3 A B A B A B 11,817 1,820 7,226 286 2383 420 87 13 96 4 85 15 16 11 26 15 14 7	Farmer 1 Farmer 2 Farmer 3 Farm A B A B A B A 11,817 1,820 7,226 286 2383 420 1,891 87 13 96 4 85 15 81 16 11 26 15 14 7 15	Farmer 1 Farmer 2 Farmer 3 Farmer 4 A B A B A B A B 11,817 1,820 7,226 286 2383 420 1,891 444 87 13 96 4 85 15 81 19 16 11 26 15 14 7 15 9	Farmer 1 Farmer 2 Farmer 3 Farmer 4 Farm A B A <	Farmer 1 Farmer 2 Farmer 3 Farmer 4 Farmer 5 A B A	Farmer 1 Farmer 2 Farmer 3 Farmer 4 Farmer 5 Farm A B

 Table 11: Postharvest Best Practice Price Premium

Capturing this price premium for graded tomatoes can prove difficult when selling through wholesale markets where the commission agents control the auction system and the price discovery is not transparent. This problem is demonstrated in Table 12.

	Farme	armer 1 Farmer 2		• 2	Farmer 3		Farmer 6		Official Market Committee Price	
Grade	А	В	Α	В	А	В	Α	В	А	В
Sales (Kg)	260	26	320	91	247	36	120	48		
Rs/kg	34	24	34	12	17	8	34	29	26	22

 Table 12: Variation in Auction Price – Muzaffargarh Wholesale Market 12/04/2021

- Farmers 1, 2 and 6 were able to extract a premium of Rs8/kg (30%) above the Official Market Committee Price for Grade A fruit quoted for the 12/04/21. This premium would indicate the superior quality of the tomatoes offered by these *foundation* group farmers.
- Farmers 2 and 6 also received a price premium for their Grade B fruit. The Grade B tomatoes from Farmer 2 were picked at full maturity.
- Farmer 3 had lower quality fruit but more importantly no experience in selling through the wholesale marketing system.
- Farmers 4 and 5 did not sell tomatoes on the 12/04/21

They delivered produce according to customer requirements. Good quality, good packing, uniform packing size and graded produce was delivered during whole season. I will prefer to buy tomatoes if they deliver to me same quality tomatoes in the coming season (Wholesaler, Muzaffargarh Wholesale Market).

Two *foundation* group members participated in the preparation and delivery of a consignment directly to a wholesaler in Islamabad. In this instance, they had the opportunity to negotiate directly on price after the consignment had been inspected.

Grade	Α	В		
Sales (Kg)	2,405	676		
% Sales	78	22		
Rs/kg	18	14		
Average Price (Rs/kg)			17.1	
Savings*				
Transport Cost (Rs/kg)			6.8	
Commission Agent Fee			1.1	
Unloading Charge			0.2	
Total Savings			8.1	
Equivalent Islamabad				
Wholesale Market Price			25.2	

Table 13: Customer Value plus Postharvest Best Practice Price Premiums

 (* wholesaler met the transport costs and the growers saved commission agent fees and unloading charges by selling direct to the wholesaler)

When compared to tomatoes from Muzaffargarh sold in the Islamabad Wholesale Market on the same day, the *foundation* group consignment received a price premium of 48% (Rs25.2/kg v Rs 17.0/kg).

The wholesaler was willing to pay this premium because of the **value created** by the *foundation* group farmers:

- The tomatoes were graded for size/weight and blemish
- The tomatoes were at the desired state of maturity.
- The tomatoes were packed to specification 13kg per wooden box.
- There was a reduction in unsalable tomatoes, minimal compression damage, no diseased or damaged fruit.

The wholesaler placed a follow-up order, but the *foundation* group farmers were unable to deliver due to a nation-wide lockdown over the Eid ul Fitr holidays.



This outcome from the consignment is an excellent example of what can be achieved by smallholder farmers who adopt nursery, production, harvest, postharvest, and marketing *best practice* and work together.

Group marketing is important for direct marketing because group marketing rewards us better price and we can deliver the required quantity only in group marketing (Foundation group male farmer).

The analysis of the physical and financial records kept by the *foundation* group farmers and the control farmer clearly demonstrates that a value chain approach, which incorporates a participatory action research methodology within a whole family context, can deliver quantifiable benefits for smallholder farmers, both male and female.

Performance Indicator	Foundation Group	Benchmark Farmer	Benefit
	'best practice'	'traditional practice'	
Nursery Production			
healthy seedlings	95%	75%	Less seed wastage
cost of production per seedling	Rs1.69	Rs2.54	33% cost reduction
production cycle	5 weeks	7 weeks	Early transplanting
profitable business	Additional family		Rs5,472
	revenue		
Tomato Production			
Weighted average harvested yield kg/ac	10,432	7,587	37.5% increase
Weighted average cost of production (Rs/ac)	10.93	14.83	26% lower
Weighted Average price (Rs/kg)	16.26	9.95	63% increase
Weighted Total Revenue (Rs/acre)	169,624	75,490	125% higher

These quantifiable benefits are shown in Table 14.

 Table 14: Comparative Performance Indicators

Foundation Group Benefits: Qualitative Analysis

The physical and financial benefits that were achieved depended upon the capacity of the *foundation* group farmers to develop the knowledge and skills required to successfully plan and implement *best practice*. The 7 training activities, as described in Part 2, achieved this outcome.

This season we learned a lot from nursery raising to linking with marketing due to which our income has improved. There is less effort, less wastage and yield improved with good quality and less effort. So, we will continue to adopt best practice in the future (foundation group male farmer).

We will discuss in advance with our customers to know their preferences then according to their preferences we will select variety and other interventions (foundation group male farmer).

More importantly, due to the *whole family* approach adopted in the TFI, females and youths shared these benefits.

After the TFI interventions we have more opportunities like nursery training and grown (our) own nursery for selling purpose. Our job has become easy compared to traditionally raised nursery. After the postharvest training, our labour became more familiar to harvest tomato at right maturity stage due to which wastage of tomato has decreased (Foundation group female farmer).

I had no idea about marketing process but during walking the chain I became to know that what market wants. I learnt that proper packing and grading are the most important factors to improve the quality and income. I also engaged to keep the records of both financial and physical data due to which we became to know the costs and benefits received. I also learned the cultural practices from my father and now I am much familiar to irrigate our fields and packing and transportation of tomato crop. It is the most important to learn because it is our own work and in future we will look after our fields (Foundation group youth).

The impact of the *whole family* approach was also evident in the involvement of family members in the decision-making process which traditionally involved only the male head of the family.

Before the TFI our family was not part of decision making. This year I discussed with my wife and children when disease attack in my field. Then my wife and children collectively decide to pull out infected plants or to do control measures (Foundation group male farmer).

I discussed with my wife about the Fair Price opportunity to sell produce. She suggested me to take risk to sell our produce through Fair Price Shop because we will save our packing and commission agent costs (Foundation group male farmer).

Foundation Group Benefits: Key Success Factors

The key success factors that delivered benefits to the *foundation* group fall into 2 categories – the people involved, and the processes adopted in the value chain strengthening activities.

The People: The Foundation Group

The outcomes achieved by the *foundation* group were a result of their individual and collective ability to change – to understand and implement *best practice*. Their ability to change is embedded in 4 interrelated prerequisites (Figure 7).



Figure 7: The Prerequisites for Change

The *foundation* group farmers:

- Had a positive attitude to change. They were prepared to take risks; they were inclusive.
- Were motivated. The outcomes from the 2019-20 season and the market research activities that they had engaged in strengthened their motivation and commitment to change.
- Had limited resources but were willing to commit the scarce resources that they had. The TFI did not subsidise any commercial activities undertaken by the *foundation* group.
- Lacked the knowledge and skill associated with *best practice*. The necessary knowledge and skills were the focus of the training activities conducted by the TFI facilitation team.

Not all smallholder farmers have the attitude and motivation to change. Therefore, any attempt to engage smallholder farmers in the absence of these key attributes has a high likelihood of failure.

The presence of a competent and respected leader was vital for the *foundation* group to function effectively - a key leadership attribute being the ability to communicate. Fortunately, the *foundation* group had such a person.

Farm leader passed on each information from community engagement to consignment delivery. He passed on updates on regular basis and shared price information with the whole group on daily basis (Foundation group male farmer).

The People: The Facilitation Team

The capacity building activities described in Part 2 (pp. 5-12) fall into 3 categories – technical, commercial and social. Very few, if any, individual facilitators will have the breadth and depth of knowledge and skills required to successfully design and implement these activities without support, hence the need for a multi-disciplinary facilitation team as described previously (p 5) and illustrated in Figure 8.



Figure 8: The Multi-disciplinary Facilitation Team

Many of the members of the facilitation team had been involved in capacity building workshops that focused on the value chain approach to identifying and evaluating new market opportunities for smallholder vegetable farmers. They also had the opportunity of participating in a *walking the chain* activity where the necessary knowledge and skills were applied. In addition, all members of the facilitation team participated in a TFI orientation activity under the guidance of the Australia-based mentoring team from The University of Queensland.

The Process:

The TFI capacity building process originates with understanding what customers value and concludes by delivering tomatoes that meet their customers' expectations (Figure 9).

Based on these customer requirements we decided the varieties '1554' and Farice 341 had characteristics to meet the consumer requirements (foundation male farmer).



Figure 9: The TFI Capacity Building Process

This process had 2 key elements:

1. All activities were planned and discussed in consultation with the *foundation* group farmers.

2. All training activities were participatory – the participants, under the guidance of the facilitation team, were actively engaged in the development of the knowledge and skills associated with understanding and implementing *best practice*.

Although all members of the facilitation team made valuable contributions to the outcomes of the capacity building process, there were 2 key individuals – the facilitation team co-ordinator and the female trainer.

Due to travel restrictions associated with the COVID-19 pandemic, it was impossible for the Australian-based mentoring team to provide any in-country support for the facilitation team. As a result, the facilitation team co-ordinator, a relatively inexperienced but highly motivated professional, was responsible for consultation, co-ordination, and implementation of the TFI activities.

Before the TFI we faced difficulty to manage the community and the activities. This year the RO took the lead and he involved the teams on that specific time due to which we learnt that the leading role plays an important role to implement the activities successfully (Facilitation team member).

I was previously production orientated and was a beginner in using the TFI approach, so I am now very much improved. I can communicate needs, work with other disciplines and know how to engage with markets. I have the skills but need more opportunities to practice them. (Facilitation team co-ordinator).

Female family members or female field workers undertake most tasks associated with tomato growing – seedling raising, transplanting, hoeing, pest and disease management, harvesting, sorting and packing. Therefore, most of the capacity building activities focused on females. If these capacity building activities were to be participatory then, due to the prevailing socio-cultural norms, they would have to be led by a female trainer. Fortunately, the TFI had access to an experienced female trainer from the Engro Foundation who was supported by a female social mobilizer in the village.

The participation of women has increased in the TFI activities due to (female trainer's) friendly nature. She valued our talk and listen our crop related issues. We can also easily communicate with a female trainer rather than a male trainer (Foundation group female farmer).

The best thing was the female trainer who trained us each step practically. Our males allowed us to participate in the trainings due to female trainer (Female field worker).

The social mobilizer has the needed ability and she must be kept involved and connected. She is a key to future success (Facilitation team member).

Part 4 The Way Forward

The results from the 2020-21 season's TFI value chain strengthening activities indicate that their focus, process, content and execution have the potential to build the capacity of the smallholder farmers to identify, evaluate and capture market opportunities that have the potential to increase their household incomes. However, many challenges remain to be addressed as this approach is scaled out.

1. Consolidation of the adoption of *best practice* within the *foundation* group

This season we learned a lot from nursery raising to linking with marketing. There is less effort, less wastage and yield improved with good quality. We will continue to adopt best practice in the future (Foundation male farmer).

All *foundation* group farmers received the same training in nursery, production, harvest, postharvest and marketing *best practice* training, however, their individual physical and financial performance, when compared on a per acre basis, demonstrated a high degree of variation (Table 15).

	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	Farmer 6
Nursery Costs	13,433	13,747	13,730	13,730	13,600	7,750
Land Preparation	8,000	10,133	6,000	7,000	6,400	12,000
Irrigation	5,392	1,280	6,380	3,960	3,520	7,287
Input Cost	19,420	30,747	17,990	12,960	19,520	32,750
Harvest	62,242	32,049	12,380	13,690	17,196	50,991
Marketing	18,232	20,789	13,714	11,630	15,418	41,359
Total VC Production	126,887	108,745	70,194	62,970	75,654	152,137
Yield	11,034	10,745	5,880	4,768	9,372	14,410
Saleable Yield	10,910	10,016	5,606	4,670	9,156	13,956
Revenue	168,887	194,873	71,060	64,230	135,320	233,364
Gross Margin	42,168	86,128	866	1,260	59,666	81,227

 Table 15: Comparative per acre Outcomes – Foundation Group

While some of these variations can be explained by the choice of market, with their associated higher packaging and transport costs, discrepancies in other costs such as seedling production, irrigation, fertilizer and insecticide need further investigation to understand their potential impact on the adoption of *best practice*. For example, what role do landlords play in decisions that affect their tenant sharefarmers?

2 Facilitation capacity

Due to resource constraints, the primary focus of the 2020-21 TFI activities was the development of the capacity of the *foundation* group to adopt *best practice*. A secondary focus was to expose the wider Baili Janobi community to these *best practices* and the benefits from adopting them. This was achieved by the formation of an *apprentice* group, who participated in most production training activities, and 3 *foundation* farmer-led field days.

We participated practically in trainings and field days. Due to trainings we learnt new method to grow tomato nursery with good germination and better health. We observed that our seed and labour cost reduced due to less wastage of seed and retransplanting the main field. We also learned about the efficient and balanced use of fertilizers. Due to training received on the fertilizers and pesticides we got clear direction about their usage according to crop stage and time of application (Apprentice group farmer).

Firstly, the best thing about the field days was the on field comparisons of tunnel nursery and fields. Those fields were clearly showed difference in terms of uniform growth, crop health, uniform fruit sizes, blemish free and less attack of insect pests and disease infestations. Secondly, it was new thing that farmers and farmer leader explained us about the 'best practices' which they adopted. Thirdly, we have extension officers, and researchers among us due to which we had the opportunity to discuss with them about each practice face to face (Field day attendee).

These activities have clearly raised the interest of the Baili Janobi community, and that of the nearby village of Haijiwah, in participating in future TFI activities. It is planned that the 2021-22 season TFI activities will focus on developing the capacity of the *apprentice* group to implement *best practice* and the establishment of a 2nd *apprentice* group in Haijiwah.

We should need to participate in activities such as walking the chain, identification of potential buyers, market training and linking with new market buyers (Apprentice group farmer).

These planned scaling out activities will test the capacity of the facilitation team.

In the medium term, scaling out value chain strengthening initiatives similar to the TFI will depend upon the development of the required facilitation capabilities within Provincial Extension Services, the private sector and NGOs.