CLUSTER DEVELOPMENT BASED AGRICULTURE TRANSFORMATION PLAN VISION-2025

Apricot Cluster Feasibility and Transformation Study

Planning Commission of Pakistan, Ministry of Planning, Development & Special Initiatives

February 2020

FOREWORD

In many developed and developing countries, the cluster-based development approach has become the basis for the transformation of various sectors of the economy including the agriculture sector. This approach not only improves efficiency of development efforts by enhancing stakeholders' synergistic collaboration to resolve issues in the value chain in their local contexts, but also helps to gather resources from large number of small investors into the desirable size needed for the cluster development. I congratulate the Centre for Agriculture and Bioscience International (CABI) and its team to undertake this study on **Feasibility Analysis for Cluster Development Based Agriculture Transformation.** An important aspect of the study is the estimation of resources and infrastructure required to implement various interventions along the value chain for the development of clusters of large number of agriculture commodities. The methodology used in the study can also be applied as a guide in evaluating various investment options put forward to the Planning Commission of Pakistan for various sectors, especially where regional variation is important in the project design.

Muhammad Jehanzeb Khan,
Deputy Chairman
Planning Commission of Pakistan
Ministry of Planning Development and
Special Initiatives
Government of Pakistan.

FOREWORD

To improve enhance Pakistan's competitiveness in the agriculture sector in national and international markets, the need to evaluate the value chain of agricultural commodities in the regional contexts in which these are produced, marketed, processed and traded was long felt. The Planning Commission of Pakistan was pleased to sponsor this study on the **Feasibility Analysis for Cluster Development Based Agriculture Transformation** to fill this gap**.** The study aims to cover a large number of agriculture commodities spread in various clusters throughout the country.

I truly hope that the policies, strategies, and interventions suggested in this report will facilitate the federal and provincial governments to chalk out and implement plans for cluster-based transformation of the agriculture sector.

Zafar Hasan,
Secretary,
Ministry of Planning Development and Special Initiatives
Government of Pakistan

FOREWORD

This is part of the series of studies on 33 agriculture commodities undertaken for the purpose of preparing a cluster-based transformation plan based on the regional realities in the entire value chain including production, processing, value addition, and marketing. I congratulate the whole team of the project especially the Team Lead, Dr. Mubarik Ali to undertake and successfully complete this monumental study. We are thankful to all commodity specialists who have contributed to this assignment. The CABI Project officers Mr. Yasar Saleem Khan and Ms. Aqsa Yasin deserve appreciation. I truly believe that this study will serve as a basis to make and implement plans for cluster-based agriculture transformation. I hope you will enjoy reading the study and it can help you making your investment decisions along the value chain of various agriculture commodities.

Dr. Babar Ehsan Bajwa
Regional Director
CAB International

FOREWORD

This report is part of the series of studies on 33 agriculture commodities to prepare the agriculture transformation plan by incorporating regional realities at the cluster level. In the report, the clusters of various commodities are identified and characterized, and viable investment options along the value chain of each cluster are proposed. For this purpose, the study team has analyzed macro data, reviewed the literature, and made extensive consultation with stakeholders along the value chain. Foreign and local internationally reputed consultants, Dr. Derek Byerlee and Dr. Kijiro. Otsuka and national consultant Mr. Sohail Moghal were also engaged to understand the cluster-based development approach and conduct cluster-based feasibility analysis. An EXCEL-based Model was developed which was validated by our national consultants. Separate viabilities for individual technologies and products suggested in each commodity are also estimated. This humongous task would not have been possible to complete without the excellent cooperation and facilities provide by CABI, the hard work of commodity specialists and our research team especially Mr. Yasar Saleem Khan and Ms. Aqsa Yasin. The true reward of our hard work is the implementation of the proposed policies, strategies and interventions to develop agriculture commodity clusters in the country.

Dr. Mubarik Ali
Team Leader
Cluster Development Based Agriculture
Transformation Plan-Vision 2020 Project
Planning Commission of Pakistan and
CAB International

ACKNOWLEDGEMENT

It is not possible to mention the names of all those who collaborated with us in completing this report, but my foremost gratitude goes to numerous stakeholders along the value chain who generously shared the information about apricot production, marketing, trade and value chain. Without their support, this report would not have reached to the level of present quality.

My sincere thanks go to **Planning Commission of Pakistan** for this initiative and especially financial assistance to complete the project activities. Here I am especially thankful to **Dr. Muhammad Azeem Khan** (Ex-Member, Food Security and Climate Change, Planning Commission of Pakistan), **Dr. Aamir Arshad** (Chief Agriculture, Planning Commission of Pakistan), **Mr. Muhammad Akram Khan** (Project Director; CDBAT project) and other CDBAT project team member **Mr. Muhammad Arif** (Research Associate) and **Dr. Habib Gul** (Research Associate) for successful coordination and support for the project.

I am also grateful to **Centre for Agriculture and Bioscience International** (CABI) and its Director for Central and Western Asia, Dr. Babar Ehsan Bajwa and his team especially Mr. Yasar Saleem Khan for selecting me as commodity specialist for this task and offering outstanding cooperation, support and advice during all the stages of this project. However, the research team takes the responsibility of any shortcoming left in the report.

Izhar Hunzai
Senior Author

Citation:

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DISCLAIMER

This report is prepared by using the data from various published and unpublished sources and that obtained during the consultations with stakeholders. The research team took utmost care to arrive at the figures to be used, but is not responsible for any variation of the data in this report than those reported in other sources. Moreover, the views expressed in this report are purely of the authors and do not reflect the official views of the Planning Commission of Pakistan, Ministry of Planning, Development and Special Initiatives or the Centre for Agriculture and Bioscience International (CABI).

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AAP	Apricot Association of Pakistan
ADP	Annual Development Plan
AKRSP	Aga Khan Rural Support Programmed
AJK	Azad Jammu Kashmir
AQSIQ	Administration of Quality Supervision, Inspection and Quarantine (of China)
CAAS	Chinese Academy of Agriculture Sciences
CAPEX	Capital Expenditure
ACDF	Agriculture Cluster Development Fund
CGIAR	Consultative Groups on International Agriculture Research
CO	Community Organization
CPEC	China Pakistan Economic Corridor
DoA	Directorate of Agriculture
FAO	Food and Agriculture Organization
FEG	Farmer Enterprise Group
FFs	Farmer Field School
GAP	Good Agriculture Practices
GB	Gilgit-Baltistan
GI	Geographical Identification
GoP	Government of Pakistan
IFAD	International Fund for Agricultural Development
IPPC	International Plant Protection Convention
ISO	International Standard Organization
ISPMs	International Standards for Phytosanitary Measures
IRR	Internal Rate of Return
KIU	Karakorum International University
KKH	Karakoram Highway
KP	Khyber Pakhtunkhwa
MARC	Mountain Agricultural Research Centre
MINFAL	Ministry of Food, Agriculture and Livestock
NARC	National Agriculture Research Council
NGOs	Non-Governmental Organizations
OPEX	Operating Expenses
PARC	Pakistan Agriculture Research Council
PCP	Planning Commission of Pakistan
PCSIR	Pakistan Council for Scientific and Industrial Research

PHDEC	Pakistan Horticulture Development and Export Company
PKR	Pakistani Rupee
R&D	Research & Development
SWOT	Strengths, Weaknesses, Opportunities, Threats
UAE	United Arab Emirates
VO	Village Organization

EXECUTIVE SUMMARY

Global production of apricots topped the historic trends in 2017 to 4.2 million tonnes from an area of 0.5 million ha with an average yield of 7.7 tonnes per ha. The global production of apricot is expanding at the rate of 2.5% per annum due to expansion in area as well as increase in per ha yield. In Pakistan, total area of apricot is 42 thousand ha with annual production of 302 thousand tonnes (including the production from GB) with an average yield of 7.2 tonnes. Pakistan requires insights from Turkey being leader in global apricot production as well as from Uzbekistan with a maximal per ha yield. Globally, France leads the apricot exports, while the top importer of fresh apricots is Germany, followed by Russia and Kazakhstan. The global trade in fresh apricots has reached US$0.85 billion and are expanding at the rate of 4.5% and 6.8% in terms of quantity and value of export, respectively.

Pakistan seems to be losing its comparative as well as competitive position compared to the world market while its apricot production has been growing at the rate of only 1.0% per annum during 2001-17. Due to the slow growth in production, Pakistan's rank in the world apricot producing countries has slipped from 5th position in 2001 to 6th in 2017 (considering only mainland production). Moreover, as growth in per ha yield of apricot is insignificant in Pakistan as compared to over 1.2% growth in the world average yield. Additionally, Pakistan did not benefit from the fast-expanding international apricot market which has reached to US$0.8 billion in 2017. Its export price is 30% lower than the world export price for apricot suggesting issues in the apricot value chain.

Under this changing scenario of international apricot market in comparison with relatively stagnant national market and in view of its importance in the livelihood of mountainous poor societies, Planning Commission of Pakistan has initiated this project to analyse the gaps and potentials along the whole value chain of the commodity, and suggest economically viable interventions, strategies and policy measures along the chain for the purpose of improving its competitiveness in national and international markets. In view of the regional variation in the functioning of the apricot value chain, this analysis was undertaken for major apricot clusters in the country. To achieve the objective of the study, macro data were analysed, related literature were reviewed, and number of stakeholders were consulted. An EXCEL Model was developed to estimate the economic feasibility of the package of interventions.

GB and Balochistan are the main apricot growing regions in Pakistan. Two apricot growing clusters are identified in this study for detailed analysis: These are: i) Northern GB cluster, and ii) Southern Balochistan clusters. As part of this study, several performance gaps are identified in the production, processing and trading segments of the value chain, specifically in the technology, market structure and availability of inputs. These included lack of improved commercial apricot cultivars, high post-harvest losses, absence of good quality processing and packaging technologies, and absence of international standards for export. The export of dried apricots has started on a small-scale, however, creating additional export market linkages and satisfying quality standards are needed to accelerate this process.

In order to bridge these gaps, from production and processing to product and market development, performance targets have been set and benchmarked on global averages for yield, quality and export standards. Based on these parameters and keeping in view the

assessed gaps and constraints, specific interventions have been proposed. These interventions include rejuvenation of old gardens and incentivizing the processing infrastructure to reduce post-harvest losses and to improve the quality of apricot for the domestic and international markets: The indirect interventions include strengthening of research on apricot and capacity building of stakeholders on quality management. These interventions are to be initiated by government and executed in collaboration with and participation of the private sector including the farmers, traders and their groups/ associations.

The estimated capital investment of cluster development/upgradation in GB is US$4.2 million, also requiring US$ 0.7 million as working capital during the 8th year of the project. In Balochistan, this amount is US$22.6 million and US$ 3.4 million, respectively. These investments and additional operational costs will generate a net cash flow of US$1.7 million (undiscounted) after deducting all the production, marketing, and processing costs and fixed investment costs during the 8th year of the project in GB cluster, with a Net Present Value of US$1.9 million over the period and an Internal Rate of Return of 22.2%. These values for Balochistan cluster are US$10.5 million, US$12.1 million and 22.8%, respectively. The upgradation plan will generate an overall gross revenue of US$16.4 million, net cash flow of US$12.2 million, NPV of US$14.2 million, and IRR of 22.8%. The cluster level details of production, revenue impacts and detailed investment in different value chain heads can be seen in the attached Summary Sheet here. An example of the value-added processing is provided in Annexure 4.

These investments are focused on increasing production, reducing post-harvest losses and increasing value-added processing, targeting premium domestic and export markets. To achieve these gains, however, the cluster approach has to be adopted to address the cluster issues at the whole value chain level. Strengthening of research especially at production and value chain level and improving capacity of stakeholders to manage the quality product at production and processing levels would be the key factors for the success of the whole value chain.

Summary Sheet

Parameter	GB	Balochistan	Overall
Area of cluster focal point (ha)	944	15278	16222
Production focal point (Tonnes)	10328	104570	114898
Yield of the cluster focal point (t/ha)	10.9	6.8	7.1
Area of the cluster (ha)	12,750	15,278	28,028
Production of the cluster (Tonnes)	15,230	104,570	119,800
Yield of the cluster (t/ha)	6.86	6.84	4.27
Annual yield growth without intervention (%)	0.13%	0.08%	0.11%
Percent area renovated in 4 years	30%	30%	30.00%
Total orchards areas renovated in 5 years (ha)	666	4,583	5,250
Increase in yield due to orchards renovated (%)	50%	50%	50.00%
Added production due to orchards renovation (t)	267	1,833	2,100
Expected additional value of production due to orchards renovated (USD)	267	1,833	2,100
Raw production to be dried for high-end domestic and export markets (ton)	6,982	30,881	37,864
Dried apricot produced (ton)	1,164	5,147	6,311
Dried apricot to be exported (ton)	116	515	631
Revenue from the sale of dried apricots in premium domestic market (US$)	3,782,103	12,867,181	15,194,629
Revenue from the export of dried apricots (US$)	58,186	12,867,181	12,925,367
Total expected incremental returns from all interventions (US$ '000)	**2,492**	**13,951**	**16,444**
Information about drying unit			
Total number of dryers required	68	304	372
Total investment on processing (USD)	**1217956**	**5444978**	**6662933**
Investments			
Strengthening of research (US$)	500000	500000	**1,000,000**
Capacity Building for improved management (US$)	32,904	32,904	65,807
Renovation of existing orchard area (US$)	2,332,050	16,041,900	18,373,950
Investment on drying units	1217956	5444978	6,662,933
Government loans on private investment	133975	598948	732,923
Total investment required year (USD)	**4,216,884**	**22,618,729**	**26,835,613**
Source of investment (US$)			
Total public sector investments, including loans and subsidies	1,554,558	6,362,037	7,916,596
Total private sector investment	3,298,529	19,596,756	22,895,284
Type of investment (US$)			
Production level investments	1,376,880	5,429,227	6,806,107
Processing level investments	2,840,004	17,189,502	20,029,507
Overall benefits and rate of return			
Total increase in production due to all the yield increasing interventions (t)	**267**	**1,833**	**2,100**
Expected additional value of production due to all interventions (000 USD)	**2,492**	**13,951**	**16,444**
Total operational costs (000 US$)	**771**	**3,448**	**4,219**
Net cash flow after deducting all costs (000 US$)	**1,721**	**10,503**	**12,225**
NPV (000 US$)	**1,878**	**12,152**	**14,030**
Internal Rate of Return	**22.2%**	**22.8%**	**22.7%**

1 INTRODUCTION

Apricot belongs to several species in the genus *Prunus* (stone fruits) however, *P. armeniaca* is the most common. Apricots have a chilling requirement of 300 to 900 hours. A dry and temperate climate is ideal for fruit maturation. A limiting factor in apricot cultivation is late frosts, extending to the spring, which can kill the flowers. Furthermore, the trees are sensitive to temperature changes during the winter season. Apricot cultivars are usually grafted onto plum or peach rootstocks.

The cultivar scion provides the fruit characteristics, like flavor and size, but rootstock provides the growth characteristics of the plant. Some of the more popular apricot cultivars in the world are 'Blenheim', 'Wenatchee Moorpark', 'Tilton', and 'Perfection'. Some apricot cultivars are self-compatible and do not require pollinizer trees; others are not: 'Moongold' and 'Sungold', for example, must be planted in pairs so that they can pollinate each other.[1]

Apricot is a versatile fruit and it offers multiple values and uses and has tremendous potential for value addition at different levels including, pulp, juice, jam, dried apricot, apricot kernels and apricot oil. Dried apricot is used as an ingredient in health foods, such as breakfast muesli, shakes, cereal/fruit bars and cakes.

1.1 Apricot Sector in Pakistan

Apricot is one of the most important crops which contributes significantly to household cash income, especially in Gilgit-Baltistan region, where it ranks number two cash crop, after seed potatoes. It offers multiple values and uses and has tremendous potential for value addition at different levels.

Total production of fresh apricots in mainland Pakistan was 177.4 thousand tonnes, harvested from an area of 29.3 thousand ha (2016). However, these figures do not include production from Gilgit-Baltistan (GB), because it is treated as a disputed area. When GB's production of 125,186 tonnes, grown on 16,750 ha (2015/2016) is included, the total apricot production of Pakistan adds up to 302,570 tonnes, and Pakistan's ranking improves from the 6th to the 4th largest producer of apricots in the world. The total area devoted to apricot in Pakistan is about 42,028 ha supplying a production of 302.6 thousand tonnes of apricot. The average yield in Pakistan is calculated as 7.20 t/ha (Table 1).

[1] Adapted from Wikipedia: https://en.wikipedia.org/wiki/Apricot

Table 1: Major Apricot Producing Province/Regions in Pakistan (As of 2016)

S #.	Province	Production (ton)	Production Share (%)	Area (ha)	Area share (%)	Yield (t/ha)
1	Balochistan[1]	163,856	54	25,584	60.85	6.40
2	Gilgit-Baltistan (GB)[2]	125,186	41	12,750	30.33	9.82*
3	Others[1]	13,528	5	3,710	8.82	3.65
3.	Total Mainland Pakistan[1]	177,384	59	29,294	70	6.06
	TOTAL	302,570	100	42,044	100	7.20

Source: [1]MNFS$R (2017); [2]GGB (2015)
Note: As apricot in G-B is grown in mixed orchards hence difficult to isolate its yield. Consultations with experts informed that reported yield is over estimated & actual yield is likely to be around 5.71 t/ha.

The largest producer of apricot is Balochistan, with a 54% share in the total production in 2016, followed by GB, with a share of 41%. The remaining 5% is produced in other regions mainly in KP. The average yield in Gilgit-Baltistan is nearly 9.82 t/ha which is good considering the limited use of inputs. However, according to the experts and stakeholders interviewed for this report, this apricot yield is over estimated due to mixed-orchard management. The more realistic suggested yield for GB is 5.71 t/ha. In Balochistan, the focal district, Killa Saifullah has an average yield of 6.84 t/ha.

The available data for GB shows a highest yield compared to other provinces, although there are some doubts on the yield number in GB as these numbers do not figure out in national statistics. Similarly, it is widely believed that the figures reported for Balochistan are difficult to separate from quantities coming from Afghanistan and Iran because of informal cross-border trade.

In Pakistan, apricot production during 2001-16 has been growing at the rate of around 1% per annum, much lower than the population growth rate of 2.1% suggesting that per capita availability of apricot from domestic resources is declining overtime. Most of the increase came the expansion in its area while there is insignificant improvement in per ha yield of apricot over the period. The trends in area, production, and yield across the two main apricot growing regions are the similar (Table 2).

Due to the high perishability of fresh apricots and long distances from the market, the bulk of the harvest in GB is dried on-farm and sold locally and through wholesale auction markets in major urban centres of the country. In Balochistan, the bulk is sold as fresh in major urban markets of Quetta, Karachi, and cities in Sindh and Punjab. Both fresh and dried apricots produced in the rest of the country have to compete with imports from Afghanistan and Iran through Peshawar and Chaman.

Table 2: Long Term Production Trends

Year	Gilgit-Baltistan			Balochistan			Pakistan		
	Area (ha)	Prod. (tonnes)	Yield (t/h)	Area (ha)	Prod. (tonnes)	Yield (t/h)	Area (ha)	Prod. (tonnes)	Yield (t/h)
2001	10,983	106,406	9.69	22,258	140,916	6.33	36,506	259,092	7.10
2002	11,126	107,736	9.68	22,481	142,748	6.35	36,907	262,407	7.11
2003	11,237	108,706	9.67	22,705	144,747	6.37	37,279	265,542	7.12
2004	11,349	109,684	9.66	22,955	146,484	6.38	37,678	268,124	7.12
2005	11,463	110,672	9.65	23,162	148,974	6.43	38,035	271,458	7.14
2006	11,577	111,446	9.63	23,370	151,655	6.49	38,396	274,761	7.16
2007	12,921	114,286	8.84	23,627	153,930	6.51	40,035	279,747	6.99
2008	12,792	116,572	9.11	23,887	155,777	6.52	40,204	284,053	7.07
2009	12,664	118,903	9.39	24,150	158,737	6.57	40,377	289,555	7.17
2010	12,537	120,092	9.58	24,416	161,118	6.60	40,556	293,256	7.23
2011	12,286	120,212	9.78	24,684	163,696	6.63	40,613	296,183	7.29
2012	12,164	121,414	9.98	24,956	164,842	6.61	40,802	298,748	7.32
2013	12,042	122,021	10.13	25,230	165,007	6.54	40,995	299,720	7.31
2014	12,750	123,242	9.67	25,508	165,172	6.48	42,022	301,358	7.17
2015	12,878	123,365	9.58	25,788	165,337	6.41	42,471	301,944	7.11
2016	12,750	125,184	9.82	25,584	163,856	6.40	42,044	302,570	7.20
Average (%)	***1.05***	***1.09***	***0.13***	***0.93***	***1.01***	***0.08***	***0.95***	***1.04***	***0.10***

Source: The data for Balochistan was taken from http://www.amis.pk/Agristatistics/DistrictWise/2012-2014/Apricot.hhe. The data for GB is interpolated from a 2007 report by the Government of GB (Northern Area's Agricultural Statistics 2007, DoA, Gilgit), and reported in "Apricot Value Chain Assessment Final Report for the Agribusiness Project (2013)", by USAID/ Agribusiness Support Fund (ASF), page 8.2

Exports of fresh apricot from Pakistan have decreased considerably since 2008 when significant amount of apricots were exported to UK and the Middle East (Saudi Arabia, Bahrain and United Arab Emirates). This market has been taken over by Turkey, Spain and USA. On the other hand, while imports of apricot remain fluctuating over the period but have increased dramatically during 2016. This has created a serious balance of trade issue in apricot trade, and the deficit has reached to US$ 9.7 million in 2017 (Table 3).

[2] http://agribusiness.org.pk/wp-content/uploads/2015/04/6.Apricot-Value-Chain-Assessment-March-282013.pdf

Table 3: Trends in apricot trade from Pakistan during 2001-17

Year	Export		Import		Trade deficit	
	Quantity (ton)	Value (000 US$)	Quantity (ton)	Value (000 US$)	Quantity (ton)	Value (000 US$)
2001	525	537	3318	445	2793	-92
2002	737	781	2835	388	2098	-393
2003	469	530	4873	688	4404	158
2004	291	279	4636	653	4345	374
2005	267	391	5258	737	4991	346
2006	331	421	4928	725	4597	304
2007	664	882	10367	1633	9703	751
2008	982	1110	27439	3625	26457	2515
2009	767	1150	5177	982	4410	-168
2010	523	1156	1242	684	719	-472
2011	571	1519	5360	960	4789	-559
2012	816	1428	26035	5627	25219	4199
2013	963	2074	3116	2970	2153	896
2014	219	421	6960	6384	6741	5963
2015	272	292	6519	8491	6247	8199
2016	243	474	1206	944	963	470
2017	222	302	13804	10168	13582	9866

FAOSTAT, Trade, Crop and Livestock Products Data: http://www.fao.org/faostat/en/#data/TP

1.2 Global Scenario of Apricot

Globally, apricot is produced on about 0.54 million ha supplying a production of 4.3 million tonnes with an average per ha yield of 7.7 ton. Although Pakistan is the 4th largest producer of apricot in the world (including GB), most of the production is consumed domestically, and only a fraction of the total annual output is exported. While, globally about 13% of the production is traded in the international market, Pakistan brings less than 0.2% of its production in the international market. Farm-gate price of apricots in Pakistan is far below the international average, which shows that Pakistan has a competitive edge at the production level. Its exports earn 10% lower than the world average export price (Table 4).

Table 4: Comparison of world vs. Pakistani Apricot Sector (2017)

Parameter	World	Pakistan	Share (%)
Area including GB (000 ha)	536	42	5.76
Production including GB (000) ton	4257	303	4.20
Yield (t/ha)	7.67	7.21	94.06
Value of production at farm level (Only mainland) (million US$)	3,394	210	6.19
Farm gate price (US$/ton)	624	451	72.31

Parameter	World	Pakistan	Share (%)
Volume of trade (000) ton	546	0.222	0.04
Value of international trade (US$ m)	827	0.302	0.04
Export quantity as % of production	13%	0.12%	-
Export value as % of production value (US$ m)	31%	0.37%	-
Average export prices (US$/ton)	1515	1360	89.81

Source: FAOSTAT, Production, Crops Data: http://www.fao.org/faostat/en/#data/QC
FAOSTAT, Trade, Crop and Livestock Products Data: http://www.fao.org/faostat/en/#data/TP

Unlike in Pakistan where average growth rate in apricot production during 2001-2017 is only 1% per annum, world average growth during the period has been about 2.5% (Table 5). It has increased by over 60% from 2.6 million tonnes in 2001 to about 4.6 million tonnes in 2017. This growth in apricot production is much higher than the world average population growth at 1.19% implying that world per capita consumption is expanding overtime while it has shrunk in Pakistan during the period.

More importantly, the global growth is coming both from the expansion in area as well as in per ha yield, while in Pakistan it is mainly due to the expansion in area. The slow growth in apricot production in Pakistan has deteriorated its position among the world leading apricot producing countries from 5th in 2001 to 6th in 2017 (considering only mainland production). Moreover, slow growth in its per ha yield compared to the world average has implications for the countries comparative advantage in the global as well as in national markets.

Table 5: Apricot global production trend during 2001-17

Year	Area (000 ha)	Production (000 ton)	Yield (ton/ha)
2001	433.5	2641.0	6.09
2002	439.7	2616.3	5.95
2003	466.5	2891.5	6.20
2004	475.8	2784.2	5.85
2005	480.6	3626.0	7.54
2006	521.1	3462.3	6.64
2007	508.2	3294.2	6.48
2008	512.2	3685.2	7.20
2009	550.8	3756.4	6.82
2010	564.7	3305.6	5.85
2011	536.1	3818.5	7.12
2012	532.2	3867.5	7.27
2013	557.5	4097.2	7.35
2014	553.8	3343.4	6.04
2015	519.1	3963.4	7.64
2016	525.3	3766.1	7.17
2017	536.1	4257.2	7.94
Growth rate (%)	1.3	2.5	1.22

Source: FAOSTAT, Production, Crops Data: http://www.fao.org/faostat/en/#data/QC

During 2001-17, the world apricot market is expanding at a high rate of 4.5% per annum. It has increased from 0.27 million tonnes worth of US$0.29 billion in 2001 to 5.5 million tonnes in 2017 worth of US$0.83 billion in 2017. The expansion in fresh apricot world trade is much higher than the dried apricot (Table 6). Pakistan largely remained disconnected with this expanding world apricot market as its contribution in world export market remained insignificant over the period.

Table 6: Apricot global export trend during 2001-17

Year	Apricot fresh		Apricot dry		Total	
	Quantity (000 ton)	Value (Million US$)	Quantity (000 ton)	Value (Million US$)	Quantity (000 ton)	Value (Million US$)
2001	166.7	164.1	105.1	127.0	271.8	291.2
2002	184.8	178.5	86.8	152.9	271.7	331.4
2003	152.8	195.6	90.4	194.5	243.2	390.1
2004	166.6	215.9	99.0	248.9	265.6	464.7
2005	207.4	251.6	115.1	239.4	322.5	491.1
2006	248.8	296.5	136.8	217.8	385.6	514.3
2007	182.7	301.8	130.9	242.0	313.5	543.8
2008	239.7	367.5	125.9	404.5	365.6	772.0
2009	279.3	366.4	125.3	349.8	404.5	716.2
2010	255.1	385.9	118.4	429.5	373.5	815.4
2011	264.0	406.4	125.4	450.3	389.4	856.7
2012	335.2	451.6	138.3	382.5	473.5	834.1
2013	358.5	538.4	147.3	405.4	505.7	943.8
2014	305.6	474.2	145.8	463.0	451.4	937.1
2015	316.3	429.4	119.1	405.0	435.4	834.5
2016	331.3	424.5	124.1	376.3	455.4	800.9
2017	406.3	460.9	139.9	366.5	546.2	827.3
Growth rate (%)	5.5	6.8	2.3	6.7	4.5	6.8

FAOSTAT, Trade, Crop and Livestock Products Data: http://www.fao.org/faostat/en/#data/TP

With an estimated 730 thousand tonnes of production in 2016, Turkey was the top producer of apricots in the world, followed by Uzbekistan and Iran. Other leading apricot producing countries include Algeria, Italy, Pakistan, Ukraine, France, Spain, and Japan (Table 7). Egypt, Italy, are Uzbekistan are among the highest per ha apricot yield producing countries. Pakistan can greatly specially learn from Uzbekistan to enhance its per ha yield.

Table 7: Top Apricots Producing Countries of the World (2016)

Rank	Country	Production (Tonnes)	Area (ha)	Yield (t/ha)
1	Turkey	730,000	123,805	5.89
2	Uzbekistan	662,123	56,206	11.78
3	Iran	306,115	54,392	5.63
4	Pakistan*	302,570	42,044	7.20

Rank	Country	Production (Tonnes)	Area (ha)	Yield (t/ha)
5	Algeria	256,771	38,239	6.71
6	Italy	237,021	18,917	12.53
7	Spain	125,711	18353	6.83
8	France	110,850	11872	9.34
9	Egypt	102,247	6,677	15.31
10	Japan	92,700	15,600	5.94

FAOSTAT, Trade, Crop and Livestock Products Data: http://www.fao.org/faostat/en/#data/TP
*Pakistan ranks 4th when production from GB is included in national statistics

France and Spain are the major apricot exporting countries of the world having about 50% combined share in the world market (Table 8). For Pakistan, to compete in exports with these countries will be difficult unless Pakistan improves the value chain of apricot dramatically. However, Pakistan has a great potential to learn from Turkey and Uzbekistan to improve apricot value chain for export.

Table 8: Top Apricot Exporting Countries of the World (2016)

Rank	Country	Export (000 US$)	% share
1	France	118.96	25.29
2	Spain	108.77	23.13
3	Italy	45.21	9.61
4	Turkey	27.42	5.83
5	Uzbekistan	24.27	5.16
6	Greece	21.45	4.56
7	USA	14.797	3.15
8	Jordan	10.46	2.22
9	All Others	89.93	21.1
	World Total	470.32	100

FAOSTAT, Trade, Crop and Livestock Products Data: http://www.fao.org/faostat/en/#data/TP

Germany and Russia represented the major importers of apricots in 2017, finishing at approx. 22%, and 16% of total imports, respectively. From 2007 to 2017, the most notable growth rate of imports, among the main importing countries, was attained by Saudi Arabia (+12.4% per year), while the other global leaders experienced more modest paces of growth (ABN Newswire (2018). In general, apricot import price continues to indicate a moderate downturn. Pakistan should explore Russia and Saudi markets for its apricot export.

1.3 Need of the Study

Concluding the macro situation of apricot at national and international level, its production in Pakistan seems to be losing its comparative as well as competitive position compared to the world market. In Pakistan, its' production has growing hardly at 1.0% per annum rate during 2001-17 while globally it is expanding at a rate of 2.5% per annum. As a result, Pakistan's rank in world apricot producing countries has slipped from 5th position in 2001 to 6th in 2017 (considering only mainland production). Moreover, as growth in per ha yield in apricot is

insignificant in Pakistan compared to over 1.2% growth in the world average yield, Pakistan's competitive position has also lost significantly over the period. Moreover, Pakistan did not benefit from the fast-expanding international apricot market which has reached to US$0.8 billion in 2017. Its export price is 11% lower than the world export price for apricot suggesting issues in apricot value chain.

Under this changing scenario of international apricot market in comparison with relatively stagnant national market and in view of its importance in the livelihood of mountainous poor societies, Planning Commission of Pakistan has initiated this project to analyze the gaps and potential along the whole value chain of the commodity, and suggest economically viable interventions, strategies and policy measures along the chain for the purpose of improving its competitiveness in national and international markets. In view of the regional variation in the functioning of the apricot value chain, this analysis is undertaken for major apricot clusters in the country.

2 GOAL AND PURPOSE

The overall goal of this study is to contribute to the Cluster Development Based Agriculture Transformation Plan -V2025.

Specific objectives of the study are to:

1. Identify the major clusters of apricot production in Pakistan
2. Characterize and conduct SWOT analysis for each cluster
3. Identify technical and investment gaps in each cluster
4. Assess potential for higher production and value-added trade/ export in each cluster
5. Suggest investment strategies to reach the assessed potential
6. Conduct economic and social feasibility of the suggested interventions

3. METHODOLOGY

The data and information related to the characteristics, gap, potential and needed interventions to meet the gaps in apricot clusters were collected from three sources:

a) *Macro-data. Relevant macro data were collected from various published and unpublished reports of government and non-governmental organizations and internet search on apricot value chain (see Annexure 1, for the macro data sources)*
b) *Stakeholders Consultations. Primary information was collected through meetings and consultations, key informant interviews, surveys and focus group discussions using structured tools and open-ended questionnaires (see Annexure 2 for the list of stakeholders consulted).*
c) *Literature Review. The literature related to the functioning, gaps, and interventions in apricot value chain was reviewed and synthesized (see Annexure 3).*

The following generic parameters and indicators were used in collecting the data:

- Global context of the apricot sector
- Production potential and review of apricot sector
- Cost of production, harvesting, post-harvest processing, from producers and producer groups
- Marketing, trading, and processing from traders, wholesalers, retailers, and processors
- Issues and constraints relating to production, processing, and trading from all stakeholders
- Benchmarks, synthesis and recommendations, based on the analysis of the quantitative and qualitative data, using global parameters

The author used these data to first identify major apricot producing regions in the country and, based on this information, proceeded to identify, characterize and select one or more clusters for upgradation and development. The next steps included undertaking a SWOT analysis, describing strengths, weaknesses, opportunities, and threats in the selected cluster/s, as well as documenting value chain functions and quantifying the cluster potential. Based on these analyses, specific interventions were proposed for bringing about improvements in each selected cluster. The costs and benefits of each intervention are estimated to finally work out the Internal Rate of Return (IRR) of the whole package. An Apricot Transformation Plan is also formulated, which identifies sustainable cluster upgrading strategies for the development of the sector that can help create significant economic opportunities for producers, processors and all the other stakeholders participating at different points of the value chain.

4 LITERATURE REVIEW

Apricot is one of the most cultivated stone fruits in the world (Hurtado et al., 2002; Vilanova et al., 2003; Ercisli, 2009). It is one of the nutritionally high value fruits – it includes the nutrients thiamin, riboflavin, niacin, pantothenic acid, vitamin B6, folic acid and vitamin C, for example (Marlett and Vollendorf 1994; Marlett, JA and Vollendorf, NW. 1994). The Central Asian apricots are the oldest group with the rich genetic diversity (Mehlenbacher et al., 1990).

In Pakistan, apricot is cultivated in Balochistan, Gilgit-Baltistan, and parts of AJK and KP. Thompson (1988) reported that apricot was introduced in Gilgit-Baltistan from central Asian countries. The Central Asian group is the oldest and richest in biodiversity and includes local apricots from central Asia, China (Xinjiang), Afghanistan, Baluchistan, and Kashmir. Apricots grow best in mountainous regions with a hot, dry summer and uniform, cold winter (Layne et al. 1996).

Commercial cultivars show good local adaptability and represent an interesting genic pool for breeding programs (Mehlenbache et al. 1990; Mehlenbacher SA, Cociu V, Hough LF. 1990). However, the crucial factor is to ensure that the cultivar name corresponds to the actual cultivar, a particularly important aspect to farmers. In both GB and Balochistan, farmers use traditional methods to identify cultivars, based on pomological, morphological and horticultural traits. However, since the apricot is a perennial tree with a juvenile period of up to 3 or 4 years, these traditional methods are inconvenient and require expertise and time, which in turn makes them costly.

The structure of the apricot sector in Pakistan reflects the geographical context, consumption patterns, market access, the type of production and processing technology used, and management practices followed. For instance, prior to the construction of the Karakoram Highway (KKH) in mid 1980s, GB was isolated from the mainland Pakistan and the main markets. Under these conditions, apricot cultivation originated from a wide range of naturally occurring cultivars indigenous to the area. The cultural practices followed by farmers, were designed to satisfy subsistence needs, such as diversity in taste, maturity timing, yields, sugar content and other characteristics needed for self-provisioning, not for trading, especially in distant markets. This has resulted in too many varieties and much of the production lacking in quality, uniformity, hardness and other traits, needed for commercial purposes. This meant growing varieties that would mature at different times of the season to ensure availability for an extended period of time during the summer, and varieties that are high in brix level or sugar content, which are not suited for storage and transportation, but ideal for drying and preserving the high natural sugar content for use in winters, which are severe. Due to the seasonality of production and high perishability of fresh apricot, drying was the preferred method of processing and preservation for consumption throughout the year (Hunzai, I. A, 2000).

Apricot is the top dry fruit transported to down country and a major cash earner. The apricot cultivars are cultivated for hundreds of years in Gilgit-Baltistan and used as fresh and dry fruit as well. There are more than sixty apricot cultivars found in different parts of GB, which are not fully classified (MARC scientists). The most common ones include Marghulam, Shakarfo, Shikanda, Charmagzi, Shai Pawand, Nili Pawand, Halman, Habi, Ali Shah Kakas, Astore 1, Narie and Skardu Local (Ibid).

There is considerable scope to introduce new cultivars with extended shelf life and successive ripening sequence over the season to extend the apricot marketing down to big commercial centres of plains (ASF, 2015).

Apricot sector is much better organized in Balochistan, which has a much longer history of commercial cultivation and marketing, as well interaction with neighbouring Afghanistan and Iran as well as Turkey, with which apricots have been traded and varieties exchanged over centuries (Sana Samad, 2017).

Specialized nurseries exist in Balochistan, both in the private sector and in the public sector, but not in GB, where farmers produce their own seedlings and then graft them with available varieties. Most private fruit nurseries in Balochistan include a rootstock block, bud-wood block and stock plant block. However, due to inefficient crop management, the condition of trees is poor and skilled technicians are scarce (ibid).

The apricot tree varieties grown in Killa Saifullah are commercial types, and an optimum yield is obtained from them. Orchards are customized for growing the apricot. Whereas, in GB, the orchards are mixed, including other fruit trees including apricots, peaches, mulberries, almond and walnuts, etc. (interviews with farmers).

The local (including Iranian and Afghan) cultivars that are popular in Balochistan include Shakarpara, Charmagz, Saffaida, Kaisha, Amiri, and Zardalu. New varieties that have been introduced from the European sources include New Castle, Royal, Sungold, and Goldkist, among others (Allah Dada Khan, 2015).

Average farm-size in GB is less than one ha, while in Balochistan, the average farm size is 24.2 ha. This means, a small number of large farmers are engaged in apricot cultivation in Balochistan, while in GB it is the other way around.

Moreover, landholding is getting even smaller in GB through division and sub division within generations. Farmers try to make the best use of available land resources, but the rate of efficiency varies across households and the region. One early conclusion related to small farm size is that the region of GB may not be suitable for growing cereal crops, but ideal for growing high value fruits, such as apricot, cherries and walnuts due to its cool and temperate climate. Thus, growing horticultural crops is becoming the primary activity of majority of households in GB.

In Balochistan, water is a key constraint, while in GB, water is plentiful but needs investment in irrigation infrastructure. Potential exists for both horizontal and vertical growth in GB. IFAD is presently investing US$ 120 million in GB to develop new land for expanding the production of commercial crop. The top two value chains that are being targeted are apricots and potatoes (IFAD, 2016).

Killa Saifullah produces more than 100,000 ton of apricot, and that is more or less the upper limit because of water scarcity. GB has a much higher potential for increasing the cultivated area under apricot.

GB is considered to be the largest producer of high-quality organic apricots in Pakistan (The Nation 2017). Apricots are the most commonly grown fruits with an average of 15 trees per

household and it is estimated that there are more than 3 million apricot trees in GB (DoA, GB, 2015). Thirty per cent of the rural households in GB annually earn between PKR. 6,500 to 9,500 from sale of apricot and its by-products (Ibid). Traditionally, the dried apricot and apricot oil has remained one of the main food supplements of local people that is associated with good health and longevity of local people. Now, small companies, assisted by NGOs, have developed apricot oil as a branded product.

Geography has provided a unique opportunity to both Balochistan and GB, as both are close to huge markets. GB is situated at the Pak-China border that serves as gateway to China Pakistan Economic Corridor (CPEC) through KKH. Balochistan is close to the mega city of Karachi and the Middle East, and with Iran again under sanctions by the USA, the Middle East market is easily accessible to traders in Balochistan who use motorized boats to ship agricultural products to Oman, from where fruit and vegetables are supplied to the entire Middle East.

Gilgit-Baltistan, where chemical inputs are seldom used because of its remoteness, offers ideal conditions for producing organic apricots. With rising populations in the Middle East and higher-income brackets in China, there is an opportunity to sell certified organic products at a premium price. China has become the largest importer of food in the world and there exists 30% unmet demand for organic food products in Chinese domestic market. There is tremendous potential to export certified organic products including fresh and dry apricot products from Gilgit-Baltistan to the wealthy Chinese consumers (International Trade Centre (ITC), 2011).

Over 2.5 million domestic tourists visited GB during the summer of 2017, according to the Tourism Department of GB. The biggest attraction is scenic beauty of the area and its reputation as a place where healthy food is grown in the natural environment. This offers a good opportunity for the local producers and businessmen to sell their apricot products to these tourists. The demand for fresh and dry fruit during the tourist season is very high.

5 CLUSTER IDENTIFICATION AND CHARACTERISTICS

5.1. Production and Trading Route of Apricot

As reported in the introduction of this report, the main apricot production centers are GB in the north and Balochistan in the south west. The largest domestic consumption center is Karachi followed by Lahore, Faisalabad, Rawalpindi and Islamabad. As such, as a matter of proximity to nearest consumer markets, apricots produced in GB are dried and supplied to the markets in Islamabad and northern Punjab. The fresh and dried apricots from Balochistan are sold in markets of Karachi and other southern cities. As reported earlier, less than 0.2% of apricots are exported, mostly to European Union (EU) countries and the Middle East. Dried apricots were included in the border trade between Pakistan and China in the 1980s, which is no longer the case now (Figure 1).

Figure 1: Map of Pakistan Showing Apricot Production & Trade Flow

5.2. Identification of Apricot Cluster

Based on the above analysis, two main apricot growing and trading clusters are identified in this study for detail analysis. These are:

5.2.1. Balochistan Southern Apricot Cluster.

This cluster consists of Killa Saifullah, Mustang, Loralai, and Zhob districts with Killa Saifullah as its focal point. The cluster contributes 87% of total provincial area and produces nearly 86% of the total apricot production of the province. The focal point Killa Saifullah (KS) is located in the north-western part of Balochistan that alone contributes 64% of the provincial production and 60% of the area (Table 9).

The other major apricot producing district is Zhob with a share of 12% in total apricot production of Balochistan. Zhob is the highest apricot yield producing district in the cluster, but its area is relatively small compared (Table 9). Zhob has a potential to be developed a full-fledged cluster if proper policy and technology support is provided.

Table 9: Apricot Production in Balochistan (As of 2015)

S#.	Location	Area (ha)	Production (tonnes)	Area share (%)	Production Share %	Yield (t/ha)
Balochistan Northern Cluster						
1	Killa Saifullah	***15,278***	***104,570***	59.7	***63.82***	***6.84***
2	Mastung	2733	5,153	10.7	3.14	1.89
3	Loralai	2267	11,578	8.9	7.07	5.11
4	Zhob	2006	19,108	7.8	11.66	9.53
Total Balochistan Southern Cluster		**22,284**	**140,409**	**87.1**	**85.7**	**6.30**
Non-Cluster Districts						
1	Pishin	1076	3,586	4.2	2.19	3.33
2	Quetta	588	5,804	2.3	3.54	9.87
3	Killa Abdullah	662	4,398	2.6	2.68	6.64
4	Kalat	376	3,874	1.5	2.36	10.30
5	Harnai	167	1,770	0.7	1.08	10.60
6	Khuzdar	133	1,204	0.5	0.73	9.05
7	Ziarat	115	1,477	0.4	0.90	12.84
8	Barkhan	87	494	0.3	0.30	5.68
9	Sherani	54	536	0.2	0.33	9.93
7	Musa Khail	31	229	0.1	0.14	7.39
10	Nushki	5	36	0.0	0.02	7.20
11	Chagai	3	14	0.0	0.01	4.67
12	Kohlu	3	25	0.0	0.02	8.33
Total non-cluster districts		**3300**	**23447**	**12.9**	**14.3**	**7.10**
	TOTAL BALOCHISTAN	**25,584**	**163856**	**99.0**	**100**	**6.40**
Source: Ministry of National Food Security and Research: http://www.mnfsr.gov.pk/pubDetails.aspx						

5.2.2. GB Northern Apricot Cluster.

This cluster consists of Skardu, Ghanche, Kharmang, Ghizer, Nagar, Shigar and Hunza with Skardu as its focal point. The whole cluster covers 80% of the total production of the GB province. The focal point contributes 17% of the area and 12% of the production of the GB (Table 10).

Table 10: Apricot Production in Gilgit-Baltistan (As of 2015)

Sr. #.	District/Location	Area (ha)	Production (tonnes)	Share in area (%)	Share in production (%)	Yield (t/ha)
GB Northern Apricot Cluster						
1	Skardu	2,211	15,230	17.3	12.17	6.89
2	Ghanche	2,018	24,841	15.8	19.84	12.31
3	Kharmang	1,679	14,921	13.2	11.92	8.89
4	Ghizer	1,528	16,734	12.0	13.37	10.95
6	Nagar	1,029	13,500	8.1	10.78	13.12
5	Shigar	1,440	14,355	11.3	11.47	9.97
6	Hunza	944	10,328	7.4	8.25	10.94
Total GB Northern Cluster		**10,849**	**109,909**	**85.1**	**87.9**	**10.131**
Non-Cluster districts						
1	Gilgit	935	9,718	7.3	7.76	10.39
2	Diamer	514	1,554	4.0	1.24	3.02
3	Astore	451	4,005	3.5	3.20	8.88
Total Non-cluster Districts		**1,901**	**15,277**	**15**	**14**	**8.036**
	TOTAL	**12,750**	**125,186**	**100.0**	**100**	**9.82**
Source: GB Agriculture Survey Data (2015), DoA, GGB, Gilgit						

5.3. Comparison of Cluster Characteristics

In GB, apricot contributes significantly to household cash income, in the whole region, where it ranks number two cash crop, after seed potatoes. The comparison of key characteristics in both the clusters is made in Table 11.

Table 11: Characteristics and Comparison of Clusters

Salient Features	GB Northern Cluster	Balochistan Southern Cluster
Products	Fresh apricot, dried apricot, apricot kernels, apricot oil	Fresh apricot, dried apricot, apricot kernels and apricot oil
Apricot Growing Regions /Districts	Skardu, Ghanche, Kharmang, Ghizer, Nagar, Shigar, Hunza	Killa Safiullah, Mastung, Loralai, Zhob
Focal Point	Swat	Killa Saifullah
Area of the cluster: (000 Ha)	12.75	22.28
Production: (Tonnes)	125,186	140.41
Average yield: (Kg/Tree)	50Kg/Tree or 10 ton per ha	35Kg/Tree or 6.3 tonnes per ha
Area of the focal point (000 ha)	2.21	15.28
Production of the focal point (000 ton)	15.23	104.6
Yield of the focal point (ton/ha)	6.89	6.84
Percentage of the crop area that lies in the cluster (Apricot area of the cluster/Apricot area in the country)	45.00%	35.00%
Percentage of the total cropped area in the cluster (Apricot area in the cluster/total cropped area in the cluster)	10.00%	6.00%
Geographical and Environmental Factors	Soil texture: Sandy Loam	Soil Texture: Sandy/silty texture
	Steppe and mountainous valleys	Mountainous and flat lands
	Mid-latitude steppe / semi-arid cool climate	The climate of Killa Saifullah is semi-arid (steppe) kalt (cold). It can be termed a “warm summer and cold winter
	Access to snow-melt/glacial water through water channels/ducts	Irrigation is dependent on precious groundwater, which is depleting, and limited in supply, and has competing claims from other crops and sectors. The groundwater is pumped from ever deeper depths, at a high cost of fuel or subsidized electricity. The traditional Karez system is also in practice in some areas
Apricot Growers	Large commercial growers, with good backward and forward linkages	Small farmers, mixed orchards, poor links with sources of technology, inputs and markets
Product Features	Uniform product, well-known in the market, both fresh and dried	Unknown in the market, only dried are sold, because fresh are difficult to transport
Varieties and their Features	Few varieties, all commercial, local and exotic, bred to tolerate transport and storage stresses	Too many varieties, but very few commercial ones, almost all local, fragile and low shelf life.

Salient Features	GB Northern Cluster	Balochistan Southern Cluster
Nursery raising and Planting	Professional skills, commercial orientation	Traditional skills, subsistence oriented
Input Management Practices	Organized	Disorganized
Pruning and Harvesting	Largely scientific	Largely non-scientific
Packaging and transportation	Available at cost	Not available
Wholesale and retailing	Yes	Yes
New Technology Infrastructure	Yes	No
Export and domestic marketing	Mainly domestic market; both fresh and dried	Only domestic market, mainly dried
Supply Chain	Well established	Weak
Certification	No	NO
Socioeconomic networking/Gender involvement	Agricultural labour available	Only family labour
Subsidies /Incentives/ Facilities	Yes	No
Market infrastructure	Well developed	Under-developed
Source: Feedback from different stakeholders and survey of secondary sources **NB:** Please see the Annexure-2.1 for detailed comparison of the two apricot clusters		

5.4. Description of Apricot Value Chain

5.4.1. GB Northern Cluster

The growing of apricots is oriented towards local varieties; which GB farmers traditionally consider as more valuable than the imported (exotic) cultivars. The quality of these varieties is excellent; some even better than the Mediterranean commercial cultivars in terms of taste and resistance to pest and diseases. However, because of their higher brix, fresh GB apricots are extremely fragile and very difficult to store and transport, especially in the absence of a cold chain. GB Apricots are certainly one of the most promising fruit species with the highest future potential for development due to the farmers' familiarity with their cultivation, the excellent quality of indigenous genetic resources, and easy to dry characteristics of their varieties. There is a good potential for increasing the value-added aspects of the product through improved production, processing and marketing practices. The apricots in GB are grown in mixed orchards.

The apricot trees and the fruits are an important part of the GB culture and have significant economic importance for its people. Apricot trees are valued for their: a) wood which is considered to be the best quality for carving kitchen utensils and firewood for heating in winters, b) apricot ingredients are an important part of the local food chain, c) income from commercial sale of fresh and dried apricots and, d) apricot kernel is an essential part of the daily diet of a majority of the people of GB, as well as a commercial product that is considered

a cure for a number of ailments. Lately, apricot oil is also being sold by farmers in the local and limited quantities in the national and export markets. However, this is being done on individual basis and, so far, no large-scale commercial activity has been observed in this regard.

The major segments of apricot value chain in GB cluster are a) production, b) processing and, c) trading/marketing (Figure 2). Fresh apricots from GB are difficult to transport. Therefore, most of them are processed (dried). Only a small fraction of the total apricot production is sold fresh in GB, while the bulk is sundried (some farmers use Sulphur dry) method, but the majority don't use any chemicals. The de-shelled kernels of dried apricot are sold as an edible nut. Apricot oil is also extracted on small scale as a high value product for export.

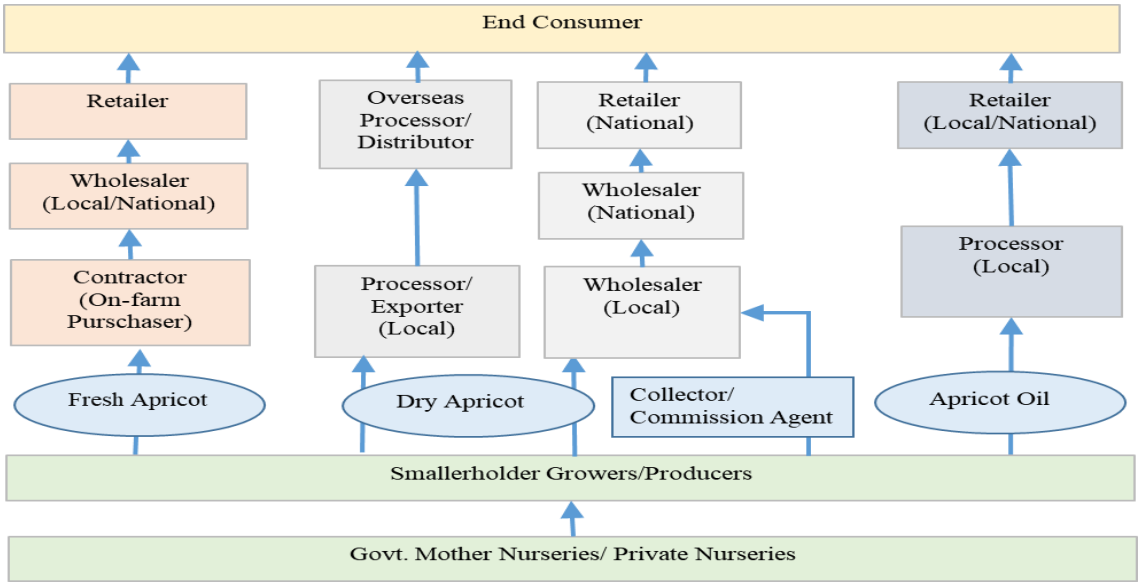

Figure 2: Description of Apricot Value Chain in Gilgit-Baltistan

5.4.2. Balochistan Southern Cluster

The history of apricot value chain in the province goes as far back as 1920s, when the British introduced different varieties of horticulture plants, including the apricot and cherries in the region. The farmers have appropriate farming skills and are generally motivated. Availability of improved varieties of plants is increasing though slowly, and there are functioning linkages between farmers and market agents which create favourable conditions for apricot production and marketing in the province.

Killa Siafullah is one of the biggest clusters in terms of apricot production in the country. The growing of apricots is oriented towards commercial varieties and grown in orchards. The quality of these varieties is high for they give an optimum average production of at least 50kg per tree. There is a good potential in increasing the value-added aspects of the product through improved production, processing and marketing practices.

The apricot tree and its fruit are important for generating revenues and strengthening the local economy. Apricot trees are valued for the income from commercial sale of fresh and dried apricots. Unlike in GB, apricot kernel oil has not been developed as a consumer product, which

has medicinal value in the national and export markets, especially used in the cosmetic industry.

Fresh apricots produced in the rest of the country have to compete with imports from Afghanistan and Iran through Peshawar and Chaman. Dried apricots exported to Europe mostly originate from Balochistan and are shipped from Karachi shipyard (KS).

Most of the marketable apricot produce is directed to the domestic market. During the winters, the dry fruit from Balochistan, including the dry apricots are sold in domestic markets at the premium prices, and they reach as far as to GB during the summer tourist season, as the local supplies are already exhausted. Balochistan largely caters to the major markets of Karachi and other cities in Sindh, as well as to South Punjab for fresh and dry apricots. Hence the major market segment for apricot from KS is primarily the domestic market in Pakistan, which has got huge potential due to the fact that country's population is growing at the rate of nearly 2.5% per annum. It is not a coincidence that Pakistan is sixth largest country both in terms of population and production of apricot in the world.

Export of apricots from KS are far below the international standard of 8.63% export to production ratio. The main reason is the quality concerns and lack of value addition demanded in the international markets. The interventions at market side as a result of this cluster development effort, are expected to improve this market segment.

The cumulative effect of cluster development interventions shall increase the marketable production from the existing 58 to 89 metric tonnes in five years. The overall value and the revenues from apricot sector in KS are likely to go up from the existing $56.0 million to an estimated $81.4 million over a period of five years. The Figure 3 shows the apricot value chain flows in KS, Balochistan.

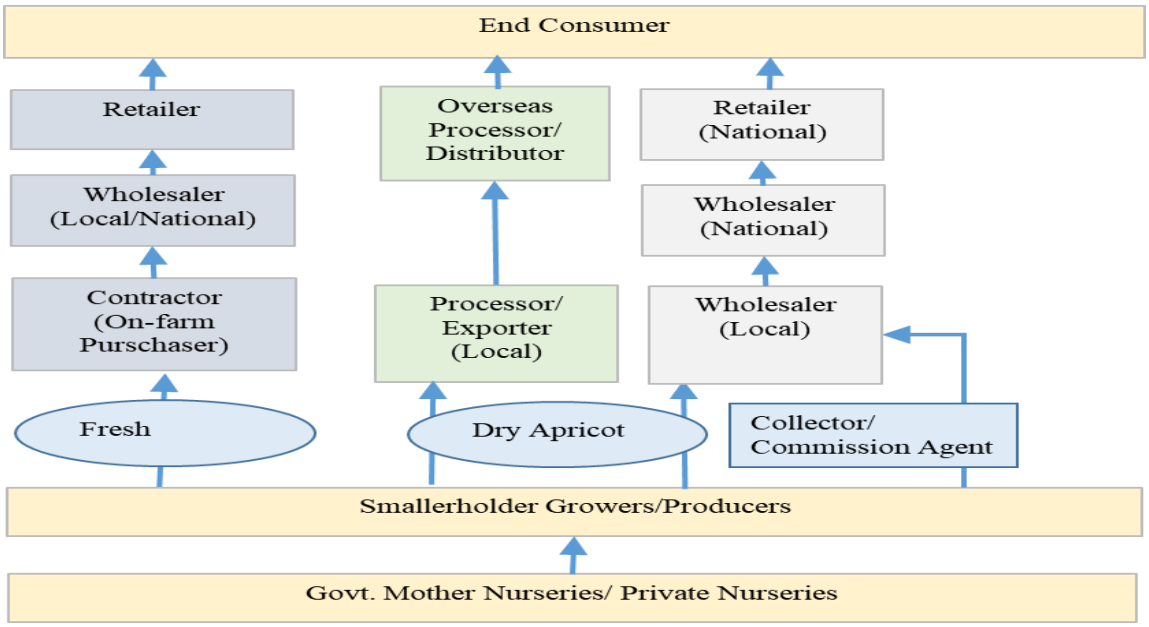

Figure 3: Description of Apricot Value Chain in KS, Balochistan

Dried apricots are ready in October-November period, and the traders sell them during the winter period when the demand is high in both local and national markets. The summer tourist season in GB coincides with fresh harvest. So, there are two peak demand seasons: winter in the whole country for dried apricots, and summer tourist season for fresh apricots, in GB.

5.5. SWOT Analysis

The SWOT analysis was carried out in focus group discussions conducted in both the clusters with different stakeholders of the apricot value chain. The results are organized around the value chain functions, including inputs, production, storage, and marketing; strengths and opportunities are coupled together and likewise weaknesses and threats are combined.

5.5.1. GB Northern Cluster

The northern cluster has many strengths and opportunities, including a natural comparative advantage with respect to agro-ecological conditions — water, climate and off-season with major competitors, homogenous farming communities, no tenancy and landlessness, a growing tourism industry, and proximity to China. Major weaknesses are poor planning, and policy and priority neglect and inadequate investment in research, technology development /breeding, extension, marketing, etc.

Weaknesses and threats are represented by climate change, landslides that cause road blocks for days and even weeks; poor infrastructure for storage, processing, transportation and weak institutions, especially with regard to regulation, research and extension services, absence of regulatory measures for quality control of inputs, non-transparent practices in local market systems, and high cost of transportation and unreliable supply. These factors generally hold back investment into the value chain, inhibiting its development.

The apricot value chain is one of the oldest value chains in the province. Therefore, farmers have traditional farming skills and are generally motivated. Availability of improved varieties of fruit plants is improving though slowly, and there are functioning linkages between farmers and market agents which create favourable conditions for apricot production and marketing in the province.

However, several weaknesses are hampering the value chain. Important among these are related to non-availability of the improved inputs and tools in the local market, limited access of the value chain actors to finance, absence of cold storage and fruit processing facilities, poor orchard management and storage skills of farmers, poor access to improved tools, and continued use of faulty packaging. Table 12 presents the SWOT analysis for the norther apricot cluster in GB.

Table 12: SWOT Analysis of Northern Apricot Cluster in GB

Parameters	Strengths	Weakness	Opportunities	Threats
Environment/ Climate Change	Sandy loam soil texture, temperate climate makes the region ideal for cultivating and growing different varieties of apricot.	In upper parts of the region, frost and precipitation may affect flowering and bearing of the fruit	Starting from south to North, fruit is ready for harvest successively. Fresh fruit is avail round the three months of summers in GB	Severe cold/weather conditions sometimes hamper the fruit bearing capacity of apricot trees
	Availability of abundant snow-melt/glacial water from spring to late summers in GB	Apricot Trees are grown in mixed orchards	Indigenous varieties adapted to local climate	
Input Supplies	Growing demand for input supplies including fertilizers and pesticides	Non-availability of appropriate quality fertilizer and micronutrients in local input market	The private sector can fill the gap by providing input supplies to the growers	Slow uptake of inputs by the farmers
	The apricot varieties are local/indigenous and organic in GB	Low uptake and usage of fertilizers and pesticides in GB	Local farmyard manure can be used to fertilize the new apricot plants	
		Limited availability of certified, quality, and pure variety seed/seedlings	Government can establish mother nurseries to promote different varieties	
Cluster interaction	Large number of farmer/growers in GB apricot cluster. More than 100,000 households grow apricot in GB	Little interaction among farmers and researchers	Possibility of learning from progressive farmers in the cluster	Lack of optimal coordination and integration of apricot value chain actors
	Apricot value chain is functional in the region	Producers have little information about the quality requirements in national and international market	Possibility of collective efforts for achieving the economies of scale	
		No contract farming with defined quantities and quality parameter		
		Little credit availability from formal institutes for the small growers/farmers in GB		
Production Management practices	Farmers having traditional skills in apricot production	Traditional orchard management practices are faulty (notably pruning, layout and fertility management, and irrigation)	Horizontal and vertical expansion potential exist; Road infrastructure improving; matching grant from ETI GB	Impacts of climate change, swings in weather conditions
	Possibility of diversification into improved varieties	Low productivity (Yield gap is at least 15kg/ tree) from the existing varieties which have high sugar content and short shelf life		
	Possibility for growth at apricot production	Sub-optimal and no use of fertilizer and pesticides	Opportunity for expanding extension services	

Parameters	Strengths	Weakness	Opportunities	Threats
	level; current yield is 35Kg/Tree	High pre- and post-harvest losses due to lack of skills and infrastructure (i.e., storage facilities); losses/wastage is as high as 40% of total production	in private sector at production and harvesting	
Transportation	KKH connects the region with all major cities in the country	Access roads to remote areas prone to blockages	Availability of paper boxes in the market already being used in certain other fruits and currently is being for packing apricot	Road blockages due to climatic and natural hazards may hamper the transportation to down the country
		No environment (temperature, humidity, etc.) control during transportation		
		High fuel cost especially diesel used in transportation; high freight costs	The produce is sold fresh and mostly as dry apricot in local market. This is particularly the case due to a growing tourism industry GB	
		No cold chains or cold storage are available		
Marketing	High prices can be earned in local, national and international markets for quality apricot products	Farmers are disconnected from high value markets	Financial support by the commission agents and wholesalers to harvesting contractors can be converted into quality-based delivery contracts	Supermarkets may exclude small farmers from having access high value markets
		No proper grading (rather topping the good quality fruit over poor quality)		
		Auctioning in the wholesale market with visual and spot grading	Bulk selling can result in better result for growers	
		Little capacity of farmers and traders and little quality infrastructure to produce, handle, and market the quality products	Emerging supermarkets can introduce contract with farmers which may improve retailing quality, and reduce post-harvest losses and trading margin	
Trade/Export	Few traders/processors are exporting apricot to other countries; most apricot from GB is traded within the country	Food safety standards and traceability (HACCP, EuropGAP, Global Gap, IFS etc.,) are major obstacles to enter into high end international markets	Growing demand for apricot products in domestic markets	High cost of certifications and quality standards
		Lack of flight services, shortage of air cargo space and inadequate cargo handling limit the export	Better prices for higher quality apricot products in domestic/national market	

Parameters	Strengths	Weakness	Opportunities	Threats
Processing	A number of products can be made from apricot including the dry apricot, apricot kernel (nut), jams juices and purees	Fresh apricot grown in GB has limited shelf-life (10 to 24 hours) and hence is suitable for drying and processing	Huge demand for processed apricot products in national and international markets	Processing of apricot potentially by large may corporations may impact the margins of small processors
		Unavailability of modern processing plants, technologies, and equipment for processing	Government provides incentives on the import of agriculture machinery including the cold storage equipment	
	Apricot can be used in many value- added products such as bakery and confectionary items as an ingredient	Lack of capacity and resources for small scale stakeholders to get involved in apricot processing		
Source: Feedback from different stakeholders of apricot value chain and secondary sources				

5.5.2. Balochistan Southern Cluster

The SWOT analysis of the apricot cluster was carried out for Killa Saifullah around its value chain functions: inputs, production, storage, and marketing. Strengths and opportunities are coupled together and, likewise weaknesses and threats.

The area is endowed with a number of advantages. These include favourable agro-ecological conditions, economies of scale from large landholdings/ orchard size, a long tradition of commercial production, and large and captive markets nearby (Karachi and Mideast). The cluster can benefit from new value-added products, such as apricot oil, apricot juices, and kernels. However, there are limited opportunities for horizontal expansion of cultivation, because of dwindling water resources. This is only possible if farmers invest in high efficiency irrigation technologies, such as sprinklers and drip.

Threats include depleting groundwater resources, prolong spells of drought, other extreme events due to climate change, militancy and insecurity. Despite these challenges, the apricot value chain in the province is able to create substantial incomes for the actors associated with it.

Table 13 presents the SWOT analysis of apricot cluster in Balochistan.

Table 13: SWOT Analysis of Southern Apricot Cluster in KS, Balochistan

Parameters	Strengths	Weakness	Opportunities	Threat
Environment/ Climate Change	Sandy and silty texture of soil, flat plains, Subtropical climate with hot weather in summer and cold in winter, make the province suitable for cultivating and growing commercial varieties of apricot.	Wind/sand storms can impact the fruit bearing capacity of apricot trees	Fresh apricot is available during May, June and July	Lowering water Table can pose a serious threat to availability of irrigation water
	Ground water is the primary source of irrigation water	Dependence on ground water Table	Indigenous varieties adapted to local climate	
Input Supplies	Growing demand for input supplies including fertilizers and pesticides	Non-availability of appropriate quality fertilizer and micronutrients in local input market	The private sector can fill the gap by providing input supplies to the growers	Slow uptake of inputs by the farmers
	The apricot varieties grown in Killa Saifullah are commercial with higher yield factor	Low uptake and usage of fertilizers and pesticides in Balochistan (Killa Saifullah)	The local produced compost and manure can be used to increase the fertilization of soil	
		Limited availability of certified, quality, and pure variety seed/seedlings	Government can establish mother nurseries to promote different varieties	
Cluster Interaction	Growers are concentrated in geographical location. Larger orchards owned individual orchards	Little interaction among farmers and researchers	Possibility of learning from progressive farmers in the cluster	Lack of optimal coordination and integration of apricot value chain actors
	The apricot value chain in Killa Saifullah has a commercial focus and is trade oriented organized	Producers have little information about the quality requirements in national and international market	The margins for participants in the cluster can be increased by promoting value adding activates	
		No contract farming with defined quantities and quality parameter		
		The value is loose organized with little focus of value addition		
Production Management practices	Farmers having appropriate skills in apricot production. Orchard based production management is followed	Orchard management practices followed by the growers need to be further strengthened with new technologies and knowledge	Vast potential for increase in production compared to major producing provinces where production has nearly reached maximum levels	Sand/dust storms and wind storms may hamper the production capacity of apricot trees
	Possibility of diversification into new improved varieties			
	Optimum level of production is	Sub-optimal and no use of fertilizer and pesticides	Opportunity for expanding extension	

Parameters	Strengths	Weakness	Opportunities	Threat
	achievable (at least 50kg/tree of yield)	Pre- and post-harvest losses can be further reduced from the existing 20% to 25% due to lack of efficient practices at production and harvest level	services in apricot sector	
Transportation	The province is appropriately linked by road with all the major cities in the country	No environment (temperature, humidity, etc.) control during transportation	Availability of paper boxes in the market already being used in certain other fruits and currently is being for packing apricot	
		High fuel cost especially diesel used in transportation; high freight costs	The produce is sold fresh in the southern parts of the country including Sindh and Punjab	
		No cold chains or cold storage are available		
Marketing	High prices can be earned in local, national and international markets for quality apricot products	Farmers are disconnected from high value markets	Financial support by the commission agents and wholesalers to harvesting contractors can be converted into quality-based delivery contracts	Supermarkets may exclude small farmers from having access high value markets
		No proper grading (rather topping the good quality fruit over poor quality)		
		Auctioning in the wholesale market with visual and spot grading	Bulk selling can improve the returns for growers and small traders	
		Little capacity of farmers and traders and little quality infrastructure to produce, handle, and market the quality products	Emerging supermarkets can introduce contract with farmers which may improve retailing quality, and reduce post-harvest losses and trading margin	
Trade/Export	Few traders/processors are exporting apricot to other countries; most apricot from Balochistan is traded within the country	Food safety standards and traceability (HACCP, EuropGAP, Global Gap, IFS etc.,) are major obstacles to enter into high end international markets	Growing demand for apricot products in domestic markets	High cost of certifications and quality standards
		Lack of flight services, shortage of air cargo space and inadequate cargo handling limit the export	Better prices for higher quality apricot products in domestic/national market	
Processing	A number of products can be made from apricot including the dry apricot, apricot	Except for selling apricot as fresh and dry fruit, no value adding apricot	Huge demand for processed apricot products in national and international markets	Processing of apricot potentially by large may corporations may impact the

Parameters	Strengths	Weakness	Opportunities	Threat
	kernel (nut), jams juices and purees	products are made in Balochistan		margins of small processors
		Unavailability of modern processing plants, technologies, and equipment for processing	Government provides incentives on the import of agriculture machinery including the cold storage equipment	
	Apricot can be used in many value-added products such as bakery and confectionary items as an ingredient	Lack of capacity and resources for small scale stakeholders to get involved in apricot processing		

6. CHALLENGES FACED BY THE CLUSTERS

6.1. Overview

One of the major constraints confronted by the farmers in both regions is placed upon by the nature itself. Cold breezes/ storms in GB and strong dusty/ sandy winds and storms in Killa Saifullah, Balochistan during flowering /blossoming season impact the overall production yield. Climate change related negative impacts, such as new diseases and shifts in crop cycle are emerging issues in both the regions. Further research and development efforts are needed to address these issues. Indicative areas for research in this regard are proposed in the final section of this report.

In northern Balochistan cluster, the key challenge facing the horizontal expansion of apricot value chain is water for irrigation that is showing continuously a depleting. Most of the region is dependent on groundwater that is extracted through as many as 10,000 tube wells. As water table is going down due to prolonged droughts, overdraft, and variation in the climate, farmers at higher elevations increasingly face problems in having access to water for irrigation.

Apricot producers in Balochistan cluster are relatively large – few supplies in big quantities (more than 105,000 t). These growers prefer to sell their apricots fresh and only small amounts are processed for value addition. Thus, there is scope for vertical expansion of value chain through industrial level processing of the fruit.

Balochistan cluster also enjoys a leading position in the production of apricots, dates, and melons, including watermelon, in that order. Besides, it produces several varieties of more than a dozen of other fruits, including grapes, pomegranates, peach, plum, coconut and papaya, as well as summer vegetables for the mega city of Karachi and urban centres in the Southern Punjab. All of these crops compete for irrigation water, and the winners in recent

years have been apricots, dates, and grapes, and other crops that have an export market, as well as fresh summer vegetables.

According to the officials of the Agriculture Department, overall, drought and militancy are the main threats in Balochistan that affect every aspect of life, including agriculture. Because of a porous border, apricots and other agricultural products are easily traded across the border. This naturally cedes key advantages to Iran, the second largest producer of apricots in the world and Afghanistan, which specializes in dried fruits.

6.2. Production Level Constraints

Overall, land and water are the key constraints at the production level. In the northern GB cluster, land is scarce but water is widely available, while reverse is true for Balochistan cluster (Table 14). In both the clusters, invest is required on irrigation infrastructure. In the southern Balochistan cluster, this means switching from flood irrigation to sprinklers and drip systems, while in the norther, it takes digging channels across sheer mountain faces and terracing the steep slopes underneath. Both are expensive. In GB, the government has recently taken a loan from IFAD to bring more land under irrigation, which must be allocated to high value crops, such as apricot, in conjunction with adaptive research in varietal development, good agronomical practices and disease prevention.

Table 14: Gaps and Constraints at Production and Postharvest Level

S#.	Parameter	Northern GB Cluster	Southern Balochistan Cluster
1.	Key constraint on cultivation expansion	Land	Water
2.	Bulk of cultivars used	Indigenous material	Developed varieties but old
3.	Irrigation source	Surface, natural stream (Flooding)	Groundwater (flooding)
4.	Orchards	Mixed	Specialized
5.	Production inputs	FYM	Chemicals
6.	Yields	High	Low
7.	Postharvest losses	Around 50%	Around 30%
8.	Certified seedlings of improved cultivars	Not available	Limited Availability
9.	R&D support	Limited	Moderate
10.	Growth strategy	Vertical and horizontal	Vertical

To overcome the handicaps of smallholder farming in the northern GB cluster, NGOs have trained farmers, including women to adopt cooperative methods for accessing production inputs and pooling small surpluses for marketing. In many parts of GB, Farmer Enterprise Groups (FEGs) have been established to market their apricots together. Therefore, horizontal integration between farmers is effective. Beyond pooling produce for sale, FEGs do not offer any other services as they are not linked to larger associations that could provide loans, training, marketing and export support, etc.

Technology is a key driver in apricot production, particularly the apricot varieties. In GB, most apricots cultivated by farmers originate from a wide range of naturally grown cultivars, indigenous to the area. Local cultivars typically have a high sugar (brix) and moisture content causing a short shelf life. Fruit quickly deteriorates after picking and bruises easily during transport. Consequently, local varieties are not suitable for the fresh apricot market on a long distance. In contrast, in the Southern Balochistan cluster, most of the varieties used by farmers are developed but old (Table 14).

In GB, MARC (a subsidiary of NARC) is entrusted with the responsibility to carrying out research and varietal trials and there are several DoA and private fruit tree nurseries in various districts, but the demand for good quality and certified plants is always ahead of supply. One major constraint is that the national research and development (R&D) initiatives are almost entirely focused on major commodities that are produced in the plains of Punjab, Sindh and KP, namely cotton, rice, sugar, wheat, maize, mangoes and citrus, which leaves out temperate crops, such as apricots, cherries, grapes and other that are grown in hilly areas of Balochistan and KP and mountain environments of GB and AJK.

The research capacity in the smaller provinces and specially-administered regions are typically weak. The research in the apricot clusters needs to be upgraded, and should focus on both selective breeding of local varieties as well as introduction of suitable new varieties after proper trials and evaluation of results, as well as promotion of improved cultivation practices, and establishing globally recognized certification regimes.

There are over 120,000 grassroots actors/farmers and roughly 100 apricot traders and wholesalers, providing a ratio of 1,200 farmers to one buyer, ensuring a reasonable level of competition in the northern GB cluster. Most households in GB grow apricots in mixed orchards, often on marginal land, because good farmland is used for growing food crops, such as wheat, barley, potatoes, and vegetables. They also don't use inputs, such as fertilizers, labour and management (very little effort is devoted to pruning, grafting and other management practices).

However, despite low input use per ha yields are higher due to intensive management of the few trees in GB compared to large commercial farms in Balochistan. Without doing much, farmers are earning some income. This is against the backdrop that only two decades ago, it was considered a shameful thing to sell fruit. Now even kids are selling apricots and other fruit to tourists on roadsides. The traditional subsistence-oriented farming is giving way to commercial agriculture. The new generation of farmers is educated and they want to invest in new technology and sell their product in lucrative markets. The cluster based agricultural transformation is very timely for these farmers.

Contrary to the northern GB cluster, improved and commercial although old varieties are grown in the southern Balochistan. Farmers have moderate levels of skills in orchard management and appropriate technologies are used for harvesting. Whereas in the north, the post-harvest losses are as high as 50%, in the south, the same are nearly 30%. In both the apricot producing clusters, extension services are weak, family labor is deployed from sowing and harvest. The availability of certified seedlings is a major issue in GB, while its availability is limited in Balochistan. Use of pesticides is almost non-existent in the northern cluster; some

farmers use farmyard manure. In the south, farmers make moderate uses of pesticides and commercial fertilizers.

6.3. Value Chain Level Constraints

Processing refers to all kinds of activities that add value to products made from a raw commodity. Processors – the entrepreneurs who carry out processing, for further value addition – are an integral part of the value chain who play the role of interface between the growers, traders and end-consumers.

In both the clusters, the main method of processing is sun drying (Table 15). Most of the drying takes place at the farm level. Women are intimately involved in all aspects of harvest, drying and grading in GB, while these activities are performed by male wage laborers in Balochistan. High cost of energy is a key constraint on centralized processing/drying in both clusters. Simple, home based technologies are used for drying, using Sulphur fumigation and solar tunnels. Pulping machinery for juices and cold-presses for oil, packaging technologies such as heat-sealed bags and vacuum packs are also now increasingly available in both the clusters. However, despite the availability of these technologies, their uptake and adaptation are slow. There are very few entrepreneurs investing in innovative technologies to develop new value-added apricot products. In GB, NGOs have introduced many useful innovations, including attractive packaging for dried apricots, kernels and oil.

The handling and storage of fresh apricots is a big challenge, as the fragility of the fresh product and absence of commercial cold storage (Table 15) makes it difficult to establish a reliable supply chain for the trading of fresh apricots. Breaking this problem further, shortages of electricity and high cost of diesel are the underlying issues. During the summer months when tourism is at its peak, fresh apricots are directly retailed through open stalls on the roadside. Balochistan being a mature market, commercial storage, both for fresh and for dried is not a major issue. Traders in Balochistan also use commercial storage available in Karachi which is their main market. In GB, commercial storage is a key missing service, especially for the fresh product. Packaging is done at both consumer and bulk level, the qualities of which vary widely within and across clusters.

Table 15: Gaps and Constraints at Processing Level

S#	Parameter	Northern Balochistan Cluster	Southern GB Cluster
1.	Cold storage	Limited at market level only	Limited at the market level only
1.	Drying method	Sundry	Sundry
2.	Oil extraction	Yes, but limited	No
3.	Pulping for consumer products	Almost none	In moderate scale
4.	Sulphur fumigation	Yes	Yes
5.	Organic certification	No	No
6.	Fairtrade certification	Yes	No

Currently, the production, processing and trade in the apricot sector in the clusters is not technology driven – the focus is on local cultivars - commercial cultivars, suitable for the fresh fruit market, with good transportation characteristics is lacking in both the clusters. Other factors such as orchard management and post-harvest practices are also to be addressed. Poor access to electricity is a cross-cutting constraint to performance of the processing and storage segments. Furthermore, if the processing segment is to grow, a diversification strategy is necessary to develop new products and new markets. If in-country trade in higher-value fresh apricots is to develop, facilities for packing, cold storage and refrigerated transport will be necessary. With GB and Balochistan as major centers for temperate fruit in Pakistan, such infrastructure has the potential to benefit the whole horticulture sector, not just apricot.

6.4. Trading Level Constraints and Gaps

Market linkages are heavily reliant on the tenacity of the individual processor/trader, creating a constricted market structure. Whilst there is little horizontal coordination between competing wholesalers, there is a certain amount of vertical coordination in the supply chain (Table 16). For example, GB wholesalers will advance cash to smaller traders to source apricot. The same practice is common with contractors who in certain cases buy the standing crop in southern Balochistan cluster. There is also coordination between wholesalers in supplying apricot to wholesalers to the national market. Traders do not have any long-term binding agreements with suppliers or buyers - all orders are one-off transactions.

Traders typically strive to achieve the highest margins by buying at the lowest price and selling at the highest price. Very little attention is paid to product differentiation and quality aspects to achieve price premiums. Communication technologies and internet services are easily obtainable, labor is available on a permanent and seasonable basis and financial services to traders are provided by both formal and informal banking institutions.

Table 16: Gaps and Constraints at Trading Level

S#.	Parameter	Northern Cluster	Southern Cluster
1.	Contract farming	No	Yes
2.	Cold storage facilities	No	Little at market level
3.	Horizontal linkages in the cluster	Weak	Weak
4.	Vertical linkages in the cluster	Moderate	Moderate
5.	Product differentiation	High	Low

In summary, an enabling agricultural policy in support of the public and private sectors to develop the temperate fruit industry is highly desirable in both the clusters. Improvements are also necessary with the provision of up-to-date and useful market information to inform producers, processors and traders what types of apricot products consumers want and what they are willing to pay more for. When striving to meet market requirements, the use of ‘standards’ is an effective means of improving quality. The use of information technology, especially for the emerging e-commerce, and associational activities for access to knowledge, technology and information are also key success factors.

7. CLUSTER DEVELOPMENT POTENTIAL

7.1. Overview

The strategically located clusters, one in the north, bordering on China and Central Asia, and the other in the south, close to the Middle East, make Pakistan a natural hub for trade, transit and tourism at the crossroads of South, Central, and West Asia. Balochistan is a desert oasis, with abundance of fertile land and grows a variety of horticultural crops. Gilgit-Baltistan is a mountain oasis with plenty of water and slopping alluvial fans, which need terracing for crop cultivation.

In this section, an attempt has been made to evaluate the potential in terms of production, quality and market side of the apricot value chains in both the clusters, based on the targets set in section 8 for incremental improvements in the cluster performance. In addition, both quantitative and qualitative analyses are presented to explain the nature of active, dormant and inactive segments of the apricot value chains in the two clusters.

7.2. Production Potential

Based on publicly available data, a small yield gap exists between the global per ha yield and that of Pakistan. The global average yield is 8.16 tonnes/ha, whereas in Pakistan it is 7.20 tonne/ha – thus on average, yield gap of 0.96 tonnes/ha exists. The estimated average yield for southern Balochistan cluster is 6.84 tonnes/ha and 9.82 tonnes/ha for northern GB cluster, respectively. Experts believe that the actual yield may be much lower in both the clusters. Regardless of what the actual situation may be, an increase of 25% in the yield from the current base in both the northern and southern cluster over the period of five years can be realized by addressing many of the weak segments identified in the previous sections. A key intervention that can increase productivity, production and quality is to replant or renovate 30% of existing orchard in both the clusters with latest varieties, which can give at least 50% higher yield in the focal points of each clusters. This increase in production can be absorbed by increased demand in the cities, expected growth in e-commence and improved quality and exports. Increasing production potential shall result in creation of 1,200 and 800 new jobs at the production level in the northern cluster and southern cluster, respectively.

7.3. Export to Production Ratio

The apricot sector in Pakistan is characterized by one of the lowest exports to productions ratios, currently ranking as 35th in the world. The country exports a mere 0.09% of its total produce of nearly 303 tonnes. The global average is 8.72%. Thus, Pakistan lags behind in terms of exports to global markets. As a leading producer of apricots in the world, Pakistan should have at least an equal production to export ratio with the global average. Bridging this gap is a key target of the apricot cluster development plan. However, it must be noted that exporting fresh apricots poses considerable logistical challenges and higher transportation

costs, especially from the northern cluster. Therefore, the strategy proposed is to focus on drying the product in both the clusters, while also channelling some of the fresh apricots to export markets in the Middle east and South East Asia, to test the waters there.

7.4. Improvement in Quality

7.4.1. Quality for Domestic Market

One of the areas of concern in apricot sub sector in Pakistan is that there exists a gap in export price of apricot when domestic prices are compared to the global prices of the commodity. Average price of one-tonne of fresh apricots is US$ 826/tonne on wholesale globally, compared to US$ 693/tonne for the same in Pakistan. The farmgate price of fresh apricots in the north, is even less and hovers around US$ 300/tonne. One of the reasons for this difference is the low quality of the produce, with over 30 traditional varieties.

Interventions and strategies are required, which will improve the quality and price of at least 10% of the production for high-end domestic market. Improving quality and hence price of apricot will need varietal development, improved postharvest technologies, such as grading, drying, certification, good packaging, improved transportation facilities, and targeted marketing strategies, etc.

7.4.2. Quality for Export Market

The export price of Pakistani dried apricots is US$ 1,463 per tonne, which is less than half the global average of US$ 3,200 per tonne. Improving quality of the product can increase the price and bring it closer to the world average, such as US$ 3,000. Increasing prices through quality improvement for high end domestic and export markets will establish Pakistan as a serious player in the world apricot market, where it is already the fourth largest. As stated earlier, the main potential remains in dried apricots, especially for value-added export, job creation and foreign exchange earnings.

7.5. Reduction in Post-Harvest Losses

One of the major concerns of agriculture in the country is that post-harvest losses are very high. For example, postharvest losses in apricots account for nearly 40% in the northern cluster. Similarly, in southern cluster, these losses are 20%.

Given the high perishability of the fresh apricots (the traditional varieties grown in the north have a high brix content) and long distances involved in collection, most of the market bound produce is dried in the north. The technology to dried apricot is very simple, as shown in Figure 4. Over the period of five years, some 45% of total produce can be dried in northern. In southern cluster, 30% of produce is recommended for drying. This shall result in incremental revenues of nearly US$43 million in northern cluster and some 24 million in southern cluster in fifth year.

We assume that with the proper incentives, at least half of the postharvest losses (40% to 20% in the northern and from 20% to 10% in the southern cluster), can be saved by using

improved methods of drying. In monetary terms, this will result in in an additional income of US$ 26.19 million and US$ 21.82 million, for the northern and southern clusters in fifth year, respectively. In addition, some 500 and 300 new jobs are expected to be created at the processing level, for the north and south, respectively.

Figure 4: Solar Dryer

7.6. International Standards

To improve the quality and price of apricots to international level, we have to adopt international quality standards at each segment of the value chain. Dried fruit and nuts are less complicated to export than fresh produce. The IPPC - the International Plant Protection Convention - is the international treaty under which common standards are developed for pest control in plants and plant products across international borders. The Commission on Phytosanitary Measures (CPM) is the governing body of the IPPC and it has adopted a number of International Standards for Phytosanitary Measures (ISPMs) that provide guidance to contracting parties in meeting the aims and obligations of the Convention[3]. In addition, each country has its own specific standards for each crop.

Various countries and trading blocs have their own additional requirements. For instance, for exports to China, the relevant agency is the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ), which is the "ministerial administrative organ directly under the State Council of the People's Republic of China in charge of national quality, metrology, entry-exit commodity inspection, entry-exit health quarantine, entry-exit animal and plant quarantine, import-export food safety, certification and accreditation, standardization, as well as administrative law-enforcement." Interested foreign food exporters to China must register under the new AQSIQ registration system, which provides all the guidelines for the export of fresh fruit to China, including apricots[4]. Potential exporters are required to fill out the Food Exporter application, whereupon the AQSIQ will

[3]https://www.ippc.int/en/core-activities/standards-setting/ispms/#publications
[4]http://www.aqsiq.net/importer-register.htm

grant the exporter an AQSIQ registration number. These requirements are specific to each commodity and country.

For exports to EU, the most important rules to follow for dried fruits are:

- Maximum Residue Levels (MRLs) / Pesticides. Regulations on the approved level of pesticides found in imported dried fruits on the EU market are stated in Council Directive 90/642/EEC
- Approved Additives Regulation. This regulation is based on Directive 95/2/EC and deals with the non-nutritive substances, which can legally be added to some or all food products. Sulphur dioxide (for lightening and to help preserve colour) is permitted for certain groups of dried fruit, but limited to a certain concentration. Apricots may contain 2000 mg/kg. The additives should be mentioned in the list of ingredients on the label of the dried fruits in the consumer packs.

8. PLAN, POLICIES, AND STRATEGIES

8.1. Plan

The above constraints, gap, and potential analysis and consultation of stakeholders helped us to develop an apricot development plan and fix its targets for the five-year development projects (Table 17).

Table 17: Targets of Apricot Cluster Plan

S#.	Targets for Apricot Cluster
1.	Establish new or renovate 30% area of existing orchards to increase production by 25%. This can be done by increasing the supply of certified plants of latest varieties, improving technical and market services, and adopting globally accepted phytosanitary standards
2.	Reduce postharvest losses by half from the current benchmarks (40% to 20% in the northern and from 20% to 10% in the southern cluster), by improving and scaling up postharvest technologies, mainly drying.
4.	Increase the quality and shelf-life of by: a) incentivizing establishment of the cold chains and improved drying systems in the southern cluster, and focusing on hygienic drying in the northern cluster
5.	Increase exports of dried apricots from less than 1% at present to at least by10% of production. Similarly, divert 10% of the fresh production to high-end domestic market in the southern cluster (its uneconomical to transport fresh apricots from the northern cluster, so drying for off-season and export market is the best option. Also, fresh apricots in the northern cluster can be sold for a good price in the local tourism market.

8.2. Policy Reforms

At the policy level, the current practice of providing general subsidies and “export rebates” to selected commodities should be eliminated, as these are grossly abused. Instead, subsidies and incentives should be specific and results oriented. For instance, import duties on all post-harvest technologies should be eliminated, but these technologies should be clearly defined. Moreover, investment incentives for processing industries and storage and cold chains should be carefully reviewed and enhanced. Revenues lost through these measures should be recovered by increasing import duties on value-added agricultural products, and increasing sales taxes on fizzy drinks. A water tax, as recommended by the recent Symposium on *“Creating a Water Secure Pakistan”*, hosted by the Supreme Court of Pakistan on fizzy drink manufacturers should be levied, as they do not pay for the water they use for their products.

This change of policy would not only greatly improve Pakistan’s balance of payments, but also reduce public health costs. Moreover, a nationwide program should be developed, in which all

rural districts can compete for Cluster Development Grants to specialize in specific high-value crops for export. Another policy recommendation is to include apricots in the bilateral/ multilateral trade agreements with friendly countries (OIC, Arab League, China). At present, China-Pakistan bilateral trade agreement does not include fresh or dried apricots.

At the local level, supporting farmers to organize themselves as marketing groups, such as *Farmers Enterprise Group (FEGs)* would be a key element of the strategy, for achieving economies of scale access to inputs, finance, technology, and market information, especially in the northern cluster where farm size is small and a large number of small farmers are engaged in the apricot value chain. Therefore, we propose that special incentives should be provided to organize these groups in the northern cluster. These FEGs will be established at the union council level. Special loans should be provided at concessional terms to each FEG to allow them to market their apricots under a brand name, help various stakeholders in adopting best practices, hold trade fairs, competitions, and arrange various training events etc.

A common intervention recommended for both the cluster is to form a national Apricot Association, or Apricot Association of Pakistan (AAP). This entity should have a website of its own and work to promote best practices, share knowledge, market information, technology and lobby with government for enabling policies, on behalf of its members. AAP should also develop Apps for marketing, and also represent apricot growers and traders in international fairs and events.

8.3. Strategies for the Northern Cluster

8.3.1. Production Level Strategies

The primary production strategy is to narrow the yield gap with the global average. The plan is to increase the yields by 30% from the current base of 125,184 tonnes/year to 165,00 tonnes/year in the span of five years. This will be done by:

a) *Importing high quality germplasm*. The northern cluster has over sixty varieties, of which at least four are considered as commercial varieties. These include Marghulam, Halman, Habi, and Ali Shah Kakas. In addition, there are some regional and international varieties that are popular in Pakistani market, including Shakarpara, Charmagz, Saffaida, Kaisha, Amiri, and Zardalu. New varieties that have been introduced from the European sources include New Castle, Royal, Sungold, and Goldkist, among others. There is a need to coordinate and exchange germplasm between major apricot producing clusters, having traits of high yields and longer shelf-life with tolerance to late frost, and resistant to common diseases. In addition, new germplasm can also be obtained from China, Turkey, or USA.

b) *Development and supply of latest and certified varieties to farmers*. A strong breeding program at MARC needs to be established on apricot in the northern cluster. This breeding program will initially rely on the selection of high yielding material from a wide array of germplasm collected, but later it will do some breeding work in developing new varieties. The advance lines (not varieties) will be handed over to the GB research system that will test these in different districts of the northern cluster and finalize the

varieties suitable for the district. After finalizing the varieties at the research station by some independent evaluators, the provincial research system will also demonstrate these varieties under the farmers' field and allow the farmers to select the better varieties for propagation. This program should be implemented in conjunction with the selective breeding of the most suitable local varieties; hybrids can also be created by crossing the local with new varieties to produce better results.

c) *Widespread distribution of new varieties*. Parent blocks should be established at the government nurseries; commercial nurseries should also be supported to set up mother blocks and multiply certified plants for sale to farmers under the truth-in-label rules.

d) *Promoting proper orchards certified under* International Standards for Phytosanitary Measures *(ISPMs)*. In each district, at least 5 commercial gardens each of 0.2 acre should be established at 75:25 cost sharing basis with farmers bearing the 75% cost.

e) *Appropriate training in nursery and orchard management*. Model nurseries should be developed used as demonstration and technology diffusion points for promoting good agricultural practices. The model nurseries should be used farmers field schools (FFS), where farmers and researcher can co-experiment and learn latest scientific practices. It will be highly desirable to invite experts from China and other countries to help in putting in place specific phytosanitary standards needed for export to China /other countries in these demonstration plots. Moreover, about 100 farmers should be provided on-hand training in each apricot growing district.

8.3.2. Processing and Value Addition Level Strategies

By processing and value addition, we mean harvesting at the right time, washing, sorting, drying, grading and retail packaging and then establishing a robust supply chain to deliver the product from the clusters, all the way to super markets in Islamabad, Lahore and other cites, or to the air cargo facilities for export. In this way, not only higher prices are ensured but also the product's shelf life is extended, and transportation and retail level losses are reduced.

Dried apricots, especially sundried ones have a premium value in the wholefood markets, as they can be used in a variety of ways, such as a flavor ingredient in processed foods, including cereals, fruit bars, cakes yoghurts, ice cream and cheese, etc. Dried apricots can be packaged into small heat-sealed bags as a healthy ready-to-eat snack. Opportunities for product development are largely unlimited, from improving the quality, packaging and marketing of dried apricots, to making new products and seeking new markets, especially in the whole food, organic and ingredients market niches.

Another important processing and value addition method is to cost process the product, and establishing a cold chain between the processing centres to super markets in the main cities in the country, or outside. However, cold processing is relatively difficult in the northern cluster due to many factors, including traditional varieties, which are highly perishable, volume and uniformity issues involved in too many varieties that ripe at different, times and high costs of collection, storage and transportation, with poor road infrastructure and uncertain flights. In

the southern cluster, this option is technically available for export but at considerable risk and competition from well established players, such as Iran and Turkey. Even in the high-end-super stores in big cities like Karachi, fresh apricots are sourced from the wholesale market, the so called 'wet market', and displayed in cool shelves, because that is cheaper.

Therefore, the main value addition and processing strategy would be to dry and package 60% of the production in the north and 50% in the southern cluster. This will be achieved by:

a) *Promoting dried apricots and their uses*. Dying technologies are already manufactured in the local market and are multipurpose, i.e., can be used for drying apricots, cherries, grapes, tomatoes and other fruits and vegetables. They will be provided to FEG members on credit by the government and the original cost will be recovered in five years. The number of drying units in each FEG will depend upon the demand for processing. The FEG members will also receive training to the processors in Sulphur and non-Sulphur techniques.

b) *Branding of apricot products*. Each FEG will get its product branded and cost of branding will be initially borne by the FEGs and charged from the farmers who will sell their fresh and dried produce through the FEGs. For branding, the 'Mountain Fresh' and 'Organic Food' business models are additional options to improve the value for the farmer groups and other value chain actors. Certifications for IPPC, Phytosanitary, Organic, Fairtrade, and Geographical Indication' can be pursued as other value-added strategies. GI can be used on products that have a specific geographic origin and possess qualities or a reputation that are intrinsically due to that place of origin.

c) *Holding competition and rewards for processors*. Special competition will be held and rewards will be provided for outstanding processors of dried and fresh apricots. These competitions will be held at district-level and then concluded at the cluster level.

d) *Forming an Apricot Association of Pakistan*. This should be a joint activity for both the clusters, which should have a website and develop its own marketing apps.

8.3.3. Marketing and Trading/ Export Level Strategies

Two folds' strategies are suggested to improve marketing and trading at domestic and international levels. These are:

a) ***Increase the export to production ratio***. Currently, Pakistan exports only 0.08% of apricots to the world market, while for the world this ratio is 8.75%. Through proper commercial strategies, we want to bring this ratio to closer to 10% in five years. This will be achieved through following steps:

- *Providing market information*. A small unit will be established in the department of agriculture consisting of three scientists (marketing specialist, economist, and information analysist) with supporting staff. It will regularly provide information to the stakeholders about international market requirements (i.e., standards, price, potential buyers, etc.).

- *Sponsoring international tours*. Top three best exporters will be sent abroad every year to identify potential markets and new buyers at 50% government expenses.

- *Holding competition and rewards for exporters.* Special competition will be held and rewards will be provided for outstanding exporters of dried and fresh apricot. These competitions will be held at the cluster level.

b) ***To improve the quality and export price***. Currently, the export price of Pakistani apricots is around US$1,463 per tonne compared to international average export price of US$3,200 per tonne for dry apricot, reflecting a poor quality (in terms of old varieties, smaller size, texture and taste). Meeting international standards is important for the export market and many processors/exporters have faced difficulties meeting these requirements and quality standards demanded by the buyers. It is proposed to provide support in producing high quality apricots with international standards at the FEG level, for high end domestic market and for export. To meet these standards, the following interventions and mechanisms are suggested.

- Incentives for adopting best practices and certification regimes. International best practices and certification regimes are being adopted in all segments of the value chain, especially in production, logistic, and marketing to become competitive in national and international markets. For this, special investments are required to adopt and certify these practices. Special tax incentives will be provided to establish certification companies in the northern cluster. The government will also incentivize various stakeholders along the value chain to adopt these practices by paying 25% of the machinery cost recommended by the certification agencies at various levels. However, farmers have to agree to pay for any additional infrastructure, labor, and monitoring costs.
- Training stakeholders to adopt ISPMs. International consultants will be engaged by the Federal Government to spell out requirements at production, processing, transportation, storage, and marketing levels and provide training of trainers who in turn will train farmers, processors, traders, exporters, etc. to adopt the ISPMs standards. One hundred farmers and 25 other stakeholders will be trained to adopt the ISPMs in each district every year.

8.4. Strategy for Southern Cluster

The southern cluster is much better streamlined on the production side, compared to the northern cluster. For example, apricots are gown in commercial orchards in the south, compared to mixed orchards in the north, where farmers are going through a transition from subsistence to the commercial farming. Still, there is room for improvement. The following strategies and interventions are recommended for to increase yields through orchard management, product diversification, market segmentation and other value-added measures that are needed to be taken to get maximum value from the southern apricot cluster.

8.4.1. Production Level Strategies

The production strategy for the southern cluster would be the same: increase the yield by 30% from the current base in five years. This shall include importing germplasm and multiplying it at government facilities. The private registered nurseries will then propagate improved seedlings for distribution to farmers in the medium term. A related intervention would be to provide technical assistance to private nurseries and orchard owners to upgrade production systems and get their farms ISPMs certified for export. To support these interventions, appropriate training in nursery / orchard management will be imparted.

In the southern cluster, a key production constraint highlighted earlier is water scarcity and the threat of prolonged droughts. To address this problem, it is important to select high-yielding varieties that are also resistant to the vagaries of a changing climate, such as droughts. The following specific interventions are proposed:

a) *Importing high quality germplasm*. The southern cluster grows a number of good local and regional (Afghanistan and Iran), including Shakarpara, Charmagz, Saffaida, Kaisha, Amiri, and Zardalu. New varieties that have been introduced from the European sources include New Castle, Royal, Sungold, and Goldkist, among others. There is a need to coordinate and exchange germplasm between major apricot producing clusters in the country. In addition, new germplasm can also be obtained from China, Turkey, or USA, having specific traits to suit the prevailing conditions in Balochistan, such as tolerance to drought and pests. Such germplasm can be imported from China, Turkey or USA (California). Bilateral and multilateral agencies can be approached, such as Consultative Groups on International Agriculture Research (CGIAR), FAO or the Chinese Academy of Agricultural Sciences (CAAS) as well as Pakistan's missions overseas, for assistance in accessing the require germplasm.

b) *Development and supply of latest and certified varieties to farmers*. A strong breeding program needs to be established under the Directorate of Agriculture Research, Government of Balochistan. This breeding program can initially focus on the selection of high yielding materials from a wide array of germplasm collected, but later it can undertake long-term breeding work in developing new varieties.

c) *Distribution of new varieties*. Parent blocks will be established at the government nurseries and commercial nurseries will be incentivized to set up mother blocks and multiply certified plants for sale to farmers under the truth-in-label rules.

d) *Promoting proper orchards certified under International Standards for Phytosanitary Measures (ISPMs)*. In Balochistan, commercial nurseries are available, but they are seldom certified under ISPMs, which is why exporters find it difficult to export fresh apricots. Initially, at least 5 ISPMs certified commercial nurseries should be established in the focus district on cost sharing basis with farmers bearing 75% of the cost.

e) *Appropriate training in nursery and orchard management*. The ISPMs certified nurseries should be used for field demonstration and training, where other good agricultural practices (GAP) should also be adopted, and farmers should be exposed to new technologies and practices and innovations. One of the key objectives of this

intervention shall be to bring the postharvest losses that are currently 20% of total production down to 10% over five years in the southern cluster.

8.4.2. Processing and Value Addition Level Strategies

As in the northern cluster, processing and value addition are missing steps in the southern cluster. Therefore, the strategy would be the same: a) incentivizing the private sector to dry at least 50% for both domestic and export market, b) promotion of dried apricot use in food within the country, and c) holding competition and rewards for apricot processing and export of dried apricots. The plan includes the following interventions.

a) *Promoting dried apricots and its use*. The processing of fresh apricots results in separating the fruit by size and grade. For instance, after proper sorting and grading, at least 15% of the fresh apricots will turn out to be bruised or under-sized. This quantity will be destined for drying. This also be established at the cold chain centres under the supervision of FEGs. The drying equipment is very simple and used for drying different products, such as apricots, grapes and some vegetables. Under this plan, the best drying technologies will be identified and demonstration units will be distributed to progressive farmers, or provided as part of the demonstration processing units/ cold chains.

b) *Branding of apricot products*. Balochistan is well known in the Middle East for fresh fruit and vegetables, and it could be a good brand name. Different districts can also develop their own brands. Under the cluster development plan, experts will be hired to develop apricot brands for the southern cluster

c) *Certifications for IPPC, Phytosanitary, Organic, Fairtrade, and Geographical Indication'* can also be pursued as other value-added strategies. GI can be used on products that have a specific geographic origin and possess qualities or a reputation that are intrinsically due to that place of origin.

d) *Holding competitions and rewards for Processors*. Special competitions will be held and rewards will be awarded for outstanding processors of dried and fresh apricots. These competitions will be held at district-level and then concluded at the cluster level.

8.4.3. Marketing and Trading Level Strategies

The strategy would be first to increase the export to production ratios through various measures including; a) the provision of market information (standards, process and potential buyers) - for this a small unit in agriculture department will be established to regularly provide market information to various stakeholders; b) sponsoring international tours – for example top three exporters shall be sent abroad on exposure visits at 50% government expenses; and c) holding of competition and rewards for exporters.

Secondly, measures are to be taken to improve the quality and export price and in order to meet the international standards. The suggested interventions include; *a) provide incentives for adopting best practice and certification regimes* - for this, special tax incentives will be

provided to establish certification companies in the northern cluster. The government will also incentivize various stakeholders along the value chain to adopt these practices by paying 25% of the machinery cost recommended by the certification agencies at various levels. However, farmers have to agree to pay for any additional infrastructure, labour, and monitoring costs. *b) Training stakeholders to adopt ISPMs.* International consultants will be engaged by the Federal Government to spell out requirements at production, processing, transportation, storage, and marketing levels and provide training of trainers who in turn will train farmers, processors, traders, exporters, etc. to adopt the ISPMs standards. One hundred farmers and 25 other stakeholders will be trained to adopt the ISPMs in each district every year. A common intervention proposed is to establish an Apricot Association of Pakistan. This should be a joint activity for both the clusters, with an interactive website and marketing apps.

9. BENEFITS AND COSTS OF CLUSTERING

This section discusses the costs associated with cluster development strategies presented in previous section. This also identifies resources and requisite inputs for achieving all the targets given in section 8. An economic and social impact analysis has also been undertaken that evaluates the cost and benefits of the apricot cluster development interventions in the two target regions.

9.1. Investment Needs

A public-private investment strategy is needed to support the cluster development efforts in GB. A capital investment of US$ 11.44 million is needed to upgrade the northern apricot cluster. Of this 70% should be provided by private investors and remaining 30% by government, for which an Agriculture Cluster Development Fund (ACDF) should be established under PCP. The seed money for ACDF should come from CPEC investments. Details of these investments are summarized in Table 15, below.

Table 18: Proposed Investments for the Development of Northern Apricot Cluster

Capital Costs	Unit Cost US$	Quantity	Cost (US$ million)
30% of area renovated/replanted (ha)	3,250	3,825	9.94
Drying units (US$)	10,000	150	1.5
Total			**11.44**

Similarly, a combined investment of US$ 26.5 million is estimated for improving the apricot cluster in Balochistan, of which US$ 30% is proposed to come from the public sector, while leveraging the other 70% from private sources. Table 16 below detail investment details for the southern apricot cluster in Balochistan

Table 19:Proposed Investments for the Development of Southern Apricot Cluster

Capital Costs	Unit Cost US$	Quantity	Cost (US$ million)
30% of area renovated/replanted (ha)	3,250	7,675	24.99
Drying units (US$)	10,000	150	1.5
Total			**26.49**

9.2. Summary of all Investment Costs

It must be noted that these investments are capital investments, not working capital that includes production costs or value chain costs, such as land preparation and boundary walls for nurseries and orchards, labor, raw and packaging material, transportation, distribution, financial costs (the working capital), which are substantial, and borne by the value chain actors.

As these costs are expected to increase as a result of new investments, famers, processors, and other value chain actors need access to credit, which is typically not available from the formal financial institutions. These costs and returns are detailed in the Feasibility Model (Annexes 5 & 6).

In the Table 17 below, we have provided a summary of all CAPEX and OPEX investment costs, and proposed a financing plan.

Table 20: Summary of Investment Costs (US$)

Description	Northern Cluster	Southern Cluster	Total (US$)
CAPEX Investment	11.44	26.49	*37.93*
OPEX Investment	60.58	76.43	*137.01*
Total investment	***72.02***	***102.92***	***174.94***
Proposed Financing			
Grants (10%)	7.2	10.29	*17.59*
Credit (70%)	50.42	72.04	*122.45*
Private capital (20%)	14.40	20.59	34.98
Total financing	***72.02***	***102.92***	***174.94***

Note: A revolving credit fund can be established in partnership with public sector banks. Alternatively, the government can provide loan guarantees to value chain actors to obtain credit from private banks, who will be responsible for due diligence.

9.3. Feasibility Model Parameters

A feasibly model was developed to estimate the costs and returns for the cluster development interventions. The results of the model are based on the following key parameters and assumptions set each for northern and southern cluster.

Table 21: Key Parameters and Assumptions of Feasibility Model

Parameters/Assumptions	Northern Cluster	Southern Cluster
	Total Value	Value
Area under cultivation in focal point (ha)	12,750	25,584
Total Production (t)	125,184	163,856
Default yield (t/ha)	9.82	6.84
Annual yield growth without intervention (%)	0.13	0.08
Farm-gate/ wholesale price of (US$/tonne)	693	693
Total percentage of area where orchards would be renovated (%)	30	30
Assumed yield increased from renovated orchards (%)	25	25

Parameters/Assumptions	Northern Cluster	Southern Cluster
	Total Value	Value
Current post harvest Losses (%)	40	20
Reduction in post-harvest losses after intervention	20	10
Percent of production to be dried/processed (%)	60	50
Current Exports (%)	0.08	0.08
Exports to be increased over five years (% of production)	8.75	8.75
Current Pakistani Export Price (US$)	1,463	1,463
Target export price of dry apricot (US$)	3,000	3,000
Average international export price (US$)	3,200	3,200
% of domestic production to be evaluated at international price	10	10
Gestation period (years)	4 years	4 years
Cost of certified orchard establishment (US$/ha)	140	125
Cost of orchard during gestation period (US$/ha)	3,250	3,250
Cost of Production Inputs and management of existing plantation (US$/ha)	213	213
Cost of local transportation (US$/tonne)	15	15
Cost of national transport (US$)	50	50
Cost of international transport (US$)	100	100
Marketing costs (% of gross revenue)	1	1

9.4. Economic and Social Returns

The investments as proposed in the previous sections are expected to generate substantial economic, social and environmental returns. As discussed in the previous section, the key objective of cluster development is to improve the overall efficiency of the apricot sector in the country. This efficiency shall be realized as a result of measures taken at production, processing and marketing levels.

Following is a summary of the expected costs and returns for both the clusters. For details, please refer to Annex 5 and 6 in this report.

Table 22: Economic Returns and Investments in the Northern Cluster

Parameters	Northern Cluster	Southern Cluster
Total Gross Revenue over the period of 9 years (US$ '000)	15,573	86,315
Total Operating Costs over the period of nine years (US$ '000)	6,262	33,460
Total Investments (US$ '000)	4,217	22,619
Cash Flow (US$ '000)	4,761	30,236
Discount rate (%)	8.5%	8.5%
NPV (US$ '000)	1,878	12,152
IRR (%)	22.2%	22.8%

Based on these parameters, an IRR of 22.2% has been estimated that shows a reasonably high potential for returns and profitability in apricot value chain in this cluster. The cluster interventions will stimulate the local and national economy, creating jobs and incomes along the entire value chain, as well as secure substantial foreign exchange earnings.

Similarly, in the southern cluster, an IRR of 22.8% has been estimated that also shows a reasonable returns and profitability in what is a mature apricot value chain in this cluster. The cluster interventions will stimulate the economy, creating additional jobs, income and generate foreign exchange earnings.

9.5. CONCLUSION

To conclude, the overall economic, social and environmental impact of the cluster development program is positive, sustainable and long lasting. In summary, lot need to be done to become competitive in international markets. But if the country can invest in R&D, and processing and quality infrastructure, it can enhance income to farmers, middlemen, and traders, and generate foreign exchange for the country and new employment opportunities.

10. PROGRAMS AND PLANS

This report presented an overview of the potential of apricot sector in Pakistan. Identified the apricot clusters as part of the V2025 of GoP. Discussed the gaps and constraints of identified apricot clusters in GB and Baluchistan. Gave recommendations for cluster development in both the regions; and estimated the economic and social impact of the cluster development interventions that shall set new frame conditions at production, processing, and marketing level of apricot value chain in both the regions. In support of the findings and recommendations presented in previous sections, the following plans and programs are proposed for further value addition.

10.1. Program for Organization and Networking of Stakeholders

In support of the strategies and interventions proposed in section 8 of this report, the following programs/plans are recommended to further strengthen the interventions and to creating greater opportunities for participation and learning.

The proposed program of actions for organization of stakeholders at different levels of value chain is summarized in Table 22 below.

Table 23: Program for Organization and Networking of Stakeholders

S#.	Area of Action	Purpose	Institutions to be involved	Priority
1. Gilgit Baltistan				
1.1	• Form Apricot Farmer Enterprise Groups (FEGs) at grassroots level. 4 FEGs in total with each having a membership of at least 25 farmers. GB has 4 apricot producing districts, and thus 1 FEGs per district	Organization of Apricot farming community for collective action	Village Organizations (VOs), LSOs, NGOs (AKRPS), DoA GB, Department of rural development GB.	Short to medium term (1 to 2 years)
1.2	• Form Apricot Processors and Traders Association at market/business level. At least 4 processors should be initially involved.	Improve coordination between the stakeholders of Apricot value chain	DoA GB, NGOs, Private Sector	Short to medium term (1 to 2 years)
2. Balochistan				
2.1	• Form Apricot Farmer Enterprise Groups (FEGs) at grassroots level. 4 FEGs in total with 1 FEG in each apricot producing district and FEG each having a membership of at least 30 farmers.	Organization of Apricot farming community for collective action	NGOs, DoA Balochistan, Department of rural development Balochistan.	Short to medium term (1 to 2 years)
2.2	• Form Apricot Processors and Traders Association at market/business level. At least 4 processors (1 processor in each apricot producing district) should be initially involved.	Improve coordination between the stakeholders of Apricot value chain	DoA Balochistan, NGOs, Private Sector	Short to medium term (1 to 2 years)

10.2. Program for Research Reform

Table 23 below summarizes indicative areas for further research to strengthen the apricot cluster in the two regions are proposed along with the estimated costs.

Table 24: Program for Research Reform

S#.	Identification of Areas for Further Research	Research Purpose/ Priority	Indicative Research Institutions
1. Gilgit Baltistan			
1.1	• Identify suitable cultivars for mountain areas • Develop strategy for quickly distributing improved seedlings	Apricot production improvement (Short to medium term (1 to 2 years)	MARC, PARC, KIU, DoA Gilgit Baltistan
1.2	• Develop training modules • Develop formats for Farmer Field Schools (FFS) for on-farm training of Apricot producers	Improve Orchard Management and On-farm Processing Skills (Short to medium term (1 to 2 years)	MARC, DoA Gilgit Baltistan
1.3	• Survey for identification of target group of 4 processors	Product Diversification from Processed apricots (Short to medium term (1 to 2 years)	Private businesses, DoA Gilgit Baltistan, MARC
1.4	• Consultation with processors to assess interest in establishing a Fruit Processor Association • Scoping survey to identify new products and potential buyers	Create market Linkages for quality Processed Apricot (Domestic and Export) Medium to long Term (2 to 5 years)	Private businesses, DoA Gilgit Baltistan, MARC, Export promotion board, Embassies
1.5	• Identify suitable fresh fruit traders to support the cluster • Identify suitable fresh fruit buyers to link with in premium markets through a market survey • Consultation to decide on implementation strategy – wholesale market or individual traders • Identify most suitable cold storage and fresh fruit trading technology	Develop Cold-Chain Infrastructure for Fresh Fruit Trading Medium to long Term (2 to 5 years)	FEG clusters; Farmer Associations; Business associations and cooperatives.
1.6	• Research into Climate change related negative impacts such as new diseases and shifts in crop cycle	Investigate into climate related negative impacts on horticulture Medium to Long term (2 to 5 years)	MARC, DoA Gilgit Baltistan, KIU, research institutions
2. Balochistan			
2.1	• Survey for identification target group of 4 processors	Product diversification from processed apricots Short to medium term (1 to 2 years)	Private businesses, DoA Balochistan
2.2	• Consultation with processors to assess interest in establishing a Fruit Processor Association • Scoping survey to identify new products and potential buyers	Create market Linkages for quality Processed Apricot (Domestic and Export) Medium to long Term (2 to 5 years)	Private business, DoA Balochistan, Export Promotion Board, Embassies

S#.	Identification of Areas for Further Research	Research Purpose/ Priority	Indicative Research Institutions
2.3	• Identify suitable fresh fruit traders to supporting the cluster • Identify suitable fresh fruit buyers to link with in premium markets through a market survey • Consultation to decide on implementation strategy – wholesale market or individual traders • Identify most suitable cold storage and fresh fruit trading technology	Develop Cold-Chain Infrastructure for Fresh Fruit Trading Medium to long Term (2 to 5 years)	FEG clusters; Farmer Associations; Business associations and cooperatives.
2.4	• Research into Climate change related negative impacts such as new diseases and shifts in crop cycle	Investigate into climate related negative impacts on horticulture Medium to Long term (2 to 5 years)	DoA Balochistan, P&D department, Research Institutions

11. Annexures

Annex 1: Macro Data Sources

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Annex 2. List of Stakeholders Consulted

The following stakeholders were consulted during this feasibility study exercise

#	Name	Title	Location	Contact
1.	Asghar Ali	Director, DoA	Gilgit	0306 3069900
2.	Melad Karim	COP, Sadpara Development Project	Skardu	0302 5430003
3.	Ahsan Mir	PD, GBTI (IFAD)	Gilgit	0345 5456795
4.	Muzaffar u din	GM, AKRSP	Gilgit	0345 8521990
5.	Mr. Kamal Din	CEO KADO	Skardu	0300 0227770
6.	Wazir Fida Ali	Member Village Organization	Skardu	0355 5262999
7.	Abbas Khan	Member Village Organization	Skardu	0346 9555025
8.	Haji Kazim	Member Village Organization	Skardu	0348 5513564
9.	M. Imran Khan	Member Village Organization	Skardu	0346 9558845
10.	Fida Ali	Member Village Organization	Baltistan	0355 5678966
11.	Ghulam Nabi	Member Village Organization	Baltistan	0346 2833520
12.	Mohd. Yaqoob	Member Village Organization	Baltistan	0346 3163045
13.	Ejaz Hussain	Member Village Organization	Baltistan	0344 9137470
14.	Shahana	Member Women Organization	Baltistan	0341 9554809
15.	Nargis	Member Women Organization	Baltistan	0342 5916920
16.	Nazira	Member Women Organization	Baltistan	0344 8802006
17.	Farzana	Member Women Organization	Baltistan	0342 5508085
18.	Ghulam Ahmed	SDP	Skardu	0314 3141519
19.	Waseem Abbas	AKRSP	Skardu	0345 5936050
20.	Mohammad Iqbal	Former, Head of Value Chain, FAO	Balochistan	0300 2361660
21.	Shahishah Khan	Entrepreneur	Balochistan	0334 2408650
22.	Mohammad Yahya Musakhel	Farmer	Balochistan	92 828601034

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Annex 4. Brief Description of the Product, Process and Cost/Benefit

The cluster report on apricots provides the full suite of products, interventions, costs and returns, divided into production, processing and marketing stages. The purpose of this section is to highlight one key intervention, the processing/ drying part, leading to the finished product.

It is important to note that this intervention in isolation will not work and not produce the desired results, as it is just one part of the integrated cluster development plan and interventions proposed in the main report. The purpose here is to provide an example of the end product, assuming that all the steps in the value chain are taken care off, especially the provision of high quality and certified planting material.

Key parameters

#	Description	Details
1.	Product	Dried apricot
2	Process	Decentralized (household/ *muhallah* level) dehydration and packaging
3.	Technology	Solar Dehydration Units (SDUs), originally designed by PCSIR, nor widely fabricated and available in the market (as shown in Figure 4 in this Report)
4.	Number of SDUs	20 (10 in each cluster)
5.	Locations	Killa Saifullah, Gilgit, Hunza, Nagar, Skardu and Khaplu districts
6.	Target markets	Local tourist market, domestic and export markets
7.	Employment generation	800-persondays

Process Flow

Picking the fruit

Apricot harvest is best accomplished when they are completely ripe on the tree. The ripening period of the fruit starts in June and extends all the way to August, depending on elevation and varieties. Once ready to harvest, the picking season may span 2-3 weeks. The farmer knows when to pick apricots visually once the fruits change from green to yellowish-orange in color and feel slightly softened, but still firm to the touch. The exact hue varies according to cultivar but regardless of the variety, all apricots soften extremely quickly, making them vulnerable to bruising and subsequent rotting. The recommended method is to gently pick the ripened fruits from the tree.

Storage

The harvested fruit will keep for approximately one to three weeks stored in a cool location and free from damaging factors such as additional weight upon the fruit, which may result in bruises and decay. The fruit is best stored in a single layer to minimize potential damage due to bruising.

Drying

There are a number of ways to dry the apricots. The common method used in the two clusters is sun-drying. Traditionally, people simply spread out the fruit on willow twig-meshed flat trays, either whole, or cutting them into two halves, and destoning and placing these on rooftops or on flat ground, protected from animals, as seen in Figure 5. However, this method attracts insects and gathers dust, and leads to a sub-standard product. Also, open sun drying is less efficient and it takes several days and can easily be damaged and loses color if it rains.

Figure 5: Traditional method of open sun drying

A more modern approach is using an enclosed sun dryer, which combines warm temps, low humidity and airflow to dry food quickly. The warm temperatures allow the moisture to evaporate; the low humidity pulls moisture rapidly from the fruit and into the air, and the moving air speeds up the drying process by pulling the moist air away from the food. The process is also dust and rain proof. (See figure 6, which is reproduced below). Apricots must be dried both as whole and after cutting them into two-haves (destoned).

Figure 6: Pre-treatment before drying

Before placing destoned or cut halves in wooded trays, which must be thoroughly scrubbed washed, and placing the trays inside the drying unit, fresh apricots must be treated by dipping them in the Potassium metabisulfite solution (PMS). A second method is Sulphur fumigation inside the drying chamber. While Sulphur dried apricots retain their original colour, they are often disliked by discriminating customers in some markets. Simple sun-dried apricots fetch a higher price, but maintaining hygiene is major challenge. The drying technology, however, remains unchanged for both options.

Packaging of Fruits

Finally, the dehydrated fruits will be packed and then stored in the finished goods store.

Key Inputs and Units

SR #	Inputs	Units
1.	Trays per drying unit (#)	20
2.	Fresh matter per tray (kg)	5
3.	Time required for one round of drying (hours)	24-48
4	Quantity of fresh matter per drying unit per drying round (1x2) kg	100
5.	Drying rounds per season (#) *	20
6	Quantity of fresh matter per drying unit per season (4x5) kg	2,000
7.	Number of drying units (#)	20
8.	Total quantity of fresh matter processed in 20 units per season (6x7) tonnes	40
9.	Labor: 50 kg of fresh matter processed per person, (person days)	800
10.	Land (Sq. ft)	10
11.	Chemicals (kg)	20
12.	Washing equipment (plastic tubs)	Variable
	Output	**Units**
13.	Percent of dry to fresh matter (%)	17
14.	Total quantity of dried matter processed in 20 units per season (8x13/100)) tonnes	6.8

**Opportunity cost of family labor; includes time required for cleaning of trays and drying units, between drying rounds*

Intervention Cost (US$)

Description	Cost (US$)
Capital cost	
Land (10x10=100) sq. ft. @ 10	1,000
Drying units (20 @500/ unit)	10,000
Sub total	***11,000***
Working capital	
Raw material US$ 400/tonne) for 40 tonnes	16,000
Labor (US$ 7/day for 800-person days)	5,600
Chemicals lump sum	100
Transportation (US$ 50/tonne) for 40 tonnes	2,000
Packaging material (lump sum)	1,000
Sub total	***24,700***
Total	**35,700**

Revenue Generation (US$)

Description	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Finished goods at@100% capacity (tonnes)	0	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Revenue (at US$ 4,500/tonne)	0	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600	30,600

Year	Costs (US$)	Income (US$)	Cash flow (US$)
0	-11,000	0	-11,000
1	24,700	30,600	5,900
2	24,700	30,600	5,900
3	24,700	30,600	5,900
4	24,700	30,600	5,900
5	24,700	30,600	5,900
6	24,700	30,600	5,900
7	24,700	30,600	5,900
8	24,700	30,600	5,900
9	24,700	30,600	5,900
IRR		52%	
NPV		22,978	
Interest Rate		10%	

Notes:

- Apricots fetch a higher value as fresh rather than dry
- Drying apricots is a good method to reduce postharvest losses, which are 30-40%, in both the clusters
- In such scenarios (high postharvest losses), the opportunity cost of fresh fruit is close to zero; in our calculations, we have taken the farm gate prices as US$ 500/tonne, which is roughly half the average prices of fresh apricots
- The calculation does not include likely income from apricot kernel oil, if apricots are dried after destoning them.

Annex 5: Analysis for Economic Returns in the Northern Cluster

Analysis for Economic Returns, Costs and Investments in GB	Input value	Increment	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Baseline Situation (2016): Acreage, yield, production and value											
Area under apricot cultivation (base year 2016) (ha)	12,750		12,750	12,750	12,750	12,750	12,750	12,750	12,750	12,750	12,750
Baseline yield (%)	9.82			9.84	9.86	9.87	9.88	9.90	9.91	9.92	9.93
Growth in yield	0.13%										
Production (tonne)	125,186		125,186	125,186	125,186	125,186	125,186	125,186	125,186	125,186	125,186
Increase production by renovating/ replanting 30% of total orchard area with HYVs											
30% of the orchard area renovated/ replanted in 4 years (%)	30%	6%	6%	6%	6%	6%	6%				
Acreage renovated /replanted per year (ha)	6%	765	765	1,530	2,295	3,060	3,825	3,825	3,825	3,825	3,825
Assumed yield increase in renovated/ replanted orchard area (%)	25%	5%						5%	5%	5%	5%
Incremental production on renovated/ replanted acreage (tonnes)								115	153	191	191
Increased total production after interventions				***125,186***	***125,186***	***125,186***	***125,186***	***125,301***	***125,339***	***125,377***	***125,377***
Value added processing and quality improvement for high end domestic and export markets											
				15.0%	30%	45%	60%	60%	60%	60%	60%
60% of the annual production dried for high-end domestic and export markets (1 dry tonne=6 fresh tonnes), from year 2	60%	15%		3,130	6,259	9,389	12,519	12,530	12,534	12,538	12,538
				2.5%	5%	8%	10%	10%	10%	10%	10%

10% of the dried product exported, from year 2 (tonne)	10%	2.5%		13	52	117	209	209	209	209	209
Economic Returns: estimate of revenues generated from all streams	Price (US$)										
Average wholesale price for fresh apricots in Pakistan	693										
Farmgate price of fresh apricots in GB (tonnes)	300										
Revenue from the sale of dried apricots in premium domestic market (US$)	1800		-	5,633,370	11,266,740	16,900,110	22,533,480	22,554,135	22,561,020	22,567,905	22,567,905
Revenue from the export of dried apricots (US$)	3000		-	39,121	156,483	352,086	625,930	626,504	626,695	626,886	626,886
Total expected incremental returns from all interventions (US$ '000)			***-***	***5,672***	***11,423***	***17,252***	***23,159***	***23,181***	***23,188***	***23,195***	***23,195***
Operating costs											
Production cost (US$/tonne)	213		162,857	325,714	488,571	651,429	814,286	814,286	814,286	814,286	814,286
Dry processing costs (US$/fresh tonne)	600			1,877,790	3,755,580	5,633,370	7,511,160	7,518,045	7,520,340	7,522,635	7,522,635
Local transportation costs (US$/tonne)	15		-	46,945	93,890	140,834	187,779	187,951	188,009	188,066	188,066
National transportation cost (US$/tonne)	50		-	156,483	312,965	469,448	625,930	626,504	626,695	626,886	626,886
International transportation cost (US$/tonne)	100		-	1,304	5,216	11,736	20,864	20,883	20,890	20,896	20,896
Marketing costs (% on turnover)	1%		1,630	24,080	46,560	69,070	91,600	91,680	91,700	91,730	91,730
Total operating costs (US$ '000)			***164***	***2,432***	***4,703***	***6,976***	***9,252***	***9,259***	***9,262***	***9,264***	***9,264***

30% renovation /replantation of existing orchard area (US$/ha)	3,250	765		2,486,250	2,486,250	2,486,250	2,486,250				
150 units for drying	**10000**	**150**	**500,000**	**500,000**	**500,000**						
Total Investments (US$ '000)			**500**	**2,986**	**2,986**	**2,486**	**2,486.25**	**-**	**-**	**-**	**-**
Total Gross Revenue (US$ '000)	150,265		-	5,672	11,423	17,252	23,159	23,181	23,188	23,195	23,195
Total operating costs (US$ '000)	60,577		164	2,432	4,703	6,976	9,252	9,259	9,262	9,264	9,264
Total Investments (US$ '000)	11,445		500	2,986	2,986	2,486	2,486	-	-	-	-
Cash Flow (US$ '000)	78,243		-664	254	3,734	7,790	11,422	13,921	13,926	13,930	13,930
Discount rate (%)	0.0%										
NPV ((US$ '000)	66,798										
IRR (%)	251.5%										

Annex 6: Analysis for Economic Returns, in Southern Cluster, Balochistan

Analysis for Economic Returns, Costs and Investments in GB	**Input value**	**Increment**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**
Baseline Situation (2016): Acreage, yield, production and value											
Area under apricot cultivation (base year 2016) (ha)	25,584		25,584	25,584	25,584	25,584	25,584	25,584	25,584	25,584	25,584
Baseline yield (%)	6.40			6.41	6.42	6.43	6.43	6.44	6.44	6.45	6.45
Growth in yield	0.08%										
Production (tonnes	163,856		163,856	163,856	163,856	163,856	163,856	163,856	163,856	163,856	163,856
Increase production by renovating/ replanting 30% of total orchard area with HYVs											
30% of the orchard area renovated/ replanted in 4 years (%)	30%	6%	6%	6%	6%	6%	6%				

Acreage renovated /replanted per year (ha)	6%	1,535	1,535	3,070	4,605	6,140	7,675	7,675	7,675	7,675	7,675
Assumed yield increase over the base in renovated/ replanted orchard area (%)	25%	5%						5%	5%	5%	5%
Incremental production from renovated/ replanted acreage (tonnes)							-	230	307	384	384
Increased total production after interventions			***163,856***	***163,856***	***163,856***	***163,856***	***163,856***	***164,086***	***164,163***	***164,240***	***164,240***
Value added processing and quality improvement for high end domestic and export markets											
				12.5%	25%	38%	50%	50%	50%	50%	50%
50% of the annual production dried for high-end domestic and export markets (1 dry tonne=6 fresh tonnes), from year 2	50%	13%		3,414	6,827	10,241	13,655	13,674	13,680	13,687	13,687
				2.5%	5%	8%	10%	10%	10%	10%	10%
10% of the dried product exported, from year 2 (tonnes)	10%	2.5%		14	57	128	228	228	228	228	228
Economic Returns: estimate of revenues generated from all streams	**Price (US$)**										
Average wholesale price for fresh apricots in Pakistan	693										
Farmgate price of fresh apricots in GB (tonnes)	300										
Revenue from the sale of dried apricots in premium domestic market (US$)	1800		-	6,144,600	12,289,200	18,433,800	24,578,400	24,612,938	24,624,451	24,635,964	24,635,964
Revenue from the export of dried apricots (US$)	3,000		-	42,671	170,683	384,038	682,733	683,693	684,013	684,332	684,332
Total expected incremental returns from all interventions (US$ '000)			***-***	***6,187***	***12,460***	***18,818***	***25,261***	***25,297***	***25,308***	***25,320***	***25,320***
Operating costs											
Production cost (US$/tonne)	213		326,787	653,574	980,362	1,307,149	1,633,936	1,633,936	1,633,936	1,633,936	1,633,936
Dry processing costs (US$/fresh tonne)	600			2,048,200	4,096,400	6,144,600	8,192,800	8,204,313	8,208,150	8,211,988	8,211,988
Local transportation costs (US$/tonne)	15		2,334,948	51,205	102,410	153,615	204,820	205,108	205,204	205,300	205,300
National transportation cost (US$/tonne)	50		5,734,960	170,683	341,367	512,050	682,733	683,693	684,013	684,332	684,332

International transportation cost (US$/tonne)	100		-	1,422	5,689	12,801	22,758	22,790	22,800	22,811	22,811
Marketing costs (% on turnover)	1%		-	29,250	55,260	81,300	107,370	107,500	107,540	107,580	10,750
Total operating costs US$'000)			***8,397***	***2,954***	***5,581***	***8,212***	***10,844***	***10,857***	***10,862***	***10,866***	***10,769***
Capital Costs	**Unit cost (US$)**	**Quantity (#)**									
30% renovation /replantation of existing orchard area (US$/ha)	3,250	1,535	4,988,880	4,988,880	4,988,880	4,988,880	4,988,880				
150 units for drying	10000	150	500,000	500,000	500,000						
Total Investments (US$ '000)			**5,489**	**5,489**	**5,489**	**4,989**	**4,988.88**	**-**	**-**	**-**	**-**
Total Gross Revenue (US$ '000)	163,972		-	6,187	12,460	18,818	25,261	25,297	25,308	25,320	25,320
Total Operating Costs (US$ '000)	76,435		5,489	2,954	5,581	8,212	10,844	10,857	10,862	10,866	10,769
Total capital investment (US$ '000)	44,717		-	29,250	5,489	4,989	4,989	-	-	-	-
Cash Flow (US$ '000)	48,309		-	-26,017	1,390	5,617	9,428	14,439	14,447	14,454	14,551
Discount rate	0.0%										
NPV (US$ '000)	3,593										
IRR	26.1%										

Annex 7: Assumptions Table

Key Assumptions	Gb	Bn
Production costs	*Modern*	*Modern*
Family labour @US$3/day/ha for 120 days (US$)	*360*	*360*
Cost of energy for irrigation @US$ 7 per ha		*7*
Cost of inputs per ha @US$0.35 per tree X 1000 trees)	*350*	*350*
Other costs (US$	*50*	*50*
Total production costs (US$/ha)	*760*	*767*
Production costs (US$/tonne)	*213*	*215*
Renovation Assumptions		
Cost per plant (US$/plant)	7	5
Plantation density (# of plants) per ha	500	500
Cost of replanting 1 ha (US$)	3,500	2,500
Unit cost of renovating one grown up tree (US$)	5	5
Current tree density (# of grown up trees) per ha	300	400
Cost of renovating 1 ha (US$)	1,500	2,000
Average cost of planting/renovation 1 ha	3,250	3,250
Processing Plants		
Cost of land (US$)	1,000	1,000
Building/ process yard (US$)	3,000	3,000
Cost of plant with 2 tonnes capacity/day US$)	35,000	35,000
Cold truck (US$)	40,000	40,000
Drying unit including trays (US$(	10,000	10,000

Office equipment (US$)	2,000	2,000
Installation costs (US$)	2,000	2,000
Training costs (US$)	2,000	2,000
Total cost per plant	*95,000*	*95,000*
Cold processing costs		
Raw material (US$/tonne)	*1,500*	*1,500*
Packaging material @US$ 0.3 per kg (US$/tonne)	*300*	*300*
Labour cost @100 kg processed per day per worker @ US$ 8.6 wage/day (US$/tonne)	*86*	*86*
Utilities (US$ tonne)	*30*	*30*
Total cold processing costs (US$/tonne)	*1,916*	*1,916*
Dry processing costs		
Raw material (US$/tonne)	*400*	*400*
Consumables (chemicals etc.) US$/tonne)	*100*	*100*
Labour cost @50 kg processed per day per worker @ US$ 5 wage/day (US$/tonne)	*100*	*100*
Total dry processing costs (US$/tonne)	*600*	*600*
Transportation cost	*Unit cost*	*Unit cost*
Local transport (US$/tonne)	*15*	*15*
Surface transport to mainland markets (US$/tonne)	*72*	*50*
Transportation on KKH to China (US$/tonne	*100*	*200*
Processing plant capacity (tonne/day)	2	2
Average annual processing requirement (s)	2	2
Annual (3 month) processing capacity /plant @ 80% capacity (tonnes)	144	144
Number of cold processing plants needed (#)	6	3

Average annual dry processing requirement (fresh tonnes)	23	13
Capacity of drying unit (ton/ season/year)	20	20
Number of Drying units required (#)	23	12
Local transportation: total production less postharvest losses at the farm level (%)	95	95
National transportation: total production less 25% local sales and 5% postharvest lose (%)	70	70
International Transportation: production bound for export to China by road	10	10