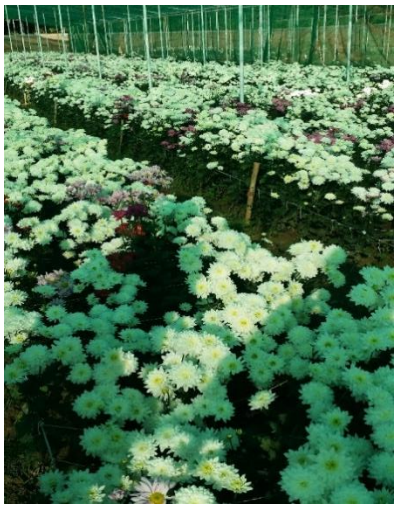
CLUSTER DEVELOPMENT BASED AGRICULTURE TRANSFORMATION PLAN VISION-2025

Floriculture 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 Center 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 barley 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 **Center for Agriculture and Bioscience International** (CABI) and its Regional Director for Central and West Asia, Dr. Babar Ehsan Bajwa and CABI 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.

Mr. Shamoon Sadiq
Senior Author

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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 Reforms or the Center for Agriculture and Bioscience International (CABI).

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LIST OF ACRONYMS

AARI	Ayub Agriculture Research Institute
ADP	Annual Development Plan
AMIS	Agriculture Management Information Service
B2B	Business-to Business
BOI	Board of Investment
CABI	Center for Agriculture and Bioscience International
CDF	Cluster Development Fund
EPB	Export Promotion Bureau
FEGs	Farmers Enterprise Groups
FFS	Farmers Field School
FSC&RD	Federal Seed Certification & Research Development
GAP	Good Agriculture Practices
HEC	Higher Education Commission
ICT	Information and Communication Technology
IPM	Integrated Pest Management
IRR	Internal Rate of Return
ITC	International Trade Center
KP	Khyber Pakhtunkhwa
NARC	National Agricultural Research Center
NPV	Net Present value
NRSP	National Rural Support Programme
PARC	Pakistan Agriculture Research Center
PCP	Planning Commission of Pakistan
PHDEC	Pakistan Horticulture Development & Export Company
PMU	Project Management Unit
RSP	Rural Support Programs
SMEDA	Small and Medium Enterprises Development Authority
SPS	Sanitary and Phyto-Sanitary
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TDAP	Trade Development Authority of Pakistan
UAF	University of Agriculture Faisalabad
UK	United Kingdom
USA	United States of America
WTO	World Trade Organization
ZTBL	Zarai Taraqiati Bank Ltd

EXECUTIVE SUMMARY

Growing of flowers and selling them in the market has become a huge sector at the global level which has been booming at an average growth rate of 7% per annum since 2001 and its value has surpassed US$42 billion in 2019. It has been one of the most dynamic and fast growing industry in the past two decades all over the world with the major paradigm shift of production centers from developed to developing countries due to cheap labor and suitable environments in the latter. Enhanced incomes, change in life style of people and enhanced use of cut flowers for special occasions has been the main driving forces behind the increased demand especially of high-quality flowers. The sector employs millions of people and provide them livelihood worldwide.

International trade of flowers which has been growing at over 5% per annum since 2001, has reached at US$ 8.6 billion in 2017. The Netherlands, with its geographic location and development of capital intensive production technologies and marketing structure has become the world's main exporter of floricultural products and center for floriculture trade in the world. Other countries like Colombia, Kenya, Ecuador, China, Canada, USA, France, Britain and Italy have also well-established flower industry. Pakistan remained behind of benefiting from the booming flower sector nationally and internationally as it has not attempted to build necessary infrastructure to meet these demands. As a result, the country has lagged far behind the global averages in yields, quality, price and exports of various flowers, although it has huge potential to grow diversified flowers in various regions on account of availability of favorable agro-climatic conditions and cheap labor.

In view of its potential in generating incomes, foreign exchange and employment, booming global demands and Pakistan's suitable diversified eco-regional environment for flower cultivation, the Planning Commission of Pakistan (PCP) has decided to make floriculture a modern, sustainable, and profit-driven sector which can not only meet the local demand, but also export the quality flowers. In the first step, the Commission has initiated this study to analyze the flower value chain including its production, marketing, trade and input supplies, identify gaps and potentials, and recommend interventions, policies, and strategies along the chain to make flowers in Pakistan globally a competitive and self-driving industry. In view of regional variation in the value chain across various flowers, this analysis is conducted for major flower clusters in Pakistan. To achieve the objective of the study, a large number of stakeholders are consulted, related macro data are analysed and literature are reviewed. An EXL model has been developed and is used to estimate the economic viability of the package of suggested interventions.

In the current feasibility study two flower clusters i.e. Rose (rose cut flowers and loose petals) and Gladiolus, have been identified for more detailed study of their respective value chains. As part of this study, several gaps were identified in the production, postharvest handling and marketing components of the value chain, specifically with the production, infrastructure, technology, market structure and availability of quality support services. At production level, these include the lack of appropriate planting material and appropriate management practices to produce high quality marketable flowers such as inappropriate peat material, absence of soil treatment, ineffective insect and disease control, flooded irrigation and low plant density etc. At post-harvest level major constraints are absence of

handling preservatives, packaging materials, cold storage, refrigerated transport, value addition infrastructure for domestic and export markets, branding, attractive packaging and disconnect with international market are major gaps.

In order to address multilevel challenges from production to product and market development, performance targets are set, based on leading flower growing countries average yield, quality and export and the interventions are designed to meet these targets over the period of five to ten years. Based on these parameters and keeping in view the gaps and constraints, specific interventions have been proposed for both the clusters.

These interventions include establishment of Pattoki Floriculture Center with all the supportive elements as common facility center for small flower farmers by incentivizing large numbers of small floriculture farms under protected cultivation adhering to international requirements, strengthening flower research, organizing producers into Farmers Entrepreneur Groups (FEGs) to resolve local issues, implementing quality standards, and ensure quality in groups, capacity building of stakeholders along the value chain, supplying true-to-type plants through tissue culture to meet the demands of consumers in various markets and linking growers with domestic markets and traders with international markets. The Pattoki Floriculture Center can also serve as Flower Auction Centers which can play a vital role as common platform for the grower and buyers. There is an urgent need in Pakistan for the application of better technologies to boost the floriculture industry's performance such as greenhouse technology for export quality flower production, cold storages to preserve the freshness of flowers, provision of improved packaging materials and preservative solutions to create attraction for the consumers. It is estimated that about 35% losses at the post-harvest level is wasted due to lack of cool chain system. Even those which reach the market are of poor quality with very short vase life.

These interventions are to be initiated by government in partnership with private sector and executed in collaboration with participation of private sector including the farmers, exporters, traders and processors. A time-horizon of five to ten years has been set for realizing the intended outcomes of the cluster development interventions. The total estimated investment of this cluster development/up-gradation plan is US$25.04 million for both the clusters. The public sector share in the total investment would be about 42% in terms of strengthening research, building capacities of stakeholders along the value chain, put basic infrastructure like Floriculture Centre in the hub of the clusters, incentivizing the green houses, value chain and processing infrastructures, and providing interest free loans for one year on the building of these infrastructures. We believe that these incentives will bring the remaining 58% of the investments in the private sector.

The investment on capacity building and improved value chain and processing infrastructure will increase the operational costs of various activities along various segment of the chain, which is estimated to be US$2.9 million during the last year of the plan in both the clusters. Accounting for all the yearly value chain costs including the production, processing and marketing costs applied over five years and investments applied, the estimated Net Present Value (NPV) of the plan would be US$10.5 million and US$ 2.7 million, and Internal Rate of Return (IRR) at 52% and 25% for the rose and gladiolus clusters respectively. These IRRs are based on respective investment costs in each product cluster and the present value of resulting revenues over a period of five years. More cluster-level details of revenues,

operational costs, and investments under various heads can be seen in the Summary Sheet given below.

This Up-gradation Plan is to be initiated by government and executed in collaboration with participation of private sector including the farmers, traders and their groups/associations. This Up-gradation Plan is expected to produce far reaching economic and social impacts, including increased production of high quality flowers and export benefiting all the stakeholders. These interventions are expected to create over 4,000 jobs along the value chain and generate nearly US$ 686,000 foreign exchange per year from increased quality exports.

Strengthening of research, capacity building of the growers on production management (GAP/SPS) will be the key for the success of the Up-gradation Plan.

Summary Sheet of flowers clusters

Item	Rose	Gladiolus	Overall
Area of cluster focal point (ha)	1,200	1,200	2,400
Production (tonnes)	16,302	16,302	32,604
Yield of the cluster (tonnes/ha)	14	14	14
Production from improved practices during 5th year (tonnes)	3,260	3,260	6,521
Gross revenue from improved management practices (000 US$)	4830.2	3777.5	8607.7
Saved production from reduced post-harvest losses (tonnes)	1,956	1,956	3,912
Value of saved production - reduced PH losses (000 US$)	2898.1	2266.5	5164.6
Added export due to improved value chain in 5th year (tonnes)	86	108	194
Value of increase export during 5th year (000 US$)	381.1	305.7	686.8
Production through improved VC in 5th year - domestic market (tonnes)	1,076	1,076	2,152
Value of production of improved VC in 5th year-domestic market (000 US$)	5144.8	3057.2	8202.0
Number of floriculture center	1	-	1
Cost of floriculture center (000 US$)	740.7	0	740.7
Total number of small green houses required	50	50	100
Cost of greenhouses (000 US$)	7407.4	7407.4	14814.8
Number of small cold storage required	20	20	40
No of Tissue culture labs	1	1	2
Total Investments (000 US$)			
Research & Development Level Interventions	2259.3	1814.8	4074.1
Capacity building of stakeholders	88.4	30.1	118.5
Tissue culture labs	298.9	156.7	455.6
Floriculture Center	740.7	0.0	740.7
VC infrastructure (Cold storage, green house)	8888.9	8148.1	17037.0
Processing infrastructure (Dehydration plant)	88.9	0.0	88.9
Loan	1020.4	259.3	1279.7
Marketing/Export level interventions	333.3	913.5	1246.9
Total public sector investments, including loans and subsidies	6030.8	4471.3	10502.1
Total private sector investment	7688.0	6851.3	14539.3
Production level investments	2646.6	2001.6	4648.1
Value chain level investments and processing	9998.2	9061.7	19059.9
Marketing and export level investments	333.3	259.3	592.6
Floriculture Center	740.7	0.0	740.7
Overall benefits (000US$) and rate of return			
Total increase in production – all intervention in 5th year (tonnes)	5,217	5,217	10,433
Total investments (US$)	13718.8	11322.5	25041.4
Gross revenue due to all interventions in 5th year (US$)	13254.3	9406.9	22661.1
Increase in operational cost during the 5th year (US$)	541.4	2350.6	2892.0
Net cash flow after in 5th year (undiscounted) (US$)	12231.4	0.0	18806.2
NPV (M.US$)	10544.9	2719.8	13264.7
Internal Rate of Return	52%	25%	41%

1. INTRODUCTION

Cut flower business deals with the growing and marketing of flowers along with their specific length of stem and leaves. The cut flowers are usually used for indoor decoration. Live cut flowers have a limited life. The majority of cut flowers can be expected to keep alive for several days with proper care and postharvest handling strategies. They can be treated in various ways to increase their life. To keep cut flowers beautiful and longer, flower stems should be placed in water immediately. Alternatively, the air will rapidly move into the water-conducting tissues and plug the cells that will cause early wilting of the flower. The return on floriculture crops is much higher than the other agricultural crops. Cut flower demand fluctuates during the year depending upon various social functions whereas supply of cut flowers fluctuates due to seasonal effects of weather.

Agriculture in Pakistan mainly revolves around the major crops like wheat, rice, cotton, maize, sugarcane, etc. Flowers occupy only 0.5% of the cultivated area. However, flower cultivation and its marketing (to be referred here as 'Floriculture' in this study) is a fast growing sector of Pakistan, which will be the best option of enhancing income of farmers and other stakeholders along the value chain and eradicate poverty from rural areas. As Pakistan is blessed by favorable agro climatic and socioeconomic conditions, such as cheap labor, flat land, irrigation facility, suitable soils, etc., it has the potential to develop a strong floriculture sector. The floriculture sector is famous but small around big cities like Karachi, Hyderabad, Lahore, Rawalpindi, Islamabad, Peshawar, Faisalabad, Multan and Quetta where flowers consumption is high.

The Pakistani floriculture sector is not very well developed because of low productive propagating flower material being used, poor disease and pest control, lack of knowledge about the market, non-availability of skilled labor during harvesting, and unavailability of suitable facilities for harvest. The issues related to market are underdeveloped domestic market, lack of post-harvest treatments like cold chain storage facilities, inadequate transport facilities, and lack of collaboration between private and government sectors. All these factors contribute towards low productive, low quality, and high cost flower business in the country. (Floral Daily, 2015).

Demand for cut flowers in Pakistan is growing tremendously as more and more people are becoming aware of the value of beauty of flowers as decorative items. Pakistan has favorable climate and cheap labor for growing these crops whereas they need much less resources for production. Unlike other crops and horticulture cultivation where returns are seasonal, the flowers can give premium prices almost round the year. Net profit against the investment is much higher for these crops compared with others conventional and horticultural crops. However, there are lack of needed resources, interest by government, and availability of skilled human resource to develop the floriculture sector up to international standard. It is need of the time to produce skilled personals and provide required infrastructure and resources to promote floriculture in the country which can ensure the competitiveness of our farmer, save the economy from foreign exchange deficit by boosting exports, and eradicate poverty in rural areas.

Major advantages of flower production include:

• Favorable agro climatic conditions

• Easy availability of land

• Cheap labor

• Proximity to markets in Japan, Pacific Rim, South-East Asia and Middle East countries which have a large growing demand.

• In west, the biting cold of winter months curtails flower production. As this period is the prime cultivation time in Pakistan, the potential is enormous.

• Cut flowers fetch maximum price during first and last quarter of the year, whereas, during 2nd and 3rd quarter, prices is less. The Pakistani flowering season is during this period from November to April; hence the produce will be available in 1st and last quarters, thus commanding highest prices in the international market.

1.1. Flower Production & Trade in Pakistan

Major flowers grown and marketed in Pakistan are:

- Rose (Surkha Ghulab and cut roses)
- Gladiolus
- Tuberose
- Marigold
- Annual Chrysanthemum
- Statice (Gul-e-Sataish)

Statistical data reveals that almost 10-12 thousand tonnes of flowers are produced in Pakistan on an estimated area of 7,080 ha with scanty data available on fresh flowers. This implies that only 0.5% of total cropped areas are under flower crops in the country. According to a recent survey, around 2,500 growers along with over 1,000 wholesalers and retailers are involved in the flower business in the country (Ahmad et al., 2018).

During 2017, 14.7 million Gladiolus, 16.8 million rose stems, while 292 tonnes of Surkha roses were marketed from Pattoki mandi (the biggest flower market in the country). The major share of total flower area of about 4,450 ha is in Punjab. Flower production is emerging sector in KP and area under various flower crops such as roses, gladiolus and lilium are fast increasing and have reached around 1,012 ha. In Sindh, mostly Surkha rose, Motia/Jasmine, and marigold are being grown on an area of about 1,214 ha (UAF survey). While rest of area is in Baluchistan (only a few hundred ha), Kashmir (Rawlakot and Kotli), and recently emerging in Gilgit Baltistan.

Since last decade, production of flowers in Pakistan has increased and similar trend is expected to be continued during the coming years (PARC 2014). Moreover, recently, new flower crops like stock, snapdragon, delphinium, sunflower and celosia have been introduced by the University of Agriculture, Faisalabad, and their commercial production has also been started which will further promote flower production in coming years in Pakistan.

Currently, growers are getting on an average around 135,850 gladiolus stems from one ha of land, while average rose petal yield is around 13.59 tonnes of fresh petals per ha and 1.73 million stems of cut rose per ha; however, this may vary based on several production and handling factors (Dr. Iftikhar Ahmed, UAF-Survey).

Flowers are highly perishable and require immense care during production as well as in marketing. It involves sophisticated value chain infrastructure which can boost the returns in floriculture. Most of the flowers produced in Pakistan are sold locally and very few are exported as the produce does not meet the international export standards, large numbers of cut flowers are wasted because of lack of infrastructure, postharvest mishandlings and improper marketing.

Sporadic efforts are being made from Pakistan for export of floriculture products, since last two decades. However, due to lack of proper patronage from public sector and unavailability of cool chain and other marketing infrastructure, no regular export is being done from Pakistan so far. In 2017, the total exports were 434 tonnes with the value of US$ 1.059 million which put Pakistan at 62nd position among flower exporting countries in the world. Major importers of Pakistani flowers are Germany and United Arab Emirates (Figure 1). Major exports are of cut roses (Table 2).

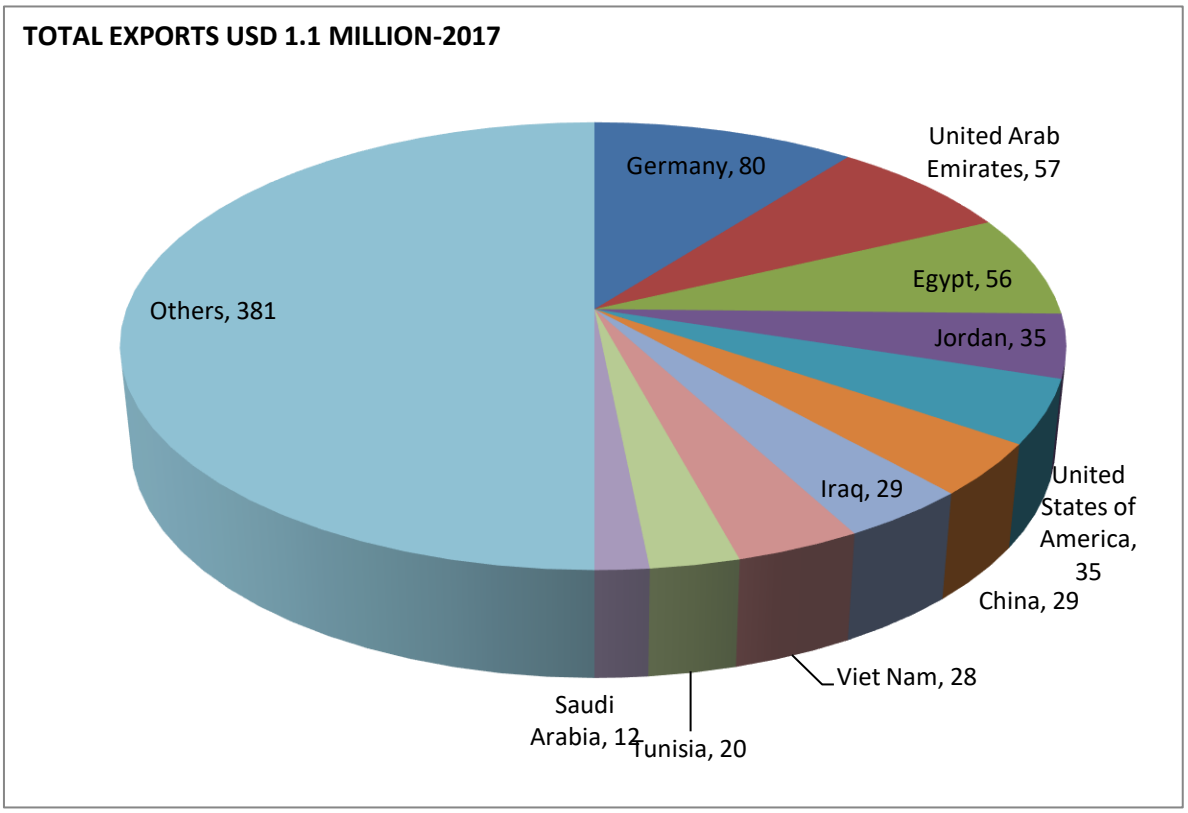


Figure 1: Floriculture exports from Pakistan-(Tonnes, 2017)
Source: ITC Data

Table 1: Local Production and Imports during 2016

Type of Flower	Production/Year (Million)	Demand/Year (Million)	Import (Million)
Cut Rose	109.500 Sticks	136.875 Sticks	27.375 Sicks
Gladiolus	73.000 Sticks	91.250 Sticks	-
Tuberose	11.000 Sticks	14.600 Sticks	-
Lilium	No local Production	0.913 Sticks	0.913 Sticks
Chrysanthemum	-do-	1.280 Sticks	1.280 Sticks
Gupsophilla	-do-	0.913 Sticks	0.913 Sticks
Others	-do-	1.460 Sticks	1.460 Sticks

Source: ITC Data

Due to change in life style of the people as well as growing real estate, event management, hotel and restaurant businesses in the country, demand for various floriculture products has increased several folds during past decade. Demand has also risen due to globalization; masses have become familiar with role of flowers in daily life to fulfill aesthetic needs. There has been an increased demand of quality flowers in the major urban areas such as Karachi, Lahore Islamabad/Rawalpindi, Faisalabad, Multan and Hyderabad. In order to fulfill the local demand Pakistan has been importing various varietal flowers which are in short production and/or not produced in Pakistan, mainly cut flowers and bulbs from Holland, Malaysia, Sri Lanka, Kenya, Saudi Arabia & Thailand.

1.2. Production of Flowers at Global Level

The flower demand worldwide is changing very rapidly; many more flowers are needed year round for the fast developing impulse sales in the mass-market. According to Future Market Insight (FMI), the global revenue from floriculture is projected to supersede US$ 43.2 Billion, registering a robust annual growth rate of 7.0 percent in 2019. This growth is expected to continue due to extensive demand for floriculture—an important activity in agro-business, specifically in Asian and Southeast Asian markets, considering favorable climatic conditions. Scope for floriculture in developing economy is anticipated to flourish as a mainstream occupation, majorly dominated by small and medium sized enterprises. Moreover, low cost of production, transportation, and marketing especially due to the environmental factors, infrastructure, and low labor costs in developing countries, is also a critical factor contributing to the growth of floriculture industry.

Worldwide production of cut-flowers has become more sophisticated in producing new and better quality products to meet the consumers' evolving demand. To meet this growing and changing demands, production has to move from countries that have traditionally been consumers and growers, such as the Netherlands, to other relatively new producing countries such as Colombia, Ecuador, Kenya and Ethiopia. Some of these countries have similar climatic and socio-economic environment as Pakistan, however, due to lack of socio-political stability and corporate culture, Pakistan fails to bring value chain infrastructure

needed for the floriculture sector thus the country is unable to streamline the floriculture on modern lines in order to fetch an appropriate share in global flower trade.

During the last 40 years, Netherland has created a big flora culture industry and now more than 100 countries are sending their flowers and plants to this market and from there wholesalers send them to customers all over the globe. Those wholesalers are able to supply each customer with wide range of products. Every day millions of different flowers and plants in all kind of colors are available for the international buyers and all according the international standards. It took about 40 years to develop and follow these standards, which helps supplying customers all over the world with a guaranteed fresh product having a long vase life. Netherland is also the middle point of the daily market in selling flowers and plants. The two big auctions "Aalsmeer" and "Flora Holland" markets are operating five days a week, play a major role in the international selling of flowers and plants. On those auctions the daily world market prices are settled and in a few minutes' people all around the world can follow this by high communication systems and latest techniques.

1.3. International Flower Trade

The world trade of flowers has reached at US$8.6 billion in 2017 from US$4.1 billion in 2002. During the last 15 years, it grew with an average growth rate of 5.1% per annum, although it has been almost stagnated (rather has slightly negative growth rate) during the last 5 years. The highest growth in flower trade during the last 15-year was in Ethiopia followed by China. Pakistan picked up its flower trade (mostly de-hydrated rose) during 2007-12 although from almost zero base but the growth could not be sustained, as its last five years' growth is now on a declining trend (Table 2).

Table 2: Export Trends in Flowers by Major Exporting Countries 2002-17

Exporters	Exported Value (US$ Million)				Growth Rates (%)		
	2002	2007	2012	2017	15 Years	10 Years	5 Years
World	4122.5	7123.1	8763.5	8639.8	5.1	1.9	-0.3
Netherlands	2152.4	3944.6	4566.6	4207.0	4.6	0.6	-1.6
Colombia	672.6	1114.9	1270.0	1399.6	5.0	2.3	2.0
Ecuador	291.1	403.0	771.3	881.5	7.7	8.1	2.7
Kenya	99.6	313.4	453.0	540.9	11.9	5.6	3.6
Ethiopia	0.0	68.8	162.0	196.6	85.2	11.1	3.9
Malaysia	22.7	52.0	121.0	107.5	10.9	7.5	-2.3
China	6.5	35.7	90.0	103.9	20.2	11.3	2.9
Italy	82.0	91.8	84.8	98.2	1.2	0.7	3.0
Pakistan		**218**	**1,208**	**1,059**		**17.1**	**-2.6**

Source: ITC Data

https://www.trademap.org/tradestat/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7c0603%7c%7c%7c4%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1

The next decade the production and trade growth of flowers would continue to grow but the dynamics of exports and imports would rather change. The traditional countries such as USA, Europe, Russia and Japan will still remain world's largest markets in absolute terms but may not expect to increase, whereas the countries with strong economic growths such as China and India would have high consumption and growth potential of flowers. In certain markets the consumers are moving to low end of the markets sold by supermarkets, discount stores and Do-It-Yourself (DIY) stores. In major flower producing countries, cut-flowers are mainly purchased from local florists except in UK where supermarket is the main source of supply. Indoor potted plants are mainly purchased from garden centers and florist. *Global trade in flowers and plants that are easy to grow and transport would continue to expand which would benefit the low cost production regions.* Pakistan has great potential of benefiting the rising flower demand in China because of its proximity with this big market and its growing relationship through CPEC project.

Developed countries in Europe, America, and Asia account for more than 90% of the total demand. International trade in floriculture, to a large extent is organized along the regional lines. Asia-Pacific countries are the main suppliers to Japan and Hong Kong. African, Middle Eastern, and other European countries are the principal suppliers to Europe's main markets, Colombia and Ecuador dominate the market in the USA. Global exports over the last few years have grown exponentially. For developing countries alone, global exports reached almost US$ 4 billion in 2012, a 24% growth against 2010. For Least Developed Countries alone, the vast majority located in Sub-Saharan Africa, the total value of cut flower exports more than doubled from US$ 208 million in 2011 to US$ 568 million in 2012 (ITC – Floriculture at a glance). However, Pakistan has not benefited from the ballooning international trade in flowers as it remains an insignificant player in the world market.

The Netherlands (49%), Colombia (16%), Ecuador (10%) and Kenya (6%) are among the top flower exporters constituting nearly 81% of the global share in export value (Table 2). It is worth noting that Netherland is the major exporter as well as one of the major importers of flowers in the world. This is because, as explained earlier, of its modern flower wholesale market which attracts flower from all over the world for export to other countries. Netherlands has long been at the center of cut flower production in the European floral market. The cut flower industry has flourished and grown in Netherlands since the 1970's. As early as 1995, Dutch growers produced over 8 billion blooms of flowers annually, which in turn yielded a revenue equivalent to about US$ 3.2 billion (ITC- Floriculture at a glance).

Though the Netherlands continues to be the largest exporter of cut flowers in the world market with 592 thousand tonnes valued at US$4.2 billion of exports, the country is currently facing intense competition from other countries that are producing cut flowers more inexpensively and on a larger scale than ever before, hence in the last 5 years the exports have declined by 2.6%. Columbia holds 16% global share with most of flowers are marketed to USA, this is followed by Ecuador with 10% share is exporting to USA, EU and Russia. Kenya, a recent entrant as a major exporter holds 6% share with major exports to EU and to some extend to USA and Russia. The main driver of Kenyan production and exports are due to high quality blossoms because of ideal climate all the year around, without having to invest large amount in green houses. The growth rate has been 3.6% during the last 5 years.

Other upcoming countries making their mark in the global scenario are Ethiopia, China and Israel (ITC_ Floriculture at a glance).

Using modern logistics system, people all over the world can order flower in the morning, and applying the modern cooling systems, the customers receive flowers and plants fresh the same day or early morning next day from across the globe (Figure 2). Producing and trading of flower and plants has now become a huge internationally connected industry with billions of sales and engaging millions of people worldwide. However, to be connected with this international industry, it is necessary to knock down the trade barriers and open the trade borders.

Figure 2: Trade flows of flower bulbs, cut flowers, cut foliage and other living plants (excluding intra-EU)

Source: Rijswick (2016)

Cut flowers transported through sea shipment are becoming more prominent and the future trend in the floriculture sector. Columbia transports about 15% of its flower exports through sea shipment (700 containers) to EU and UK (Rabo Bank 2015). Expansion of container shipment in cut flowers is mainly driven by price difference between air and sea freight.
The overall global imports are around US$ 8.1 billion in 2017 but have increased at a rate of 4.1% during the 15 years' and at 0.8% during the last five years. USA, Germany, Netherland and UK constitute nearly 57% of the global import in value terms. Pakistan imports are in the range of US$0.890 million. USA is the largest importer with US$1.45 billion and continuously growing at the rate of 4.5% during the last 5 years. About 70% of the cut flowers presently sold in the USA are imported and over 90% of these come from Colombia, Ecuador and the Netherlands. Roses are the main imported flower with 41% of the share (Table 2). China currently exports flowers and have little imports from its neighboring countries like Vietnam, but with increasing labor cost it will be impossible for the country to produce large quantities of flower to meet its booming domestic demand. This is expected to create a niche for Pakistani flowers, especially during the winter when flower supply from China is very limited while it is peak season for Pakistani flowers.

Table 3: Import Trends in Major Flower Importing Countries during 2002-17

Importers	Imports Value (US$ 000)				Growth Rates		
	2002	2007	2012	2017	15 Years	10 Years	5 Years
World	4439.4	7122.2	7824.6	8140.9	4.1	1.3	0.8
USA	684.2	1043.6	1167.5	1453.8	5.2	3.4	4.5
Germany	830.1	1102.2	1164.7	1188.0	2.4	0.8	0.4
Netherlands	440.2	672.4	738.2	994.8	5.6	4.0	6.1
UK	833.1	1139.6	954.1	964.1	1.0	-1.7	0.2
France	408.2	521.5	438.7	388.5	-0.3	-2.9	-2.4
Russia	50.7	485.8	746.8	350.8	13.8	-3.2	-14.0
Japan	150.7	258.8	441.5	348.7	5.8	3.0	-4.6
Belarus	1.6	9.1	11.8	181.4	37.3	34.8	72.8
Italy	153.9	238.2	208.7	180.7	1.1	-2.7	-2.8
Switzerland	**141.4**	**177.8**	**186.9**	**172.9**	**1.3**	**-0.3**	**-1.5**

Source: ITC Data

In view of the potential of the sector in generating income and employment, fast growing international market and despite favorable diversified eco-regional environment Pakistan's inability to benefit from this very profitable market, the Planning Commission of Pakistan has initiated this study to analyze the whole value chain of the flower sector, identify gaps and potentials, and recommend interventions, policies, and strategies to make the flower a competitive and self-driving sector. To incorporate the variation across flowers, this analysis is conducted for major flower growing clusters in Pakistan.

2. GOALS AND OBJECTIVES

The overall goal of this study is to contribute to *the Cluster Development Based Agriculture Transformation Plan -V2025.* Specific objectives of the study are:

1. To identify the major cluster of flower production in Pakistan
2. To characterize and conduct SWOT analysis of flower cluster
3. To identify technological, institutional, infrastructure and policy gaps in the cluster
4. Assess the potential of flower production in the cluster
5. Suggest technological, institutional, infrastructure and policy interventions to achieve the cluster potentials
6. Conduct economic and social feasibility of the suggested interventions. The purpose of the whole exercise is to develop a research-based cluster development plan for flower to achieve the following targets.

3. METHODOLOGY

The project was initiated with a workshop organized by meetings organized by project sponsors CABI/Planning Commission in Islamabad. The main purpose was to have a proper understanding of the study to be conducted and expectations from the project sponsors. The meeting led to the development of the questionnaires and survey methodology.

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

a) *Macro-Data*. Macro data were collected and analyzed from various sources, main source were ITC data, UAF-HEC project data 2018, Pakistan Statistical Year Book 2016, Agriculture Statistic of Pakistan AMIS
   Besides, all the relevant material, concept papers, proposals, baseline survey reports, project/strategy documents were reviewed to reveal the information regarding pre and post project interventions scenario of the flower sector (Detail list in annexure 2).
b) *Stakeholders Consultations*. The primary data were collected with field visits, holding interviews and focus group discussions with the stakeholders in the flower supply chain in Pattoki Punjab. The stakeholders included (detail list in annexure 1):
   - Growers
   - Professional Farm Contractors
   - Provincial Government Agriculture Departments, Research Institutes
   - Universities
   - Public Sector Trade Development Agencies
   - Government and Donor Development Programs
   - Input Suppliers
   - Wholesalers/Contractors
   - Processors
   - Regulator – DPP
   - Packaging Material Manufacturers
   - Transporters
   - Exporters
c) *Literature Review*.

Research papers, policy drafts, feasibilities, and newspaper articles were consulted and used for preparing this report.

Following generic parameters and indicators are used in collecting the data:

- Global context of flower sector;
- Production potential and review of flower sector;
- Cost of production, harvesting, post-harvest processing of flowers from the growers and grower associations;
- Marketing, trading, and processing from traders, wholesalers, retailers, and processors;
- Issues and constraints relating to production, picking, drying, selling, marketing, trading, and processing from all stakeholders;

- Recommendations and benchmarks based on global parameters;

The author then used these data to first identify the flower cluster in the country and then used his subjective judgment in prescribing the characteristics of each cluster, identifying the cluster strengths, weaknesses, opportunities, and threats (SWOT), investigating the functioning of existing value chain, and quantifying the cluster potentials. Based on the above analysis, interventions for improvement in each cluster were suggested. The cost and benefits of each intervention are also estimated to finally work out the Internal Rate of Return of the whole package. A Flower Transformation Plan is also formulated which identifies sustainable cluster upgrading strategies for the development of the flower sector that can help create significant economic opportunities for producers, processors and all the stakeholders participating at different points of the value chain.

4. LITERATURE REVIEW

Pattoki serve as the center for floriculture activity in Pakistan where the farmers have developed some expertise. The wholesale markets established in Kasur district is the major forum for buying and selling of fresh cut flowers and loose rose petals. About one million pieces of cut flowers are daily sold from Pattoki to different markets in Pakistan, mainly to large urban cities such as Karachi, Lahore, Peshawar and Islamabad.

Cut roses were the leading flower crop in the Pattoki area, but production systems and practices were outdated and primitive, resulting in cut stems that were not acceptable in international markets. The majority of growers (65%) had only basic education (grade 10 or less) and 57% had small landholdings (<1 ha); therefore, they did not have modern production techniques and resources for high-quality cut rose production. Moreover, lack of production and postharvest facilities, ignorance of both public and private resources, and poor production and postharvest practices were prevalent. Growers' training regarding production and postharvest management would be required to lift the quality standards of this industry up to the international level (Ahmad et al., 2010).

The cut flower industry in Pakistan is in its infancy stage, mainly due to lack of infrastructure and facilities, skilled manpower, professional training, modern production and handling techniques, and elite planting material (Kurd et al., 1999). Similar bottlenecks have been reported in other provinces of the country, which are also impeding the development of cut flower production in those areas. Other reasons limiting the growth of the cut flower industry in Pakistan are the lack of progressive growers, cold chain facilities, and government interest (Kurd et al., 2001).

Most of the flowers produced in Pakistan are sold locally and very few are exported as our produce does not meet the international export standards' large numbers of cut flowers are wasted because of lack of infrastructure, post-harvest mishandlings and improper marketing. The important cut flowers that have a known name in Pakistani trade are Roses, Gladiolus, Iris, Carnation, Narcissus, Lilies, Gerbera, Freesia (Gul-e-Farzana) and Statice (Gul-e-Sataish). Statistical data reveals that almost 10 to 12 thousand tonness of floricultural products are produced in Pakistan on an estimated area of 6,880 ha with no data available on fresh flowers (PARC, 2014).

The majority of respondents (97.5%) were growing roses in open fields, whereas only 2.5% were using greenhouses. Few growers in Pakistan have sufficient capital to afford the construction of greenhouses and the high cost of energy required to operate them. Since most growers have small landholdings, it is unlikely that they can save sufficient capital to construct a greenhouse without support by governmental or other agencies. However, 14–33% of the experienced growers who were in business more than 5 years were using greenhouses, indicating that they were successful enough to afford the greenhouses. As smaller businesses develop and become larger, they may also be able to build greenhouses. The use of high tunnels may be a lower-case alternative to greenhouses.

Of those surveyed, 35% of growers blamed environmental conditions and soil salinity for impeding plant growth, while 27.5%, 10%, 10%, and 7.5% reported that postharvest

handling, nutrition, salinity, and soil/growing media, respectively, were the major problems in rose cultivation. The results suggested that climatic and edaphic factors restrict commercial rose growth and productivity in the study area. These problems may be overcome by using best management practices as well as greenhouse production with proper media and well-balanced nutritional programs containing all required macro- and micronutrients.

Regarding postharvest problems, 60% of respondents reported lack of cold storage facilities as a major hurdle, while 22.5% and 17.5% indicated that shorter vase life and improper non-refrigerated transportation, respectively, were the major problems. Thus, the lack of infrastructure is a major problem (Ahmad et al., 2010).

Regarding harvest stage, 60% of respondents reported that they harvested flowers at partially open bud stage, whereas 40% harvested flowers at tight bud stage. Harvest stage depends on where the flowers will be marketed. Flowers are harvested at partially open bud stage when marketed in nearby local markets and at tight bud stage when transported to distant markets. As majority of the growers were harvesting flowers at partially open bud stage, most flowers were sold in the nearby local markets. All the growers who were illiterate or had less than a 10th grade education harvested their flowers when they were partially open, while the more educated growers harvested them when they were tighter indicating that they were more knowledgeable about proper harvest standards.

Regarding postharvest handling, 92.5% of respondents placed their flowers in water, while 7.5% used ice for this purpose. No one reported using any floral preservatives. For packaging materials, 60% of growers used wooden crates, while the rest 40% used spent cardboard boxes without ventilation holes and layers of dry grass in-between (data not presented). Sixty percent of growers use ice for storage of cut roses, while 40% marketed flowers without storage (data not presented). Except for the part-time postgraduate growers, the more educated growers used ice, indicating that they had a comparatively better understanding of the perishability of their produce and had better packaging and storage conditions (used ice) for their product than other growers. The roses were being transported by rail (40%), both rail and non-refrigerated trucks (30%), non-refrigerated trucks (27.5%), and carts and bicycles (2.5%). All the transport facilities were non-refrigerated, whereas refrigeration is a prerequisite to preserve quality of flowers during transportation (Mercurio, 2007). These results revealed a deficiency in the proper infrastructural facilities required to preserve the quality of this highly perishable commodity. During October to November and February to March, good-quality flowers were produced by growers, but due to unavailability of proper postharvest facilities, more than one-third of the product was wasted, reducing net return and profitability (Ahmad, 2009).

Producers indicated that they were only selling locally because of non-cooperation of government organizations (45%), ignorance of international standards (30%), and poor-quality production. In Pakistan, most of the flowers are produced in winter season when Europe sinks in the snow and most of the traditional functions are held during that period. Our country is rich in resources and has got favorable climate conditions that are very helpful for raising cut flower. Pakistan can earn its foreign exchange in billions of U.S. dollars through export fresh flowers and flower buds (PARC, 2014).

The “cool chain system” covering the whole country could save about the 40% production that is wasted due to absence of proper cold storage facilities and improper handling. It is necessary that TDAP and PHDEC should evolve a plan of action to boost production and exports. Although a cut flower farm is a profitable and attractive venture. The grower is still not rewarded properly in financial term for this work. The middleman or shopkeeper takes a major share of the profit. Especially, shopkeeper enjoys the maximum margin. There is an opportunity for a flower shopkeeper or exporter to set up a business backed by this own cut flower farm. An investor in the floriculture sector can get maximum profit by making the product value added for supplies to hotels as flower baskets, bouquet, and bunch or for direct exports.

Exports of cut flowers and house plants are the need of the day of Pakistani farmers (growers). Being in the stage of infancy the target quality and quantity cannot be achieved unless modern ways and means are adopted along with the provision of basic infrastructure. This will include expertise (staff and skilled labor for crop management, grading and packing), technical advice on production, post-harvest techniques, legal and financial marketing aspects, adequate cool room capacity, reliable supplies of quality planting stock, contact supplies of packing material, post-harvest dis-infestations facilities (for pest control), refrigerated transport to markets, reliable freight forwarded reliable specialist exporters. This will be additional to capital (large amount is required to run the business), market search (to exploit sale opportunity) and the scientific data (to explore the suitability of varieties to certain situation and regions). These modern ways and means of production and marketing will ensure quality production and proper utilization of produce up to the end consumer (AgriHunt, 2014). Other major constraint was inadequate capital that hindered the production of floriculture while the use of farm size, labor, manure, educational level, experience and age of the farmers were having significant influence on the revenues of the farmers. (Manzoor, et al., 2001)

5. IDENTIFICATION AND CHARACTERIZATION OF CLUSTERS

5.1. Identification of Clusters

Although no authentic published data on individual flower is available, recently Ahmad et. al., 2018 has conducted a survey, according to which rose and gladiolus are the main flowers cultivated throughout the country (Table 4).

Table 4: Main Flowers (Cut and Loose) Cultivation with Respective regions in Pakistan

CROP	AREA (HA)	MAJOR PRODUCTION LOCATIONS
Rose	**1,214**	- **Punjab** (Pattoki, Chunian, Kasur, Faisalabad) - **KP** (Peshawar valley, Mardan, Swabi)
Rose Petals (Loose Flowers)	**2,631**	- Punjab (Chunian, Multan, Mailsi, Pattoki, Choa Saedan Shah, Jampur, DG Khan, Sargodha, Faisalabad, Lahore, Gujranwala) - Sindh (Hyderabad, Mitari, Tandoajam, Gharoo, Dhaaby G, Saakro etc.) - KP (Mardan, Peshawar Valley)
Gladiolus	**2,226**	- **Punjab** (Pattoki, Chunian, Kasur, Okara, Faisalabad Multan, RYK, Kalarkahar, Soan Valley, Taxila) - **Sindh** (Hyderabad, Larkana) - **KP** (Swat, Peshawar, Mansehra, Mardan, Swabi, CharSadah) - **Balochistan** (Quetta) - **Kashmir** (Rawlakot, Kotli) - **Gilgit Baltistan**
Tuberose	**316**	- **Punjab** (Pattoki, Gujranwala)
Marigold	**202**	- Punjab (Pattoki, Chunian, Sheikhupura, Rawalpindi. Faisalabad) - Sindh (Hyderabad, Miatri Karachi) - KP (Peshawar Valley) - Balochistan (Quetta)

Jasmine	**121**	- Punjab (Lahore, Pattoki, Multan, Faisalabad, Rawalpindi); - Sindh (Karachi, Hyderabad); - KP (Peshawar)
Statice	**107**	- **Punjab** (Pattoki)
Chrysanthemum	**Annual (81)** **Perennial (20)**	- Punjab (Pattoki, Kasur, Chunian, Sheikhupura) - Sindh (Hyderabad, Karachi) - KP (Quetta, Qalat)
Cosmos, Calendula etc.	**≈ 20**	- Punjab (Lahore, Pattoki), - Sindh (Karachi)
Lilium	**6**	- **Punjab** (Kasur, Multan, Lahore, Rawalpindi, Islamabad)
Tulip	**6**	- **Punjab** (Sheikhupura, Multan, Vehari, Lahore, Rawalpindi)
Chrysanthemum	**6**	- **Punjab** (Pattoki, Faisalabad) - **KP** (Swat)
Gerbera	**2**	- **Punjab** (Pattoki, Lahore, Khanewal)
Gypsophilla	**2**	- **Punjab** (Pattoki)
Narcissus	**2**	- **KP** (Haripur, Peshawar, Swat)
Lisianthus	**0.4**	- **Balochistan** (Quetta)
Amaryllis	**0.8**	- **Punjab** (Kasur)
Carnation, Annual Specialty cuts, Misc. Cuts	**≈ 4**	- **Punjab** (Lahore, Faisalabad) - **Baluchistan** (Quetta)

(Ahmad et al., 2018)

Based on the level of production and marketing importance especially its export potential around which the farmers, agribusiness, exporters, support institutions and infrastructure, we identify two main flower product clusters in Pakistan for detailed study:

1. **Rose Cut Flower Cluster**. Mainly grown in Pattoki, Chonian, Faisalabad, Kasur in Punjab and Peshawar valley, Mardan, and Swabi in KP. Based on its concentration and potential for export, Punjab rose cut flower cluster is selected here for detail study with Pattoki as its focal point (Table 5). Similarty, rose as loose petal is grown in Punjab and Sindh but the main production area is Pattoki Punjab as the focal point.

2. **Gladious Cluster**. Grown throughout the country, but its highest concentration is in Pattoki, therefore considred as Gladious Cluster focal point (Table 5).

Rose and gladiolus flower production occupies prime position among flower production in Pakistan, accounting for about 80 percent of total production of all flowers in the country.

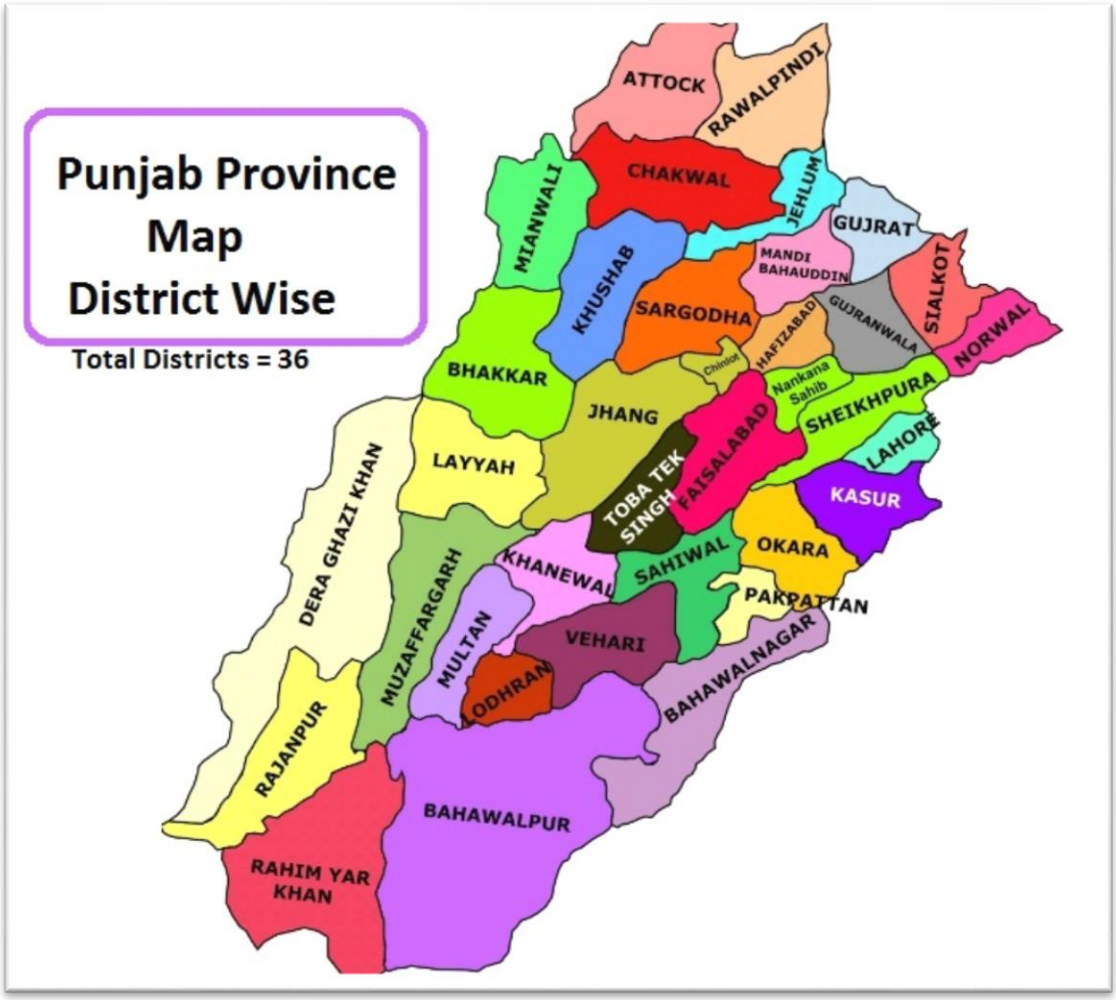


Figure 3: Focal point for Cut Rose and Gladiolus Flowers in Pakistan

Pattoki is taken as focal point for both rose and gladiolus clusters because of the following consideration:

- Located in Kasur district in central Punjab province
- Major production area of cut flowers, ornamentals and cut foliage in Pakistan
- Large number of floriculture farmers
- Over 300 nurseries
- Three wholesale markets (mandis)
    - Pattoki Mandi for cut flowers and cut foliage
    - Tara Gargh Mandi for loose rose petals and garlands
    - Thing Mor Mandi for cut flowers
- Punjab Agriculture Department Extension office
- Nursery Association (non-active)
- Railway Station

The rose and gladiolus clusters in Pattoki, District Kasur, Punjab (Figure 3) have generated a leading floriculture business in Pakistan. It covers 17% of the national area under flower production.

5.2. Characterization of clusters

Cluster characters are prescribed in detailed in Table 5, and briefly described here.

Table 5: Flower Cluster Characteristics

Salient Features	Rose Cut flower Cluster	Gladiolus Cluster
Product	Rose flowers and rose cut flowers (loose petals)	Gladiolus flowers
Districts	Kasur (Pattoki, Chunian, Kot Radha Kishan)	Kasur (Pattoki, Chunian, Kot Radha Kishan)
Area of the cluster: (ha)	1200	1200
Production of the cluster: (tonnes)	10,000-12,000	10,000-12,000
Average yield of the cluster: (stems or tonne per ha)	Cut roses: 1.47 million to 1.98 million flowers Surkha roses: 13.59 tonnes	Gladiolus: 135,850 flowers
Percentage of the crop area that lies in the cluster (flower area of the cluster/flower area in the country)	31%	54%
Percentage of the total cropped area in the cluster (flowers area in the cluster/total cropped area in the cluster)	40%	20%
Geographical and Environmental Factor	Soil varies from clay loam to loam and sandy loam in texture, have high soil pH greater than 8 with low organic matter contents	Soil varies from clay loam to loam and sandy loam in texture, have high soil pH greater than 8 with low organic matter contents
	Latitude 31.02 N, Longitude 73.84 E and 186 m altitude	Latitude 31.02 N, Longitude 73.84 E and 186 m altitude
	Topography has level lands with gentle slope for irrigation	Topography has level lands with gentle slope for irrigation
	Subtropical climate with very hot and dry summers and mild cool winters	Subtropical climate with very hot and dry summers and mild cool winters
	Ground water is brackish and not fit for irrigation	Ground water is brackish and not fit for irrigation
	Canal water best for irrigation and available except during canal closure periods	Canal water best for irrigation and available except during canal closure periods
	Average annual rainfall is 424 mm	Average annual rainfall is 424 mm
	Average temperature in summer is 33.7 C and 12.2 C during winters. In summers, June is the hottest month when temperature rises up to 41 °C and in winters it drops to 5 °C.	Average temperature in summer is 33.7 C and 12.2 C during winters. In summers, June is the hottest month when temperature rises up to 41 °C and in winters it drops to 5 °C.

	Due to smog in autumn and fog is winter, area is facing abrupt temperature fluctuations which is affecting production and quality of flowers	Due to smog in autumn and fog is winter, area is facing abrupt temperature fluctuations which is affecting production and quality of flowers
Flower Growers	About 90% of flower growers have small landholding of average farm size of less than 4 ha. Majority of growers rent/lease the land and make investment	About 90% of flower growers have small landholding of average farm size of less than 4 ha. Majority of growers rent/lease the land and make investment
	Majority of growers (>70%) are illiterate or have basic schooling. Majority (80%) of growers have good experience being involved in flower production for many years.	Majority of growers (>70%) are illiterate or have basic schooling. Majority (80%) of growers have good experience being involved in flower production for many years.
	Labor is easily available in the area for planting and harvesting of flowers	Labor is easily available in the area for planting and harvesting of flowers
	Majority of growers market their flowers to local wholesale markets in the cluster	Majority of growers market their flowers to local wholesale markets in the cluster
	No representative flower growers association exists in the cluster so far, which is direly needed in the area for highlighting issues and seeking possible solutions	No representative flower growers association exists in the cluster so far, which is direly needed in the area for highlighting issues and seeking possible solutions
Product Feature	Roses fragrant, red or pink in color and best for value addition.	Gladioli white, red or pink in color.
	Roses may be used as petals or as cut flowers. Cut flowers have 1.5-3.0-inch bud diameter and 9-24 inches stem length.	Gladiolus and tuberose has 36-48 inch stem length.
	Rose cut flowers are bunched in 50 flowers.	Gladiolus are bunched in 24 or 100
Variety Feature	Roses are thorny plants. Bush roses for value addition grow vigorously, have dense canopy, compound leaves, may or may not form hips, erect branches and flowering in flushes. Cut varieties may have more or less prickles, compound leaves, and stay small because of harvesting along with stems.	Gladiolus grows erect with 7-8 leaves arising from base of plant, and spikes erect which grow from middle of the plant
Nursery and Planting	Roses are either propagated through cuttings or budding. Rosa bourboniana (Lahori gulab) is used as rootstock	Gladiolus is propagated through corms (bulbs) which are either imported from Netherlands or multiplied locally. 50,000 to 60,000 bulbs are planted per acre (1,25,000-1,50,000 per ha)
	Roses are propagated locally in	

	Pattoki or acquired from Institute of Horticultural Sciences, University of Agriculture, Faisalabad	
	Rose cuttings are prepared in November-December, while budding is done in July-August	Gladiolus is planted in October-November
	Bush roses for value addition or petals are planted at 3 × 3 feet distance between plants and rows. Progressive growers are planting at 1-2 ft spacing between single row plants in 4-6 ft wide rows. While hybrid roses for cut flowers are planted at 1 × 1 ft spacing in beds	Plant to plant distance is 6x9 inches and row to row is 12x18 inches
	For bush roses, 4,000-5,000 plants are planted per acre (10,000-12,500 per ha), while cut rose plants are planted at 10,000 plants per acre (25,000 per ha)	
Inputs/Management Practices	For roses, NPK (20-20-20) 1 bag per acre at 15 days interval for cut roses, while 1 bag per acre every month for bush roses	For gladiolus, 4 bags Nitrophos and 2 bags K2SO4 at planting, 500 g Mg plus 1 kg Sulphur plus 25 kg CaSO4 at 3rd leaf stage, while 5 kg Zn plus 2% Boron and Ferrous Sulphate at 6 leaf stage
	Farm yard manure is applied for roses in December (2-3 trollies per acre).	No FYM for gladiolus
	Except a few big growers, other growers are using below average and imbalance inputs, which affect yield and flower quality	Except a few big growers, other growers are using below average and imbalance inputs, which affect yield and flower quality
	Green manuring done during summer prior to sowing	Green manuring done during summer prior to sowing
	Pesticides regularly sprayed on roses to control thrips and mites.	Pesticides regularly sprayed to control fungal diseases on gladiolus. Corms treated with fungicides before planting
	No government control on the supply or prices of inputs like seeds and pesticides. Majority of inputs are available from local dealers and retailers. Growers get inputs from dealers and commission agents on credit, which make it difficult to use standard input products	No control on the supply or price of inputs like seeds and pesticides. Majority of inputs are available from local dealers and retailers. Growers get inputs from dealers and commission agents on credit, which make it difficult to use standard input products
	Flood irrigation is the only method of irrigation to all flower crops in the cluster. So far, no drip irrigation is being used in the region for flower farming. Irrigation is applied as per	Flood irrigation is the only method of irrigation to all flower crops in the cluster. So far, no drip irrigation is being used in the region for flower farming. Irrigation is applied as per

	requirement and availability of canal water. During summer water is applied at weekly interval, while during winter at 20-30 days interval	requirement and availability of canal water. During summer water is applied at weekly interval, while during winter at 20-30 days interval
	Critical time for irrigating roses is after pruning and at flowering.	Critical times for irrigating gladiolus is after sowing and flower development
		Some growers intercrop gladiolus with vegetable crops like cabbage, chilies or coriander, but not a regular practice
		Weedicides are hardly used after sowing bulbs. Growers control weeds by weeding manually.
Pruning/Harvesting	Pruning is done to remove old diseased branches, avoid flower damage due to bruising and invigorate new growth for better quality flowers. Roses are pruned heavily in winters (either December or mid-February), while also light pruning is done in May-June, when temperature is high and good quality production is not feasible	Gladiolus and tuberose are not pruned, while marigold and chrysanthemum are pinched at early growth stage to enhance branching
	Harvesting is done manually and is done on marketing forces. If price is low in the market, flowers are held on plants for some time, which lowers flower quality.	Harvesting is done manually and is done on marketing forces. If price is low in the market, flowers are held on plants for some time, which lowers flower quality.
	Flowers are harvested during day time using flower cutters (Secateurs), placed on bare soil under direct sun which leads to early senescence and blockage of the vascular system with germs.	Flowers are harvested during day time using flower cutters (Secateurs), placed on bare soil under direct sun which leads to early senescence and blockage of the vascular system with germs.
	After shifting under shed, they are either kept on dirty grasses or held in dirty water tubs (roses) which also block the stems and add to free moisture which increases botrytis attack	
Packaging/Transportation	Flowers are packed in wooden crates or spent boxes which have no ventilation holes for transportation. Moreover, dead grasses and weeds are used for cushioning effect while transportation, which deteriorate flower quality.	Flowers are packed in wooden crates or spent boxes which have no ventilation holes for transportation. Moreover, dead grasses and weeds are used for cushioning effect while transportation, which deteriorate flower quality.
	Roses are bunched in 50. Flowers are packed in extra quantities per	Gladiolus are packed in 24 or 100 stems. Flowers are packed in extra

	pack in order to lower transportation cost but cause damage to flowers.	quantities per pack in order to lower transportation cost but cause damage to flowers.
	Rose petals are packed in cotton bags and transported by staking in non-cooled vehicles.	
	Flowers are transported on bikes, carts, and uncooled vehicles, which cause damage to the 1/3rd of the produce during handling and transportation. Railway is used for transportation to Karachi & Hyderabad.	Flowers are transported on bikes, carts, and uncooled vehicles, which cause damage to the 1/3rd of the produce during handling and transportation. Railway is used for transportation to Karachi & Hyderabad.
Wholesaler/Retailer	The local mandis are developed by the private sector which are small, congested and in deplorable conditions. All wholesalers (artis) are growers too.	The local mandis are developed by the private sector which are small, congested and in deplorable conditions. All wholesalers (artis) are growers too.
	Commission agents and contractors buy flowers from growers in wholesale local market. Price paid to the growers depend on variety, stem length, bud size or number of flowers per stem, and number of open flowers	Commission agents and contractors buy flowers from growers in wholesale local market. Price paid to the growers depend on variety, stem length, bud size or number of flowers per stem, and number of open flowers
	Auction in local wholesale market depends on flower quality and variety	Auction in local wholesale market depends on flower quality and variety
	Final grading and packing is done be commission agents in the wholesale market	Final grading and packing is done be commission agents in the wholesale market
	Commission agents control the marketing process and different growers are linked with specific commission agents in the market	Commission agents control the marketing process and different growers are linked with specific commission agents in the market
	Damaged flowers or poor quality flowers are included in center of bunches and this malpractice is quite common	Damaged flowers or poor quality flowers are included in center of bunches and this malpractice is quite common
	Prices are high during wedding seasons, when supply is short and at special occasions like valentine's day, Eids, New Year, Rabi-ul-awal, etc.	Prices are high during wedding seasons, when supply is short and at special occasions like valentine's day, Eids, New Year, Rabi-ul-awal, etc.
	Domestic markets, viz. Lahore, Rawalpindi, Karachi, Faisalabad, Multan and Sargodha	Domestic markets, viz. Lahore, Rawalpindi, Karachi, Faisalabad, Multan and Sargodha
New Technologies/ Infrastructure	There is no infrastructure such as cold stores at local mandis. They are using ice on flowers for distant markets such as Hyderabad,	There is no infrastructure such as cold stores at local mandis. They are using ice on flowers for distant markets such as Hyderabad, Karachi

	Karachi and Rawalpindi	and Rawalpindi
	No proper postharvest handling/packaging unit available in the cluster	No proper postharvest handling/packaging unit available in the cluster
	No rose water or rose oil extraction unit available in the cluster	
	No floral box manufacturer unit available in the cluster	No floral box manufacturer unit available in the cluster
Export	Rose petals are exported to Gulf countries & Germany after dehydration	
	Very limited number of cut flowers are being exported to Gulf countries and prices in international markets are quite low than other countries produce due to low quality	Very limited number of cut flowers are being exported to Gulf countries and prices in international markets are quite low than other countries produce due to low quality
Supply Chain	There is no well-defined supply chain of flowers in the country. Inadequate packaging and transportation procedures pose constraints and bottlenecks throughout the supply chain	There is no well-defined supply chain of flowers in the country. Inadequate packaging and transportation procedures pose constraints and bottlenecks throughout the supply chain
Certification	No farm in the cluster is GlobalGAP certified. As majority of farmers are poor and have small landholdings, they cannot afford this expensive certification. Moreover, being their produce is only marketed locally, they are not interested in this unsustainable certification.	No farm in the cluster is GlobalGAP certified. As majority of farmers are poor and have small landholdings, they cannot afford this expensive certification. Moreover, being their produce is only marketed locally, they are not interested in this unsustainable certification.
Socioeconomic Networking/ Gender Involvement	On farms, whole families work for various cultural practices like weeding and harvesting. Women and children also participate in handling flowers.	On farms, whole families work for various cultural practices like weeding and harvesting. Women and children also participate in handling flowers.
Subsidies/Incentives/Facilities	No subsidies or incentives are given so far to flower growers and stakeholders	No subsidies or incentives are given so far to flower growers and stakeholders

5.3. SWOT Analysis

The SWOT analysis was carried out in major rose and gladiolus flower-producing areas with the consultation and participation of different stakeholders. The clusters have several strengths and opportunities, including trained labor and established market with respect to agro-ecological conditions (Table 6). The results are structured around the value chain functions such as inputs supplies, production practices, cluster interactions, marketing/trade & exports and processing & Infrastructure. Major weaknesses are poor planning, and policy and priority neglect and inadequate investment in research, technology development/breeding, extension, marketing, etc. Threats include diseases and insect

infestation and poor quality, which are made worse by poor production infrastructure, energy shortages for cold storage and processing, and non-transparent trading practices in local market systems. These factors generally hold back investment into the value chain, inhibiting its development.

Table 6: SWOT Analysis for Rose and Gladiolus Cluster in Pakistan

Parameters	Strengths	Weaknesses	Opportunities	Threats
Environment/ Climate Change	Favorable climatic conditions in 1st and 4th quarter of the year for flower production when demand is high	Too hot summer which makes good quality flower production rather impossible during 2nd and 3rd quarter of the year	Different agro-ecological climatic zones in Punjab where flowers can be produced during extended period of the year	Sudden climate changes like abrupt temperature change, rainfall patterns and smog adversely affect flower quality and yield
	Fertile sandy loam to loamy soils			Increase in pollution (pesticide/chemical use)
	Some flowers, like gladiolus may be grown over extended periods		Some crops have quite short-duration which minimize environmental hazards impact on those crops	
Input Supplies	Granular fertilizers and pesticides are available in the market	Outdated planting material and production techniques are used for majority of flower crops	Corms/bulbs of gladiolus are imported for many commercial cultivars	Non-availability of improved planting material of new cultivars of roses and other flowers
	Canal water is available in most areas of the cluster except canal closure periods	Poor production infrastructure with almost no greenhouse for good quality and year round flower production		Shortage of canal water when canals are closed
		Underground water is not fit for flower production		Heavy use of pesticides and their residues
		Organic matter is declining in the soils	Promotion of dairy farming and poultry farming may help increase organic matter in soils	
		Disease incidence and soil sickness in soils increasing due to continuous	Cultural control methods may help disinfect the soils from fungi	Incidence of fusarium and botrytis in gladiolus crop

Parameters	Strengths	Weaknesses	Opportunities	Threats
		monoculture		
		Non-availability of water soluble macro and micronutrients		
		Non-availability of floriculture crops specific pesticides which have less residual effects		
Cluster Interaction	Flower production a major business of large population of the cluster	No corporate and collaborative farming is being done in the cluster	Policies to promote corporate farming and learn from high earning farmers in the cluster	
		Unavailability of proper extension network	Identification of new clusters for floriculture production & value addition	Unstable socio-political situation in the country
		Poor interaction of growers and stakeholders with researchers and academia	Development of cooperatives and enhancing interaction between all stakeholders	
		Lack of regional cooperation	Human resource development (job opportunities & women empowerment	
		Out-dated production techniques as told by forefathers are being used by majority of growers	Organization of trade shows in the area for promotion of interaction	
		Malpractices and lack of trust		
Production Management Practices	Some family businesses are quite experienced in flower production	Lack of improved varieties seeds, certified varieties and tissue culture facilities	Establishment of modern tissue culture labs. For mass production of flower crops nursery	Depletion of environment and water resources
		Unavailability of modern soilless substrates for quality flower production	Provision of certified seeds of new flower crops	Problems associated with training of illiterate growers and stakeholders regarding modern production techniques

Parameters	Strengths	Weaknesses	Opportunities	Threats
		Unavailability of proper plant protection facilities and over use of agronomic crops pesticides which increase rejection of flowers in export markets due to high residual effects	Training of growers and stake holders regarding optimal production protocols, good agricultural practices and sanitary and phyto-sanitary measures	High pesticide use and residues along with poor quality produce increase rejection rate in export markets
		No recommended production protocols best suited to cluster agro-climatic conditions available to growers to ensure best quality production		
		Growers have no idea about proper harvesting and handling procedures		
Transportation	Reliable road and rail infrastructure is available	No reefer trucks available for transportation of flowers	CPEC may improve transportation infrastructure for distant markets and export	Higher import custom duties/taxes on inputs
		Improper packing by noxious weeds and spent boxes with no ventilation holes.	Development of proper floral boxes with ventilation holes	Social issues like police teasing and road taxes
		Limited freight space and high costs of transportation to distant cities and non-availability of air space, no infrastructure for export marketing	Provision of sufficient cargo space with affordable costs	
		Improper staking and parking of vehicles in direct sun damages flower quality	Proper bunching, sleeving, preservatives treatment, and packaging and holding/transport at low temperatures	
Marketing	Higher returns than traditionally grown agronomic crops for major flower crops grown in the cluster	Growers and stakeholders have no idea about international marketing standards and their	Development of market act and marketing reforms	Poor marketing system

Parameters	Strengths	Weaknesses	Opportunities	Threats
		requirements		
		Un-competitiveness in global markets	High market prices of various flower crops in export markets	
		No proper grading of flowers in markets		
		Majority of growers are not directly connected with markets and middleman getting more share		
		Lack of marketing infrastructure, like platforms, storage, auction clocks, etc.		
Trade/Export	Established market link with all major cities of the country	Lack of trained human resource	Training of growers and stakeholders	Import of artificial flowers from China
	Geo-proximity to middle east, Japan, Thailand, Malaysia, and European global markets	Poor quality flower production which is not suitable for export, and result in very less exports	Provision of flower crops during 3rd and 4th quarter of year to global markets when demand is high	Poor interest of growers and stakeholders in capacity building
		No incentives and guarantees/protections from Government for flower growers		
		No credit facilities are available for flower growers and stakeholders	Provision of working capital with low interest for developing facilities	
		No information about payments of royalties and WTO laws	Establishment of farmers' group to promote trade and export	
		Lack of public-private partnership in flower business	Lowering import duties on floriculture related materials and infrastructure	Unavailability of cool chain facilities
Processing/Value Addition	Value added products like rose water, jam, oil, etc. are popular and have great demand in the country	Non-availability of trained manpower and resources for small growers for processing	Increased demand of flower based value added products both domestically and internationally	
	Flower perishability may be reduced through value addition	No information about proper postharvest handling techniques		High cost of high tech processing machines and equipment

5.4. Value Chain Analysis

5.4.1. Input Providers:

A substantial presence of input providers exits in the flower producing areas. City has several dealers of fertilizers. In addition to authorized dealers of fertilizers and pesticides who sell as per the policies of their principals, there are many who buy in retail (small) quantities. These dealers also sell on credit to small growers who usually are short on finances. Due to proliferation of plant protection chemical brands/labels, growers find it difficult to differentiate between quality products and substandard ones. Availability of standard products is reported as an issue by growers. Similarly, there are many stories of cheating growers by selling counterfeit products by fertilizer as well as pesticide dealers. There are serious implications of substandard and counterfeit fertilizers and plant protection chemicals for flower growers as well. Many experts believe that incidence of disease has increased due to ineffectiveness of these chemicals. They also claim that some of the pathogens have mutated due to in appropriate application of broad spectrum pesticides and therefore several insect pests have developed resistance against plant protection chemicals available in the market.

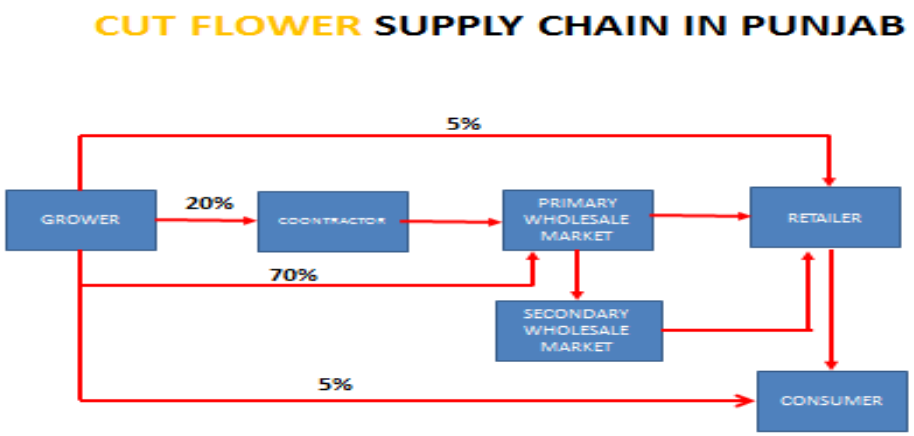
5.4.2. Structure of Flower Production

Flower farms are the production houses where they are produced. Majority of growers lease the land from owners, make necessary infrastructure, and manage all the farming activities at the farm. About 90% of flower growers have small landholding of average of less than 4 ha. Majority of growers (>70%) are illiterate or have only primary schooling. 80% of growers have good experience being involved in flower production for many years. Through the interviews the consultant was informed that 70% of the growers manage to grow and market their cut flowers both rose and gladiolus through the wholesale markets themselves but a small number of growers may also sell the ready crop at flowering to contractors, who are responsible for the harvesting, post-harvest operations, logistics and marketing. It was also highlighted that most of the contractor's/commission agents are growers themselves. There is no price, quality, and time-bound contracts between farmers and market agents**.**

Whereas the loose rose petals are sold to the contractors which they sell it at the whole sale market. On the other hand many farmers de-hydrate the rose petals and sell it to the value addition industry to form various products such as essential oil, rose water, etc.

5.4.3. Structure of Marketing Channels

Thing Mor mandi in Kasur is specified for cut flowers, while Pattoki market is for cut flowers,



ornamental plants and cut foliage and Tara Gargh mandi is for loose rose petals and garlands. All these mandis are owned and operated by the private sector and they are small, congested and in a deplorable condition. Pattoki mandi is the leading flower market in the country, from where flowers are shipped to whole of the country. The flowers, especially roses and gladiolus, are grown for sale as cut flowers.

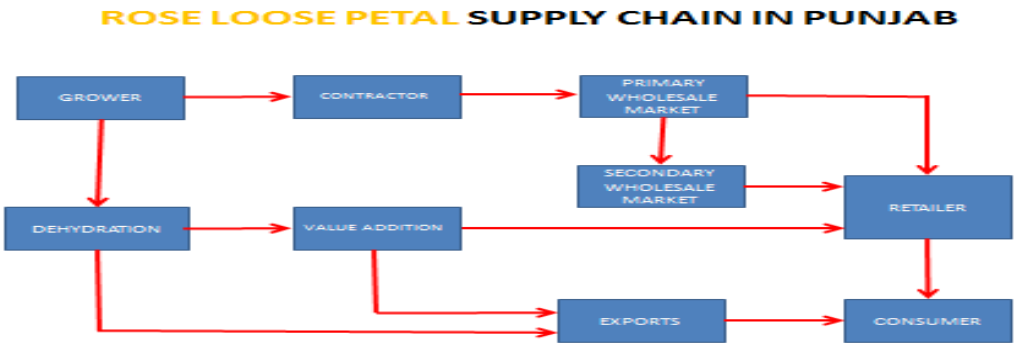


Figure 4: Cut Flower Supply Chain in Pakistan

Farmers, commission agents, and wholesalers are the main players of the market. Farmers sell the produce to wholesalers in primary wholesale markets. Commission agents and contractors buy flowers from growers in wholesale local market. Price paid to the growers depend on variety, stem length, bud size or number of flowers per stem, and number of open flowers. Prices are high during wedding seasons when supply is short and at special occasions like Valentine's day, Eids, New Year, etc.

Final grading of flowers is done by the commission agents at the wholesale market. The flowers are packed into wooden or paper carton, with each flower pack containing 50 pieces of cut flowers (Figure 4). Each package has one thousand pieces of cut flowers (20 packs @ fifty pieces). Damaged flowers or poor quality flowers are included in center of bunches and this malpractice is quite common. These packages are transported to the destination by railway and road. Most of the flowers are transported by road where carts, chingchi and vans are used for short distance markets, whereas buses and railways are used for longer distance markets. Most of the flowers sent to Hyderabad and Karachi are sent through

railways. But due to lack of infrastructure (lack of space during season, no shed or storage facility) at the railway station the quality of flowers is compromised.

Figure 5: Packing & Transportation of Flowers

The market's flowers are used on all occasions – they are worn as jewelry at weddings, used to decorate rooms for newlyweds, in spas and even during funeral rites in all religions. They are also used in processed products such as extraction of essential oil from rose petals units' cluster has a potential in the Pattoki Zone. Further value addition is done by larger industry for: Perfumery, Cosmetics, Essences, Fragrances, Medicines, etc.

Figure 6: De-hydration of loose rose petals

Loose petals are also dehydrated for use in food products, potpuri, etc. The growers either sell it to the contractors which further goes through the traditional supply chain, i.e., primary market and to the secondary markets and ultimately to the consumer. As for cool chain system the fresh rose petals is concerned they are packed with ice while being transported. The other chain is that the growers normally dehydrates it in the open and then sell it to the value addition industry for further processing.

5.4.4. Secondary or Terminal Market

These markets are generally located in big urban locations. Lahore, Karachi, Islamabad, Faisalabad and Multan are prominent terminal markets in the country. Flowers produced in Pattoki reaches through the traditional distribution channel to the consumers.

6. CHALLENGES FACED BY THE CLUSTERS

Almost whole rose and gladiolus produce in the country are marketed locally. Although good quality flowers are being produced, but due to certain challenges in production these are not exported to global markets. These challenges include outdated cultivars, poor production techniques which result in low standard quality than required in global markets, heavy use of pesticides having high residual effects on flowers at harvest, improper postharvest handling and non-existence of cool chain, and packaging facilities.

Both the rose and gladiolus clusters in Pattoki are not developed on scientific lines. There are many shortfalls in production and handling, which need to be overcome if Pakistan needs to enter in global floriculture trade. There is a need for diversification of the production units with new species and cultivars which have high market demand and also new uses in the global markets. There is also a need for improved cultivars, for which purpose Pakistan need to follow breeder rights and IPRs, which are not effective so far in the country and is a major hindrance in getting new cultivars for production and marketing. Almost all flower production is in open fields and in soil, which limits quality production due to environmental extremes and soil borne pathogens. No flower crops specific fertilizers or pesticides are available in the country and most of agronomic crop pesticides are also applied on flower crops. This has high residual effects and such products cannot be exported to global markets. Due to lack of trained manpower and absence of cool chain facilities, even after production of good quality flowers, more than 1/3rd of the produce wasted which lowers the profitability.

6.1. Production Level Constraints

The average national yield of cut roses is 2.5 million stems per ha, 13.60 tonnes of petals of surkha roses and 135,850 stems of gladiolus, which is comparatively low. In case of gladiolus it is due to different production method, while the yield of cut roses is reasonably high, but are not of the quality demanded in global markets. The planting material suitable for different eco-system is not available. Nursery preparation is generally poor for rose flowers. Moreover, yield varies from farm to farm due to different production practices and input use, indicating yield gap which could be improved. Various studies and consultations with stakeholders have highlighted several constraints for low yield, which are: unreliable supply of certified and improved planting material of new varieties, inefficient farm management practices, inadequate pest and disease management strategies, improper pruning, dysfunctional research and poor extension system, lack of mechanization due to small scale farms, no technical know-how about modern production techniques and international market standards required for export, literacy and access to information (Table 7).

Table 7: Gaps and Constraints at Production Level

	Parameters	Rose Cluster	Gladiolus Cluster
1	Research resources	Scanty	None
2.	Special purpose (i.e., for shape, color, aroma, resistance/tolerance, etc.) breeding program	Non-existence Private sector non-active in floriculture R&D	Non-existence both Private sector non-active in floriculture R&D
3.	Mother nurseries or GPUs	None	None
4.	Planting material	Planting material available but uncertified, not suitable for various ecosystem.	Corms/bulbs are imported. Reuse of corms every year reduce flower quality
5.	Nursery preparation	Unscientific	No nursery as they are propagated through corms which are either imported or multiplied.
6.	Plant density	Moderate	Low
7.	Management practices	Primitive	Primitive
8.	Pit material and treatment	Inappropriate material and no soil treatment	Inappropriate material and no soil treatment
9.	Irrigation system	Flooding	Flooding
10.	Pruning	Limited	Not Required
11.	Weeds	Medium problem	Medium problem
12.	Floriculture specific Commercial inputs, like pesticide, micronutrient.	No specific inputs for floriculture is made available.	No specific inputs for floriculture is made available.
13	Insects and Diseases	Thrips and Mites along with Scales	Botrytis, Fusarium Rot and Dry Rot cause
14	Quality	Poor	Moderate
15.	Labor input	Hired and family labor	Hired and family labor
16.	Harvesting/post-harvest techniques	Inappropriate and cause high losses	Inappropriate and cause high losses
17.	Extension services	Not available	Not available
18.	Price, quality, and time bound contracts between farmers and marketers.	None	None

Another factor for low yield of gladiolus is due to low density plantation per acre which is due to soil type and the irrigation system to be used in Pakistan (flooding). Moreover, no flower crop specific pesticides are available in cluster, so mostly agronomic crop based pesticides are being used, which have higher residual effect making produce un-exportable. So, insect

pests and diseases causes significant yield loss. Some of the major diseases which are commonly present in the gladiolus farms and have threatened the flower farming particularly gladiolus in Pakistan include Botrytis, Fusarium Rot and Dry Rot. On roses, Thrips and Mites along with Scales pose serious threat to good quality production. If steps are not taken on emergency basis the threat of pest and disease would become so prevalent that it would be difficult to reverse back leading to threatening the future of floriculture industry in the country. No cooperative or contract farming thus there is no community cooperation to control pests or supply quality flowers.

6.2. Market Level Constraints

Consumers at high end markets tend to pay higher price for quality cut flower. It was witnessed at the wholesale market that a consignment of good quality cut flowers was being transported in reefer van for a Karachi buyer. But due to poor infrastructure in the value chain including tunnel farming and lack of technical and management capacity and financial resources of the growers, most of cut flowers marketed are not of quality standards. There is no price, quality, and time-bound contracts between farmers and market agents.

6.3. Domestic Market Inefficiency

Lack of grades and standards. A major governance related weakness of flower value chains in Pakistan is a lack of well-defined grades and standards. Such grades and standards are essential for the competitiveness in markets with heterogeneous product needs. The current lack of well-defined grades and standards makes price comparisons for flowers of different qualities/grades difficult for both consumers and value chain actors. Consequently, the value chain actors incur losses because of low quality flowers in their supplies and consumers fail to get value for their money.

Poor post-harvest practices. Post-harvest management practices are poor in both the flower clusters (Figure 7). Various studies and discussion with stakeholders highlighted that there are high post-harvest losses ranging from 30-40% (Ahmad et al., 2010, Asif, 2016). The major causes of such high losses are due to poor technical and management practices, inappropriate non-refrigerated mode of transportation, poor packaging and lack of cold storages facilities. Most of flowers in domestic markets are packed in spent boxes without ventilation holes which pile up gases particularly ethylene in the boxes, which kills the flowers.

Poor transportation means. The transportation from farm to wholesale market is done in a traditional way by using carts, bikes, non-refrigerated open trucks, pick-ups, etc., which leads to around 5% losses. Hardly anybody is using refrigerated transportation.

Lack of post-harvest preservatives. Moreover, postharvest diseases and desiccation cause loss of value and shorter vase life. No proper postharvest preservatives are available in the country and handling without treatment leads to early senescence (Table 7).

Figure 72: Poor Postharvest handling practices in the flower cluster area

6.4. Export Market Inefficiency

Lack of market information. For exports to high end markets, the importers' quality standards are stringent and changing overtime. There is no mechanism to collect the quality requirements and associated prices of flowers in different importing markets and disseminate these to value chain stakeholders in the country (Table 8). Moreover, floriculture is a very dynamic sector globally with emerging new production and post-harvest management technologies. No mechanism exists in the country to collect and disseminate the information about these emerging technologies in floriculture production and marketing to the producers and value chain managers.

Flowers must be flawless, conforming to the grading standards and long vase life. Bunches or bouquets be arranged according to pre-set parameters in agreement with customer (stem length, flower size, petal count, number of flowers or stems, bud opening stage, etc.). Color mix and product mix are very important in connection to specific destination. The flowers should be free from pest/disease. Lack of understanding of these requirements in international markets can lead to rejection of product at the border.

Table 8: Gaps and Constraints in Domestic and International Marketing

	Parameters	Rose Cluster	Gladiolus Cluster
1.	Information about production and national and internat'l marketing	No mechanism exists, Disconnect between farmers and buyers	No mechanism exist, Disconnect between farmers and buyers
2.	Grades and standards	Not specified	Not specified
3.	Availability of quality planting material for high end markets	Not available to the producers although some organizations have developed a high-quality rose propagating material	Quality corms are imported but they are expensive. Moreover, quality becomes poor during multiplication.
4.	Packaging	Inappropriate, and without proper aeration	Inappropriate and without proper aeration
5.	Cool Chain/ Transportation	No cool chain infrastructure. Inappropriate and non-refrigerated transport cause 5% post-harvest losses	No cool chain infrastructure. Inappropriate and non-refrigerated transport cause 3% post-harvest losses
6.	Post-harvest preservative	Not available, not used	Not available, not used
7.	Air space availability	Either expensive or not entertained by airlines	Not exported

Inappropriate product presentation and packaging. Presentation and packaging can bring significant logistical challenges, particularly when handling different flower types or arrangements. To meet the demand of consumers in different countries and to protect the original solid colors, mixes, specific stem counts, sometimes weight are the main objectives of packaging and product presentation. boxes, sleeves, decorations and others are very important in the retail/mass market scenario. Bar codes, certification and other information on boxes such as traceability are important components for exports to higher end markets.

According to our findings, **first** of all, planting material and production quality is not even close to the mark required for export. Quality of Pakistani flowers is one of the important impediments in the export of these flowers. It clearly indicates that if competitiveness of the rose cut flowers in the international markets is to be improved, proportion of A-grade flowers with longer sturdy stems and bigger flower diameter would have to be produced. **Secondly**, good and vigorous gladiolus flowers, it has to be protected from hot climate perhaps by growing it under protected cultivation, and continuous multiplication of its bulbs should be avoided; **Thirdly**, understanding the quality requirements of consumers including those for packaging and making product presentation consistent to their demand is very important to compete in international flower market.

6.5. Inadequate Value Chain Infrastructure

For few internationally traded goods, time-to-market is as important as for the cut flowers. Flowers are very sensitive to the treatment that they receive after harvest. Strict control of

humidity, temperature and air quality is essential for delivering an attractive product to the market. Thus in the floriculture industry, inadequate cold chain infrastructure in Pakistan reduces product vase life and lose their freshness.

Eco-labels and certification are increasingly important. GLOBALGAP, Rainforest Alliance, FairTrade, Veriflora and MPS are now recognized by consumers, and some importers and traders (both wholesale and retail) now request them. Some mass marketers have their own certificate or recognize specific ones. Environmental sustainability and Corporate Social Responsibility (CSR) are considered equally important. International suppliers to the US have standardized individual efforts in this respect, e.g. Flor Verde (Colombia), Flor Ecuador.

6.6. Lack of Processing

Currently, flowers are being harvested during noon, which is generally prohibited for export. In roses, it leads to loss of volatile compounds from rose petals. Mostly, rose petals are marketed and very limited quantity is used for rose water extraction or other value added products. The main constraints in processing are the lack of appropriate roses with high essence content, awareness of the potential investors about the potential of rose extraction, and the knowledge about the availability of technology for the rose extraction (Table 9).

Table 9: Gaps and Constraints in Value Chain and Processing

	Parameters	Rose Cluster	Gladiolus Cluster
1	Appropriate material for processing	Available only with some research institute.	No processing
2	Cold chain	Not developed	Not developed
3	Value addition/processing technologies	Low level technologies available but not adopted.	No processing
4	Auction/wholesale markets	Poor infrastructure	Poor infrastructure
5	Certification for traceability	None	None
6	Branding	None	None
7	Air Freight	Lack of air space with airlines	Lack of air space

7. CLUSTER POTENTIAL

In this section an attempt has been made to evaluate the potential in the cluster in terms of production, quality and market side of flower value chain. This will be helpful to establish benchmarks 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 flower value chain cluster.

7.1. Production Potential

Looking at the gaps and after discussion with the stakeholders, we believe that rose cluster yield can be enhanced by 50% approximately from 14 tonnes/ha to 20 tonnes/ha through better farm management practices, increasing plant population, using modern production techniques, and by soil solarization. This is also possible by propagating high-yielding rose such as Rosa Centifolia material and standardized technologies which are available with the research institutes and agricultural universities in the country. Yield of gladiolus cluster can also be enhanced up to 50% by improving management practices especially minimizing disease incidence.

In addition to improvement in per hectare yield, there is a potential to increase area under floriculture, although in this study we are not exploring this potential. For example, with the available heat tolerant rose varieties developed by UAF and AARI, rose petals can now easily be grown in areas with high summer temperatures. With more stable yield and being more profitable, growers are converting from other agriculture produce to rose production in Pattoki cluster. If facilities and training are provided to the growers, yield and quality can be substantially improved for both cut flowers and rose petals production.

7.2. Demand Potential

Due to change in life style of the people as well as growing real estate, event management, hotel and restaurant businesses in the country, demand for various floriculture products has increased several folds during past decade. Demand has also risen due to globalization; masses have become familiar with role of flowers in daily life to fulfill aesthetic needs. There has been an increased demand of quality flowers in the major urban areas such as Karachi, Lahore Islamabad/Rawalpindi, Faisalabad, Multan and Hyderabad. This is also due to a change in lifestyles and trends of using flowers at special occasions such as weddings, funerals, Valentine Day, Christmas, Mother's Day. Also in fresh form they are used in garlands, bouquets, wreaths and in dried form they are the source of natural essence that is used as Attar and flavoring for various food items. In order to fulfill the local demand Pakistan has been importing various varietal flowers which are in short production and not produced in Pakistan, mainly cut flowers and bulbs from Holland, Malaysia, Sri Lanka, Kenya, Saudi Arabia & Thailand which can be substituted with enhanced production in the country.

Moreover, climatic and human resource advantages also depict potential to enter into global markets and fetch foreign exchange for the country. With introduction of improved varieties and modern production techniques and provision of required infrastructure, quality flowers can successfully be grown for export.

In world market, scarcity of flowers is found during winter because of more festivals (Christmas, New Year, Valentine Day, International events), in winter during this time, freezing conditions of major production center i.e. European countries. Therefore, in Europe there is a decline in flower production and the cost of production is substantially higher during the winters, resulted the export demand increases. To overcome the higher production cost, European countries are looking towards new production centers like Asia (India, China) and African countries (Ethiopia, Kenya) for cheaper flowers. Being blessed with diverse agro-climatic conditions, Pakistan can lead in production of cut flowers required in global market.

An increase of 50 % yield of Roses and Gladiolus from the current base in the Pattoki cluster over the period of ten years can result in an additional production 40,755 tonnes (valued at US$ 6.10 million) of Roses and 203.78 million stems of gladiolus (valued at US$ 23.61 million).

7.3. Production to Export Ratio

There is considerable potential for exports of Pakistani flowers to high end markets in Gulf and Far East countries and Europe especially Germany, Dubai, Saudi Arabia, Qatar, Oman, China, Thailand and Japan, etc. Pakistani flowers can fetch good prices in international markets, as long as they meet quality standards, quarantine requirements with regular delivery and reliable logistics. Export potential to China is enormous due to very big market, FTA status, its proximity to Pakistan and coming of CPEC project.

Potential for export of cut flowers from Pakistan exists due to favorable agro-climatic zones and proximity to Gulf and East-Asian markets. Moreover, Pakistan has enormous scope to enter in global cut flower exports by growing varieties demand in global markets and by producing suit stems as per international standards. Some of these rose varieties are already available with research institutes, like AARI and University of Agriculture, Faisalabad.

With the opportunities stated above and after discussion with stakeholders, we assume that the production-export ratio of rose can be improved from 0.4% to 0.8% (100%) and 0 to 0.5% for gladiolus. This is expected to generate additional annual revenue of US$0.448 million in both the cluster in five years.

7.4. Improvement in Quality

One of the areas of concern in floriculture sector of Pakistan is the gap between the domestic prices compared to the global prices. The export price of Pakistani flowers (mainly de-hydrated rose loose petals) was US$2,404/tonne whereas the average price of top ten exporting countries of roses was US$5,909/tonne. Reason of this difference is the low quality of the produce (cut flower and dehydrated rose petals) using traditional pre and post-

harvest production activities and using manual sun drying of rose petals result in loss of volatile compounds. Interventions and strategies which can improve the quality such as by adopting best practices and modern mechanical dehydration technologies and practices of petals can at least increase quality and exports of the domestic produce to international export standards. This will increase economic returns in the whole value chain. Along with dried petals, we need to focus on export of cut flowers because cut flowers account for 50% of total floriculture trade in international markets. Although currently no significant exports of cut flowers are being made from Pakistan, but there is enormous scope to fetch our share from global floriculture trade as there are several markets in our geographic proximity and we just need to deliver quality products as per their demands.

Improving the value chain and establishment for both rose and gladiolus clusters - (mentioned in the strategy section) and with proper marketing strategy it will bring this quality at least par to the world average quality thus fetching at least average world price of top ten exporters. Using this higher export price for the existing and additional export will bring US$5.037 million in the fifth year.

7.5. Reduction in Post-Harvest Losses

Post-harvest losses, one of the major concerns of agriculture in Pakistan, account for nearly 35% of wastage of flowers in the country. With improved post-harvest technologies such as better harvesting techniques and packaging, cool chain system and appropriate dehydration system, these losses can be reduced to 15%. This will generate estimated revenues of US$14.842 million in the cluster for both rose and gladiolus flowers at the existing farm gate price. The number of cold storages and processing units to be established in each cluster has been calculated in the Cost & Benefit section. As per requirements, these units are expected to create 300 jobs.

7.6. Establishment of Allied-industries

Allied-industries associated with floriculture like greenhouse construction and installation, shade net manufacturing, grading and packaging machines, etc. will come up owing to high demand with the expanding area under protected cultivation. This will also create substantial income and employment opportunities in the peri-urban areas.

8. PLAN, STRATEGIES, POLICIES AND NETWORKING

8.1. The Plan

After discussing with stakeholders along the value chain and looking at the potentials of each cluster, it is planned to formulate a five-year development project to achieve the following specific targets in each cluster (Table 10).

Table 10: Targets of Flower Cluster Plan

1.	A 20% increase in per ha yield of the remaining rose gardens and gladiolus gardens through improved management practices
2.	Reduce post-harvest losses from 35% to 25%
3.	Increase export to production ratio of rose by 100% (0.40% to 0.80% for rose and from zero to 0.5% of gladiolus in the next five years
4.	Improve the quality of both flowers so that 5% of its local produce can fetch the average world export price.

8.2. Macro Policies

The floriculture sector has great potential not only to generate income, employment and foreign exchange earning but also beatify the environment. But the sector has 11een neglected in the past and needs lots of government attention to revive. Number of policy issues required to be addressed by the Government in floriculture sector and agribusiness. They are:

- To make floriculture a priority sector for addressing the issues, floriculture may be declared as an industry and investment in the sector may be given special incentives. Incentives would be required in the beginning to promote floriculture export.
- The Government should encourage and facilitate through incentives such as grants, credit with low interest rate and tax incentives the establishment of flower value chain infrastructure such as tissue culture labs, certified nurseries, flower auction floors, value addition and cool chain infrastructure by private sector.
- The Ministry of Commerce need to continue the incentives as provided in the Strategic Trade Policy Framework 2015-2018. Special incentive to be provided to floriculture sector as it is a still in its infancy stage.
- Reduction in import duty on planting material and equipment especially the quality hybrid flower seeds.
- Air freight should be reduced to reasonable level. Sufficient cargo space may be provided in airlines.

- Government needs to put lots of efforts to pu in place the floriculture applied research both in the public and private sector. While public sector can focus on collecting and supplying germplasm, the private sector can develop varieties of different flowers suitable under various ecosystem. Similar, incentives should be provided to develop floriculture related tools and equipment within the country in the private sector.
- Floriculture seed industry especially for home gardening needs to be promoted. The tissue culture nurseries to supply certified true to type propagating materials should be encouraged in the private sector.
- Technical skill training is required to create professional human resources in managing flower production both on open field and greenhouse, landscaping, nursery raising, flower packaging, storage, and transportation. Special training would be requited in harvest and post-harvest handling of flowers. The Floriculture Directorates in the provinces should play a leading role in this.
- Many of the floriculture activities like IPM, certification, branding, etc. require community action. Similar, effectiveness of quality assurance and possibility of initiating quality-price contract farming through groups should be emphasized through FEGs. The public sector should play a catalyst role in the social mobilization of farmers and other stakeholders along the value chain.
- Most importantly, is the role of the government and flower organizations in promoting the public awareness about the potential benefits of using flowers on the mood of the people and on the beatification of the environment.

8.3. Strategies

The promotion of floriculture sector in Pakistan requires adopting an aggressive strategy in line with the best practices in the world for the purpose of tapping the fullest potential of the sector in local and export markets. Execution of this strategy requires making improvements in the existing production and marketing setup of flower for the purpose of increasing the country's flower production and its quality to meet international standards.

8.3.1. Social Mobilization and Networking

One of the strategic interventions in floriculture cluster development is to organize Farmers Enterprise Groups (FEGs) involving 20-25 growers who are willing to make investment together on value chain infrastructure. The floriculture related infrastructure will be owned and operated by the group. The needed investment for the infrastructure, after whatever has been provided by the government, will be gathered from the farmers and profit from the services supplied will be shared among the farmers proportionate to the level of their contribution in the investment.

New varieties of rose and gladiolus will be tested and introduced and incentive will be channeled through FEGs. Experiments and field trials shall be organized with focus on quality flower production in their fields. Field days shall be organized by FEGs with help of agriculture departments in a crop season to share experience and results of the application of modern techniques. The rest of the farming community shall also be invited to share

learning, experience and overall benefits of modern techniques. Also these FEGs would be able to create economies of scale and can collectively deal with input suppliers, technology suppliers, financial support, contractors, exporters and processors to get better deals.

Some NGOs, particularly, Rural Support Programs (RSPs) have initiated rural development activities with community participation. RSPs organize small community groups, mobilize group resources to build financial capital and provide training to develop skills of its members. RSPs provide micro finance services to members of community organizations without collateral. RSPs can organize a relatively small group of several growers interested in enterprise development. Due to their experience and extensive network the project needs to collaborate with RSPs social mobilization of these FEGs and support them in their collective efforts.

8.3.2. Strengthening of Floriculture R&D

The existing Floriculture and Landscaping Research Institute (FLSI) under the Directorate of Floriculture in Lahore should be shifted to the DG(AR) in AARI, Faisalabad and its development component should be shifted to DG(AE&AR) in Lahore. The capacity of FLSI requires a major overhaul and upgrading. Some of key areas identified through survey and discussion with the stakeholder and experts where the research and development efforts need to be initiated on priority basis are:

- **Establishment of protocols for tissue culture labs**. Tissue culture labs can produce true to type healthy bulbs of gladiolus and other flowers with exciting colors and shape. The distribution of such bulb along with recommended practices can uplift the floriculture sector in the country. The research should establish and supply the protocols for the multiplication of these bulbs to the private sector.
- **Development of high-yielding rose varieties**. Currently, Surkha rose is grown on large area in the country for petal production and export. However, it has less yield and poor quality oil contents in the petals. Therefore, there is a need to introduce new high yielding rose varieties which have better oil contents and constituents.
- **Dissemination of existing varieties**. At University of Agriculture, Faisalabad, a new variety of *Rosa centifolia* has been developed which profusely flowers throughout year even at higher temperatures than 40C, which need to be popularized and distributed among growers for getting higher flower yields of good quality throughout the year.
- **Soil treatment to disinfect against fusarium**. At Pattoki, due to continuous gladiolus production on same soils, soils have got seriously infected with fusarium, which is resulting in heavy loss of crop. Therefore, this soil needs to be treated either by solarization or through rotation for 3-5 years in order to disinfect the soils and protect next crops. This needs comprehensive studies to be conducted for sustaining soils for future flower production.
- **Development of local homemade floral preservatives**. Currently, growers have no idea of using floral preservatives in Pakistan because no floral preservatives are commercially available in Pakistan. Being a necessary component of postharvest handling of cut flowers, research on homemade local preservatives is being

conducted at University of Agriculture, Faisalabad, which need to be disseminated to growers and stakeholders for keeping their flowers fresh for longer periods.

- **Development of grades and standards**. **There is therefore a need for FC in coordination with the Agriculture economics and marketing wings of provincial agriculture departments in collaboration with relevant institutions to develop grades and standards for rose and gladiolus flowers.** Strict enforcement of such grades and standards would help consumers to obtain the values they desire and increase the profitability of value chain actors.
- It is recommended that special platform at major wholesales markets needs to be established for those products conform to established grades and standards. It is necessary to establish cold stores at these special platforms so that the flower quality is kept and also during glut period the seller can store it and sell it appropriate time.

But this should not be the only issues addressed by the FLSI in the long and medium term. It should be assigned major responsibility for developing new flower varieties under different stress situations, promoting floriculture healthy seedlings of improved flower varieties, developing and introducing new scientific flower and seedling production and post-harvest handling techniques, and exploring the international flower market. Specific issues not only just in production but along the whole value chain will be undertaken by the institute at the request and funding of FEGs and other flower related associations along the value chain. The results of this research will be generally conveyed to flower farmers across Pakistan, but more particularly to the cluster farmers and other stakeholders along the value chain.

8.3.3. Establishment of Floriculture Center

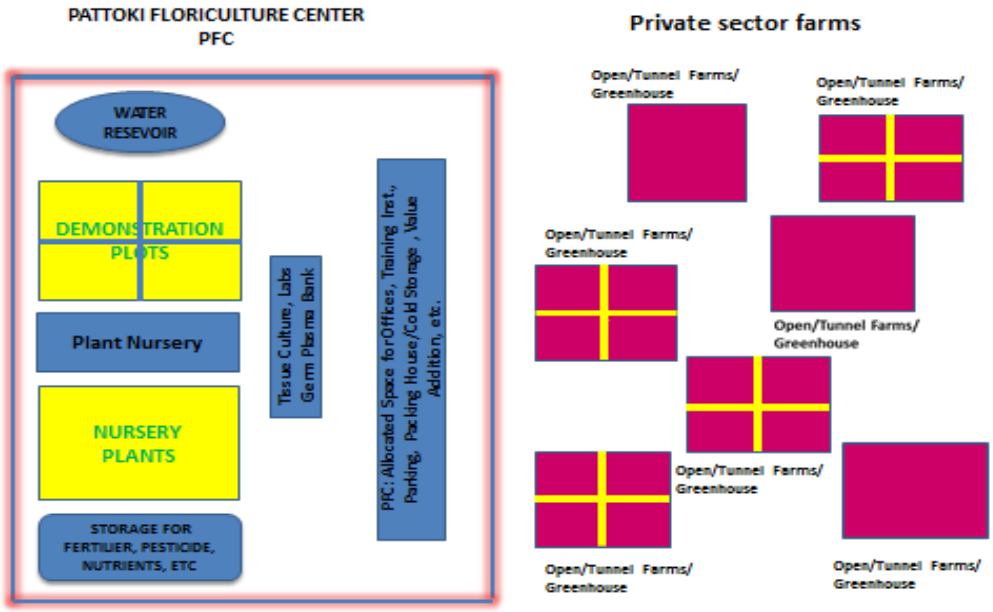
A Floriculture Centre (FC) as common facility centre will be established under FEG/Association in each flower cluster with all the necessary supportive infrastructure for the purpose of producing and supplying quality flower for export and high-end domestic markets. The proposed facilities shall be established on an area of 4 ha which will be provided by the government. Each FC will provide modern technologies such as protected materials like plastics, green houses, drip irrigation, fertigation technology, etc. on subsidized prices as per demand of the farmers. The Centre will be put up under public private partnership through incentive mechanism such as grants/loans. Having a consolidated flower area organized on modern practices will immediately attract the attention of the national and international stakeholders. This model has been implemented in India under the project name TANFLORA – Tamil Nadu Floriculture Infrastructure Park with the support of Indian government (Brief in Annexure 3). The following infrastructure and services will be developed in the FC:

1. Flower Pack House. This facility will be for the purpose of cleaning, grading and packaging of flowers as per the customer requirements in national and international markets. The number and capacity of these packing houses will be determined by the production figures of floriculture.
2. Cold Storage. For preserving the flowers freshness, it is important to place it in controlled temperature and humidity conditions. For this purpose, cold stores will be built, and the number and capacity of these cold stores will be determined by floriculture production in each cluster.

3. Proper Transportation Facility. Small reefer trucks for flower transportation will be provided by the centre. These trucks may be owned by the FC or rented from the market on need basis.
4. Extension and Advisory Services. The FC will host the floriculture staff from the agriculture department. The facility would also develop demonstration plots growing flowers under best practices to showcase and serve as a training facility for the growers in pre and post-production activities in the production of quality and exportable (GlobalGAP) products. Depending upon the nature of the assignments, the FC may engage short-term experts may from time to time including foreign experts and local universities faculty and researchers.
5. Farming Input Suppliers. The project will be a large consumer of farming inputs. Therefore, there will be provision for input suppliers to build their stores in the FC. Farmers will be able to get all the required inputs from the centre.
6. Loading Stations and Parking Areas. There will be areas and bays in the FC; to be used for loading the product boxes on trucks and containers.
7. Offices. A separate offices area for the farmers to carry out their routine business activities will be established. Similarly, there will be offices for local and international traders, farming input suppliers, transporters, etc.

The FC would be working under the Steering Committees of the FEGs/Association including members from the business community as well. The Project Managers and all other members of core technical team, supporting team including accounting, administration, and monitoring be deployed from the private sector with 20% financial support from the government. The remaining cost will be borne by the member of the FEGs on volunteer basis. The government will provide one-time endowment fund to provide 20% subsides on building the infrastructure of FC. The donors may also contribute in the endowments fund. The endowment fund will be managed by the Secretary Agriculture (SA) on the request of the SC of the FC. The Agriculture Department will also support the facility by providing extension services through Directorate of Agriculture Extension (Horticulture) and Directorate of Agriculture (Floriculture) on ongoing basis.

The estimated cost of the FC is estimated to be Rs. 100 million. Besides, the support services would be provided to individual farmers on charge basis. It is expected to generate over 100 jobs.



8.3.4. Improved Management Practices

Some key areas to improve farm practices include timely and balanced fertilizer and pesticide/insecticides use, and use of micronutrients. **Soil management training should be imparted which includes soil testing and accordingly use of inputs.** Over spraying of chemicals should be discouraged as it is hazardous to human health and effects exports due to international MRL protocols. Though Pest Warning and Quality Control department, federal and provincial seed corporation and plant protection departments are making good efforts in monitoring the adulterated fertilizers and pesticides in the market but still many unbranded adulterated inputs suppliers are active in the market, so the above mentioned authorities need to be empowered to levying strict penalties.

There is an urgent need in Pakistan for the application of better technologies to boost the floriculture industry's performance such as greenhouse technology for export quality flower production, cold storages, provision of improved packaging materials and preservative solutions. Imported technologies are expensive and, in any case, local users may find them difficult to operate, so there is a need to develop low cost, easy to operate local machinery and equipment. **The other option is to joint ventures with international companies for imparting with latest technology and know-how and also will established international marketing linkages.**

Machinery is required for mechanized harvesting, grading and packaging of cut flowers as well as dehydrators for controlled atmosphere drying of petals for preserving quality. Currently, majority of cut flowers are harvested in cluster areas during noon, which reduces the vase life and hastens flower senescence. Growers need to be trained about proper time and method of harvesting and handling flowers so that their freshness can be preserved. Moreover, flower cutters need to be sharp and disinfected frequently to remove all bacteria and other germs to avoid spread of infection among flowers. Flower should not be placed on dirty soil and need to be immediately shifted into cool shed for removing field heat and processing. After shifting and grading, these need to be treated with preservative solutions

for enhancing their vase life. Afterwards, flowers need to be properly packed in floral boxes and stacked in cold storages. To preserve quality reefer transportation should be promoted. **The FC should undertake a pilot project by introducing reefer transportation to educate growers of the benefits incurs by selling quality flowers at higher prices.** For all these interventions, proper training mechanism needs to be devised as Farmer Field Schools in various areas in the cluster. Specialized horticulture extension services are required to improve orchard level practices. These must be equipped with adequate knowledge of modern orchard practices, such as pruning, spraying, picking, harvesting and handling of flowers. To this end, both short and long term training courses on modern orchard and postharvest management need to be provided for PFC extension and Agriculture Department Extension staff. Moreover, training of trainers would be done and create Farmers Enterprise Groups (FEGs) for collective action as far training, certification and other activities required. Currently, no idea of farm certification exists in the cluster area for flower farms, which need to be initiated and GAP/SPS need to be implemented for entering into export business. This would be the focus in the production of floriculture at Pattoki Floriculture Center.

8.3.5. Capacity Building of Farmers

To make changes in above specified farm management practices, a program of capacity building of various stakeholders would be required in farm production and postharvest handling techniques covering following areas:

Pre-Harvest

- Soil Management
- Pruning
- Irrigation Management
- Disease and Pest Management
- Balance & Timely use of Fertilizer including Micronutrients and Plant Growth Regulators
- Mechanization

Post- Harvest

- Improved Harvesting and Handling Methods
- Field Heat Removal and use of Preservatives
- Improved Grading and Packaging,
- Better Mode of Transportation

University of Agriculture Faisalabad has signed a MoU with PUM Netherlands since 2017 for training of the growers and stakeholders for holding training workshops which are imparting training to the flower growers and stakeholders on specific topics of interest. Moreover, FLSI of government of Punjab is also providing guidance to the growers in the cluster through one of their instructor on weekly basis. These interventions are proving helpful in social mobilization of the growers and interested persons in the floriculture business.

8.3.6. Establishment of Certified Nursery

Clean and healthy nursery plants of high varietal purity and disease free bulbs and corms are a basic requirement for good quality rose and gladiolus flower production. This necessitates the establishment of certified clean nurseries in rose production hub (option is to establish such nursery within the Pattoki Floriculture Center) that can produce certified plants so that good quality plants can be raised from good quality cuttings. Moreover, disease free bulbs of new varieties with exciting colors and shapes need to be produced through tissue culture labs or imported for providing to the growers for good quality gladiolus flower production. For this purpose, tissue culture laboratories need to be established for disease free bulbs and saplings production.

8.3.7. Modern Production and Market Infrastructure

No country will be able to enter the international market without putting modern infrastructure which includes greenhouse technology and cool chain system. New entrants in the global floriculture scene such as Kenya, Ethiopia, India and few others have extensively invested in these technologies with the financial and technical support from the government, donors and joint venture arrangements with international companies. We suggest here to provide government support in establishing green houses and cold storages.

Green Houses. The controlled environment of green-houses gives the producer control over what kind of flowers the growers wants to produce and under the required control conditions. Some of the important aspects of using a greenhouse are higher and reliability of yield with year-round and disease free production, efficient use of chemicals, pesticides and water. As Pakistan is primarily an agri-based economy, there exists a huge potential of cut flowers cultivation under greenhouse for exports, especially when local growers have already accumulated many years of experience in cut flowers cultivation in the Pattoki cluster. To provide a jump start towards this endeavor it is proposed that farmers in Pattoki be supported to establish greenhouses.

Cold storage and reefers. To keep the cold chain intact from production to market there is need for establishing small scale cold stores at farm-level at Pattoki production area, medium size cold storage at wholesale markets local “mandis” in Pattoki and large scale stores at Karachi and Lahore airports for exports. These stores can be utilized for other products like fruits and vegetables as well. More important is to introduce reefer transportation especially catering to distant markets such as Karachi, Islamabad and Peshawar. The cold storages and reefer transportation would be established under grant mechanism by the government.

8.3.8. Introduction of Processing

There are three main reasons for flower processing: utilization of excess produce and elimination of waste; stabilizing farm income by adding profits; and finally affording an outlet for creativity. Hence there is wide range of products which can be value added, processed products include essential oils, petal jam (rose, rhododendron), jelly, ready to serve beverages, wine, floral tea, rose hip juice, poultry feed, insect repellent, floral dyes, petal embedded handmade paper, cosmetics like calendula cream, rose water, rose cream etc.

Pharmaceutical and nutraceutical compounds: Due to globalization international competition is increasing, people are becoming more conscious, therefore use of natural ingredients is increasing in food and pharmaceutical industry. Thus, flowers pigments like carotenoid, xanthophyll, anthocyanin etc. are being used in food industry and compounds like lutein, vincristine, catharanthine, vitamin C extracted from rose hips are being used in pharmaceutical industry.

Despite many value addition options available, we propose that Pakistan should initially invest on Dehydration Facilities because of the availability of large rose petals during the peak season of rose supply. The dry rose flower export from Pakistan has been a recent phenomenon. Currently, it is not being done scientifically and petals are just dried under sun which results in loss of quality and volatile contents resulting in low prices in international markets. Therefore, there is need to establish small scale modern dehydration units in the cluster area for efficient drying of the petals preserving their volatile components. The best thing is to start a dehydration unit that require very cheaper infrastructure. Mainly two methods are commercially viable i.e. Press Drying and Embedding & Drying. Naturally available unutilized flora and cultivated colorful annuals can be dehydrated through press drying. Standard cut flowers and other attractive flowers can be dehydrated in its original color and shape through embedding and drying using either hot air oven or micro wave oven or solar cooker.

There is a demand for dried flowers within the country as well. It is being used in value addition by making Gulkand, rose sharbat and rose water. There is also a great scope of drying the flowers and to convert them into everlasting value added products like dry flower arrangements, baskets, bouquets, table arrangements etc. Among different dry flower products out pot pourri is a major dry flower export item. Besides this there are press dried flower products including greeting cards, bookmarks, swaths, paper weights, wall hangings, table tops, table mats, etc. Most of these dry flower products have a shelf life of 6- 9 months therefore, consumer can enjoy these flower products for comparatively longer time and utilize maximum benefit of the money spent. Training on making such value added products should be imparted in the Pattoki Floriculture Center. The dehydration plants for drying rose petals would be established under matching grant mechanism by the government.

8.3.9. Database for Floriculture

Presently there is no database to understand the dynamics of the floriculture sector in Pakistani and international markets. This is critical for planning towards strategic intervention, hence the priority of the government is to have a detailed surveys looking all aspects of the floriculture sector in the domestic and international markets.

9. BENEFITS AND COST 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 conducted that evaluates the benefits of the floriculture cluster development interventions in the target region of Punjab.

9.1. Summary of Costs

Two types of costs are required to implement the upgradation plan: i) Investment fixed costs, ii) operational costs for improved value chain. The total investment costs of the projects over the whole project period is US$13.71 and US$11.323 million in Patoki rose and Pattoki gladiolus cluster, respectively (Table 11). The distribution of these costs over the period can be seen in the production cost sheet of each cluster in EXL model.

Table 11: Summary of Investment Costs for Rose and gladiolus clusters

Summary of Investment Cost	Rose Values	Gladiolus Values
Total Investment (Mill. US$)	13.719	11.323
Total ha of land under flower production (ha)	1,200	1,200
Estimated investment per hectare (US$)	11,432	9,435
* Currency conversion rates (I US$: 135 PKR)		

The per tonne flow of operational costs at various segments of the value chain in each cluster are shown in Appendix 4, which are converted into the cluster level costs depending upon the level of output that passes into the value chain segment to meet the plan objective. It is worth noting that operational costs start during the 2nd year because 1st year is used for learning new practices and put infrastructure in place, and continue until the last year. The segment level and total additional operational costs for the whole value chain are shown in (Table 12).

Table 12: Additional operational costs (000 US$) due to upgradation plan at different segments of the value chain by cluster

Item	Gladiolus Cluster				Rose Cluster			
	Yr.2	Yr.3	Y.4	Yr.5	Yr. 2	Yr.3	Yr.4	Yr.5
Cost of Production Inputs and Harvest	478	956	1435	1913	89	178	267	356
Cost of Transportation and Storage	33	66	100	133	9	17	26	34
Cost of grading and packaging	60	120	179	239	7	14	22	29
Cost of domestic marketing	14	29	43	58	29	58	87	116
Cost of international marketing	2	3	6	8	1	3	5	6
Total Costs (000 US$)	587	1175	1763	2351	**135**	**270**	**406**	**541**

9.2. Economic Returns (Rose Cluster)

In the Pattoki rose cluster, the gross revenues before flower cluster development are estimated to US$24.21 million per year. Cluster development investments are expected to generate revenues from the 2nd year of the program resulting an additional gross revenues of US$2.96 million in the 2nd year and US$13.25 million in the 5th year. The total initial cluster investment during the 1st year is at US$5.64 million in the cluster (Table 13)

All the value chain costs including those related to the production, processing, marketing and selling are applicable from 1st through to 5th year, the total of which ranges from US$0.135 million to $0.541 million in the respective year (Table 13).

Table 13: Economic Returns and Investments in Punjab Cluster (Rose)

A	B	C	D	E	F	G
	Parameters [All Amounts: 000 USD]	Year 1	Year 2	Year 3	Year 4	Year 5
	Revenues Under Existing Conditions (000 US$)					
	Total gross revenues from cluster before interventions	18,887	18,887	18,887	18,887	18,887
	Expected Revenues from Cluster Development Interventions (000 US$)					
	Intervention-1:					
	Expected additional revenue from Improved Manangement Practices	-	944	1,889	2,833	3,777
	Intervention - 2:					
	Expected additional revenue from Reduced Post Harvest losses	-	496	1,039	1,629	2,266
	Intervention – 3:					
	Expected additional revenue from increase in prodution export ratio	-	62	134	215	306
	Intervention -4:					
	Improvements in value chain:	-	623	1,338	2,147	3,057
	a) Average export price (USD/t) of top 10 exporting countries					
	b) % of domestic production to be evaluated at international prices					
	Total Expected Additional Gross Benefits (TAGB)from cluster development interventions – (Sum of all intervention revenues)] (000 US$)	-	*2,126*	*4,399*	*6,824*	*9,407*
	Expected Costs (000 US$)					
	Value Chain Based Costing		478	956	1,435	1,913
	Cost of Production Inputs and Harvest (C1)		33	66	100	133
	Cost of Transportation and Storage (C2)		60	120	179	239
	Cost of grading and packaging (C3)		14	29	43	58
	Cost of marketing (C4)		2	3	6	8
	Others		587	1,175	1,763	2,351
	Total Costs [TC] – [Sum of all Costs] (000 US$)					
	Cluster Investments (Please see key notes) (000 US$)					
	Investments required on Research & Development Level Interventions (USD)	148	370	370	444	481
	Investments required on capacity building (US$)	12	9	5	5	-
	Investment on tissue culture labs (USD)	77	27	27	27	-
	Investments required on value addition infrastructure (USD)	3,259	2,444	1,222	1,222	-
	Investments required on Marketing/Export level interventions (USD)	104	78	39	39	-
	Loan (USD)	367	272	137	137	-
	Total investments (000 USD)	3,967	3,200	1,800	1,874	481
	Net economic return (000 US$)	-3,967	-1,662	-1,424	-3,188	6,575
	Net Present Value (000 US$)	2,719,821				
	Estimated Internal Rate of Return (IRR) (%)	25%				

Gladiolus_table | Punjab_Final_ gladiolus | rose table | Punjab_Final_Rose | VC-gladiolus | VC cost_Rose

Offsetting the value chain costs from revenues, net economic benefit during the 1st year will be negative at US$5.64 million. This amount is exactly equal to the value chain investment in the 1st year, as no revenues or benefits is expected during the 1st year of cluster development program. The net economic benefits in subsequent years are expected to range from US$ 3.77 million in the 2nd year to US$ 0.481 million in the 5th year (Table 13).

9.3. Economic Returns (Gladiolus Cluster)

In the Pattoki gladiolus cluster, the gross revenues before flower cluster development are estimated to US$18.89 million per year. Cluster development investments are expected to generate revenues from 2nd year of the upgradation plan. All the four cluster interventions are expected to result in additional gross revenues of US$ 2.13 million in 2nd year and US$9.41 million in the 5th year. The total initial cluster investment during the 1st year is US$ 3.97 million in the Pattoki cluster.

All the value chain costs including those related to the production, processing, marketing and selling are applicable from 1st through to 5th year, the total of which ranges from US$0.587million to $2.35 million in the respective year.

Offsetting these value chain costs from revenues, net cash flow in the 1st year will be negative US$ 3.97 million. This amount is exactly equal to the value chain costs in year 1, as no revenues or benefits are expected in the 1st year of cluster development program. The net cash flow in subsequent years are expected to range from negative US$ 1.66 million in 2nd year to US$6.57 million in the 5th year (Table 14)

Table 14: Economic Returns and Investments in Punjab Cluster (Gladiolus)

A	B	C	D	E	F	G
	Parameters [All Amounts: 000 USD]	Year 1	Year 2	Year 3	Year 4	Year 5
	Revenues Under Existing Conditions (000 US$)					
	Total gross revenues from cluster before interventions	18,887	18,887	18,887	18,887	18,887
	Expected Revenues from Cluster Development Interventions (000 US$)					
	Intervention-1:					
	Expected additional revenue from Improved Manangement Practices	-	944	1,889	2,833	3,777
	Intervention - 2:					
	Expected additional revenue from Reduced Post Harvest losses	-	496	1,039	1,629	2,266
	Intervention – 3:					
	Expected additional revenue from increase in prodution export ratio	-	62	134	215	306
	Intervention -4:					
	Improvements in value chain:	-	623	1,338	2,147	3,057
	a) Average export price (USD/t) of top 10 exporting countries					
	b) % of domestic production to be evaluated at international prices					
	Total Expected Additional Gross Benefits (TAGB)from cluster development interventions – [Sum of all intervention revenues] (000 US$)	-	*2,126*	*4,399*	*6,824*	*9,407*
	Expected Costs (000 US$)					
	Value Chain Based Costing					
	Cost of Production Inputs and Harvest (C1)		478	956	1,435	1,913
	Cost of Transportation and Storage (C2)		33	66	100	133
	Cost of grading and packaging (C3)		60	120	179	239
	Cost of marketing (C4)		14	29	43	58
	Others		2	3	6	8
	Total Costs [TC] – [Sum of all Costs] (000 US$)		587	1,175	1,763	2,351
	Cluster Investments (Please see key notes) (000 US$)					
	Investments required on Research & Development Level Interventions (USD)	148	370	370	444	481
	Investments required on capacity building (US$)	12	9	5	5	-
	Investment on tissue culture labs (USD)	77	27	27	27	-
	Investments required on value addition infrastructure (USD)	3,259	2,444	1,222	1,222	-
	Investments required on Marketing/Export level interventions (USD)	104	78	39	39	-
	Loan (USD)	367	272	137	137	-
	Total investments (000 USD)	3,967	3,200	1,800	1,874	481
	Net economic return (000 US$)	3,967	1,662	1,424	3,188	6,575
	Net Present Value (000 US$)	2,719,821				
	Estimated Internal Rate of Return (IRR) (%)	25%				

Gladiolus table | Punjab_Final_gladiolus | rose table | Punjab_Final_Rose | VC-gladiolus | VC cost_Rose

9.4. Implementation Plan

An investment of US$ 25.04 million is needed to support the cluster development efforts in both the rose and gladiolus Pattoki clusters in Punjab. Out of the total investment about 42% will be shared by the public sector in terms of strengthening floriculture research, capacity building of stkeholders, and providing incentives on value chain infrastructure development. The main investment is on the establishment of cold storages, greenhouses, and dehydration units. This investment would be incentivized through offering 20% subsidy on the infrastructure and providing interest free loans for the first year of the infrastructure establishment. We believe that these incentives and public sector investment will bring remaining 59% of the investment in the private sector. Eighty percent of the total government share in the investment should be provided by the federal government, by establishing a Cluster Development Fund (CDF) under Planning Commission Pakistan. The remaining 20% should come from the provincial budgets.

9.5. Conclusion

In conclusion, the overall economic, social and environmental impact of the cluster development program shall be positive, sustainable and long lasting. Accounting for all the fixed costs and variable costs including the production, handling and marketing cost, the estimated Net Present Values (NPV) for Pattoki rose cluster and Pattoki gladiolus cluster are respectively US$10.5 million and US$2.7 million, respectively. The Internal Rate of Return (IRRs) are respectively 52% and 25%, respectively. An overall NPV from both the clusters is US$13.3 million, and an overall IRR is 41%. In addition to these economic benefits, the floriculture cluster development program will generate a foreign exchange of US$0.69 million and hundreds of new jobs especially in per-urban areas. It is worth noting that the infrastructure build for floriculture can also benefit the value chain improvement of perishable commodities like fruits and vegetables. Moreover, the benefits quantified here do not include the spillover effects of the cluster development programs in other flower growing areas. Strengthening of floriculture research and capacity building of the stakeholders will be the key in the success of the floriculture upgradation plan.

10. ROGRAMS AND PLANS

Various programs that need to be initiated to implement the Cluster Upgradation Plan and key agencies involved in the implementation are narrated in Table 15.

Table 15: Summary of Target related Interventions in Flower Clusters

Target	Key Interventions	Key Implementing Partners
Increase flower yield	Supply of true-to-type plants to the farmers through the establishment of tissue culture and certified nurseries at subsidized rates. To be supplied by PFC.	Pattoki Floriculture Center (PFC), Punjab Floriculture Dept., UAF, FSC&RD, NARC
	Capacity building on production management especially proper pruning, proper dosage and timing of fertilizer and pesticide and use of IPM techniques & water management. GAP through FFS methodology.	PFC, Agriculture Extension Punjab, Academia, Certifying Agency
Establish improved new orchard	Promote High Density plantation/high yielding varieties and use of drip irrigation and hydroponics under greenhouse plantation Access of farmers to financing	PFC, Punjab Floriculture Dept., UAF, FSC&RD, NARC State Bank of Pakistan
A. Improve quality of the produce by for domestic market based upon international standards in the next five years	Value Chain Improvement which includes: Capacity building farmers and contractors for pre and post-harvest management which includes fertility management, plant protection management, proper harvesting, packaging and transportation.	PFC, Agriculture Extension Punjab, Academia, Certifying Agency
B. Reduce Post-Harvest Losses from 35% to 15% in the next 10 years	Provide incentive to adapt Certification regimes	PFC, Agriculture Extension, FEG/PMO, Certifying Agency
	Establishment of cool chain system to increase the shelf life and quality of flowers. Government to provide incentive mechanism	PFC, Agriculture Dept. Punjab, SMEDA, Grant Expert (private sector company)
	Direct linkages of farmers with the market which includes exporters, processors and retailers to bypass traditional value chain. Local expositions are effective way of networking	PFC, Agriculture Dept. (Economic & Marketing)

Target	Key Interventions	Key Implementing Partners
Increase export to production ratio (from 0.40% to 0.80%) and improve quality and export price in the next five years	Aggressive market interventions with special incentives from the government/TDAP Capacity Building besides production aspects training would be imparted on WTO, Tariffs & Trades Customs Laws and Phyto-sanitary requirement Linkages with domestic and international markets through expos/B2B Existing processing units to acquire international certifications, including quality assurance	PFC, TDAP, Agriculture Dept. (Economic & Marketing) Punjab, Commercial Councilors PFC, Academia, relevant government departments PFC, Agriculture Dept. Punjab, TDAP PFC, Agriculture Department Punjab, Certifying Agency
Establishment of Processing and Value Addition	Incentive to be provided by the government Establishment of modern rose petal dehydration units and Gulkand units at Pattoki area Establishment of Greenhouses at Pattoki cluster and under PFC project Government to provide incentives for enterprises to acquire international certifications and training on production management. Linkages with domestic and international markets through expos/B2B	Federal government and Punjab government PFC, Agriculture Dept. Sindh, SMEDA, Grant Expert (private sector company) PFC, Ag. Depts. SMEDA, Grant Expert (private sector company) PFC, Punjab Agriculture Department PFC, Agriculture Dept. Punjab, TDAP

11. ANNEXURES

Annex 1. List of Stakeholders Consulted

Sr No	NAME	INSTITUTION	LOCATION
1	M. Abdul Salam Khan	Directorate of Floriculture Punjab	Lahore
2	Abdul Ghafoor	Commission agent	Pattoki
3	M. Ijaz Hussain	President Flower market Pattoki	Pattoki
4	Saleem Ahmad	Bulb and seed importer	Lahore
5	Dr. Tariq Iqtadar	Ex-director, Floriculture Punjab	Lahore
6	M. Asif	Flower grower	Nizam Pura, Pattoki
7	M. Pervaiz	Flower grower	Chunian
8	M. Behzad Rafiq	Flower Grower	Lahore
9	Akbar Bhatti	Wholesaler, Purani mandi	Pattoki
10	Arif Sarfraz	Commission agent, Purani mandi	Pattoki
11	Mureed Ahmad	Wholesaler, New flower market	Pattoki
12	Sarfraz Numberdar	Commission agent, new flower market	Pattoki
13	Sh. M. Javed Iqbal	Director Floriculture Punjab	Lahore
14	Dr. M. Saeed	Assistant Horticulturist, AARI	Faisalabad
15	Dr. Umer Habib	PMAS Arid Agriculture University	Rawalpindi
16	Dr. Monis Hussain	Floriculture Research Station	Islamabad
17	Mr. Noor Alam Khan	Director Floriculture, NARC	Islamabad
18	Mr. Iftikhar Ahmad	Asst. Res. Officer, Floriculture	Multan
19	Muhammad Ali	Rose grower	Faisalabad
20	Basharat Ali	Rose grower	Gujranwala
21	Ch. Ijaz Ahmad	Wholesaler	Pattoki
22	Malik Faisal Mahmood	Flower Grower	Taxila
23	Adnan Ali	Flower Grower	Rawalpindi
24	Nazar Ahmad Malang	Flower Grower	Kotli Sattian
25	Azam Shahzad	Flower Grower	Mansehra
26	Shahid Nadeem	Scientific Officer Floriculture	NARC, Islamabad
27	Ijaz Saleem	Flower grower and chemist	Chitral
28	Mr. Ijaz Shah	Manufacturer Rose dehydrator	Faisalabad
29	Mr. Arshad	PAMICO industries, distilleries	Faisalabad
30	Mr. Aslam Fogi	Gladiolus grower	Pattoki

Annexure 2: List of Data and Literature Reviewed

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Annexure 3: TANFLORA INDIA MODEL

TANFLORA Infrastructure Park Ltd:

- Tanflora Infrastructure Park Limited, is a joint venture company of TIDCO & MNA & Associates, established in Tamil Nadu. The project is conceived to be one of the largest production facilities for cut roses in the world, with a total production capacity of 67.5 million roses per annum. The project is a co-operative farming concept developed on the lines of Aggrexco of Israel. It is divided into 25 grower units of 2 ha each, while the centralized common infrastructure is developed, owned and operated by Tanflora. All the 25 grower units have been allotted to 25 individual companies. Besides Tanflora has also got 1.5 ha of own production facilities and proposes to expand to 5 ha. Tanflora is the country's first Agri Export Zone for Cut Flowers. Government of Tamil Nadu had supported the project by providing funds under ASIDE Scheme for developing infrastructure. APEDA, Ministry of Commerce provided financial assistance for establishment of post- harvest facilities. National Horticulture Board provided capital subsidy to the growers.
- The roses grown by the growers are collected and processed in the post-harvest facilities of Tanflora, packed and marketed under the brand name of Tanflora, primarily exported to Europe, Australia, Middle East, Far East and Japan. Also due to increase in domestic market, good quantities of flowers are sold in domestic market mainly in Delhi, Hyderabad, Chennai etc. The sale proceeds are shared in the ratio of 70:30 on FOB basis between the growers and Tanflora.
- 'Taj Mahal', symbol of love, is a new rose variety, exclusively owned and grown by Tanflora worldwide, having obtained the rights from a French breeder. The company is also in the process of producing exclusively a new variety of rose viz. 'Kohinoor' jewel of India, on similar lines of Taj Mahal.

  The common infrastructure established by Tanflora includes:
- About 80,000 sq.ft. of grading hall, including 19,000 sq. ft. of Cold Room Facilities which can handle about 95 million stems per annum.

- Water storage steel tanks imported from Holland (10 in number) having capacity of 7.33 lakh litres per tank.
- Rainwater harvesting facilities (10 tanks) with a total storage capacity of 150 million litres, out of which 3 ponds with a total capacity of about 70 million litres are provided with pond liners from Israel.
- About 8 km length of black top internal roads and about 16 km length of storm water drains.
- Nursery with a capacity of 5 lakh plants per annum and the project started making plants, selling locally as well as exporting the planting material.

Annexure 4: Flow of Costs and Returns

Annexure 4, Table 1: Flow of Costs and Returns of Rose at Value Chain Actors Level – Domestic Supply (Rs.)

Costs/Returns		Grower	Transporter	Commission Agent	Wholesaler	Retailer
Cost per Kg	Raw Material	0			5	12
	Production	10.5				
	Harvest	5				
	Packing	1.25				
	Transport	1.0	0.5			
	Others	0.75		1.0	2	5.0
Total Cost/KG		18.5	0.5	1.0	7.00	17.00
Cost Flow		42.0%	1.1%	2.2%	15.9%	38.6%
Revenues /KG		20.0	0.75	1.5	10	36
Gross Margins		1.5	0.25	0.5	3.00	19.0
Return Flow (%)		6.1%	1.0%	2.0%	12.3%	78.3%

Table 16:Flow of Costs and Returns of Surkha Rose at Value Chain Actors Level – Exporter (Rs)

		Grower	Transporter	Exporter – Air Shipment
Cost per Kg	Raw Material			25.40
	Production	10.50		
	Harvest	5.0		4.0
	Packing			8.0
	Processing			10.0
	Transport		0.25	17.70
	Others	0.55		
Total Cost/KG		16.05	0.25	65.1
Cost Flow		19.7%	0.3%	79.9%
Revenues /KG		39.5	0.5	88.0
Gross Margins		23.45	0.25	22.9
Return Flow		50.3%	0.5%	49.1%

Table 17:Flow of Costs and Returns of Gladiolus at Value Chain Actors Level – Domestic Supply (Rs.)

Costs/Returns		Grower	Transporter	Commission Agent	Wholesaler	Retailer
Cost per flower	Raw Material	0			6	10
	Production	8.35				
	Harvest	1.25				
	Packing	0.95				
	Transport	0.58	0.25			
	Others	0.45		1.20	2	3.8
Total Cost/flower		11.58	0.25	1.20	8.00	13.80
Cost Flow		33.2%	0.7%	3.4%	22.9%	39.6%
Revenues/flower		15.5	0.5	1.75	15	30
Gross Margins		3.92	0.25	0.55	7.00	16.20
Return Flow (%)		14.0%	0.8%	1.9%	25.0%	58.0%

Annexure 4, Table 2: Flow of Costs and Returns of Gladiolus at Value Chain Actors Level – Exporter (Rs)

		Grower	Transporter	Exporter - Sea Shipment
Cost per flower	Raw Material			18.60
	Production	8.35		
	Harvest	1.25		3.0
	Packing			12.5
	Processing			5.0
	Transport		0.5	28.40
	Others	0.65		
Total Cost/flower		10.25	0.5	67.5
Cost Flow		13.0%	0.6%	86.2%
Revenues /flower		36.5	0.85	106.0
Gross Margins		26.25	0.35	38.5
Return Flow		40.3%	0.5%	59.1%

There are many actors in the floriculture value chain each having different cost and returns. In order to get a better understanding of the scenario, distribution margins for each market intermediary have been estimated. The distribution margin or price spread is the difference between the price paid and received by each specific market intermediary. The market intermediaries involved in the traditional chain include grower, contractor, transporter, commission agent, wholesaler and the retailer. Another chain is the processor/exporter sourcing flowers directly from the growers and processes and exports flowers by air.

As shown in the tables above, for rose value chain the retailer received a maximum share of 78.3 percent in the distribution margin while the wholesaler, commission agent and transporter received 12.3 percent, 2 percent and 1 percent share in the distribution margin respectively. Whereas the growers share is 6.1 percent which provides returns per kg without any value addition. Whereas for gladiolus value chain the retailer received a share of 58%, wholesaler 25%, commission agent 1.9%, transporter 0.8% and the grower 14%. It may explain here that farmers get better price in unit terms but returns per acre is low, probably due to low yield. The retailer's share in the distribution margin is calculated on the assumption that the total produce purchased by him is sold at a given price. However, in reality the retailer is the last owner of the produce and has to bear all kinds of losses, since produce left unsold fetches a much lower price the next day.