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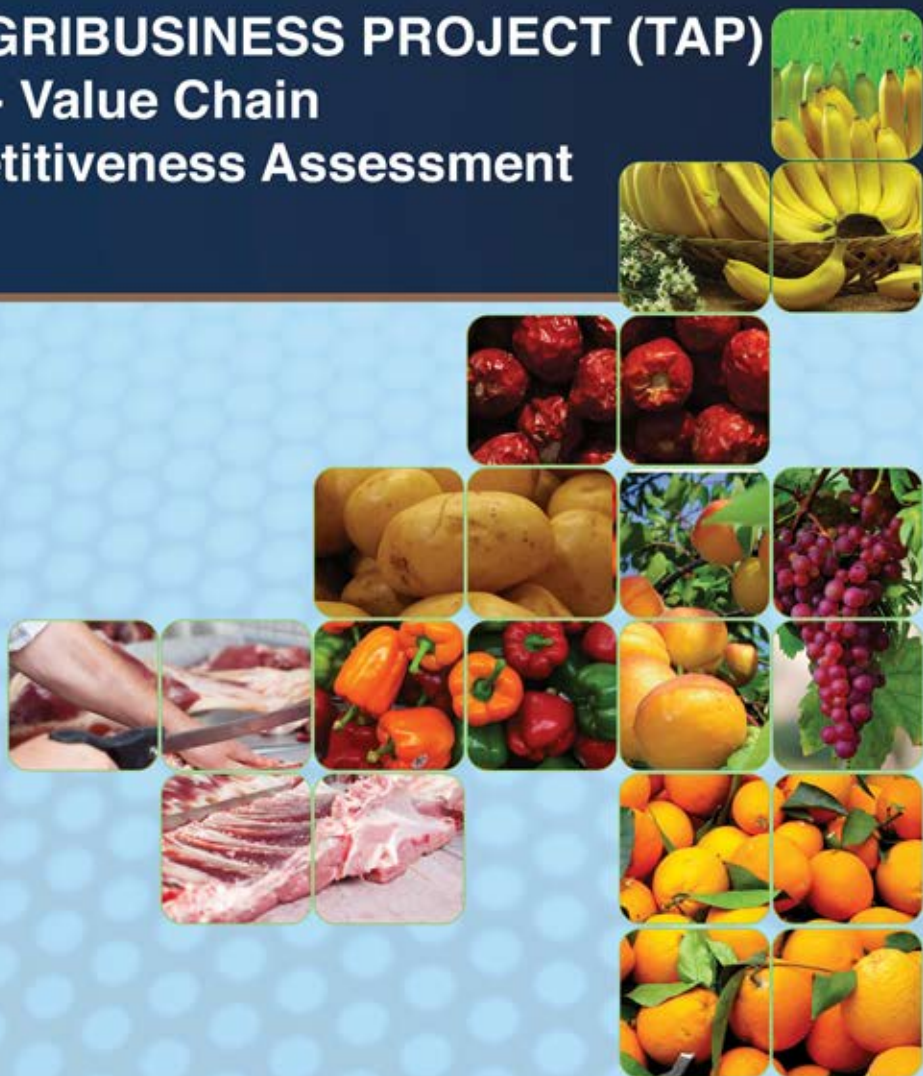


Together we will create a **ROSHAN PAKISTAN**

THE AGRIBUSINESS PROJECT (TAP)

Potato- Value Chain

Competitiveness Assessment



The Agribusiness Project - Agribusiness Support Fund

A company incorporated under section 42 of the companies ordinance 1984.

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Potato - Value Chain Competitiveness Assessment

Published by The Agribusiness Project, with the funding support of United States Agency for International Development, under Agribusiness Support Fund, Pakistan.

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This manual is a live document which can be changed/updated as the project progresses. Any suggestions for further improvement are most welcome.

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ACKNOWLEDGEMENTS

This report encapsulates the results of the Potato Value Chain Competitiveness Assessment (VCA) study undertaken by the USAID Agribusiness Project (TAP). The authors wish to thank all the associated organizations, their project staff, Dr. Afzal Haider Rizvi, Potato Growers Association of Okara for their valuable contributions particularly the TAP value chain leads and the field staff for their tireless efforts spent during the data gathering in the field.

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FOREWORD

A series of Training manuals , Guide Books and Reports have been developed by The Agribusiness Project (TAP) to facilitate the capacity building of farmers involved in TAP's targeted value chains, thereby enabling them to make the requisite transformation from 'subsistence farming' to 'farming as a business enterprise'. The Agribusiness Project is funded by USAID/Pakistan, with the overall goal of 'supporting improved conditions for broad-based economic growth, enhance profitability and employment opportunities and contributing to poverty alleviation through product and process transformation of selected value chains in horticulture and livestock sub-sectors.' The strategy of TAP focuses on:

1. strengthening capacities in horticultural and livestock value chains to increase sales to domestic and foreign markets;
2. strengthening the capacity of smallholders (through farmer enterprise groups-FEGs), individual farmers and agribusinesses to operate effectively and efficiently; and,
3. increasing productivity and profitability through adoption of new techniques and technological innovations (among farmers, agribusinesses and business development services providers).

Through TAP, farmers have been organized as Farmer Enterprise Groups (FEGs) for cultivating the benefits of scale, through optimized production and marketing, and serving as a vehicle for transferring of the benefits of TAP interventions to its stakeholders - the farmers. TAP is providing active support to the FEGs and farmers for improving small producers' positioning in a value chain through support in incorporating producers and their product into stable, profitable market channels, and provision of necessary services and assistance in business development, planning and marketing through inter-linkages. This requires intensive capacity building of the stakeholders placing capacity building at the heart of all interventions.

This report/Manual can be used by anyone involved with the production, cultivation, harvesting and enterprise development training of and for farmers/farmer business groups. The contents have been finalized with the consultation of stakeholders engaged with the value chains.

While these Reports/Manuals/Guide Books are project specific and for a farmer audience, they can also be used for the capacity building of government and non-government agency representatives, processors and exporters who are involved in implementing production/cultivation, enterprise development and value chain programs, through the communities. Finally, I want to thank USAID/Pakistan for funding The Agribusiness Project under which this intellectual capital has been prepared. I would also like to thank ASF for successfully implementing these manuals/guide books across Pakistan for the benefits accrued to the farmers.

Shad Muhammad
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THE AGRIBUSINESS SUPPORT FUND

ASF is a 'not-for-profit' company registered under Section 42 of the Companies' Ordinance 1984 with Securities & Exchange Commission of Pakistan (SECP). ASF has extensive experience in strengthening and supporting demand-driven private sector service delivery mechanisms throughout the agribusiness value chain this includes supply inputs, production and export markets ASF aims to achieve this objective by mobilizing angel investment grant provision and technical assistance support of farmer and agribusiness enterprises. The company supports start-ups as well as existing enterprises, enabling them to employ modern technique and practices and build expertise and markets understanding required by a fast-changing economic environment and to improve their productivity, profitability, competitiveness and creditworthiness

THE AGRIBUSINESS PROJECT

The Agribusiness Project is an initiative of the United States Agency for International Development (USAID) and the Agribusiness Support Fund (ASF) Pakistan .the project aims at enhancing competitiveness of agricultural value chains in Pakistan, with a focus on Horticulture and Livestock including dairy, meat and fisheries. The objective of The Agricultural Project is to support and create improved conditions for poverty alleviation. Since Pakistan's economy is agrarian in nature, The Agribusiness Project aims to invest in interventions at the primary, secondary and tertiary levels of production. Under the International Market Access Program (IMAP), the project supports the creations of linkages between exporters and importers. The objective is to facilitate market access

ABL	Allied Bank of Pakistan
ABP	State Bank of Pakistan
ADB	Asian Development Bank
AJK	Azad Jammu Kashmir
AMIS	Agriculture Marketing Information system
ASF	Agribusiness Support Fund
ASLP	Agriculture Sector Linkages Program
ATTA	Afghan Transit Trade Agreement
BCR	Benefit Cost Ratio
BOP	Bank of Punjab
BRSP	Baluchistan Rural Support Program
BSF	Business Support Fund
CIP	Commodity Import Program
CMP	Crop Maximization Project
DCO	District Coordination Officer
DFID	Department for International Development
FAO	Food and Agriculture Organization
FAP	Farmer Association of Pakistan
FATA	Federally Administered Tribal Areas
FIAS	Foreign Investment Advisory Services
GB	Gilgit Baltistan
GDP	Gross Domestic Product
HACCP	Hazard Analysis and Critical Control Points
HLB	Habib Bank Limited
IFC	International Finance Corporation
IRR	Internal Rate of Return
JAA	J. E. Austen Associates
KPK	Khyber Pakhtun Khawa
LUMS	Lahore University of Management Sciences
MCB	Muslim Commercial Bank
MT	Metric Tons
NAA	Nilibar Agriculture Association
NARC	National Agricultural Research Council
NBP	National Bank of Pakistan
NGO	Non- Government Organization
NIOA	National Institute of Organic Agriculture
NPIW	National Program for Improvement of Water Courses
NRSP	National Rural Support Program

NWFP	North West Frontier Province
PAMCO	Punjab Agriculture and Meat Company
PARB	Punjab Agriculture Research Board
PARC	Pakistan Agricultural Research Council
PBIT	Punjab Board of Investment and Trade
PBS	Punjab Bureau of Statistics
PERI	Punjab Economic Research Institute
PHDEC	Pakistan Horticulture Development and Export Company
PIDE	Pakistan Institute of Development Economics
PITD	Pakistan Institute of Trade and Development
PKR	Pakistan Rupee
PRI	Potato Research Institute
PSC	Punjab Seed Corporation
PSQCA	Pakistan Standards and Quality Control Authority
QA	Quality Assurance
SAARC	South Asia Association for Regional Cooperation
SAFTA	South Asia Free Trade Area
SBI	Sindh Board of Investment
SCARP	Salinity Control and Reclamation Project
SDC	Swiss Development Corporation
SDPI	Sustainable Development Policy Institute
SME	Small and Medium Enterprises
SMEDA	Small and Medium Enterprise Development Authority
SPS	Sanitary and Phytosanitary
SRSP	Sindh Rural Support Program
TDAP	Trade Development Authority of Pakistan
TOR	Terms of Reference
UBL	United Bank Limited
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Program
USAID	United States Agency for International Development
USD	United States Dollar
USDA	United States Department of Agriculture
UVAS	University of Veterinary and Animal Sciences
VRI	Vegetables Research Institute
WB	World Bank
WTO	World Trade Organization
ZTBL	Zarai Taraqati Bank Limited

I. EXECUTIVE SUMMARY

The five-year USAID funded Agribusiness Project, now commonly referred to as The Agribusiness Project (TAP) being implemented by the Agribusiness Support Fund (ASF) has the overall goal of supporting improved conditions for broad-based economic growth, creating employment opportunities and contributing to poverty alleviation through increases in competitiveness of horticulture and livestock value chains in partnership with all stakeholders. Specific objectives of the project are to; (i) strengthen the capacity in horticulture and livestock value chains to increase sales to domestic and foreign markets; (ii) strengthen the capacity of smallholders and farmer enterprises to operate autonomously and effectively; and, (iii) increase agriculture efficiency and productivity through adoption of new farming techniques and technological innovation among targeted beneficiaries.

The overall objective of the value chain assessment was to assess the competitiveness of the potato value chain. With a specific focus on: identifying the precise gaps in the value chain; the potential of Pakistan producers; validation of ongoing and planned interventions; Identification of attractive/alternative markets for the value chain products and identification of additional interventions that could enhance value for all the chain actors. Once completed, the augmented information and analysis presented in the assessments will also be used to facilitate further prioritization of the value chains and of the potential interventions.

Potato is a major crop in Pakistan with great potential to grow for the revenue increase of the producers and opportunities as a source of foreign reserve by increasing exports. Pakistan's potato industry is self-sufficient to supply domestic household consumption. Presently, according to the Pakistan Bureau of Statistics, it is estimated that the total annual domestic production amounts to around 4.1 Million MT, of which over 1 Million MT is used as seed and 3.1 Million MT is available for the domestic consumption, value addition and the export purposes.

Pakistan exported 301,544 MTs in 2012 with an average of \$277 per MT. Total reported area of harvest was 185 thousand hectares. Pakistan, on the other hand imported 3624 Mts. of potato powder and starch. The ware potato was exported at \$277 per MT, the Crisping export got a minimum of \$350 per MT from the comparative market. Whereas, a limited amount of seed potatoes were exported for \$650-\$700 per MT to a select market.

Pakistan presents several advantages in the global market as Pakistan is located in southern hemisphere cropping cycle and can command an edge over the European exporters. The proximity to the GCC, ASEAN and the CIS is also an advantage over other producing countries which may require more expensive logistics. The harvesting time in Pakistan also matches with the demand opportunities from these importing countries.

The Revealed Comparative Advantage (RCA) for the potatoes is 17.8 for the year 2012. This is very high and shows the strength of the sector as comparative advantage can be transformed into competitive advantages. Sri Lanka has been the most stable market for the past five years, following Afghanistan. In order to be competitive in the world market Pakistan should have stable exports year after year. Pakistan is spending too much energy in the UAE market as this is much smaller for all the efforts done for the sector. Most of the time, Pakistani potatoes get dumped in this market. Pakistan should look into other emerging markets with higher imports and price point opportunities.

This competitiveness assessment used a comprehensive methodology to consider the full range of constraints and opportunities along the entire potato value chain. These are summarized below and presented in detail in the following chapters. Major issues include:

- **Improve seed:** A comprehensive seed development program focusing in new technologies should be developed in the private sector with emphasis on research and development while legislation and regulation can contribute to disease free seed standards
- **Train producers:** Capacity building of producers for better crop husbandry and knowledge of good agricultural practices despite the limitations of the agricultural extension system
- **Ensure appropriate credit:** Proper credit availability to producers needs to be expanded with proper insurance or supervision to reduce credit risk
- **Build capacity in harvesting and post-harvest practices:** This will have an immediate impact on both yield at harvest and in reducing post-harvest loss
- **Implement domestic market linkage programs:** Market information and domestic market development will contribute to increased demand and to distribution efficiency
- **Enforce standards and grading:** This will do much to improve quality and reduce risk throughout the distribution channel
- **Improve storage:** Promotion of better and energy efficient storage facilities will reduce costs and preserve quality
- **Work with processors to boost value addition:** It is in the interest of the entire potato industry to work with agroindustry and even restaurants to increase investment in viable processing operations
- **Streamline export processes:** Pakistan exports a significant tonnage already and further exports would be facilitated by the adoption of simpler processes such as a one window service for all regulatory export operations
- **Export market development:** Pakistani exporters tend to be price takers due to the lack of international market linkages where Pakistan could position itself as a reliable supplier of high quality, graded potatoes
- **Encourage value chain (cluster) coordination:** While the Government could greatly help value chain coordination by ensuring a better and more reliable data management system, it is the responsibility of the private sector to develop mechanisms for cluster coordination and improvement and a potato sector competitiveness initiative is presented to do this
- **Regional development initiatives will have good effect:** The KPK and GB regions have great potential for potatoes given their cooler weather but currently produce less than 10% of total production; regional initiatives could boost this considerably.

The value chain approach advocated here would improve seed quality, contribute to efficiency across the value chain, boost exports and satisfy a growing domestic demand. It would also make regional development contributions in the KPK and GB regions while contributing to increased food production. A directed effort to identify attractive new international markets would also stimulate demand, provide new income opportunities, put upward pressure on quality and improve Pakistan's agricultural GDP and tax revenue. Eastern Europe, CIS and Africa should be analyzed as potentially new markets for the export of potatoes from Pakistan. Graph 4 shows potential target markets with their annual potential of 2.21 million tons for the year 2013-2014. Along with the opportunities in the GCC due to the lack of competition from the Saudi Arabian exports.

II. BACKGROUND

The USAID's Agribusiness Project, now commonly referred to as The Agribusiness Project (TAP) is being implemented through Cooperative Agreement (No. AID-391-A-12-00001) by the Agribusiness Support Fund (ASF). ASF, a Pakistani non-profit company registered under section 42 of the Companies Ordinance of 1984 was formed to provide demand-driven technical and managerial assistance and private sector service delivery mechanisms throughout the agribusiness value chains including supply inputs, production, processing and market access for domestic and export markets. The five-year TAP project began in November 10, 2011. The overall goal of the project is to support improved conditions for broad-based economic growth, create employment opportunities and contribute to poverty alleviation through increases in competitiveness of horticulture and livestock value chains in partnership with all stakeholders. Specific objectives of the project are to;

- (i) Strengthen the capacity in horticulture and livestock value chains to increase sales to domestic and foreign markets;
- (ii) Strengthen the capacity of smallholders and farmer enterprises to operate autonomously and effectively; and,
- (iii) Increase agriculture efficiency and productivity through adoption of new farming techniques and technological innovation among targeted beneficiaries.

The ASF has developed some basic information on many of the selected value chains targeted by the project. This information has been published in the following reports:

1. Horticulture (Peaches, Dates, Potatoes, Chilies) Value Chain Assessment Final Report for the Agribusiness Project (31 December 2012)
2. Dairy Value Chain Assessment Final Report for the Agribusiness Project (24 February 2013)
3. Meat Value Chain Assessment of the Livestock Sector of Pakistan (2 November 2013)

The present report is part of a series resulting from the effort to deepen the analysis provided in those reports. These competitiveness assessments focused on the following:

- Identification of the precise gaps (and therefore, the potential) of Pakistan producers in the selected value chains;
- Validate ongoing and planned interventions;
- Identification of attractive/alternative markets for the value chain products;
- Identify additional interventions that could enhance value for all the chain actors;
- Facilitate further prioritization of VCs and of the potential interventions in light of the augmented information and analysis.
- Facilities subsequent by the information in the assessments.

The methodology employed included refining maps of the functions and actors participating in each value chain, identifying variations in each depending on the product and relative efficiency of the different participants, and gathering as much information as possible on prices, costs, and efficiency metrics at each level, as well as volumes of product flowing through each of these channels. At the same time, world market information was obtained to assess Pakistan's recent performance in each chain's product(s), assess its relative position vis a vis international competitors considering volumes, prices, and recent export growth, and benchmark the gaps between them.

The information sources used include a review of previous studies, interviews with adequate representation of all functions and participant groups in each value chain, including producers, intermediaries (contractors, commission agents, traders (beuparies), exporters, supermarkets, and input suppliers as well as key informants from among academia, research and development professionals. The data presented in the reports primarily comes from reports and databases published by the Pakistan Bureau of Statistics, Trade Development Authority of Pakistan (TDAP), Directorate of Market Information, Department of Agriculture Punjab and other domestic and international secondary sources of information, particularly international databases such as International Trade Center (ITC) in Geneva and FAOSTAT. For each specific chain, various knowledge and information sources available on the worldwide web were utilized as well.

ASF provided assistance to the value chain consultant to set up meetings in the various districts where interviews were conducted. Marcos Arocha a JE Austin Associates Consultant assisted in the design of the overall framework provided guidance throughout the elaboration of the work. The work was also informed by the Rapid Market Assessment conducted in parallel by another JE Austin Associates' consultant, Matthew Brown.

These assessments, while enriching the information originally developed in the initial value chain reports through the competitiveness lens, are intended to guide and narrow down the areas where additional research efforts by TAP may be required and desirable. In this sense, rather than being considered final, they are intended to be "living documents" and evolve as those areas are further explored.

INTRODUCTION & OVERVIEW

The potato is an important crop for both farmers and consumers in Pakistan. It is the fourth most consumed crop in the world after corn, rice and wheat. The potato is highly valued as a source of complex carbohydrates with the added advantage of having low fat contents. Potatoes have the potential to be one of the most important cash crops in Pakistan, for the generation of export revenues and the future of domestic food security.

Figure 1: Nutritional Facts about Potatoes.



Micronutrients

(one raw potato, including skin, 213 g)

Minerals

potassium	897 mg
phosphorus	121 mg
magnesium	49 mg
iron	1.66 mg

Vitamins

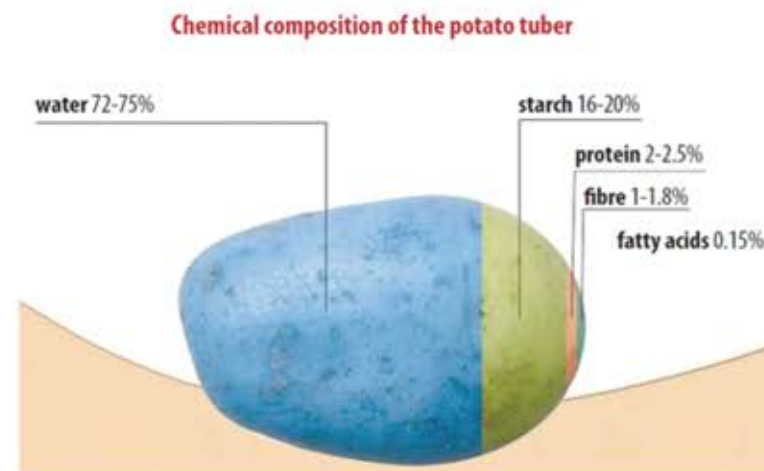
vitamin C	42 mg
niacin	2.2 mg
vitamin B6	0.62 mg
thiamine	0.17 mg

Source: United States National Nutrient Database

Wild potato species can be found throughout the Americas, from the United States to southern Chile. The potato was originally believed to have been domesticated independently in multiple locations, but later genetic testing of the wide variety of cultivars and wild species proved a single origin for potatoes in the area of present-day southern Peru and extreme northwestern Bolivia (from a species in the *solanum brevicaulis* complex), where they were domesticated 7,000–10,000 years ago. Following centuries of selective breeding, there are now over a thousand different types of potatoes. Of these subspecies, a variety that at one point grew in the Chiloe' Archipelago (the potato's south-central Chilean sub-center of origin) left its germ-plasm on over 99% of the cultivated potatoes worldwide.

Potato is a starchy, tuberous crop from the perennial *Solanum tuberosum* of the Nightshade family. The word may refer to the plant itself as well as the edible tuber. The origin of the potatoes is linked to the region of the Andes. Potatoes were introduced outside the Andes region four centuries ago, and ever since potatoes have become an integral part of much of the world's cuisine.

Figure 2: Chemical Composition of the Potato Tuber.



The annual diet of an average global citizen in the first decade of the 21st century included a consumption of about 33 kg (73 lb.) potato (FAO data). However, the importance of potato is extremely variable and rapidly changing. It remains an essential crop in Europe (especially eastern and central Europe), where per capita production is still the highest in the world, but the most rapid expansion over the past few decades has occurred in southern and eastern Asia. China is now the world's largest potato-producing country, and nearly a third of the world's potatoes are harvested in China and India combined.

Potato cultivation in Pakistan is on a constant rise and has increased to around 185,100 hectares (457,197 Acres) during 2012-2013. This number has increased from close to three thousand hectares at the time of independence. The average yield for the potatoes have increased to more than double during this period as the average yields rose from around 9 MT/hectare (3.65 MT/Acre) in 1947 to 22.13 MT/hectare (8.96 MT/Acre) in 2012.

Pakistan is self-sufficient in potatoes for domestic household consumption. Presently, according to the Pakistan Bureau of Statistics, it is estimated that the total annual domestic production amounts to around 4.1 Million MT, of which over 1 Million MT is used as seed and 3.1 Million MT is available for the domestic consumption, value addition and export purposes. There is an 11% increase in the potato production from the previous year. The annual per capita consumption of potatoes is also on a rise in Pakistan. Current reported domestic consumption is at 16 Kg per Capita per annum, which is half of the global average consumption. According to the stakeholder's estimates, Pakistani domestic consumption is closer to the world average as this is one of the major local produce and readily available in all markets at relatively cheaper rates as compared to other vegetables, meats and beans.

Potatoes are an increasingly important component of the agriculture sector in Pakistan which represents over 20% of national GDP and employs over 45% of the work force employed. Pakistan's official exports of the potatoes expanded at the rate of 11%, roughly twice the rate of growth in global trade, and represented US\$83 million in 2012. While modest as a share of US\$24.6 Billion, these exports have a disproportionately positive impact on rural incomes as well as nutrition.

The recent major increase in acreage was reached by an intensification of the cultivation in existing potato growing areas, as well as by introduction of this crop in new areas with first time potato growers. However, diseases and pests become more hazardous as a large number of first time potato producers lack knowledge of the correct crop husbandry appropriate to potatoes such as pests and disease control, land preparation, irrigation, fertilizer application, crop rotation and multi-cropping techniques. The lack of credit facilities to purchase proper inputs creates difficulties, in particular for small farmers, inhibiting their efforts to raise productivity as the cost of the inputs have gone up very high in the past five years. It was estimated that the cost of production has increased from Rs. 55,000 to more than Rs. 85,000 per acre in the year 2012.

Crop rotation with maize is also a common practice among the potato farmers in Punjab, where most potatoes are produced. Potato nutrient rich fields after harvesting potatoes are the perfect match for the spring crop this is the primary maize crop in Pakistan. "This rotation works as an insurance policy for the farmers as if one crop fails, the other covers the losses and enhances profitability". Potato is widely appreciated and accepted by most cultures and potatoes could contribute to the reduction of hunger in many parts of the world. However, in order to meet the increasing demands of a growing population, the efficiency of production must be improved.

One of the main constraints in the culture of potato is the cost of producing seed tubers, which contributes to about 35-50% of the total cost of production. Formal certified seed production is limited and faces technical, economical and managerial problems. Lack of availability of sufficient quantities of good seed and low purchasing power of the farmers forces them to rely on seed sources of doubtful quality or small potatoes graded from their own production, for which most of the small to medium farmers do not have the proper skills to process. Also, the non-certified seeds contribute to various diseases, resulting in major losses at the end of the harvest. Lack of enforcement of Intellectual property rights discourages supply from International seed producers.

Most potato farmers are medium or large as access to inputs and credit to obtain them is important. It is harder for the smaller farmers to grow potatoes as farming credits and inputs are not easily available. As noted in the focus group meetings for this study by University of Agriculture Faisalabad, Dr. Iqbal Ahmed Khan, the definition should be based upon the production level not the size of the acreage as this is a crop with relatively high returns per acre.

Poor post-harvest handling including transportation and storage practices cause unnecessary damages, losses and reduction of consumption quality product. Sufficient cold store space is available in Pakistan but the storage practices are not up to global standards at most facilities. The handling of potatoes in storage is unsatisfactory and poorly managed. Power shortage and the higher energy costs are a major constraint for proper storage at optimal conditions ensuring food security. It adds bulk to the cost of the product and sometime higher product losses. According to the members of the Cold Storage Association, there is a storage capacity of over 5 million MTs available for the potatoes but most of the facilities have the challenges of power and better management.

The product losses for the crop harvested in 2012 were the highest in the past few years as the majority of farmers had a bumper crop on the expectation of high Russian demand for Pakistani exports, which was not realized. The export targets were not met and many middlemen lost revenues and having to destroy their stocks. One of the major causes for the higher financial losses was the lack of value added facilities and a clear channel of export linkages.

Export demand tends to prefer white potatoes while local market demand prefers red potatoes. Should there be a fluctuation in the international market, the local market may not be able to accommodate a surplus of white potato demand at the moment, which could lead to losses as seen in the 2012 season in the absence of local market development for this variety.

Finally, the farmers and consumers are faced with severe cyclical fluctuations in prices, as production moves from glut to shortage, thus preventing the farmers from enjoying a reliable income and inhibiting the consumer from including potato as a regular staple part in his diet. This can directly be blamed upon poor market information, market linkages and sector management.

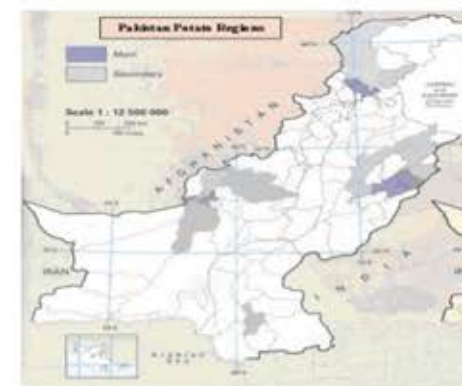
Nonetheless, there is a large potential growth in value addition, including influencing not only population growth but also influencing local eating habits and developing counter-seasonal exports that offset the harvest season in the northern countries. There are also new and non-traditional markets opening up in the CIS, GCC and the African countries. The current number of the producers stands close to 125,000 with new areas of production opening up each year.

III. PRODUCTION AND VALUE CHAIN STRUCTURE

Geography of Production

Pakistan has natural, geographic and climatic advantages for potato production. Although Pakistan is part of the Northern Hemisphere, it is included in the Southern Hemisphere Cropping Cycle. In Pakistan majority of the potatoes are produced in Punjab. There is a continuous growth in the farming land in the other provinces resulting in gradual production level increases in KPK, GB, Baluchistan and Sindh over the past five years.

Figure 3: Potato growing regions in Pakistan.



THE MAJOR ECOLOGICAL ZONES OF PAKISTAN

Potatoes are grown in all four provinces of Pakistan along with Gilgit Baltistan and Kashmir. Due to the difference in the temperature zones, sowing and harvesting periods vary from region to region. The average annual temperature in the northern areas is different from Punjab and Sindh which we can see in the table 1, given below.

Table 1: Ecological Zones of Pakistan.

Ecological Data	Punjab	Sindh	NWFP	Baluchistan
1. Mean Annual Temp.	20-25°C	25-30°C	5-25°C	10-15°C
2. Mean Annual Rainfall Range	250-750mm	100-125mm	250-750mm	125-250mm
3. Climate	Sub Topical Low Lands Semi- Arid Hot Summer, Mild Winter	Sub Topical Low Lands Arid Hot Summer, Mild Winter	Sub Topical High Lands Humid + Semi- Arid Warm to Cold winter	Sub Topical High Lands Semi -Arid Warm summer, Cool winter
4. Soils	Loamy & some sandy and clayey soils of flood plains	Loamy, sandy loam, silts of piedmont plains and desert soils	Rock outcrops & shallow loamy soils of high steep mountains	Shallow loamy, gravelly soils of river valleys rock outcrops of plateau

AREA AND PRODUCTION OF POTATOES IN PAKISTAN:

Cultivation of potatoes in Pakistan is on a constant rise and has increased to around 185,100 hectares (457,197 Acres) during 2012-2013. This number has increased from close to three thousand hectors at the time of independence. The average yield for the potatoes have increased to more than double during this period as the average yields rose from around 9 MT/hectare (3.65 MT/Acre) in 1947 to 22.13 MT/hectare (8.96 MT/Acre) in 2012. (Economic Survey of Pakistan 2013)

Table 2: Area and Production of Potatoes in Pakistan.

Crop	2011-2012		2012-2013 (July – March)		% Change in Production
	Area (000 Hectares)	Production (000 MTs)	Area (000 Hectares)	Production (000 MTs)	
Potatoes	185.0	3393.0	172.0	3767.2	11.0

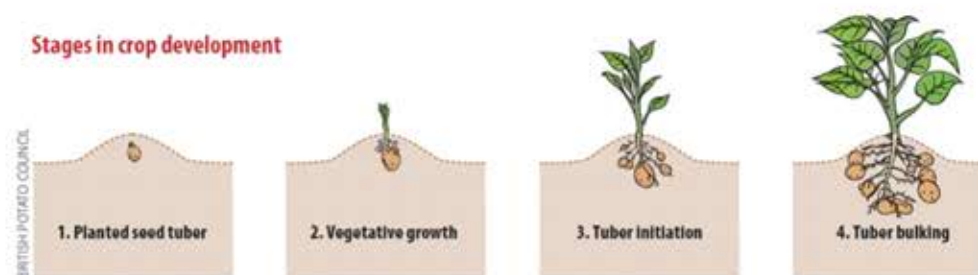
Source: Pakistan Bureau of Statistics

YEAR	AREA. (000 HA)	PRODUCTION:(000) TONNES	YIELD MT/ HA.
1947-1948	3.0	30.0	10.0
1999-2000	112.8	1871.0	17.3
2000-2001	101.5	1665.7	16.4
2001-2002	105.2	1730.7	16.4
2002-2003	115.8	1946.3	16.8
2003-2004	109.7	1938.1	17.7
2004-2005	112.0	2024.9	18.1

Sources: Agricultural Statistics of Pakistan, MINFAL, Islamabad 2004-2005.

As shown in table 2, we can see a constant increase in the area of cultivation, production over the expressed period due to better crop husbandry and better market knowledge. Still there is a potential to grow when compared with few higher producing markets of the world.

Figure 4. Stages in potato development



Provincial Shares in Area and production.

The majority of potato production comes from the Punjab area and the production percentage date of the other areas of Pakistan is given in the table 3.

Table 3. Percentage share of the national production by the provinces.

	Punjab	Sindh	KPK/GB	Baluchistan
Major potato growing Districts	Okara, Sahiwal, Kasur, Pakpattan, Vehari, Toba Tek Singh, Sialkot, Sheikhupura, Jhang, Lahore, Narowal, Gujranwala and Khanewal		Nowshera, Dir, Swat, Balakot, Gilgit, Skardu, Diamer and Mansehra.	Pishin, Killa Saifulla and Kalat from Baluchistan are important potato growing districts
Percentage Area	86	0.5	9	4.5
Percentage Production	88.3	0.3	7.2	4.2

Punjab, Sindh, NWFP and Baluchistan respectively account for 86, 0.5, 9 and 4.5 percent of the total area and 88.3, 0.3, 7.2 and 4.2 percent of the production of potatoes in the country. There are more areas under cultivation this year in Gilgit Baltistan region and KPK due to increased demand from the local and the Afghan market.

Changes in Area, Yield and Production.

Potato production during the last decade is estimated to have increased at a rate of 7.5 percent per annum on an account of 3.8 percent annual expansion in its area and 3.7 percent improvement in productivity.

In the Sindh area, potato production decreased by 3.2 percent, resulting in production decrease of 12.5 percent in the last ten years as farmers cultivated other cash crops due to higher costs of production, soil conditions and non-availability of proper husbandry practices.

Climatic conditions in the KPK area are conducive to growing three crops of potatoes in a year. Total production from these crops has increased at a rate of 6 percent annually from a 2% expansion in area and a 4% rise in yield. One of the constraints in KPK is the unavailability of the large tracts of farming land at one place for mechanized potato farming.

In the Baluchistan region, only the summer crop is cultivated. The production in this province has diminished 9.3 percent in last ten years as the area under the crop has contracted at a rate of 4.35 percent.

Major Potato Growing Seasons in Pakistan

Potatoes are harvested from January to March. As prices in Pakistan tend to be lower during these months, this encourages exports during this period, especially as this is counter-seasonal to the harvests in Europe which tend to take place during September or October. While potatoes can be stored, the additional cost of doing so means that imports can be more cost-competitive during these off-peak periods in destination markets. Therefore, Pakistani potatoes can be shipped fresh to market as part of the Southern Hemisphere Production Cycle. Pakistan should consciously incorporate this into its competitiveness strategy for the sector. Other countries in this production cycle such as India and Bangladesh do not have huge surpluses for export purposes.

Table 4. Potato growing seasons in Pakistan.

CROP	PLANTING	HARVESTING	PRODUCTION SHARE
Spring	Jan-Feb	April-June	07.10 %
Summer	March-May	August-October	15-20 %
Autumn	Sept-Oct	January-March	70-75 %

It is apparent from Table 4 that the bulk of the potato crop is harvested from January to March (called "the autumn crop") which can be exported fresh abroad or placed into cold storage for sales later in the year for the domestic market which cannot absorb this peak production during those months. The stored potatoes are gradually released during the lean crop periods, generally from June onwards. Production of potato in the highlands is increasing, due to demand in the domestic market for fresh potatoes which fetch a premium price. The size of the KPK, GB and Kashmir crop directly impacts prices of the stored potatoes as does the time of harvest and the preference of fresh produce by consumers.

Table 5 below shows the major Potato varieties grown in Pakistan and their basic characteristics. Generally there are have red potatoes destined for national consumption while the majority of white potatoes are for export markets. Domestically there are a few companies making chips (or "French Fries" as they are known in North America), and these use special varieties, suitable to their needs. Through contract farming this sector has strong growth potential. Both PepsiCo and Candyland, two major chips companies currently have contract growing arrangements with producers.

Table 5. Major potato varieties grown in Pakistan.

Major Varieties & Characteristics Of Potatoes Grown In Pakistan						
Variety	Shape	Color of Flesh	Cooking Type	Skin	Utilization	Common Scab
Diamant	Oval	Light Yellow	Mealy + Firm	White	French Fries	Just Resistible
Cardinal	Oval	Light Yellow	Mealy + Firm	Red	French Fries + Crisps	Quite Resistible
Désirée	Long Oval	Light Yellow	Mealy + Firm	Red	French Fries	Just Resistible
Raja	Oval	Yellow	Mealy + Firm	Red	French Fries	Quite Resistible
Santé	Oval	Light Yellow	Mealy + Firm	White	Crisps	Just Resistible
Kuroda	Oval	Light Yellow	Mealy + Firm	Red		Quite Resistible
Asterix	Oval	Light Yellow	Mealy + Firm	Red		Quite Resistible
L.Rosetta	Oval	Light Yellow	Mealy + Firm	White	Crisps	Quite Resistible
Russet	Oval	Light Yellow	Mealy + Firm	White	French Fries + Crisps	Just Resistible

Source: Agrico, Netherlands (Supplier of Potato Seeds)

Figure 5. Major Potato varieties grown around the world.

Potato varieties

Although the potato cultivated worldwide belongs to just one botanical species, *Solanum tuberosum*, the tubers come in thousands of varieties with great differences in size, shape, colour, texture, cooking characteristics and taste. Here is a small sample of potato diversity:



Description of the Value Chain Participants and their relationships

The objective of the value chain analysis is essentially to characterize, describe and understand a chain and in turn, to evaluate its performance. However, there is also a prescriptive dimension so that the analysis can be used to promote improved performance through appropriate public policies and private firm strategies.

The framework also allows for evaluation of chain performance by distinguishing the strengths and weaknesses associated with different activities, linkages and identifying barriers to chain development. In turn, this information can be used to prioritize interventions that can be made along the chain to improve performance.

In practice, value chain analysis can cover a range of chain issues, such as market access problems for small producers, the relative merits of different types of contractual relationships between enterprises, and the distribution of power and benefits along the value chain. Building from this acquired information, value chain analysis can then be used to promote solutions to enhance chain performance by, for example, promoting enterprise development, raising food quality and safety standards or improving competitive performance.

Figure 6. Potato Value Chain Map.

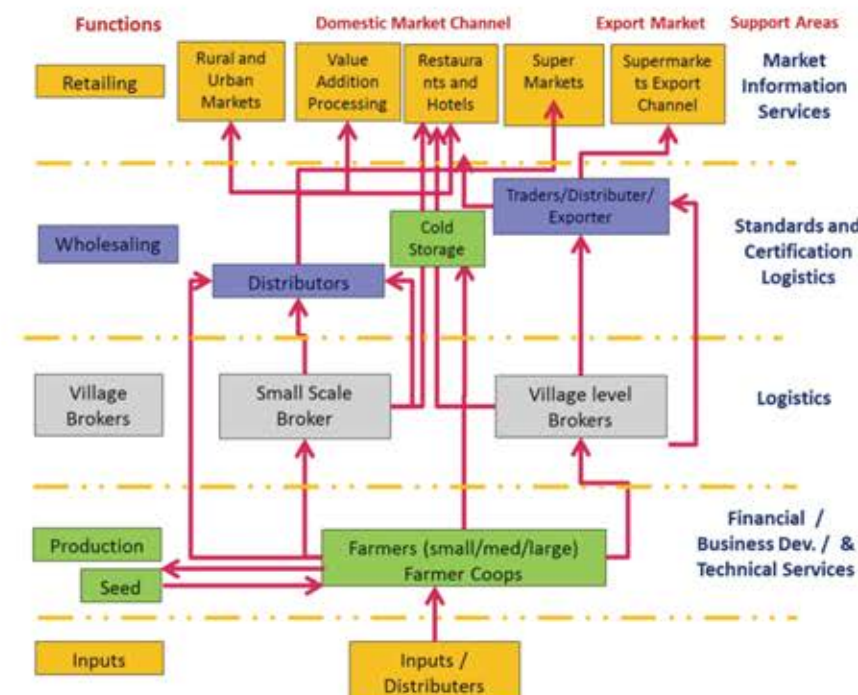


Figure 3 shows the flow of the product among the actors of the value chain. Also, the actors are also described below.

Outline of the Value Chain Actors

There are seven layers of this value chain

1. Growers

There are over 125,000 growers all over Pakistan including small farmers of the North. There are five kinds of producers, Small Farmers, Medium Farmers, Large Farmers, Corporate Farmers, Cooperatives and Farmer Associations. In the stake holders' workshop, it was mentioned by the Vice Chancellor of the University of Agriculture Faisalabad that it is hard to define the small to large farmers as this is a cash crop and even a one acre farmer can have a higher production and receive more cash than a larger land owner and receive less money at the end of the crop.

The majority of farmers market their produce as either, standing crops or at the farm gate following the harvest. A number of growers directly market their produce at the wholesale markets. This category includes both medium and large producers. Some large growers engage in direct bulk supply to downstream industries, traders and exporters. There are also few farmer cooperatives engaged into formal contract farming for various chips and seed companies.

2.Value Addition and Processing

Value addition includes on Farm Harvesting, Cleaning, Grading, Sorting, Pack House, Chips/Fries Processors, Powder/Starch Processors and Other Processors (Feed/Alcohol). Processing includes Chips/Fries Processors, Powder/Starch Processors and Other Processors (Feed/Alcohol). In the stake holder's survey, it was stated that there are only three purpose built potato grading facilities and less than twenty medium or large value addition facilities for the value addition.

3.Traders

Traders play a most important role in the marketing of the product and even play a major role in the production as they also extend credit to the farmers for crop production. This layer of actors includes the Contractor (or "Thakedar"). These operatives tend to purchase standing crops in advance or at harvest time for on-ward sale to commission agents or wholesale dealers. Contractors directly finance transactions from their own resources or from credit proceeds obtained from formal mechanisms or from informal credit supplied by commission agents.

The Middlemen (or "Beuparies") operate at the early stages of the marketing chain. They act as collectors of small quantities of perishable and non- perishable agricultural produce at the village level. Beuparies take produce to wholesale markets or sell it to commission agents.

The beuparies almost always purchase produce directly from farmers. Their major contribution is to consolidate produce from individual growers into large lots and transport them to the "mundis," or primary markets and to higher levels in the value chains.

The principal function of wholesalers is to collect agricultural produce from other dealers and distribute it to the end users in the marketing system. They purchase in bulk and directly supply processing industries, mills, traders and exporters. Wholesalers often work for traders and industries as agents. Wholesalers purchase in bulk and supply against contracts with different sources including, agribusinesses, traders and sub-wholesalers and retailers.

Sub-wholesalers ("Phariawala") are middlemen who sell to their parent markets or within the vicinity of these markets. These operatives usually purchase in small bulk from auction lots, purchased by wholesalers for onward resale to the retailers. Primarily they target small retailers or individuals whose demands do not justify them to buy in bigger volumes in auction.

Phari literally means a mat and it is also referred to a dealer who buys the products and sells on the floor (Tharha) of the wholesale market

Commission Agents (Arhti), current market committee regulations (1939 act) require that the farmers sell their products through commission agents. These agents operate as mediators between buyers and sellers. The Agents arrange auctions for the sale of agricultural produce brought into markets and charge fees for their services. The fees are usually derived as a fixed percentage of the ad valorem transaction. Often commission agents own the produce brought to market, having extended credit to the supplier, a grower, middleman or a contractor. Commission agents fall into two categories: the "katcha arhti" and the "pucca arhti". The Katcha arhti specializes in the collection of produce and the pucca arhti engages in sales and distribution.

Although the commission agents enjoy clear monopsony power, they perform some important functions in facilitating the operation of the marketing chain. These functions include; displaying produce to buyers before price settlement, explaining to sellers and buyers prices fixed in the transaction, arranging for weighing equipment at the purchase destination, collecting invoiced sales revenues from buyers and paying sellers, providing post-harvest credit, storage, arranging, paying for transportation and providing labor for loading and unloading.

4.Retailers – End of Chain Suppliers to Consumers

Retailers make direct purchases at the wholesale markets. At the end of the marketing chain, the retailer buys from wholesalers and sub-divides produce lots into smaller quantities which are commensurate with consumer demand. Some retailers, particularly large shop keepers, procure from open auctions for subsequent resale to smaller retail players. Retailers usually buy from wholesalers on credit. Repayment is required within 24 to 48 hours as the retail stock is liquidated. Retail market has various players such as Pushcart, Small Retail Store/Corner Convenience Store, Medium Size Retailer, Super Market, Hotels and Restaurants.

5.Exporters

In the potato sector it was estimated that there are over 250 medium and large exporters including small scale, medium scale, large scale, exporter groups and multinational supermarkets buying in Pakistan. Further study will be needed to identify end-market trends, demands and opportunities for increasing export volumes and margins going forward, something that can be a priority for ASF's market linkage initiatives.

6.Input Providers

There are various companies and individuals working in Pakistan with domestic and foreign links. These include value chain actors such as Seed suppliers, Importers, Contract Seed Growers, Buyers from the Domestic Market and Wholesalers, Fertilizer Dealers, Ag-Equipment Rentals, Tractors/Laser Levellers/Ridgers/Planters/Harvesters, Irrigation, Tube well service providers to small farmers and cooperative farmers. Coordinated and appropriately financed input provision will be important to expansion of production, productivity growth and meeting the specific seasonal and varietal needs of both local and international consumer markets.

7.Sector Support Service Providers

Logistics providers, storage, finance, insurance, standards bureaus, non-profits and other service providers round out the "cluster" that supports the potato value chain. Various local and international Certification Bodies are present in Pakistan catering to the export sector. Extension services from Government/Private Sector are available in this sector and they have on farm and off farm knowledge based and capacity building programs

Logistics is a problem as the availability of the reefer containers is limited and major logistics companies only service existing large exporters. Also important are the Dry/Cold Storage, GAP Consultation Services and Research and Development services. Government and Private Sector's Training services, Education and Capacity building Institutes and Market Information Services providers also support the sector.

IV. MARKET TRENDS

Domestic market

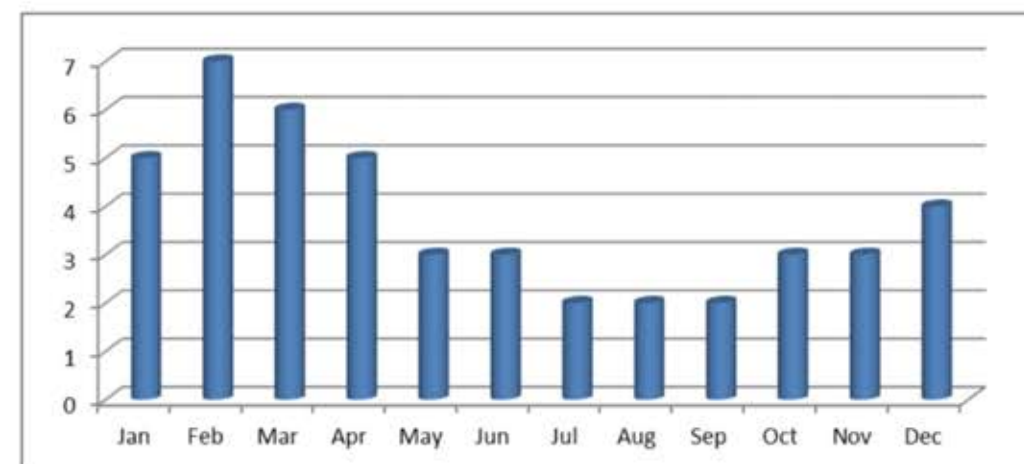
On the domestic front, accurate demand numbers are difficult to ascertain as there is a lot of informal trade and some of the officially available numbers have contradictions. The stated internal demand of about 2 million MT and 4.14 MTs of production is only partially explained by the use of some production for seeding the next crop. The figures are not entirely consistent with estimates of 16KG per-capita consumption in Pakistan. Annual production in Pakistan may be much higher given unrecorded production, consumption and trade.

Although potatoes have many uses, less than 1% of the total production goes into value addition and that is primarily for chips. The majority of this share is held by a few major companies. Two of them are into contract farming with over 7500 acres in direct contract each year. However there is the potential to expand to value added products such as starch, powder, paste, fries, crisps, alcohol, mash and meal. Within a decade, this situation could look very different. For example, in the large potato producing area of Prince Edward Island, Canada, about 60% of potatoes go to value added while on average in developed countries about 30% is processed in some form. The story of the growth in crisps is largely that of the two firms mentioned earlier (PepsiCo and Candyland) which together have a 75% of the market share in crisps. So far Pakistan is processing about 1% of the total potato produce.

Although excessive competition in value addition may create some instability in the short-term, the further growth in value-added demand will create stronger, more consistent and more secure demand for locally grown potatoes.

However, formal channels of industry cooperation (private-private, such as an effective business association) and public-private dialogue are largely absent. A competitiveness initiative for the potato industry would help remedy this while identifying strategic initiatives and policy improvements to boost growth.

Table 6. Domestic potato trade in Pakistan

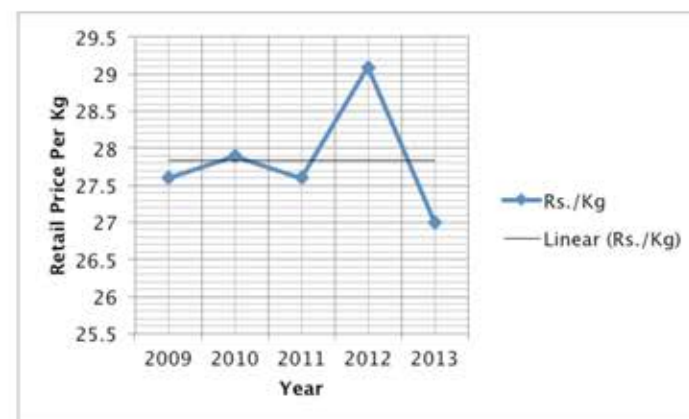


Source: Pakistan Agricultural Research Council (PARC)

There is a cyclical trend in the domestic potato trade. We can see the peaks at the production time as majority trading for the local and the export market happens while the produce is still fresh. July and August are the lean months and after that the product starts coming from the cold storage and the KPK producers. February and March also show high numbers as the major producing areas of Punjab harvest at this time.

At the producer level, farmer associations, potato producer associations and cooperatives need strengthening in technical matters, such as the know-how for adequate potatoes growing and to engage in mechanical cleaning, grading, sorting and packing. Also, managerial strengthening (marketing, pricing, credit to farmers, etc.).

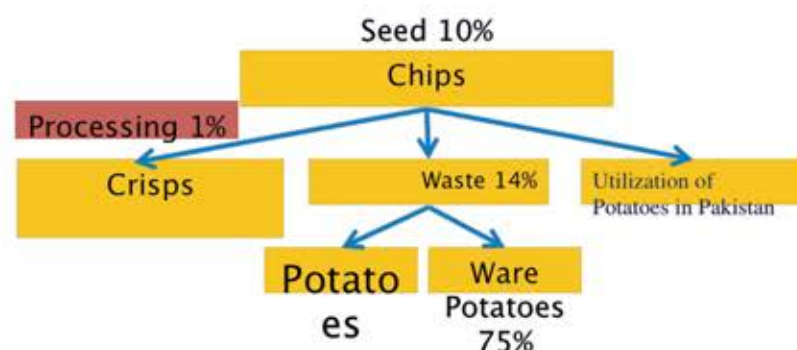
Graph 1. Retail Price of potato for five years



The average retail price for the past five years have been within in a close range and even the price spike in 2009 was relatively modest as we can see from the numbers provided by a leading supermarket, Hyperstar in graph 1. These numbers are from the Lahore market. There is only a fluctuation of two rupees in the past five years. On the other hand, we can see that the cost of production of the potato crop has increased by 30%, squeezing producer incomes, something that has increased producer risk while crop insurance schemes are largely unavailable or inadequate for the potato crop.

Currently 75% of the potato production goes to the table or "ware" potato market, 10% goes to the seed market, 1% is processed and 14% on average goes to the multiple losses as shown in the figure

Figure 7. Potato utility in Pakistan



With the changing demands for crisping, frying and table potatoes the producers should be targeting for better varieties with a focus on productivity and better consumer demand. We have also seen that the price of the crisping potatoes is \$100-\$150 more per MT as exported last year even though the quantities were small.

The global expanding markets of value added products such as fries, crisps, powder and starch lead to a demand for specialized varieties.

There is some controversy regarding the extent of post-harvest loss for the somewhat durable potato. In stake holder's meetings, industry participants did not agree with the official estimates from of 30-40% and believed that data in reporting agencies are inaccurate. Losses among large potato growers interviewed for this study were said to be about 15%. The losses in 2012, when potatoes could not be sold and were fed to animals, is seen as not reflecting normal post-harvest loss but rather a market anomaly related to a specific export conditions affecting that year.

Global Market

Figure 8. Global potato production map.

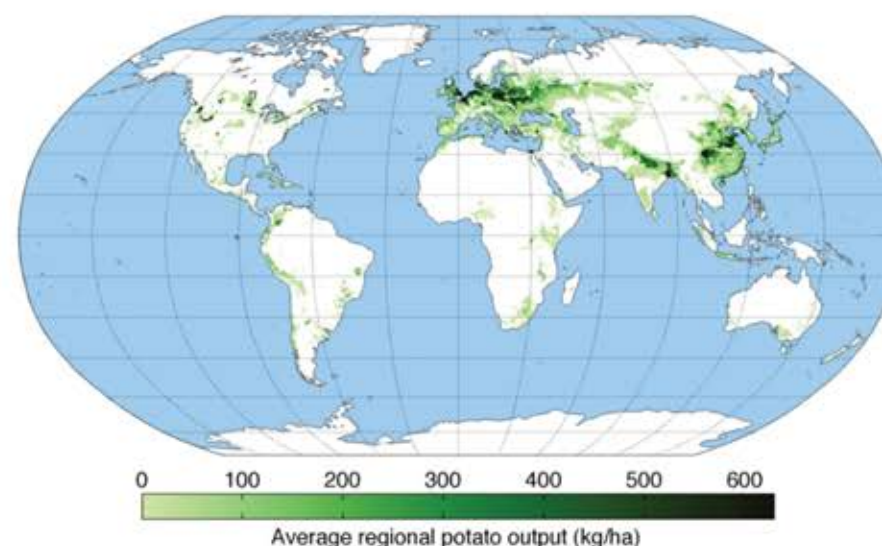


Table 7. Global potato area and production

countries	year	Area Harvested (Ha)	Production (MT)	MT per HA
World + (Total)	2012	19321198	368374112	19.1
China	2012	5431700	85920000	15.8
India	2012	1900000	45000000	23.7
United States of America	2012	458388	19165865	41.8
Netherlands	2012	149770	6765618	45.2
Egypt	2012	165000	4500000	27.3
Pakistan	2012	185100	4104400	22.2
Kazakhstan	2012	190200	3126400	16.4
Uzbekistan	2012	74000	1900000	25.7
Kyrgyzstan	2012	81517	1312699	16.1
Tajikistan	2012	41700	990200	23.7
Azerbaijan	2012	66004	968545	14.7
Saudi Arabia	2012	22000	535000	24.3
Afghanistan	2012	21500	235000	10.9
Sri Lanka	2012	4500	62000	13.8

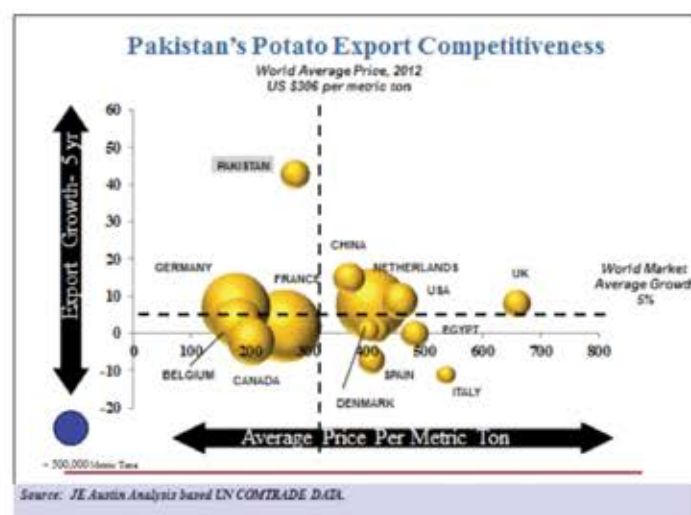
Pakistan's yield surpasses the global average although it remains about half of the yield of the most productive countries of Netherlands and the USA. The world average yield is 19MTs/Ha while Pakistan's yield is a little over 22 MT/Ha. Pakistani yield is higher than China but lower than Egypt. Egypt is a major supplier to the GCC and a Pakistani

competitor. In the past five years a lot of new areas have opened up for the potato crop in Pakistan. There is a huge production gap between the established farmers and new farmers, especially from the North and Sindh. Some of the established and progressive growers are producing 18 MTs/acre (44.5MTs/Ha) consistently thanks to better crop husbandry, seeds and inputs.

Stakeholders convened for this study indicated that the better farmers are yielding over 13.5 MTs per acre in Punjab, near the world's most highly productive countries when this is translated into MTs per hectare. However, if productivity drops below 12 MTs per acre, the crop profits do not justify the crop sowing as there are other crops which provide higher rates of return.

This study recommends improved data gathering and monitoring so that the sector can have transparent and accurate benchmarking data and so that losses can be known rather than assumed as a plug figure. Normally, this study would have provided cost-price ladders for Pakistan versus other producing countries but this analysis will have to await the provision of better data.

Figure 9. Pakistan's potato export competitiveness



Despite strong growth in external demand, Pakistan's exporters are not supplying the most sophisticated markets. The prices per ton that Pakistani potatoes obtain are well below those from other producing countries.

We have seen that in 2012 season the ware potato was exported at \$277 per MT, the Crispings export got a minimum of \$350 per MT from the comparative market whereas, seed potatoes was exported for \$650-\$700 per MT in a very small amount to a select market.

In general, most importers who supply potatoes only want to purchase scientifically treated, properly cleaned, washed, dried, sized, graded and packed according to international standards. Food security and traceability is also playing an important role in the export market.

Table 8. Pakistan's potato exports.

Importers	2008	2009	2010	2011	2012
	2008 Exported quantity, Tons	2009 Exported quantity, Tons	2010 Exported quantity, Tons	2011 Exported quantity, Tons	2012 Exported quantity, Tons
Pakistan Totals	139918	347081	215436	443046	300049
Afghanistan	15590	235298	102712	233586	185176
Sri Lanka	71312	75597	76732	48444	68020
Russian Fed.	129	84	1000	116960	19869
Malaysia	13485	25490	21314	4755	16675
UAE	8494	6663	363	2470	4510
Tajikistan	0	0	0	0	1943
Iraq	913	0	0	484	1285
Singapore	528	3038	2188	1113	764
Bahrain	62	11	195	57	367
Qatar	403	347	48	21	300
Azerbaijan	0	0	0	24558	269
Indonesia	0	0	0	0	223
Oman	565	163	16	77	140
Kuwait	277	10	0	168	132
U.K	0	0	7	3	87
China	0	0	56	0	61
Iran	28002	201	10572	756	52

Source: ITC data

Pakistan's export data for the top importing countries shows major gaps to be filled. We have few markets behaving erratically as the Russian market has gone from 129 MTs to 20,000 MTs in few years. We can also see how Azerbaijan imported 25,000 MTs in 2011 but had only 269 MTs in 2012, just a year later. This also shows how there is a spot trading going on in most of the markets, one year there could be great revenue while the next year there could be none. Table 8 shows how the exporters are dealing with one time buyers, either they are not able to give consistent service or they are simply filling a gap while the importer is unable to buy the product from his regular source. In any way this shows a gap in the market linkage for a sustainable trade and need a better understanding and capacity building of the exporters from Pakistan and the importers from the foreign markets.

Graph 2. Trade Indicators of Pakistan's potato exports to the top world markets.

Importers	Trade Indicators						
	Exported value 2012 (USD thousand)	Share in Pakistan's exports (%)	Exported quantity 2012	Unit value (USD/unit)	Exported growth in value between 2008-2012 (% p.a.)	Exported growth in quantity between 2008-2012 (% p.a.)	Total import growth in value of partner countries between 2008-2012 (% p.a.)
	83463	100	300049	278	44	19	6
Afghanistan	62492	74.9	185176	337	122	64	113
Sri Lanka	11112	13.3	68020	163	-3	-5	4
Russian Federation	4940	5.9	19869	249	557	465	18
Malaysia	2788	3.3	16675	167	-8	-12	25
Tajikistan	714	0.9	1943	367			104
United Arab Emirates	676	0.8	4510	150	-15	-20	14
Iraq	216	0.3	1285	168	73	9	-5
Singapore	156	0.2	764	204	7	-3	5
Qatar	104	0.1	300	347	1	-29	25

Studying the data of the top five markets of Pakistani exports we can clearly see that Sri Lanka has been the most stable market for the past five years, following Afghanistan. To be competitive in the world market, a country should have stable exports year after year, unless justified by some radical reason for the shift in exports. Pakistan is spending too much energy in the UAE market as this is much smaller for all the efforts done for the sector. Pakistan should look into other emerging markets with higher imports and price point opportunities. According to the table showing Pakistani exports to Iran, there is only export of 52 MTs in year 2012. The unofficial numbers prove otherwise, it is estimated from the stakeholder's inputs that Iran imports high numbers of Pakistani potatoes, somewhere in the range of Afghan imports.

Once harvested, the potatoes are cleaned, graded and packed, temperature adjusted and loaded in the reefer container for export by sea. There are very few mechanized pack house facilities available in Pakistan for proper export market. According to Mr. Shahid Sultan, one of the largest potato exporters, "He could have packed more than 500 containers if he had access to a better pack house and lost the valuable customer to Egyptian Market".

Mechanized grading sorting and packing can significantly increase the product quality and the shelf life. We can see a major increase in the exports as the timely handling can increase the amount of the shipments in the early low weather months for better quality before going to the cold storage. Most of the farmers grow their potato crop to synchronize with the corn planting and 80% of the crop gets to the market in fairly a very short span of time. A lot of farmers keep the product in their fields and try to sell off from there to save money by not sending their product to the cold storages. In this process sometimes the starch and the sugar levels change and the product quality goes down.

The world market for the potatoes is sizeable and growing rapidly. In 2012, the global market reached 368 million metric tons. The average price at which potato was imported worldwide was \$306 USD per MTs from 193 million Hectares. The average production per hectare was reported at 19.1 Mts. For the last 5 years, it has grown at an annual average rate of 5%.

Pakistan exported 301,544 MTs in 2012 with an average of \$277 per MT. Total reported area of harvest was 185 thousand hectares. Pakistan, on the other hand imported 3624 Mts. of powder and starch. World export growth has been driven by the expanding middle class in India and China In recent years. Demand for potatoes should continue to be strong in the future despite high prices, as in some markets it is an important staple food and unlikely to be replaced with any other commodity in the near future; and it remains an integral and irreplaceable part of the diet. Additionally, Potato demand for the value added products is increasing every day with more focus on renewable plastics and potato starch as in the future there is a growing demand for potatoes for uses such as paper coating and pharmaceutical needs. Potato powder is a basic ingredient used in majority baking needs.

Asia is the largest consumer of Potatoes with Europe, North America and the South America following the ladder. Netherland, Belgium and the Russian Federation are the largest importers of the potatoes with consuming almost a quarter of the world imports. Netherland and Belgium are also the largest producers of starch and powder from potatoes.

Demand for ware potatoes is also on rise in various countries. We have countries like Afghanistan, Indonesia and Japan with more than 50% increase in imports, not including over 100% increase in demand in some of the growing countries in Africa.

In the Middle East the ban on the potato cultivation in Saudi Arabia will play a significant opportunity for the Pakistani potatoes as there is an opportunity to gain one percent share in the International market, primarily exported to the G.C.C region. Pakistan has a chance to double its potatoes exports as Egypt is the other supplier to this market and is going through a political turmoil.

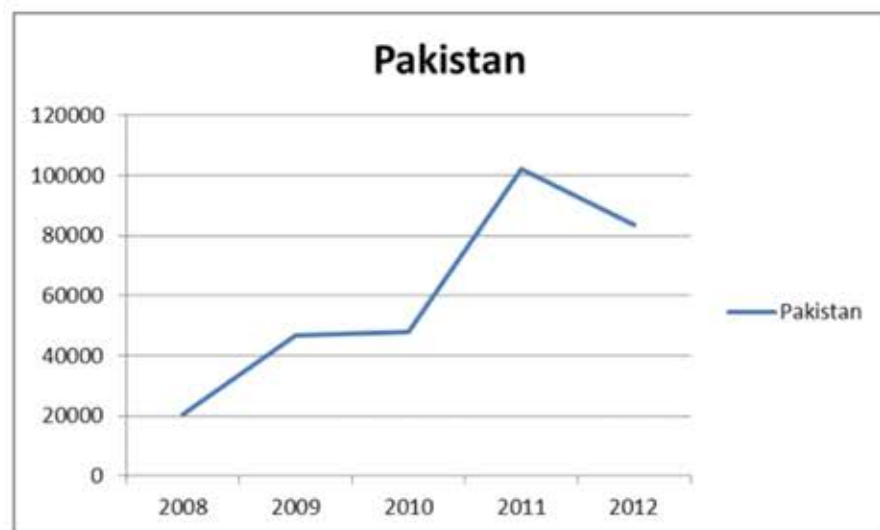
Pakistan also has a big Gap to fill, if the industry can get into more Value addition. the Netherlands and Belgium are the top importers of the potatoes but they are also the top exporters of the starch, powder and other value added products. Even though Pakistan is an exporter of the ware potatoes it still imports a large amount of potato starch, powder and other value added products for the domestic market consumption. We can see that last year Pakistan sold ware potato for \$277 per MT and on the other hand the importers bought Potato starch for prices up to \$1600 per MT.

The Potato market is not centralized or regulated internationally and there are no objective mechanisms for price reporting. The Public Ledger publishes prices based on interviews but these are not always consistent. Additionally, average prices of import and exports can be obtained from UN Comtrade data, as well as from national custom statistics but they are not factual due to major informal trade with the CIS, Afghanistan and Iran.

While Afghanistan, Sri Lanka, Malaysia and the Russian Federation are the largest importers of Pakistani potatoes, we cannot rule out the informal trade with Iran and also Afghanistan. Pakistan has a large market in the CIS where a large number of potatoes go each year through Afghanistan

informally. However the average price paid is still somewhat below the world average as the informal trade does not add real value to the value chain due to the loss of recording and business. Pakistan has a double digit growth in the exports for the past five years and this can grow substantially if better measures are taken on various levels.

Graph 3. Pakistan's potato exports for five years.



Despite the growing demand for potatoes, Pakistani exporters are getting lower prices than the world average. There is a major room to grow the margins by going to the high end markets with better paying customers. Graph 3 shows a dip in the exports in the year 2012 but it is in consistence with the world imports. Pakistan could have done better due to the demand from Russia and the CIS but grading, packing capacity played a major role .

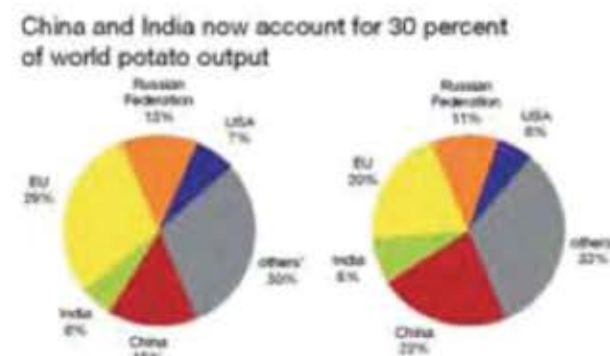
Pakistan is also a price taker rather than a price maker in various exports, including potatoes. Pakistan mostly dumps it's product in the international market and is at the mercy of the importer to give whatever price he likes .

Pakistan has not any significant market share in the CIS. With only minor exports reported to Tajikistan and Azerbaijan. Pakistan has a tremendous potential for the markets of other CIS states with a perfect pairing as an export market. Pakistani exporters have an excellent opportunity to use these states as storage and shipping destinations as well as selling to its consumer markets. There is an excellent rail road network available for transportation to the other regional buyers.

World Market Growth

Global demand for the potatoes is on the rise for past ten years, thus generating demand for exports. Another factor which can be attributed to the demand is the population rise which will cross 9 billion by the year 2050. Potato is one of the best fresh produce with relatively longer shelf life and high in nutrition. Currently Asia is the largest producer of potatoes with over 150 million tons per year. Overall production is highest in the North America, Europe and Oceania. This can be contributed to better seeds, good agricultural practices and better market systems. Generally 35%-40% of the total cost of production goes towards seed.

Figure 10. World Potato Production.



World Potato trade grew by nearly 9% last year and by a third in last 10 years. Value added fry export demand has increases by 70% in the past 10 years. Improved varieties, GAP, presentation, product development and new technologies will be a key to future success

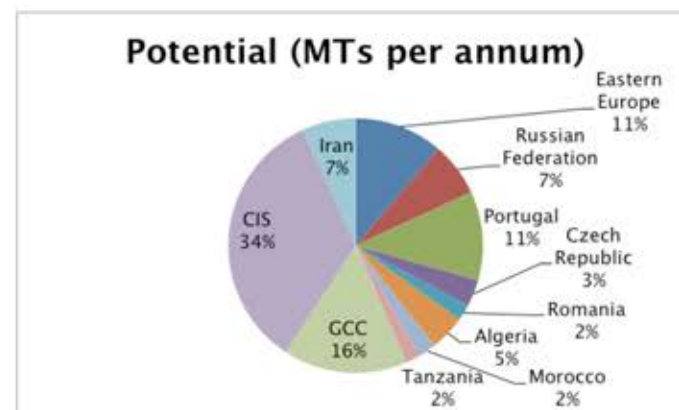
Pakistan's export trends (growth) and world market share

Pakistan needs to consolidate position in the existing markets through market promotions and consistently supplying better quality produce, shipped by maintaining a cold chain, identifying new markets and better market linkages. Pakistan has to work with sustainable market links rather spot deals.

Sri Lanka annually imports over 60,000 ton and Malaysia over 100,000 tons potatoes. Pakistan's current share is 60% and 14%, respectively. According to trade circles, share in Sri Lanka can be increased to 75% i.e. an additional 15,000 tons and in case of Malaysia up to 50% i.e. an additional 43,000 tons; both 58,000 MTs, additional.

East Europe and African Regions should be analyzed as potentially new markets for the export of potatoes from Pakistan. Graph 4 shows potential target markets with their annual potential of 2.21 million tons for the year 2013-2014

Graph 4. Potential markets for Pakistani Potatoes.



Likewise, exporters are not serving the better paying markets and segments which pay higher prices. The world average for the year 2012 was \$306 while Pakistan sold to her top ten importers at an average of \$277 per metric ton. Consistently across various markets, Pakistan's potatoes receive less than the average price, indicating that the country's exporters are serving the lower-end segments of those markets. On the other hand, the quality of the product is at par with the top tier suppliers and by no means Pakistani traders should be getting these prices.

Both, a cause and an effect of this, is the fact that exporters do not offer a differentiated price for quality to the farmers as all grades and varieties are given similar or close to similar prices. There should be value based incentives for the producers for better products, like exporters encouraging farmers through competitive prices. Pakistani exporters should also target better consistent markets rather than going for a spot trade in a season. To support consistent business with consistent quality, the exporters have to work with the farmers for contract farming. Shipping cost is a major factor in the final price and the profitability of any export. Table 9 gives the shipping costs to various ports of the countries where Pakistani potatoes are being exported.

Table 9. Ocean Freight to selected markets.

Country	Port	Reefer 40 Feet USD	Reefer 20 Feet USD
Malaysia	Kuala Lumpur	1800	300
Malaysia	Penang	2400	300
Sri Lanka	Colombo	1700	300
UAE	Dubai	1800	300
Russian Federation	St. Petersburg	5000	3000
Czech Republic	Czech Republic	5000	3000

Revealed Comparative Advantage (RCA)

In order to create a higher Comparative Economic Advantage, Pakistan has to lowering the input costs, boost productivity and create an farm to market value chain. We have a major example of this principle followed by one of the largest potato producers, China. In China the input costs are sufficiently lower than other countries which makes price of the product lower to compete in the local and the global markets, even though the production is less efficient.

Table 10. Revealed comparative advantage of Pakistan's potato sector.

PAK EXPORTS (ALL PRODUCTS)	Exported value in 2008	Exported value in 2009	Exported value in 2010	Exported value in 2011	Exported value in 2012
TOTAL	20279046	17554698	21413103	25343769	24613676
WORLD EXPORTS (ALL ECONOMIES)	Exported value in 2008	Exported value in 2009	Exported value in 2010	Exported value in 2011	Exported value in 2012
TOTAL	15989372712	12327153144	15055401572	17999547615	17981277146
Potatoes Exports	Exported value in 2008	Exported value in 2009	Exported value in 2010	Exported value in 2011	Exported value in 2012
World	3319188	3038655	3595118	4618795	3424774
Pakistan	20600	46726	47878	102187	83664
	2008	2009	2010	2011	2012
Pak Potatoes RCA	4.9	10.8	9.4	15.7	17.8
World Market Share (%)	0.62%	1.54%	1.33%	2.21%	2.44%
Pakistan Average Price	277				
World Average Price	306				
Pakistan price as a % of World Price	90.5%				

The RCA for the potatoes is 17.8 for the year 2012. This is very high and shows the strength of the sector as comparative advantage advantages can be built into competitive advantages. An RCA greater than 1.0 indicates a competitive advantage for that item, whereas an RCA lower than 1.0 identifies a comparative disadvantage. For the past five years we can see that the lowest RCA was 4.9

V. VALUE CHAIN CONSTRAINTS

Critical Analysis of the success factors & gaps with the benchmarks

There has to be clear priorities set to improve the value chain's competitiveness which includes the capacity building of small and medium farmers for better crop husbandry. We have seen major production gaps in the progressive farmers and the new potato farmers. There is a major difference in the crop production between the farmers from Punjab as compared to the farmers of the Northern areas of Khyber Pakhtun Khawa and Gilgit Baltistan.

There is a major constraint in production due to the lack of proper credit availability to the producers. Cost of production has gone above eighty five thousand rupees per acre, and from this more than thirty percent is the cost of seed. Due to the non-availability of the credit, farmers use low grade seed and inputs, resulting in lower productions and loss of profitability.

Potatoes, like other fresh produce, have the problem with the market glut as the season is very short and the farmers in the Punjab area want to sow maize and clear the fields in relatively short period. This causes an excess product in the market and the prices go down to sometimes Rs. 7.00 per kg at the farm gate level, as we noticed in the last few years.

The postharvest treatments have become very expensive as the anti-sprouting agents are imported at high costs. This makes a major constraint as the number of trained farmers is very small to provide proper care for the domestic and the export product.

Lack of the processing industry is a constraint as only 1% is going through this sector. Pakistan is losing major foreign exchange as over three thousand tons of starch and powder is imported at high prices. We have virtually no large fryer facility and a relatively small crisping industry. Marketing and market linkage is a major constraint for the domestic and the international markets. There is no pull factor and the product is pushed to the market. At the end Pakistan becomes a price taker.

Process for the export includes a long list of regulations including paperwork and various layers of agencies. This discourages more exporters to get in this sector and the monopoly of the few prevails. The exporters do not peg their prices to the product quality incentives and at the end of the market day all products command the same price on average. This discourages the sector to work on better grade product.

The benchmarking analysis conducted identified important gaps in all critical areas. The main gaps identified are as Pakistani exporters appear to match global quality but lack in various ways such as the grading and quality control related issues. Quality Standards will have to be implemented for competitiveness in the global market. Pakistani Potato branding has to be established to gain access to higher value markets. Pakistan has to fill the gaps of the GCC market due to the ban in the KSA potato production. This can add to the Pakistani exports with a 1% share of the global exports. Pakistan should involve better technology and crop husbandry to improve exports. Yields should be increased by better seeds, training, good agricultural practices, market linkages and use of extension services. A comprehensive seed certification should be in place for disease management and higher yields. New programs should be started for hydroponics and Aeroponics facilities for better seed production.

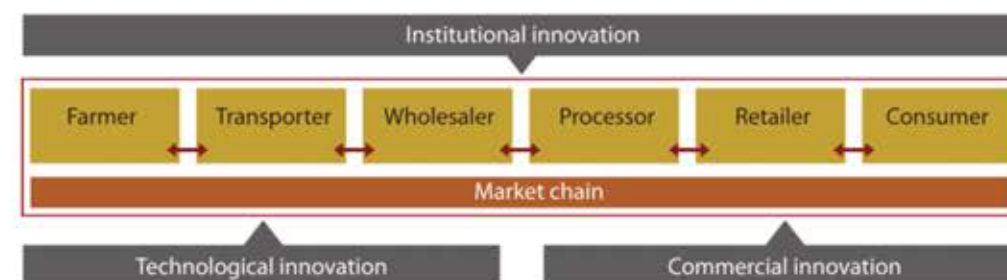
Pakistan presents several advantages in the global market as Pakistan is located in southern hemisphere cropping cycle and gives an edge over the European exporters. The adapted varieties produce good grade potatoes suitable for the local and domestic markets. The proximity to the GCC, ASEAN and the CIS is also an advantage over other producing countries that may require more expensive logistics. The harvesting time in Pakistan also matches with the demand from the importing countries. However, Pakistan has higher production than the world average but can improve more by adopting better crop husbandry practices and following standards. Insufficiency of certified quality seeds for multiplication and cultivation. Availability of the credit to the producers should be made easier at better terms so the productivity can be higher directly proportionate to the profitability.

$RTB_c = (x_c - m_c) / (x_c + m_c)$ where x_c and m_c refer to exports and imports, respectively, of product chain or group c . This indicator is calculated for chains or groups of products and thus shows whether a set of related products is more export- or import-oriented as a whole. If $0.33 < RTB_c < 1.0$, then for the product group the country is considered to be a net exporter. If $-1.0 < RTB_c < -0.33$, then the country is considered to be a net importer of the product group. For cases in which $-0.33 \leq RTB_c \leq 0.33$, then either there is little international trade in the product group in this country's case or the trade goes both ways, imports and exports, in significant quantities.

While a useful tool, RCAs are imperfect because they also embody government policies and institutions that may be distorting markets and like many indicators, it accounts only past performance. As long as these imperfections and limitations are recognized, RCAs can be helpful as analysis tools, since data are generally available in the trade record to gauge comparative advantage.

Constraints and Recommended Interventions to Improve Competitiveness of the Potato Value Chain.

Figure 11. Potato value chain flow



1. Seed Constraints

Potatoes are vegetatively propagated and this can result in the dissemination of pathogens, and viruses in particular, in the tubers. Viruses infecting potato can be categorized by their mechanisms of transmission: aphid transmitted, mechanically transmitted, and soil-borne viruses. The most important viruses in Pakistan include Potato leaf roll virus, Potato virus Y, X, A, S, M, Tobacco rattle virus, and Potato mop top virus. The methods for chemical control of virus disease are greatly influenced by their mechanism of spread in the field.

However, tubers play an important role in the spread of virus disease and this has led many regions to develop seed certification programs. The use of certified virus-free tubers by growers has been vital for control of disease worldwide. In addition, breeders have identified genetic resistance that can be introduced into popular cultivated varieties and provides a method of control that is less costly than chemical application. In recent years there has been an emergence of viruses and recombinant virus strains that have posed new challenges to pathologists for seed certification and for breeders.

- Support the emergence of local, quality seed suppliers
- Elaboration of Potato seed legislation, including the necessary regulations and statutes
- Develop a consultative mechanism by which seed manufacturing can be planned according to user demand.
- Develop a system of seed traceability (i.e. seeds sold with certificate and bags labeled with the producer name, date, location and other pertinent information).
- Establishing a formal seed production system. Utilizing the season in the North for production to catering the seed market of Punjab. This will not only supply better generation seeds but also fix the dormancy problems associated with the imported European seed.

Pakistan has a large potato seed markets when it comes to Afghanistan, Iran and the CIS. Usually the price cost ladder is higher if compared to the ware potato export.

Federal Seed Certification & Registration Department's records show that during the Year 2012-2013 (July-March) the department provided services for total 4576.2 MTs of Potato seed, from this amount 34.5 MTs was the locally produced seed and 4541.7 MTs was the imported seed.

As mentioned earlier, certified quality seed is too expensive and the regulations are very vague. There are a couple of tissue culture centers but the production levels and the quality of the seed are not enough to coup with the local market, let aside the seed production for the export market. We can see from the seed import numbers as given in the table 11 that in 2012, Pakistan imported seed worth \$24 million with a major share from the Netherlands, U.K, France and Germany. Unfortunately the imported seed is rarely below generation seven and is sold as generation three to the farmers. On the other hand majority of the European seeds do not spend enough time in dormancy to produce best results.

Table 11. Pakistan's seed imports.

Exports	Trade Indicators								
	Imported value 2012 (USD thousand)	Share in Pakistan's imports (%)	Imported quantity MT 2012	Unit value (USD/unit)	Imported growth in value between 2008-2012 (% p.a.)	Imported growth in quantity between 2008-2012 (% p.a.)	Imported growth in value between 2011-2012 (% p.a.)	Ranking of partner countries in world exports	Share of partner countries in world exports (%)
TOTAL	2393	100	3624	660	-16	-16	-53	-	100
Holland	2236	93.4	3415	655	-12	-12	-47	1	57.7
Belgium	45	1.9	11	4091	-44	-62	-69	7	2.3
Germany	44	1.8	100	440	-18	-3	-70	4	4.6
Ireland	33	1.4	15	2200	-	-	-41	29	0
France	23	1	52	442	50	50	-93	3	8.1
China	8	0.3	16	500	12	23	-78	22	0.1

The data in table 11 shows how the imports of the seed have gone down in the past few years. The reason is also that the cost of production has gone very high and due to that the available seed in the market is of higher generation and it effects the production levels at the harvest which directly affects the competitiveness of the chain.

It was reported during a stakeholder meeting by one of the larger farmer and seed importer, Dr. Rizvi that the program should not go for the tissue culture labs as they are, "type writers" and obsolete. He pointed out that the Government of Pakistan or the donor agencies should strengthen the private sector to invest in the aeroponics technology and develop labs in Pakistan. He also pointed out that India has three hydroponic labs for the potato seeds and primarily they are in the private sector. Currently the potato producers are getting a tuber for Rs. 20 from the European countries whereas they can get from India for less than Rs. 8. Last year Pakistani farmers took high yields from the Indian seeds, such as Pukhraj with 18-20 MT per acre and 20-22 MT per acre from Pushkar. Dr. Bucha, President of the Farmer Association of Pakistan, pointed out that both of these varieties are not suitable for long term storage due to high water contents

2.Improving Product Quality

New varieties that can deliver improved taste or convenience will continue to be in demand. Competition from other foods grows as we can see that the world pasta consumption is now over 12 million tons per year (FAO). Good seed of the varieties that use water and fertilizer more efficiently, disease resistant, better crop husbandry will be important and essential for the future of this crop. There should be a quality assurance system in place with certification issuance for grading and phytosanitary control. There should also be some grades and GAP standards set for the whole industry.

Yields per hectare have a room to grow as there is a marked difference in the production of the progressive farmers and the new farmers of the potato crop. This can be fixed by better knowledge and training.

Product improvement should target the following interventions through the private sector:

- Improvement in farm management practices leading to better quality and higher yields
- Introduction of new cultivars based on targeted export markets requirements or a contract
- Introduction of potato cultivars suitable for processing like French Fries and Potato Chips
- Production of seed potatoes for the domestic and export market

3.Extension Services and Technical Assistance to the stakeholders

A regulatory agency should create a consensus among exporters on minimum standards for a technical assistance package of growing, harvesting and post-harvesting practices to be disseminated among producers. This should also support the training of a critical mass of private extension agents that can provide technical assistance to the farmers.

Additionally, private extension service providers are small in their setup and the quality of the technical assistance provided to the growers is still far from ideal. For its part, public extension services do not have qualified technicians in growing potatoes and are even less effective beyond basic grains.

4.Communications Campaign

Support a communications campaign throughout the producing areas disseminating the benefits of growing potatoes (short cycle, low maintenance, good price, credit availability/marketability through contract farming) that would help increase the number of farmers that cultivate potatoes and thus raise production volumes. The content could be extended to disseminate information about better practices in growing and harvesting as appropriate.

5.Support strategic dialogue among value chain participants

Disseminate this assessment widely among value chain participants look into the possibilities of organizing an "inter-profession" group to represent the value chain in its dialogue with the government Institutionalize periodic updates to the competitive assessment.

6.Strategy to Target Potato Export Market

Potato is one of the five main exportable commodities from Pakistan. There is need to concentrate on improving product quality, availability and post-harvest management in order to enlarge its exports. Most of the times the exporters are procuring substandard products from the wholesale markets and they export the potatoes to a limited market such as Afghanistan, Sri Lanka and Malaysia. These markets are supported by cheaper prices which results into poor product. There is no market promotion or awareness and expansion to access new potential high end markets. One of the export constraints is the limited availability of the grading plants and proper cold storage facilities.

There are also constraints for R&D and growing exact varieties as required by the host consumer. There are opportunities available for contract farming for the importers from Malaysia and Indonesia for specific grade potatoes and the way they want the product packed.

There are following few recommendations to improve the export of the potatoes;

Field Demonstrations and Contract farming should be promoted so there can be production of potatoes as desired by the consumers in the International markets. We have the example of the Prince Edward Island, the largest potato producing area of Canada. The farmers only plant on contract basis, for domestic or the international markets.

Good Agriculture Practices (GAP) should be followed and there should be more awareness for other standards such as EUREPGAP, more training of the trainers, availability of financing to farmers for seed and other inputs, adaptation of new systems, such as the system of sustainable crop intensification and promoting better crop contracts. PAKGAP standards should be developed and introduced at low cost showing the producers its value.

Infrastructure Development such as new pack houses close to the production fields, development of the modern cold storages, and cool chain maintained transportation. There should be development of new testing labs in the production area. Aeroponic seed production facility is also recommended for the better grade seed production.

Export Facilitation and Linkages is one of the major constraints for the export markets and development of the better grade products. Our International consultant Matthew Brown, for the linkages went to various markets and concluded that if there are proper storage facilities developed for the Pakistani products in the host markets, we will be able to supply larger amounts in the markets all over the year. In the CIS market Pakistan can store the products at very low price and Pakistani product can be taken to Uzbekistan or similar market and store fresh potato, graded from the field and supplied all over the CIS and the Russian states through the available excellent network of railways.

We should promote direct linkages between the farmers and the importers. We have identified good contacts for farmer to importer linkages for the Malaysian and the Uzbek markets, due to our International consultant's visit to these markets.

There should be a smoother process of the Phytosanitary and plant quarantine for the exports and the seed imports to Pakistan.

Market Promotion of "Pakistan Potatoes" should be promoted as the production of the Pakistani potatoes falls in the Southern Hemisphere Cycle and there are few countries to match with Pakistan such as India and Bangladesh. Pakistani potato is perfect to export as at the time of production there are no fresh potatoes available in the European markets for export. We should promote brand and the benefits of the season of production due to its freshness and shorter transportation time.

Research and Development is the key to the future of the sustainable exports. We have to invest on disease management, modern irradiation facilities to enhance shelf life, establishment of research centers and labs close to the production areas and again a major focus on the disease free seed production.

Value addition is one of the lagging sectors in the domestic and the export markets of Pakistan. Traditionally the value addition for the national production is more than 30% of the production. In Pakistan we have close to 1% of the total production going into the value added products. In some of the established markets the value added products add up to over 60% of the national production

In Pakistan we have opportunities for French Fries, potato chips, potato flakes, dehydrated potatoes, potato powder and potato starch. We can see how the trade is weighted for various potato related categories.

Table 12. Pakistan's leading Crisp manufacturers

Company Name	Brand Name
Pepsico	Lays
Standard Foods	Golden Chips
Tripple EM	Super Crisps
Kohinoor Smith	Smiths
Consolidated	Kolson
Trading Enterprises	Krincles

Above companies in table 12 are the major processors of the crisps in Pakistan.

Table 13. World value addition price ladder.

WTO Bound Tariff (%)		
Product	Trade-Weighted Average	Maximum
Fresh Potatoes (Including. Seed)	29	378
Frozen Potatoes	16	414
Potato Flour	38	446
Potato Starch	109	550

Pakistan has huge opportunities for potato starch as we can see from the data in Table 14 that Pakistan is a net importer of this product. There were direct imports of three thousand MTs of starch and twice the amount of the potato powder in year 2012.

Table 14. Pakistan's Starch import data.

Product: Potato starch						
Importing Country: Pakistan						
	2009		2010		2011	
Exporting Country	Qty. (KG)	Value \$ Mill	Qty. (KG)	Value \$ Mill	Qty. (KG)	Value \$ Mill
Denmark	10,46,444	0.56	17,25,808	0.96	20,57,000	2.57
Germany	7,28,464	0.41	14,97,233	0.72	8,18,329	0.85
Thailand	23,025	0.01	37,071	0.02	16,703	0.02
Viet Nam	0	0	0	0	8,770	0.01
China	21,000	0.01	3,600	0	0	0
France	20,000	0.01	20,000	0.01	0	0
Czech Rep.	0	0	20,000	0.01	0	0
Belgium	0	0	20,000	0.01	0	0
Netherlands	8,04,510	0.39	3,00,000	0.13	0	0
Total	26,43,443	1.39	36,23,712	1.86	29,00,802.00	3.45

Source: UN Comtrade, as reported by the Importing countries

Regulations is one of the other constraints that we need to consider for the growth of this sector. The Government of Pakistan (GoP) has seed corporation, National Agricultural Research Council (NARC), various potato research facilities, Export Promotion Board and programs to promote this sector. The GoP should set up authentic seed certification programs to stop the spreading of the soil borne diseases to the virgin lands. Many smaller farmers in the new potato cropping areas are using low grade seed resulting in low yields and long term damage to their soil.

The Government should get into private sector strengthening programs to promote better crop husbandry practices, international standard pack houses to service local and international markets, value addition facilities to make starch, powder and other value added products to not only earn foreign exchange but save millions in importing these products.

The Government should enact effective support strategy, which at least broadens and shifts its focus to include training agricultural technicians, support the emergence of a quality certified seed subsector and providing quality assurance services.

Regulatory interventions should include: national grades & quality standards, pre-shipment inspection/certification (national/international), accreditation (national/international) and quality testing labs for cheaper and timely tests for residues and the quality control.

VI. CONCLUSION

Pakistan's Potato sector is still emerging and is lagging behind its competitors in most indicators closely associated with competitiveness - such as export volume, growth, and price. At current average yields and prices, the Pakistani value chain is only obtaining sales of US \$277 per MT of Potatoes, compared with \$409 per MT in the Netherlands. Given the strong growth of the global market for potatoes (which is likely to continue in the double digits for the foreseeable future), it is important to take the necessary steps to improve the competitiveness of the sector and thus its contribution to Pakistan's development. With adequate support, the potato industry in Pakistan has the potential to become a very significant foreign exchange earner, a source of significant income for growers, and have potential of major foreign investments.

Pakistan has a product that matches with the global better produced products. Progressive farmers of Pakistan are getting yields pretty close to the farmers from the high producing countries. The overall average production of Pakistan is low due to many small farmers without better knowledge of crop husbandry practices. Low grade and higher cost of the seed is a major issue in the competitiveness of this sector and a key potential initiative to improve production volumes is to improve the quality and availability of certified seeds. Not only is Pakistan losing a potential value-added product by importing seeds from other countries, but it is also preventing Pakistan from much needed improvements in the yields per hectare, currently obtained by the potato producers. As expressed by the stakeholders in consultative meetings that the use of better grade certified seeds can improve yields by at least 40%. This alone could improve yields from 14 MT/Acre to 20 MT/Acre. A good aeroponics facility can have a major impact on the future of the potato sector as major potato markets are supported by a strong seed development sector.

There are more contract farming programs being adopted in the sector as the major chips manufactures are increasing the contract areas. This year the transparent contract price from the two large processors is 16 PKR per kg. This is a way for supplying, what consumers want and when they want at pre-agreed conditions. We will have to bring more domestic and foreign companies into direct contracts between the producers and processors to have a sustainable market. Historically, due to the lack of better market linkages, Pakistan has been a price taker rather than a price maker, even for a better product. Stakeholder's meeting also expressed that Pakistani exporters sometimes dump the product in various markets and take the prices whatever they are offered and lose major revenues at the end of the year.

Good purpose built pack houses are also required in the market. Few progressive producers went to the World Potato Congress 2013 and ordered mobile graders. This is a market driven input and now the exporters see the demand for this as they lost the exports due to this constraint.

There are over 1,100 modern and traditional cold storage facilities in the potato growing areas of the Punjab. The majority of these cold storages have below world standard practices and facilities. This is a market driven sector and most of the owners of these storage units are going to better grade facilities as there is a growing demand from the consumers.

What emerges is a clear priority for Pakistani stakeholders to increase production volume. With only 300049 Metric tons exported in 2012 there is still a room to grow due to the geographic demands including the CIS, GCC, SARC, ASEAN countries and the emerging markets of Africa. The report shows that Pakistan has a market of 2.1 million tons to cater in 2014.

Pakistan is losing a bulk of foreign exchange and opportunities in the sector by the lack of adequate value added industry. Currently it is only processing 1% of the production through value added industry. This number should be at a minimum of 30% of the total country's production. We can see the examples of Netherlands, Germany and Belgium as being large producers but also largest importers for using the potatoes in various value added products. We have to promote the frozen fries market as it has increased over 200% globally in the last ten years and is still on the rise.

The Government of Pakistan needs to articulate an effective, clear, enabling policy for this sector. The role of the government in promoting quality, quality control service, the enactment and enforcement of the legislation and regulations concerning seed production and sales can improve the competitiveness of this sector. Sub-standard and disease infested seed is a major constraint on the production and the profitability of the value chain actors of this sector. The Government of Pakistan should also ensure the intellectual property rights for the companies producing high production varieties so they can invest more in the country.

Potatoes can surely become one of Pakistan's top agro-exports in the years to come. By following the recommendations above and launching a potato sector competitiveness initiative, it will be possible to boost production, enhance farmer income, increase agricultural GDP, contribute to export (and tax) revenues, and provide a cost-effective source of calories and nutrition while bringing economic opportunities to upland regions. By consciously strengthening this value chain by the implementation of public sector policies and private sector strategic initiatives, these goals and more will be achieved.

Annex – A: Sources, Detailed List of Interviews/Workshops

Organization	Name & Title	Contact
Ammiza Logistics and Warehousing	Khalil Ahmad Manager, Projects-Cold Chain	423.751.6311 Khalil.ahmad@raaziq.com.pk
Badami Bagh Fruit & Vegi Market	Multiple Dealers	
Chemonics	Muhammad Junaid Senior Technical Advisor	300.456.2738 mjunaid@chemonics.com
Dairy & Rural Development Foundation	Jacob Moser Chief of Party	423.111.637853
DuPont Pioneer USA	Dr. Asif Ali Shah	423.530.0247
Farmall	Mian Asif Shareef	423.532.2205
Farmers Associates Pakistan	Malik Afaq Tiwana Managing Director	346.515.8417 atiwana@hotmail.com
Farmers Associates Pakistan	Dr. Mohammed Tariq Bucha President	300.844.1100 buchatariq@gmail.com
Farmers Associates Pakistan	Maqsood Jatt Okara District Governor	333.698.2641 344.681.4406
Ghausia International	Muhammad Shabir Chief Executive	423.588.0342
Ghausia International	Nisar Ahmed Manager Exports	423.588.0342
Government of Punjab	Ch. Muhammad Arshad Jatt Special Assistant to Chief Minister	429.920.0669 Arshad163@hotmail.com
Government of Punjab	Muhammad Asif Khan DG Fruits and Vegetables	429.922.3454 300.635.8950
Government of Punjab	Dr. Farrukh Javed Minister Agriculture	429.920.3325
Government of Punjab	Muhammad Rafiq Akhtar DG Information	423.920.0731
Haji Sona	Haji Sona	
Hunza Seeda	Azhar Bhatti	423.573.1281
Hyperstar	Shahid Hussain Merchandise Manager Market	423.662.3344 shhussain@hyperstar.pk
Kahna Fruit & Vegetable Market	Multiple Dealers	
Large Tunnel Farmer	Khalid Sindhu Owner Kamalia	301.729.2400
Large Tunnel Farmer	Professor Allah Dita Gujranwala	333.629.9689
Metro	Sagar Mahmood Khan Sr. Manager QA	423.750.9634 Sagar.mahmood@metro.pk
Metro	Hamid Hussain Khan Director Foods	423.750.8000 Hamid.hussain@metro.pk
Metro	Bouzeneth Benaouda Managing Director	423.750.9789 Bouzeneth.benaouda@metro.pk
Metro	Pervaiz Akhtar Director Corporate Affairs	423.750.9635 Pervaiz.akhtar@metro.pk

Mitchell's	Mujeeb Rashid Managing Director/CEO	423.587.2392 mujeeb@mitchells.com.pk
Nilibar Agriculture Association	Chaudhary Muhammad Ali Vice President	307.699.9102
Nilibar Agriculture Association	Parvez Gondal Coordinator	332.558.1092
Pak Turk Business Association	Mehmet Kiratas Business Consular	321.707.9048
PLDDB	Col. Arshad Head of Sialge	322.888.0093
Potato Growers Association of Pakistan	Dr. Afzal Haider Rizvi, President	300.844.1132 Afzaal2020@yahoo.com
Punjab Chamber of Agriculture	Chaudhary Nasir Cheema	300.864.2426
Punjab Chamber of Agriculture	Ch. Tanveer Ahmed	300.945.6246
Punjab Halal Development Agency	Justice (R) Khalil-ur-Rehman Khan Chairman	423.637.0661 justicekhalil@phda.com.pk
Punjab Potato Growers Association	Dr. Haider Rizvi, President	
Raaziq International	Asif Zia Khan Manager, Air Export/Airfreight Division	421.117.22947 Asif.raaziq.com.pk
Rainbow Enterprises	Sheikh Shoaib, CEO	300.841.6423
Sajjad Packing and Exports	Sajjad Hussain Owner	333.425.2965
Shadi Farms Yuksel Seeds	Mian Shaukat Ali CEO	03454111141 mianshadi@yahoo.com
Tunnel Farmer	Qazi Naeem Ullah	321.615.5214
Tunnel Farmer	Tahir Iqbal Large Farmer in Shorekot	321.676.1033 333.676.1033
Vegetable & Fruit Cooperative	Ch. Manzoor Ahmed	300.840.2987
Vegetable Nursery Farmer	Jaan Muhammad	344.712.9704
Vegetable Seed Provider	Waseem Hassan Arifwala	300.875.1547
F.A. International All Pakistan Fruits and Vege Exporters Assn.	Aslam Pakhali Owner Vice Chairman,	300.825.9125 www.fafruits.com
Vegetable Wholesaler	Zeeshan Mujahid	323.445.7731
Chase International	Abdul Wahid CEO	324.256.8804 wahid@chase.com.pk
Roshan Enterprises	Saadat	
Haji Ashiq and Brothers	Haji Ashiq	300.699.1711
Vege Exporter Tasco	Karachi	213.432.2255 www.tasco.com.pk
Vege Exporter RS Trader	Umer Sajjad. Gujranwala	321.321.6466
Producer	Sajjad Kahloon	300.699.9521
Producer	Ibrar Hussain	333.626.3042
Producer	Dr. Shafiq	
Ex-Government	Dr. Zafar Altaf	51.925.7889
PARC	Dr. Sher Muhammad	331.510.5774
PARC	Hamida Masood Shah	300.271.1271

PARC	Dr. Sharif Kallu	333.574.2529
Pepsico		
DG. PARC	Dr. Mubarak	300.921.5732
GM, Mehran Foods	Daud Khan	302.827.1444
Manager Quality, R&D, National Foods	M. Arif Sheikh	301.828.8422
Manager Quality Operations, Shan Foods	M. Sarwar Haider	302.826.8422
Country Side Natural Products (Pvt) Ltd Lahore 42c,E/1 Gulberg Lahore	Gohar Sharif Butt	300.822.6356
Sindhu Model Farms Rajana Road Kamalia	Khalid Iqbal Sindhu	301.729.2400
Gugushat farms shorkoot c/o Waqas spinning mills	Imtiaz Sulaiman	300.531.0789
Al Shammash Honda Muhammdi Road Arifwala	Ch Ali Asad	300.694.9177
Dihati Traders Tahseel Road Arifwala	Zia Ud Din	300.694.9849
5/137 Qazi House College Road Daska	Qazi Naeem Ullah	321.615.6214
Arain Zari Farms Dhnote, Lodhran	Muhammad Islam	300.685.8700
New Fatima Medical Store Railway Road Mailsi, Vehari	Mahtab Hussain	300.867.0985
Dost Corporation Ghalla Mandi Hasilpur	Tahir Bashir	301.867.0159
207 E.B. Arifwala. Thana Ahmad Yar Road	Ch Muhammad Aslam	322.784.2207
House 66 Sector B Main Boulevard Askari X Lahore	Shoukat Khan	300.848.8935
L-133 Model Town A Sarwar Shaheed Road Bahawalpur.	Jalil Rahman Adreshak	300.868.6845
House No. 40 A Street No. 10 Model Town A Bahawalpur	Nawab Inaam Ullah	345.870.0175
Raza Traders / Imtiaz Sons House No. 27/A Street No. 51 Toheadabad Ravi link Road Lahore	Mr. Arif	333.421.5357 423.770.6786
165-E.B Shahzadabad Burewala Road Arifwala	Ch Mujtaba	300.818.2288
102 E.B. Burewala	Ch. Muhammad Ali	307.699.9102

Annex – B: Permanent Raised Bed Irrigation and Low Till cultivation.

After decades of input intensive farming, it was observed that soil in the flood irrigated areas of Pakistan, particularly in Punjab, is deteriorating caused by high salinity. Water absorption capacity had declined; crops used to demand irrigation after 3 to 4 weeks, but this period was reduced to less than 10 days. Input intensive farming started with green revolution in early 70's. Process involved repeated plowing to make soil powdery, high dose of fertilizer, numerous sprays of pesticides and excessive irrigations to exploit full potential of improved seed crosses. By middle of 80's yields went stagnant, this was a time when hybrid corn and improved cotton varieties (BT & others) were introduced. This gave another boost to crop yields therefore intensive input practices continued. But in few years crop yields once again went in stagnation and decline.

We were looking for sustainable processes that could improve soil health and increase yields while using lower purchased inputs. Research indicated that major causes of soil deterioration and as such declining crop yields are: 1) excessive plowing 2) excessive use of water and 3) keeping soils naked during long summer months resulting lower organic matter in soil, lower water absorption and retention capacity. It was further revealed that 6 to 7,000 liters of water is being used for production of each kilogram of rice. Over 90% of such water was evaporating adding additional salts in to soil – while huge sweet water wastage. In 2009 we undertook a challenge to produce rice in moist soil rather than saturated in water inundation. Complete crop production process was developed along with specialized machines to mechanize the process. Results were very encouraging, we were able to save over 70% water and other inputs while yield was increased few folds.

Encouraged by the rice results, we aggressively went for adoption of SRI/SCI practices on other crops, such as Maize, Cotton, Carrots, Onion, Wheat, Potato, Tomato, Garlic, Moong and many other crops with amazing results. Real test of a new crop production process is its rapid adoption by all type and size of farmers. It is pleasing to notify that over 80% Maize, Cotton, Sunflower and vegetable farmers have moved on to raised bed planting following SRI fundamentals.

Wherever, conversion of material from one form to another takes place a process is involved, which is carried out by a plant, process is theoretical in nature (software) while plant is physical (hardware). Every plant has a conversion potential, call it designed capacity, be it industrial (manmade) or organic (Natural) plant. Plant is selected keeping in consideration the environment and conversion potential of the soil. Next task is to provide ideal conditions to the plant to exploit its maximum potential. Similarly, in crop production we select most suitable seed to grow plants and put our efforts to provide ideal condition to each plant to exploit its maximum potential. To provide ideal conditions to each plant for maximum yield, we 1st determine space required by each plant, this information is generally provided by Seed Company. There are two approaches 1) to have higher number of plants and expect lower yield per plant, 2) provide more space to each plant and aim for maximum production by each plant. SRI/SCI recommend ideal space to each plant to get maximum number of plants per are those offer maximum yield.

To provide ideal conditions to crop plants we sow seeds in soil when temperatures are suitable. Soil produce, converts, acquire and store nutrients or we can call it plant food or conversion material. Normally, there is no need to add additional materials such as fertilizers in soil if soil is healthy and balanced in chemical composition.

Seed has its own food package attached to the embryo, sufficient for germination and root growth. Roots are meant to absorb nutrients using water as a carrier. Crop plant is static, unmovable, but its roots move around in search of food and water. Desire of a plant is that water be kept away but within a reachable distance so its roots crawl to water and absorb nutrients available in the area that they cover.

In the last fifteen or so years, three crop production processes evolved and largely adopted by farmers, these were 1) SRI/SCI – System of Rice/Crop Intensification, theme of it is to optimize purchased inputs 2) CA – Conservation Agriculture is based on the principle of no-tillage, according to soil science, soil disturbance is very harmful and 3) OF – Organic Farming, which is against the use of inorganic materials and genetically modified seeds. These three processes has diversity, unification of best practices of these processes were required. This is done after years of research and new unified process is named 'Paradoxical Agriculture'.

While these prescriptions have scientific justifications (e.g., Crowder et al. 2010), it has been very difficult to countervail the promotion of excessive inorganic interventions in agricultural practices. This applies also to excessive mechanical soil disturbance in intensive-tillage-based farming including in some current organic farming systems.

Paradoxical agriculture is not simply 'natural agriculture' because it accepts the use of improved modern varieties and utilizes the boon of mechanical farm power applied to soil, water and cropping system management. However, we recognize that existing genetic potentials can be exploited more productively than at present, with lower economic cost, less negative environmental impacts, and with greater contribution to human and ecosystem health.

Organic agriculture may be seen and communicated in negative terms, but it is in fact a positive strategy for agricultural production, particularly if soil disturbance can be reduced and organic matter and nutrients such as nitrogen can be biologically produced in situ through the use of cover crops including legumes. It aims for and affirms the enhancement of life, both in its abundance and diversity.



Permanent raised bed is a major breakthrough in crop production process. Advantages are:

- No-Till planting operation
- Provides moist soil to plants NOT saturated for consistent growth
- Controlled traffic compact furrows only and not planting area
- Biota fosters in raised beds which is like a food factory for plants
- Soil cover reduces requirements of other inputs to ZERO after few crops
- Reduces water requirements by 70%, less evaporation and no salt accumulating in soil
- Water – nutrients solution is concentrated resulting higher intake

Average yield of best farmers in the potato growing regions is 100 bags of 120 kilogram each. Our last crop which was harvested in February yielded 150 bags. Additional reason to above standard operating practices was one additional row of crop plants after every two rows. This means 33% increase in number of plants per acre. This is a major breakthrough in worldwide potato production practice, done for the 1st time in the entire world.

Annex – C: Aeroponic Seed Production

Most potato growers in developing countries do not use quality seed, because of high costs and lack of access. As a result, there is a high need for cost-effective methods to produce quality seed that can be accessed by small farmers at affordable cost. The purpose of this manual is to facilitate the diffusion of aeroponics for quality seed potato production in developing countries to improve access and lower costs. Aeroponics is a soilless method for producing pre basic potato seed. The method can produce higher yields (up to 10-times higher), more quickly, and at lesser cost than conventional growing methods.

The conventional way of producing quality pre basic potato seed is to multiply clean in vitro material in the greenhouse. This method usually produces yields of 5 to 10 mini-tubers per plant. The conventional method uses a sterile substrate made of soil and a mixture of various components. In modern agriculture, methyl bromide has been used as the soil disinfectant of choice, because of its low cost and ability to efficiently eliminate arthropods, nematodes, pathogens and weeds, without altering other soil characteristics. However, methyl bromide was discovered to significantly affect the atmosphere's ozone layer and is now banned in agricultural activities. The International Potato Center evaluated alternative methods (e.g., steam heat, solarization, metham sodium, and chloropicrin) and found steam sterilization to be most reliable. However, it is significantly more expensive compared to methyl bromide due to equipment and fuel costs.

Aeroponics offer the potential to improve production and reduce costs compared to conventional methods or to the other soilless method of hydroponics (growth in water). Aeroponics can effectively exploit the vertical space of the greenhouse and air humidity balance to optimize the development of roots, tubers, and foliage.

Commercial production of potato seed using aeroponics is already progressing in Korea and China. In the Central Andean Region of South America, the technology has been used successfully since 2006. At the Huancayo, Peru facility of the International Potato Center, yields of more than 100 minitubers per plants have been obtained using relatively simple materials. Current efforts are underway to incorporate aeroponics into potato seed systems of some Sub Saharan African countries.



Annex – D: Potato Value Addition - Starch

Potato is widely consumed as food all over the world. It contains the starch as major carbohydrates. The potato contains approximately 18-21% of carbohydrates. The major carbohydrate is starch. Potato starch is produced from varieties selected and grown for their high starch, low protein and low fiber contents. Potato starch is used in paper manufacture for beater, sizing, tub sizing calendar sizing and surface coating. It is also used in the textile industry in the sizing of cotton, worsted and spun rayon warps. Much of the potato starch utilized in the food industry is used in baker's specialty items. Starch is produced in India both in the medium scale sector as well as in the small scale sector. The looking its uses, there is a good scope for new entrants.

Global Potato Starch Market:

According to FAO statistics, the global production of potatoes stood at 325.55 MMT for the year 2008 with China, India, Russia, Ukraine and USA being the top producers. It is estimated that approximately 3.0 MMT potato starch is produced in the world annually. According to the UN trade statistics, the global exports of potato starch (HS code 110813) were 604,338 MT (US\$ 341 M) for the year 2009 with Germany, Netherlands, Poland and Canada as the leading exporters. For the same period the global imports were 823,077 MT (US\$ 479 M) with USA, UK, Netherlands, Chinese Taipei and Spain as leading importers.

Each year more than 9 million tons of starch is produced in EU alone, of which around 20% is extracted from potatoes. It is worthwhile to mention that potato starch production in EU is limited by quotas.

Annex –E: Cost of Production

Acres		1			
Item	Description	Unit	Qty	Price Rs/Unt.	Amount (Rs/acre)
Value of Production					
Potato Bags	Potato Yield Per Acre	Bags/Acre	120	800.00	96000.00
Total Gross Income					96000.00
Operating Expenses					
Land Preparation					
Ploughing	Ploughing (with different Ploughs)	No. of Ploughing	4	600.00	2400.00
Planking	Planking after Ploughing	No. of Planking	2	600.00	1200.00
Ridging	Ridge making for seed sowing	No. of Ridging	1	1000.00	1000.00
Laser leveling	Land Leveling	No. of Ops	0		0.00
Seed & Sowing					
Seed	Amount of Seed used	Bags/Acre	12	1400.00	16800.00
Seed treatment	Seed treatment with Chemicals	No. of Ops			0.00
Sowing expenses	Machine or manual sowing	No. of Ops	1	1000.00	1000.00
Fertilizer					
Urea	Bags of Urea Fertilizer used	No. of Bags	6.00	1800.00	10800.00
DAP	Bags of DAP Fertilizer used	No. of Bags	2.00	3850.00	7700.00
SOP/MOP	Bags of Potash Fertilizer used	No. of Bags	1.00	4500.00	4500.00
Zink	Bags of Zink used for crop	No. of Bags			0.00
Other	Bags of Other Fertilizer used	No. of Bags			0.00
Plant Protection					
Weedicides spray	Weed Control	No. of Sprays	2.00	800.00	1600.00
Pesticide spray	Insect/Pest Control	No. of Sprays	2.00	600.00	1200.00
Fungicide	disease control	No. of Sprays	5.00	750.00	3750.00
Crop Irrigations					
Tube-well irrigations	Tube well Irrigations for whole crop period	No. of Irrigations	6.00	800.00	4800.00
Canal water charges	Fixed Canal Water charges for crop period	Acre	1.00	150.00	150.00
Harvesting					
Harvest-By tigger	Charges for Using Harvester	Acre	1.00	2500.00	2500.00
Picking Labor	Charges for Picking and filling	Acre	1.00	3500.00	3500.00

Marketing/Transportation					
Transportation	Transporting to the Market	Acre	100.00	15	1500.00
Miscellaneous	Any other Expenses	Acre			0.00
Total Operating Expenses					64400.00
Land Rent (For crop period Only)	Land Rent/Lease for crop period(Months)	Acre			0.00
Labor Charges	Ag-Labor Charges for crop	Acre	1.00		0.00
Depreciation	For Ag-Machinery/Buildings	Acre	1.00		0.00
Rep & M	For Ag-Machinery/Buildings	Acre	1.00		0.00
Total Other Expenses					0.00
Total Expenses					64400.00
Net Income Per Acre					31600.00
Total Income All Acres)					31600.00

Source: Okara Potato Growers Association

Annex –F: Sri Lanka Review

Sri Lanka is the largest importer of the Pakistani product after Afghanistan and has a steady amount of imports for the past five years. Sri Lanka has population of 25 Million and the potato consumption is getting higher as the disposable income is on the rise due to the peace and government's developmental policies.

Due to very informal supply chain and not better market linkages, most exporters' strategy has been limited to purchase and sell whatever is available in the market. There is also shortage of the mechanized grading sorting and packing facilities and this also hampers the volume to be exported as the volumes cannot be met during the short harvesting period as the temperature rise is too sharp. According to the Fruits and Vegetable exporters association there are more than two hundred fifty exporters of potatoes from Pakistan and majority of them are involved in manual handling of the product.

Even though Pakistan has a 60% share of the potato imports market of the country but Pakistan still targets the lower end market. It was inferred from the survey on the both side of the aisle that the lower value potato is shipped from Pakistan as there are not well established links established between both countries. There is a mafia scenario on the Sri Lankan side as the few importers are very secretive about the 70,000 MTs of the potatoes imported to the country.

The retail prices show that there is a wide margin between B and C grade potatoes. The survey was conducted between August 23 through August 25th, 2013 and wholesale markets, Retail small, Retail corner stores and upscale shopping centers were studied. There were no A grade or premium potatoes available in the market. The B grade potatoes were sold as premium for SL Rs. 198/Kg. as advertised in major newspapers and in-store promotions. Interestingly the maximum purchase limit was 5 Kg. It was discovered after talking to the manager of Keels, an upscale supermarket that there is not much availability of the product as the higher tariff is discouraging the importers for imports. Interestingly the C grade potato was on Sale for SL Rs. 198/Kg. The local corner stores and community stores had very low grade potatoes and were sold for SL Rs. 100/Kg. The retailer stated that if there are better potatoes available, the customers are willing to pay even higher prices.

The Sri Lankan local crop gets into the market by the middle of the October and due to that the government had added an extra tariff on the import of the potatoes. Regularly the Import tax was Sri Lankan Rupees Rs. 25 but on the 23rd of August, the government increased the tax to Sri Lankan Rs. 40 per KG This is an unfair barrier for all kind of the trade of Potatoes and specially to the local farmers at the end of the day. As it shows that the local farmer's productivity has not increased and the quality of the product is still bellow world average. To maximize these issues the Pakistani exporters work in a non-transparent way with their Sri Lankan counterparts and work on under the table to maximize their profits. In this value chain, the producers in Pakistan and the consumers in Sri Lanka both loose. The government of Sri Lanka reiterated their stance by stating that these measures are adopted to support the local production and discourage product dumping.

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