PAKISTAN: FLOODS/RAINS 2012

Series No. 4

RAPID CROP DAMAGE ASSESSMENT

October 30, 2012

SUPARCO

Pakistan Space & Upper Atmosphere Research Commission

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ISBN : 978-969-9102-11-0

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Foreword

Pakistan faced floods and tormenting rains during the last three consecutive monsoons from 2010 to 2012. During these floods, the ground communication systems were generally disrupted and information on flood extent and damage through ground reporting services was not available for taking timely decisions. To address the situation and to ensure continuous provision of current and timely information to the concerned stakeholder's and decision makers satellite remote sensing and GIS technologies were extensively utilized. SUPARCO in collaboration with FAO started generating data on daily basis on flood extent, damage to households, infrastructure and crops besides undertaking detailed Damage Need Assessment (DNA). This fast track supply of information made it possible to reach out to affected and displaced masses for supply of food, medical care, relief, rehabilitation and follow up programs.

In the aftermath of floods, monitoring of flood recession and ponding of water in the affected areas on decadal basis was also carried out for several months. All of this work was published by SUPARCO-FAO jointly in three reports (Reports 1 to 3).

This report No.4 is a further step in this direction. It covers the floods of 2012. The report delineates the efforts made by SUPARCO in collaboration with FAO, in flood monitoring and mitigation programs. The report provides flood extent maps, identifies damages to canal breaches and agriculture.

In future, these reports would serve as a reference and guideline in the decision support system for administering floods, managing their impact and minimizing the drudgeries to the displaced masses. Furthermore, it will help in providing data for taking concrete steps in the long term to mitigate the effects of floods through diversion of flood water and its storage in specifically selected/proposed locations for subsequent use for agriculture and to support water deficient areas.

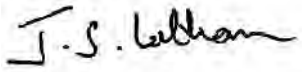
Maj General (Retired)
Ahmed Bilal, HI, HI (M)
Chairman SUPARCO

Preface

Pakistan is a country of diverse ecosystems. The climate is generally continental with sharp variations of temperature during summer and winter seasons. The Indus basin falls in the semi-arid to arid region with tropical climate in the northern mountains. Most of the rainfall is in summer months from June to September due to southwest monsoon system. Large areas of the country benefit from these rains, except western Balochistan and northern areas. Monsoon rains are generally intense and sometimes cause flooding in the country. The situation becomes more momentous when mid-latitude westerly disturbances coalesce with monsoons. The winter rains are caused by westerly disturbances. These rains result in snowfall on northern mountain peaks and moderate rains in the plains of up country.

Pakistan has during the last three consecutive years of 2010, 2011 and 2012 faced floods and flash floods. It has been responsible for damages to households, crops, seeds, food grains, livestock and infrastructure. In Sindh, where the topography is almost horizontal, the drainage of standing water, in the aftermath of floods is a serious issue.

The monitoring of these floods through conventional means is not easily possible due to sheer geographical size, scattered nature of population and limited communication infrastructure. As flooding starts, the inundated areas become inaccessible. Therefore, the use of satellite based remote sensing & GIS technologies are a fundamental requirement for effective monitoring in all phases of the disaster cycle from rescue/relief to rehabilitation/reconstruction. SUPARCO in collaboration with FAO, UN has been monitoring the floods since 2010 and has provided time series information to the concerned authorities. This current report provides information/data pertaining to the losses during the 2012 floods.



John S. Latham
Senior Land and Water Officer (Geospatial)
NRL - UN/FAO

Contents

Acronym	Description
AJK	Azad Jammu and Kashmir
CLCV	Cotton Leaf Curl Virus
CRS	Crop Reporting Services
Cusec	Cubic feet per Second
D.G. Khan	Dera Ghazi Khan
D.I. Khan	Dera Ismail khan
FAO	Food and Agriculture Organization
FCA	Federal Committee on Agriculture
GB	Gilgit Baltistan
Ha	Hectare
Km	Kilometer
KPK	Khyber Pakhtunkhwa
LBOD	Left Bank Outfall Drainage
MAF	Million Acre Feet
MINFA	Ministry of Food & Agriculture
MODIS	Moderate Resolution Imaging Spectroradiometer
NDVI	Normalized Difference Vegetation Index
PMD	Pakistan Meteorology Department
RBOD	Right Bank Outfall Drain
RIM	Regulated Irrigation Measurement
SPARCENT	Space Application & Research Center
Sq. Km	Square Kilometer
SUPARCO	Pakistan Space & Upper Atmosphere Research Commission
UTM	Universal Transverse Mercator System
WGS 1984	World Geodetic System 1984

1. Summary

The floods during last three monsoon seasons from 2010 to 2012 caused extensive damages in Pakistan. During the year 2010, the collective result of mid latitude westerly disturbances and monsoon was devastation in all provinces of the country. During 2011 monsoon was responsible for large scale catastrophe on the left bank of river Indus in Sindh. The monsoon in 2012 started with a forecast from the Pakistan Meteorological Department (PMD) of 5 to 15 percent higher rainfall from the norm. During early seven weeks this forecast appeared to be too sanguine and the shadows of a likely drought loomed large on the horizon.

A turnaround of heavy downpour occurred in the last decadal of August and continued in September 2012. The Nullah Deik in Sialkot-Narowal districts in Punjab over topped three times in the months of July, August and September. The foaming Rodkohis at the foot of Suleiman Piedmont inundated and ravaged large areas in D.I.Khan, D.G.Khan and Rajanpur districts. The torrential rains of 481mm over short period of time of about 10 days caused havoc in Jacobabad, Jafferabad, Nasirabad, Shikarpur and peripheral areas. Large sections of population were displaced and food, seeds, households, livelihood and belongings were damaged. The displaced persons are living tented under tarpaulins and plastics, on road sides, waiting for flood waters to recede. The drinking water have been polluted and fodder for livestock is becoming increasingly scarce. The affected farmers are using near maturity rice to feed their hungry cattle. The swarms of millions of mosquitoes in stinking waters are attacking animals and making them restless.

The damages to the Kharif crops have been estimated at Rs. 27.6 billion viz. cotton Rs. 12.4 billion and rice Rs. 15.2 billion. The damages to cotton were two-fold (a) a physical damage of cotton crop on about 17.2 thousand ha area and (b) depreciation of cotton quality by soaking in rain water. The physical damage mostly occurred from Rodkohis in D.G.Khan and Rajanpur. About 43 thousand bales of cotton and 15 thousand tons of banola (cotton seed) were lost in this area, valued at Rs. 1.4 billion.

In addition, there was a general depreciation of quality of cotton in all cotton growing areas of Pakistan, through exposure of the open boll cotton in the fields, to rains. The loss to this high grade cotton is assessed at 10 percent of the phutti (seed cotton at about 1.4 million bales).This resulted in a discount of Rs. 500 to Rs. 800 per 40 kg. In overall, the loss to farming community in terms of markdown in quality is estimated at Rs. 11 billion. The total loss of cotton crop is estimated at Rs. 12.4 billion.

The damage to rice crop is estimated at 406 thousand tons viz. Sindh 301 thousand tons, Balochistan 92 thousand tons and Punjab 13 thousand tons .The value of this loss at a rate of Rs. 1000 per 40 kg for paddy or Rs. 1500 for IRRI (milled) rice (Rs. 37500 per ton) is around Rs. 15.2 billion. The prospects of growing Rabi crops in the flood affected areas of Sindh and Balochistan are dismal, as the drainage of water is slow. There is a high probability that water would be stagnating in some areas, beyond the sowing timelines of Rabi crops. The likely losses during coming Rabi Season are projected at Rs. 6 billion. In general, the moisture available from the rains will be beneficial in areas not affected by floods.

2. Introduction

The floods, flash floods and torrential rains from hills are phenomenon of common occurrence in Pakistan usually during monsoon. These episodes on occasions cause heavy losses to economy, damaging crops, settlements, households, infrastructure, exterminating livestock and other valuable assets. Satellite remote sensing technology can provide rapid information on the disasters, caused by floods and other calamities. Due to temporal exposure, these systems can be efficiently used for rapid mapping of disaster stricken areas. In addition, timely use of satellite data can assist in disaster mitigation, relief work, early recovery and rehabilitation processes.

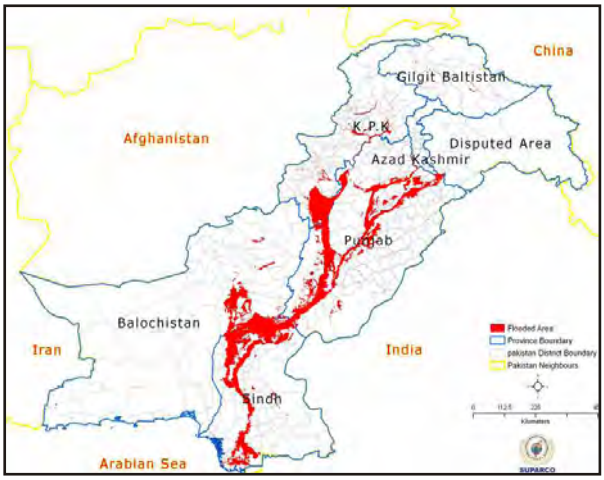
SUPARCO has vast experience in fast track monitoring of spatial episodes, including floods and other disasters, using satellite systems. The 250m resolution MODIS sensors onboard Aqua and Terra satellites have proved useful for monitoring of floods, rapid damage assessment and recession on daily basis.

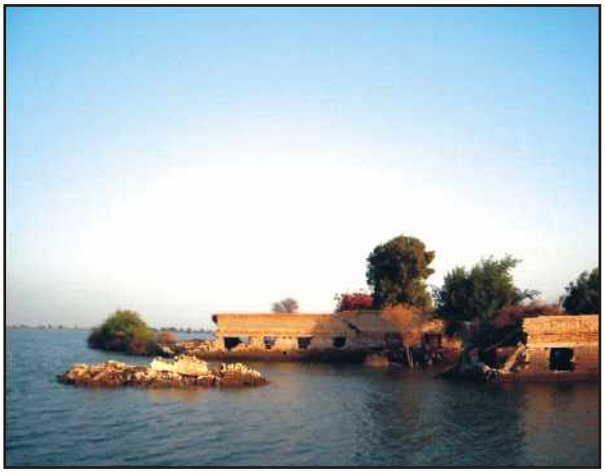
The high resolution satellite imagery from SPOT 4 and 5 has been used in the follow-up detailed investigative work. In addition, ground validation has been undertaken through field surveys in the flood affected areas for assessing crop damages. The information gathered was provided to National Disaster Management Agency (NDMA) and other organizations associated with monitoring of disasters and follow-up relief and rehabilitation programs.

3. Floods 2010 and 2011

The years of 2010 and 2011 witnessed one of the worst floods of Pakistan history, damaging crops, infrastructure, settlements, loss of livestock and adding up to human drudgeries and sufferings.

During the year 2010, the Monsoon started with a normal tempo until middle of July. Subsequently the combined upsurge of mid-latitude westerly disturbances and monsoon resulted in thrashing rains starting around 18th of July. The two occasions of heavy downpour were observed on 28-29th July, 2010 and on 5-8th August, 2010. Almost, all rivers and creeks over flooded, inundating large areas. The river Kabul caused heavy damages in the urban and rural sprawl of Nowshera and adjoining areas. The river Indus broke out its banks downstream Taunsa in Muzaffargarh district, thus inundating large areas.





Pakistan Floods 2010

In Sindh, heavy destruction occurred on the right bank of Indus below Guddu. About more than 1.1 million cusecs of water broke open the

river Indus bunds on 7 - 8th August 2011 at multiple sites including Tori, Ghauspur and others. The high tide initially hit Kashmore, Shikarpur and Jacobabad in Sindh. This water in short span of time swamped large areas of Jafferabad and Nasirabad districts in Balochistan. Thereupon, it crossed along the trajectory of Kirthar range, over almost 350 km in the south, at an accelerated pace. It finally entered Mancher Lake that is interlinked with Indus river by design. The additional districts affected were Kamber-Shahdadkot, Larkana and Dadu. This water kept standing in these areas for almost 7 months presenting a ubiquitous look up to February 2011. The total cropped area damaged was 2.3 million ha along with ravaging thousands of households and other valuable property.

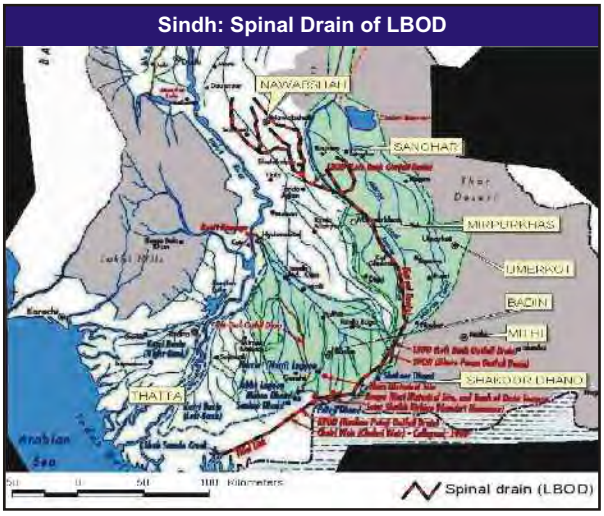
The monsoon 2011 was manifested by remarkably high rainfall with major thrust in Sindh province. The cumulative rainfall in this province varied from 400 mm to 1299 mm. These rains inundated large areas, causing damages to crops, infrastructure and human settlements, affecting the national economy. The maximum rainfall was recorded at Mithi, Sindh. The other areas receiving excessive rainfall were MirpurKhas 866 mm, Badin 647 mm, Shaheed Benazir Abad 650 mm, Chhor (Umerkot) 552 mm, Dadu 485 mm and Padidan 423 mm.

The gradient of the Sindh province towards the coastal areas is almost horizontal. The long-winded movement of water in the flooded area took place at a very sluggish pace. For the first time in known recent history, the residents of Thar desert and its upper reaches had to be evacuated by boats. A large number of farmers lost their livestock on way to safe heavens due to hunger and exertion. The cotton crop in the affected areas was mostly damaged, with loss of about 2.239 million bales. The textile sector came under high speculations on the issue of cotton crop damages. The opinions remained divided, until dependable information was released by SUPARCO/FAO.

Pakistan Floods 2011

Sugarcane crop remained protected to a great extent from the ravages of flooding. The chilies crop is also very demanding on drainage needs. The chilies growing areas received the first heavy spell of rain on 11th August, 2011.

The damage was estimated at 78.5 thousand tons from a crop of 155 thousand tons. The major affected areas were Benazir Abad, MirpurKhas, Umerkot and Badin districts. The Left Bank Out Fall Drain (LBOD) funneled large volume of water from upstream districts before its ultimate delivery to Arabian Sea. There was a massive displacement of human being and livestock. A large number of buffaloes, donkeys and other valuable livestock were lost on the way to safe heavens, due to acute shortage of fodder.



Sindh: Spinal Drain of LBOD

4. Floods 2012

The situation of rains and floods during 2012 was as follows:

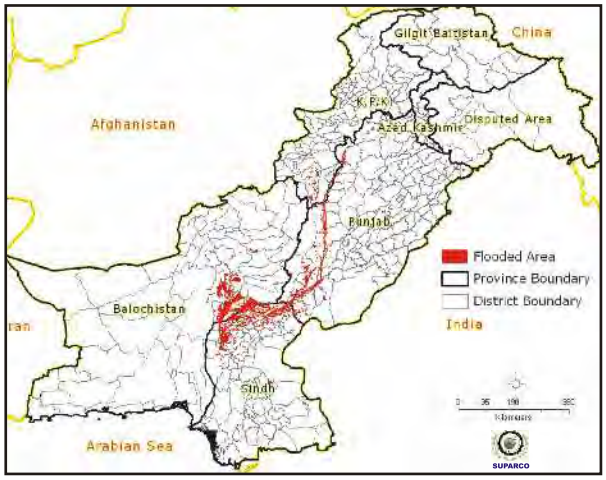
4.1 Skewed pattern of monsoon

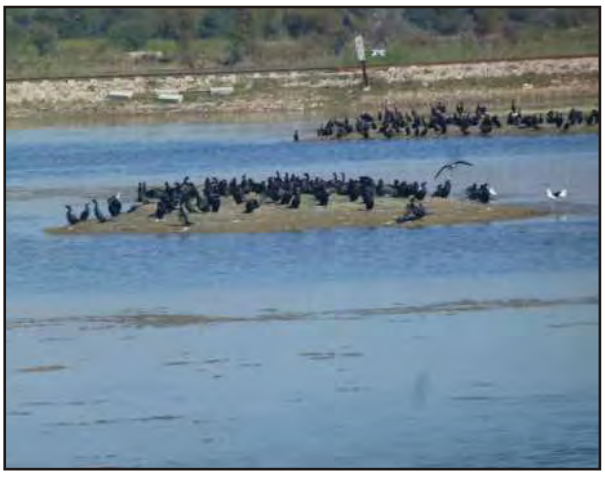
At the start of monsoons in 2012 Pakistan Meteorology Department (PMD), made a forecast of 5 to 15 percent higher rainfall than the seasonal norm. In the backdrop of the floods of 2010 and 2011, this forecast was generally taken seriously by all stakeholders including flood monitoring / relief agencies and farming communities.

Given the damages of 2011 rains to cotton crop, some of the farmers in Sindh in the districts of Sanghar and Ghotki informed the survey teams of SUPARCO that in the presence of the forecast of PMD, they have reduced the area planted under cotton crop.

The rains from 1st July to 20th August were scanty and at one time it looked as if Al-Nino conditions would prevail and prolong through the Rabi sowing season. The filling of water reservoirs became difficult. The vegetation images of the Indus Basin at this point in time, as seen from the space, looked impoverished.

The first plentiful rainfall was recorded in the last decadal of August and the tempo for this overdue monsoon gained momentum in September. Jacobabad in Sindh and the neighboring districts observed the driving rains of more than 448 mm in two days on 10-11th September (total rainfall 481mm).





Pakistan Floods 2012

Socio-economic situation at district Jacobabad

This proved to be a turnaround from dry to wet conditions thus changing the drought like situation to a flooding scenario. Large areas in the affected districts were inundated with consequential damages. The situation became further worrisome because of the run-off/overflows from upper districts of Sindh and Balochistan.

4 .2 Weather systems

The weather systems and the cumulative rainfall during monsoon period are as follows:

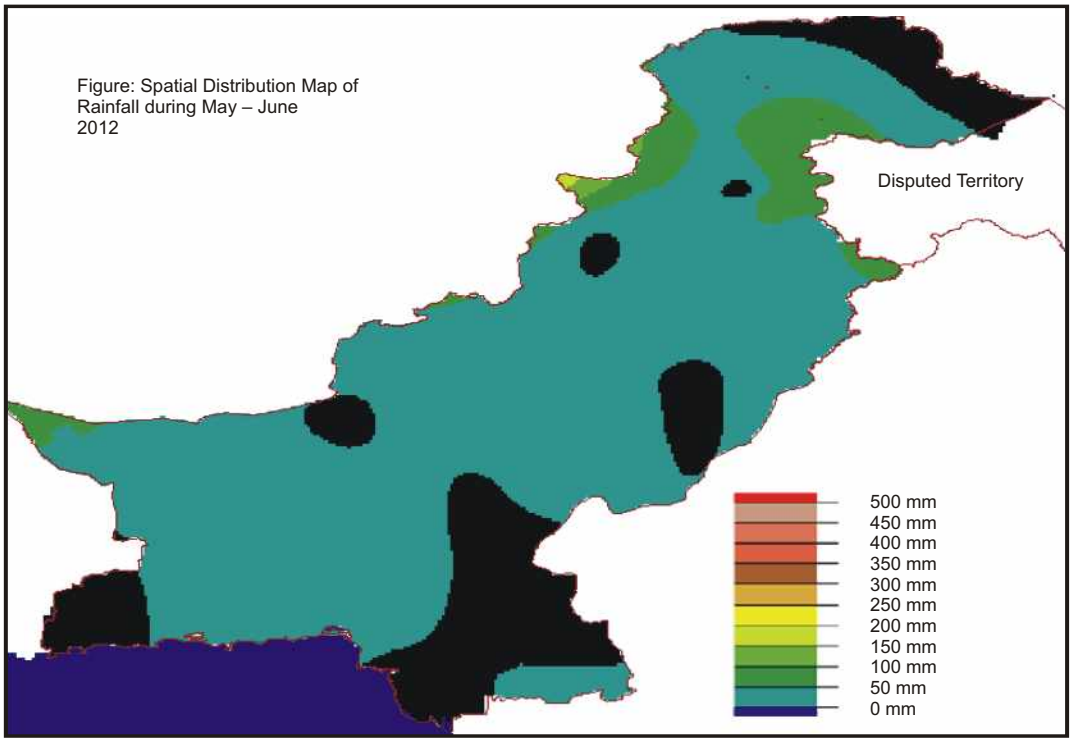


Figure: Spatial Distribution Map of Rainfall during May – June 2012

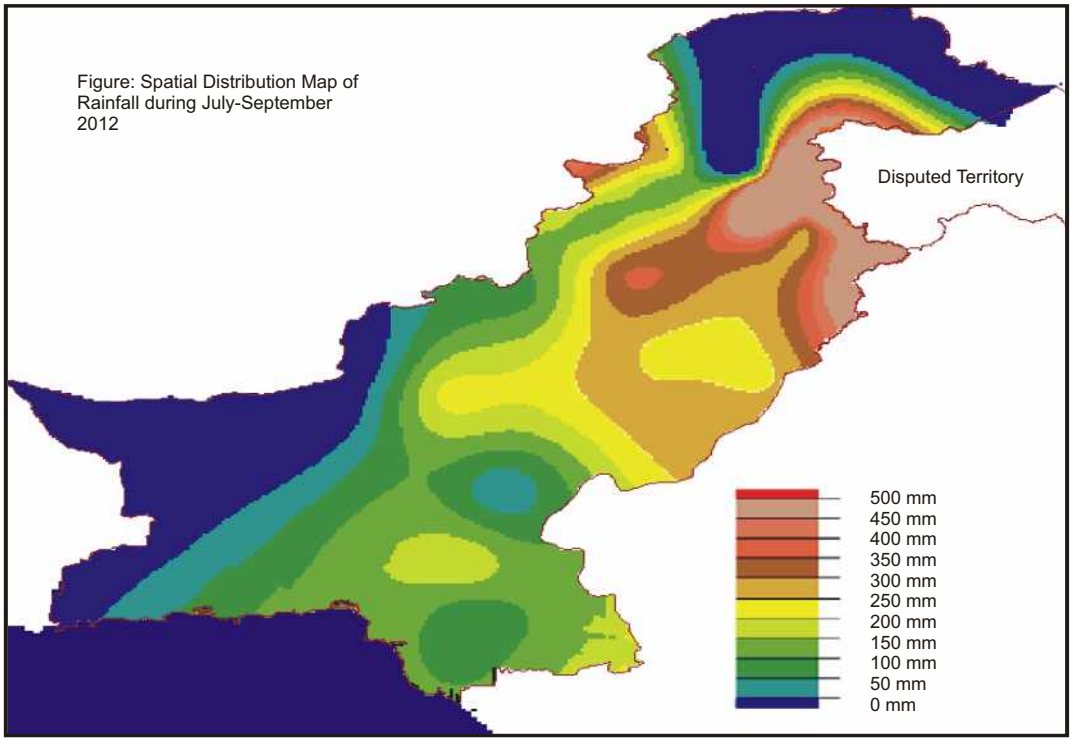
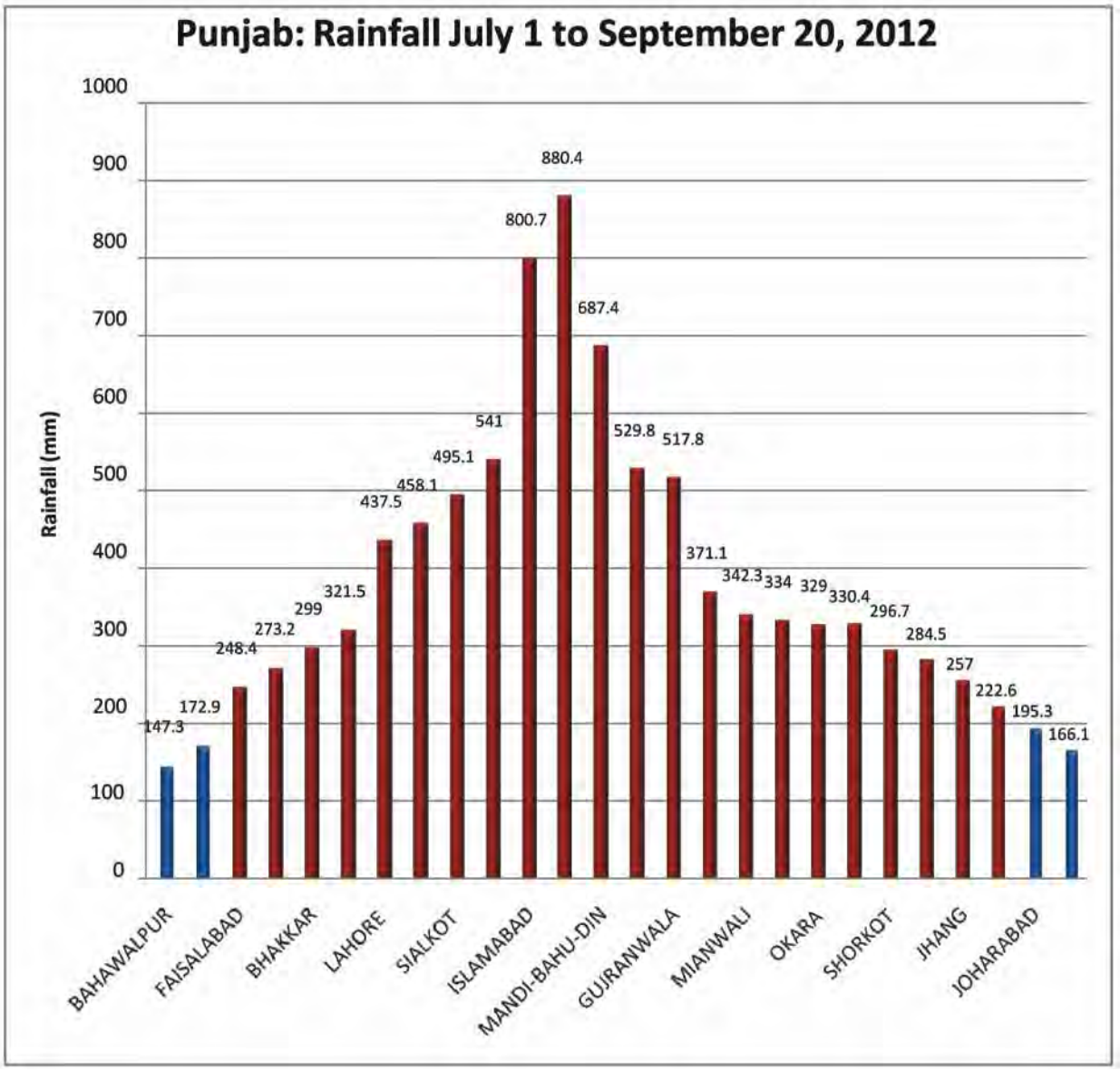
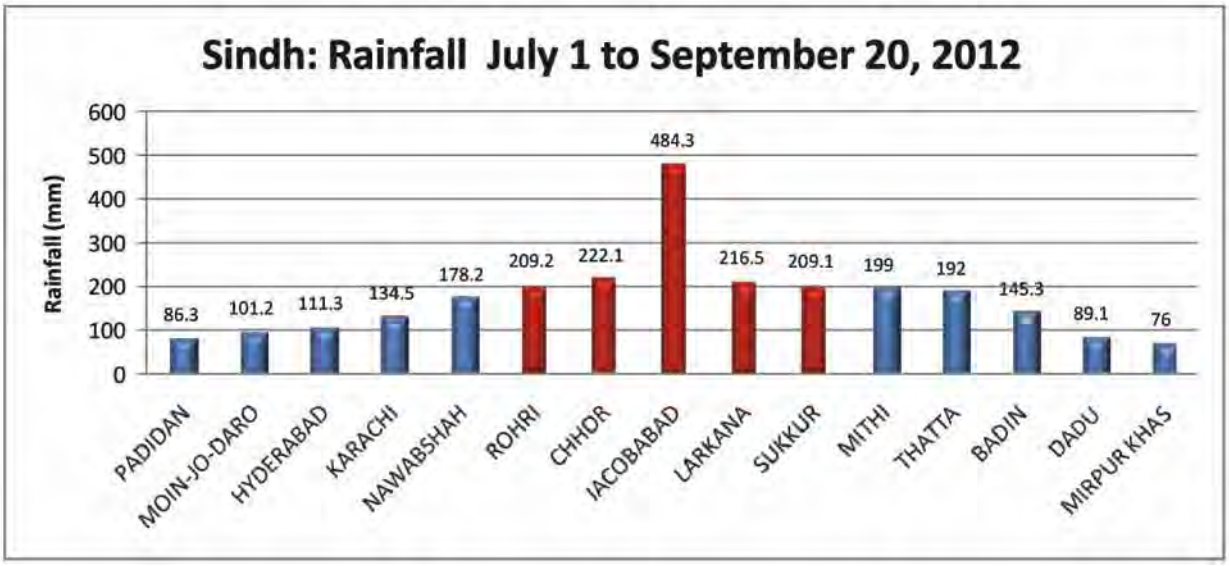


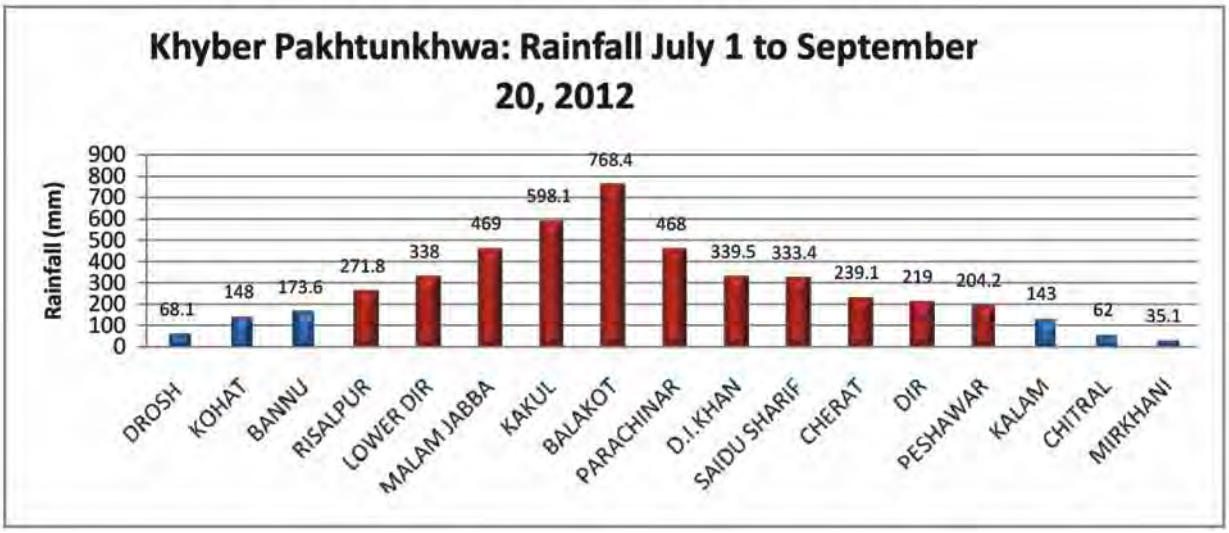
Figure: Spatial Distribution Map of Rainfall during July-September 2012



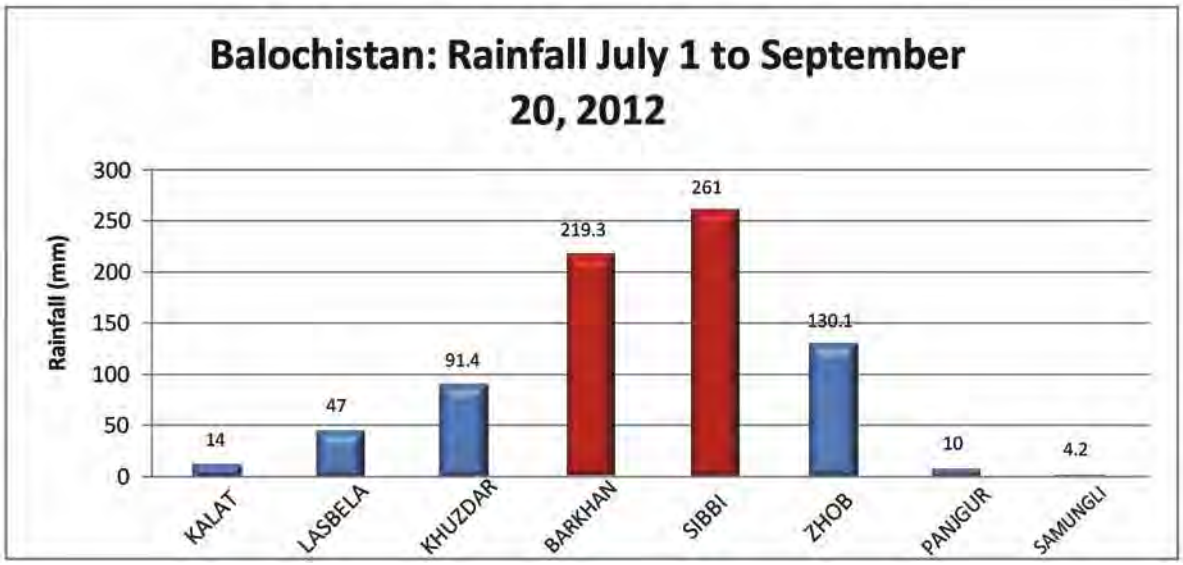
Punjab: Rainfall from July 1 to September 20, 2012		
Rainfall range	**No of Met Stations**	**Met Stations**
More than 200 mm	22	Faisalabad, Kamra, Bhakkar, Chakwal, Lahore, Sahiwal, Sialkot, Jhelum, Islamabad, Murree, Mandi- Bhau-Din , Mangla, Gujranwala, Khanpur, Mianwali, Noorpur Thal, Okara, T. T. Singh, Shorkot, Rahim Yar Khan, Jhang, Multan
More than 300 mm	15	Chakwal, Lahore, Sahiwal, Sialkot, Jhelum, Islamabad, Murree, Mandi-Bhau-Din, Mangla, Gujranwala, Khan pur, Mianwali, noor pur Thal, Okara, T. T. singh
More than 400 mm	9	Lahore, Sahiwal, Sialkot, Jhelum, Islamabad, Murree, Mandi-Bhau-Din , Mangla, Gujranwala



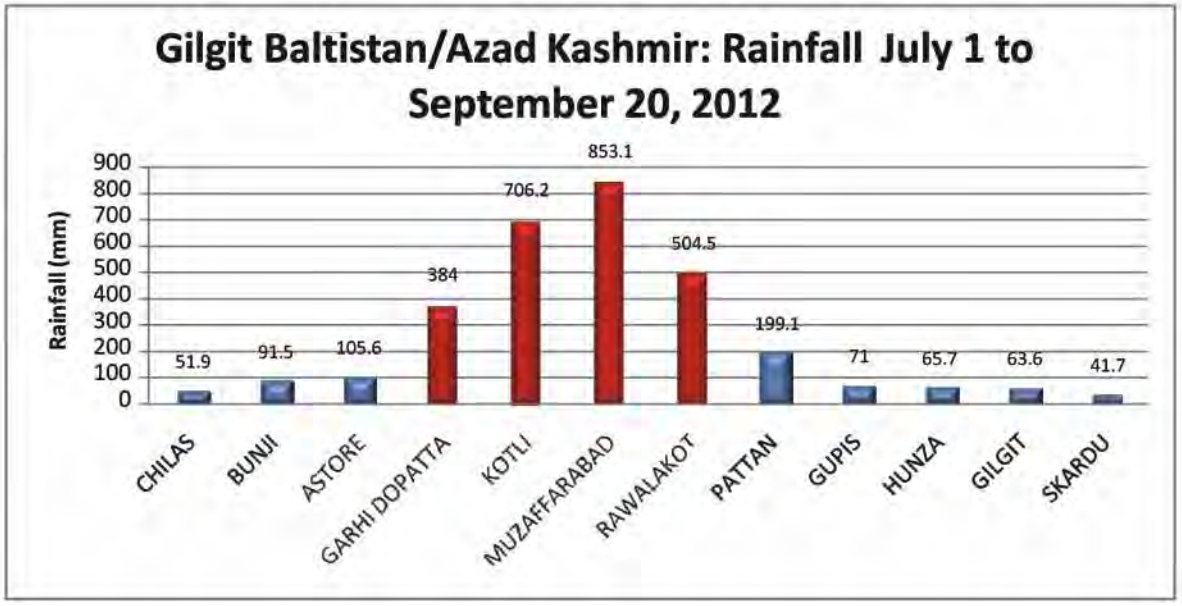
Sindh: Rainfall from July 1 to September 20, 2012		
Rainfall range	**No of Met Stations**	**Met Stations**
More than 200mm	5	Rohri, Chhor, Jacobabad, Larkana, Sukkur
More than 300mm	1	Jacobabad
More than 400mm	1	Jacobabad



KPK: Rainfall from July 1 to September 20, 2012		
Rainfall range	**No of Met Stations**	**Met Stations**
More than 200mm	11	Risalpur, Lower Dir, Malam Jabba, Kakul, Balakot, Parachinar, D. I. Khan, Siadu Sharif, Cherat, Dir, Peshawar
More than 300mm	7	Lower Dir, Malam Jabba, Kakul, Balakot, Parachinar, D. I. Khan, Siadu Sharif
More than 400mm	4	Malam Jabba, Kakul, Balakot, Parachinar

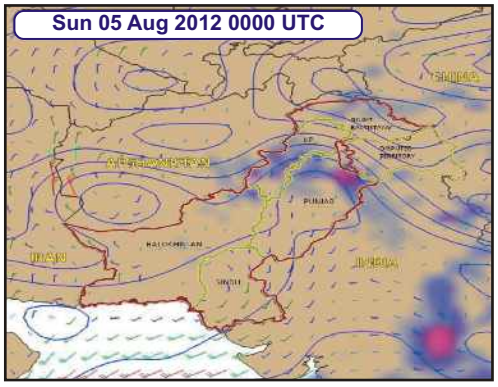


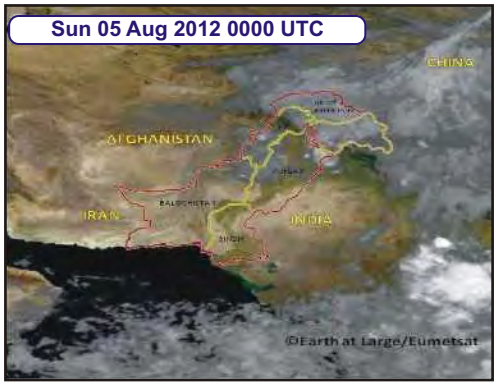
Balochistan: Rainfall from July 1 to September 20, 2012		
Rainfall range	**No of Met Stations**	**Met Stations**
More than 200mm	02	Barkhan, Sibbi
More than 300mm	NIL	-
More than 400mm	NIL	-

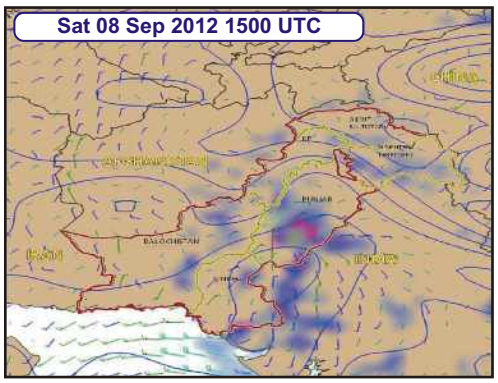


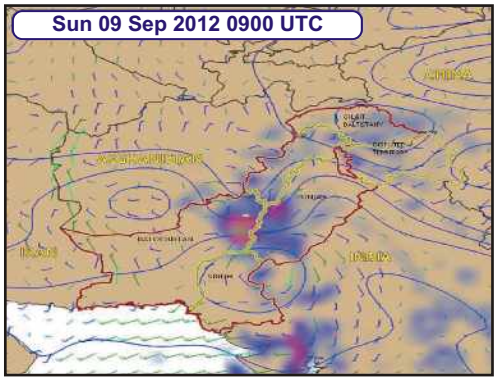
GB/AK: Rainfall from July 1 to September 20, 2012		
Rainfall range	**No of Met Stations**	**Met Stations**
More than 200mm	04	Gari Dopatta, Kotli, Muzafarabad, Rawalakot
More than 300mm	04	Gari Dopatta, Kotli, Muzafarabad, Rawalakot
More than 400mm	03	Kotli, Muzafarabad, Rawalakot

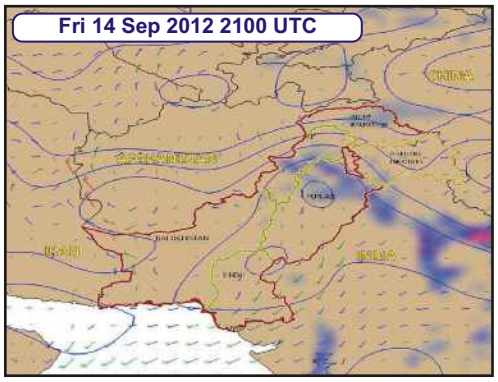
Monsoon: Aug-Sep 2012











5. Constrained irrigation water supplies

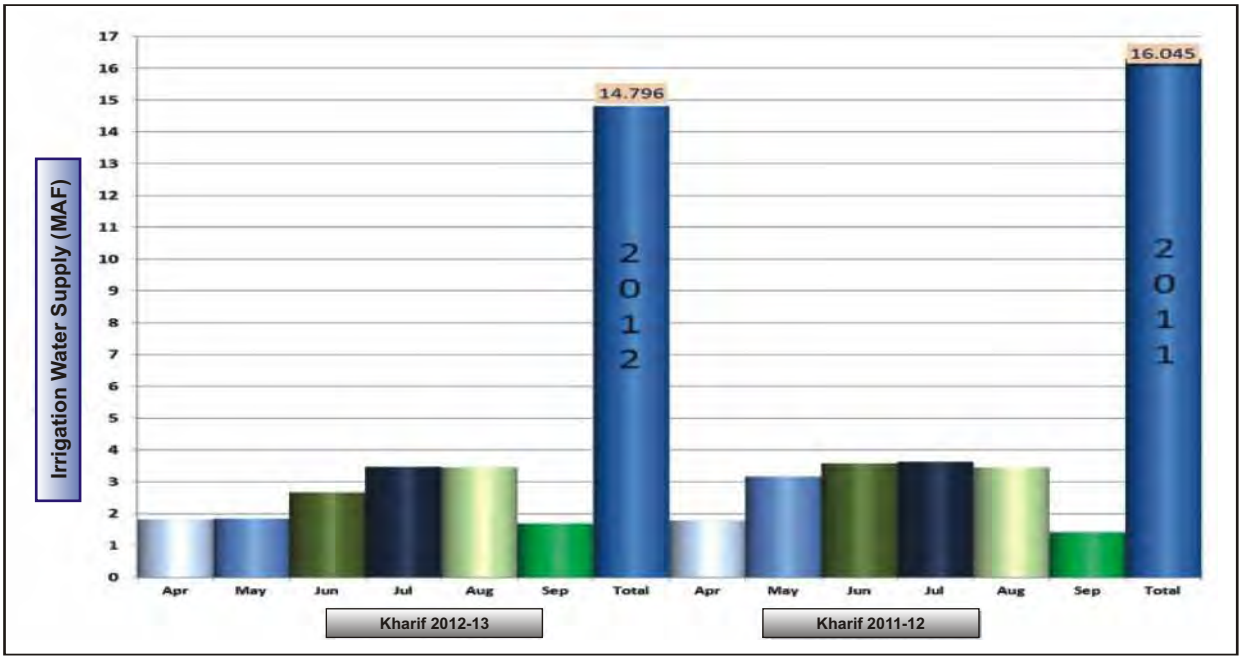
Chashma Barrage

The situation of low surface water supplies in rivers, stemming from extended cold weather, exacerbated the impact of on-going dry monsoon situation during Kharif season of 2012. The irrigation water supplies were generally short during April-August 2012 compared to corresponding period of last year. The shortfall was 15.1 percent in Punjab with

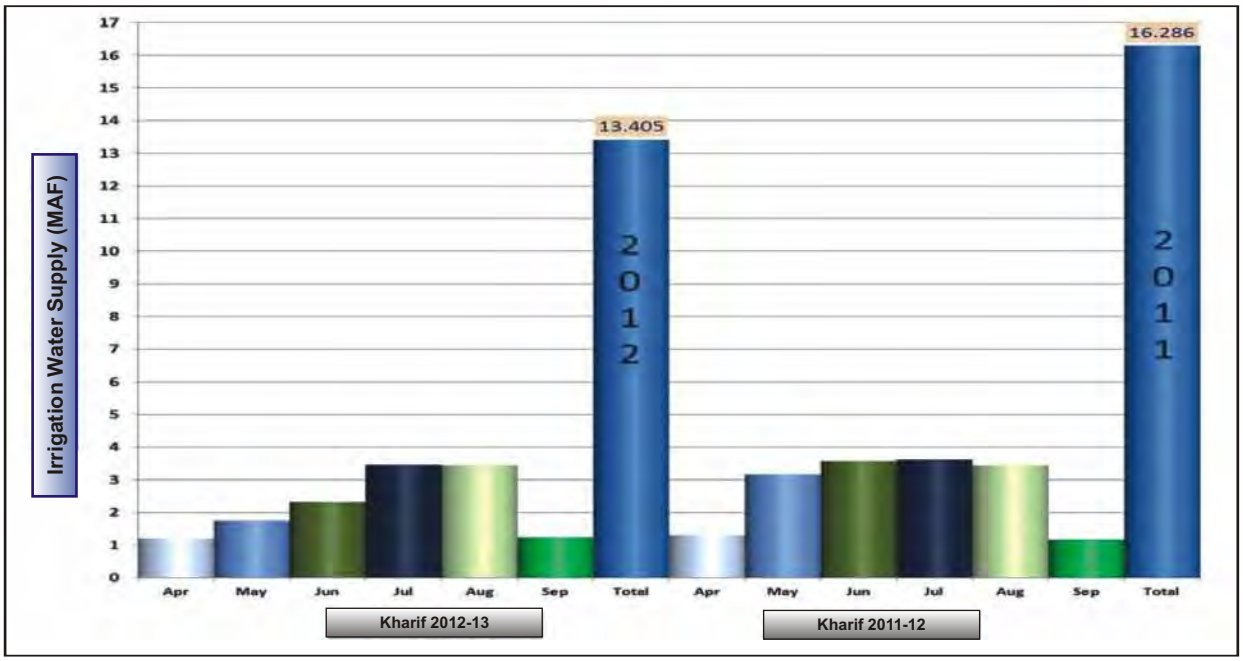
Agriculture in Attock

10.4 percent in Jhelum-Chenab zone and 19.6 percent in Indus zone. The shortfall in Balochistan was 4.5 percent. The water supply in Sindh, at end of July was short by 15 percent. However, the stepped up supplies in August resulted in an overall increase of 1 percent. The situation in KP was normal. The graphics and irrigation statistics are as follows :

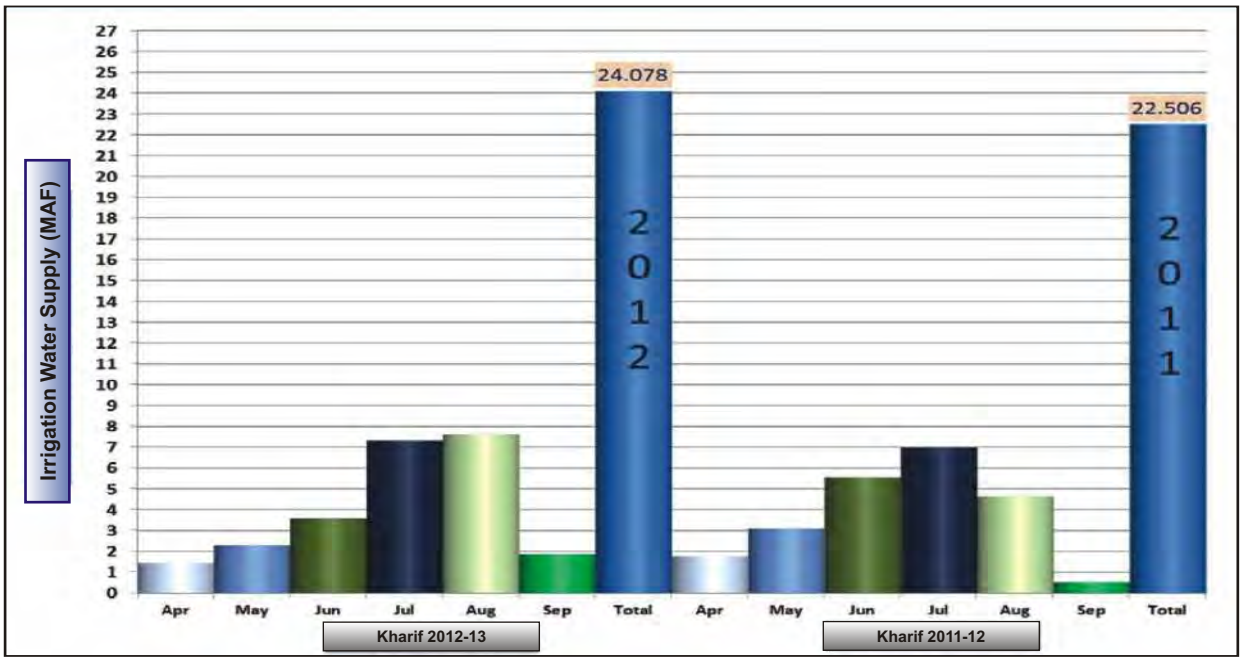
Punjab: Jhelum Chenab Irrigation



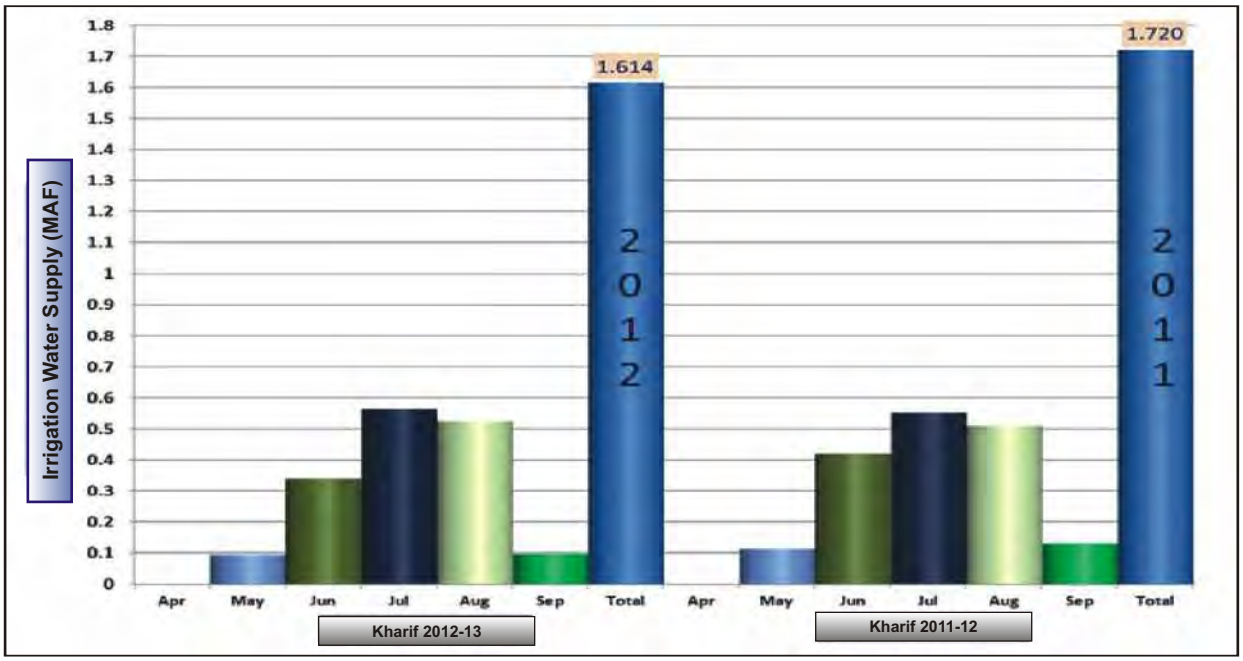
Punjab: Indus Irrigation Zone



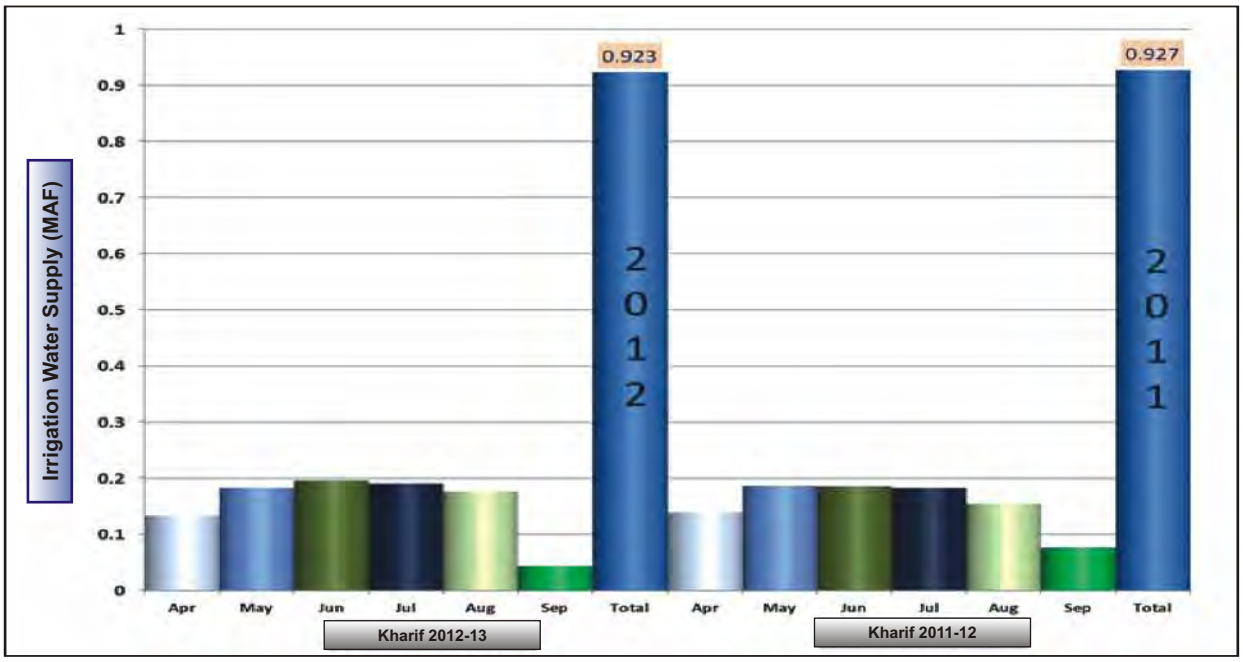
Sindh: Indus Irrigation Zone



Balochistan: Indus Irrigation Zone



Khyber Pakhtunkhwa: Indus Irrigation Zone



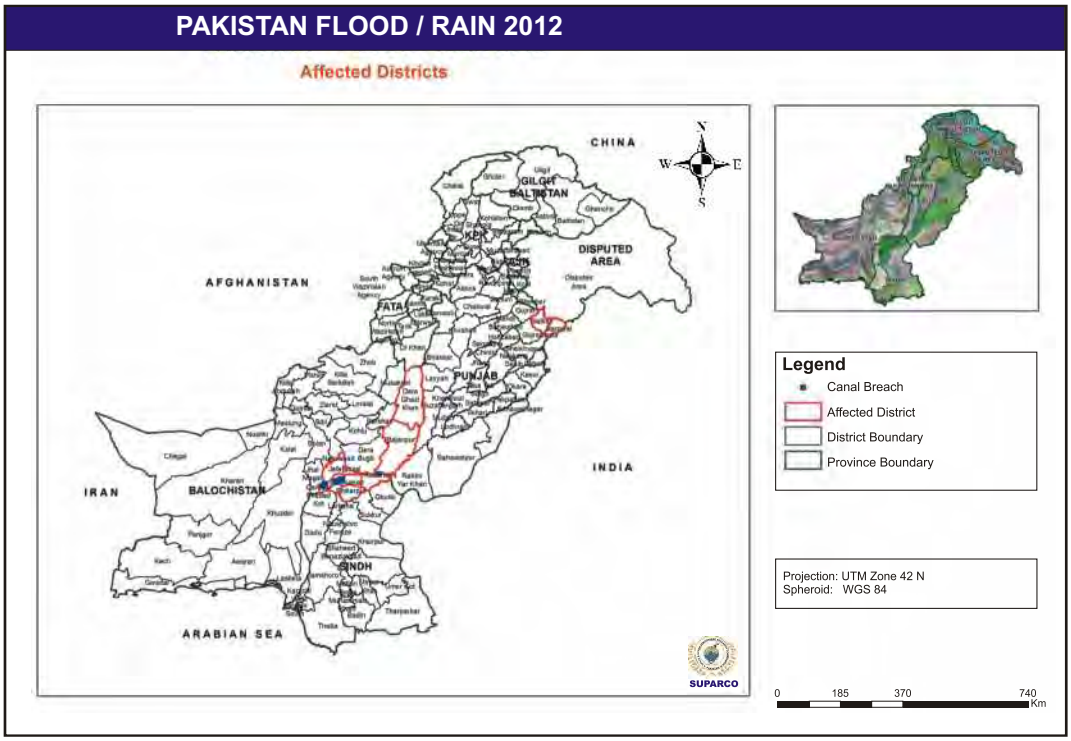
Irrigation Statistics

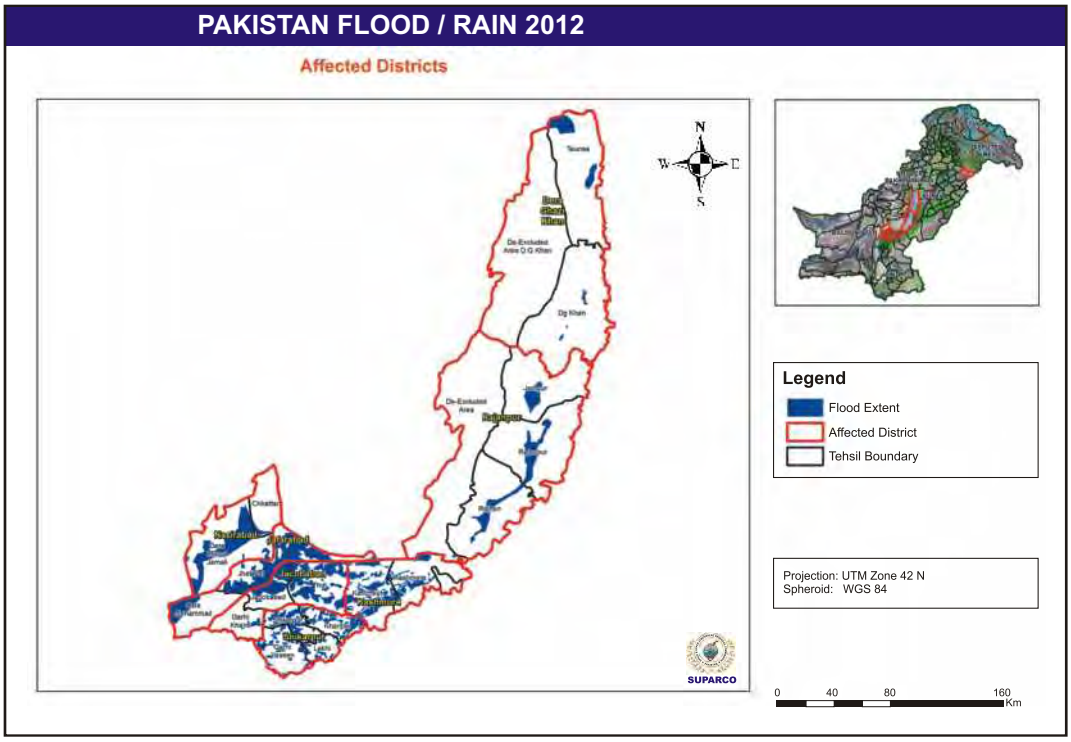
Source: Indus River System Authority (IRSA)

	Month	Year	Punjab			Sindh	KP	B-tan	Total
			Jhelum-Chenab	Indus	Total				
			Million Acre Feet						
Kharif 2012-13	Apr	2012	1.817	1.202	3.019	1.426	0.133	0.000	4.578
		2011	1.783	1.313	3.096	1.753	0.139	0.000	4.989
		Change	0.034	-0.111	-0.077	-0.327	-0.006	0.000	-0.411
		% Change	1.89	-8.46	-2.50	-18.67	-4.29	0.00	-8.23
	May	2012	1.842	1.743	3.585	2.304	0.183	0.093	6.165
		2011	2.974	3.159	6.133	3.101	0.187	0.112	9.533
		Change	-1.132	-1.416	-2.548	-0.797	-0.004	-0.019	-3.368
		% Change	-38.07	-44.82	-41.55	-25.70	-2.33	-16.78	-35.33
	Jun	2012	2.672	2.315	4.987	3.582	0.196	0.339	9.104
		2011	3.277	3.574	6.851	5.534	0.186	0.419	12.990
		Change	-0.605	-1.260	-1.864	-1.952	0.010	-0.079	-3.886
		% Change	-18.46	-35.24	-27.21	-35.27	5.32	-18.96	-29.91
	Jul	2012	3.436	3.464	6.900	7.312	0.191	0.564	14.967
		2011	3.402	3.629	7.031	6.980	0.183	0.552	14.746
		Change	0.034	-0.165	-0.131	0.332	0.008	0.012	0.221
		% change	1.01	-4.56	-1.86	4.76	4.45	2.19	1.50
	Aug	2012	3.343	3.441	6.783	7.597	0.176	0.523	15.079
		2011	3.201	3.445	6.645	4.628	0.155	0.508	11.937
		Change	0.142	-0.004	0.138	2.969	0.020	0.015	3.142
		% change	4.44	-0.11	2.08	64.14	13.15	2.89	26.32
	Sep	2012	1.686	1.240	2.926	1.857	0.044	0.095	4.921
		2011	1.408	1.166	2.575	0.510	0.077	0.129	3.291
		Change	0.278	0.073	0.351	1.347	-0.034	-0.034	1.630
		% change	19.72	6.29	13.64	264.20	-43.59	-26.15	49.55
	Total	2012	14.795	13.404	28.199	24.078	0.922	1.615	54.814
		2011	16.045	16.286	32.331	22.507	0.928	1.720	57.485
		Change	-1.249	-2.882	-4.132	1.571	-0.006	-0.105	-2.671
		% change	-7.79	-17.70	-12.78	6.98	-0.60	-6.11	-4.65

6. Floods and flash floods

The main areas affected by floods and flash floods are shown in the following maps:





6.1 River floods

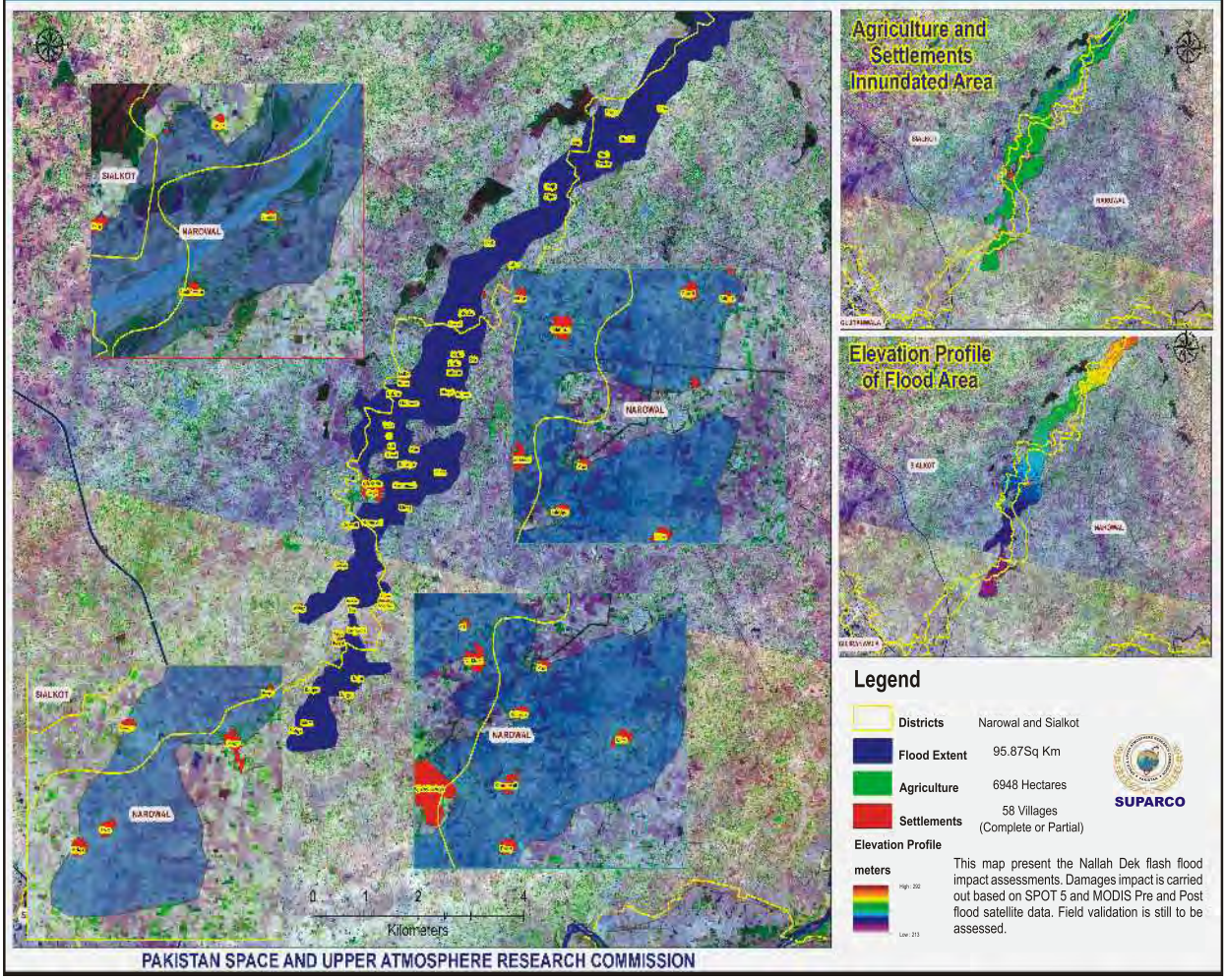
There were some low/medium floods in rivers of Kurram, Swat and Kabul. The water generally kept flowing within the proximity of riverbed, without causing any serious damages.

6.2 Overflow of creeks

The Pasrur area in Sialkot and the follow on areas in Narowal were affected by Daik Nullah (creek). It outburst three times in consecutive months of July, August, and September. The affected area was around 6.9 thousand ha. The main crop in this area is rice. The trivial damage caused to this crop in July was generally recouped by re-sowing the crop. The subsequent losses to rice in this area have been estimated at 6.2 thousand tons.

Aerial view : Pasrur, Sialkot

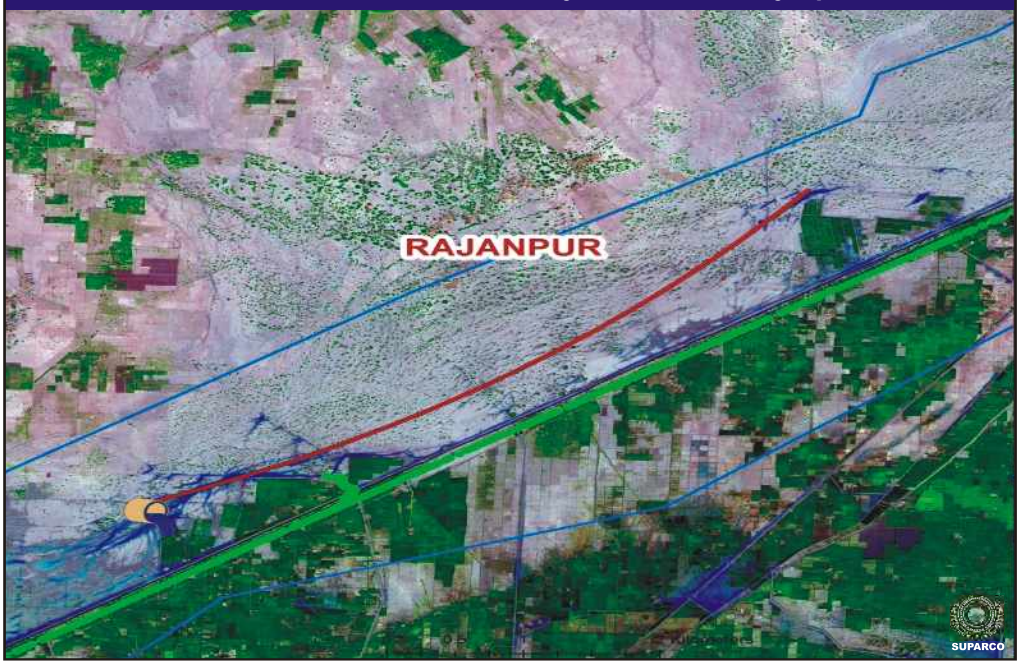
Flash Flood in Sialkot-Narowal: Nullah Dek during September 2012



6 .3 Torrential flows in rodkohis

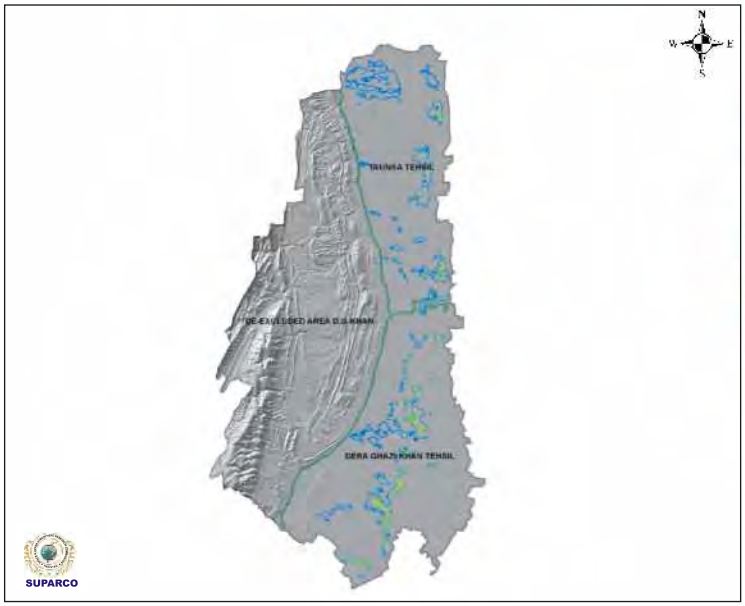
The furious Rodkohis at the foot of Suleiman Piedmont in D.I. Khan, D.G Khan and Rajanpur flared-up with torrential rains, eroding large areas of fertile soil tracts, turning around boulders and damaging households and farm property. The satellite images of floods in D.G.Khan and Rajanpur are given below :

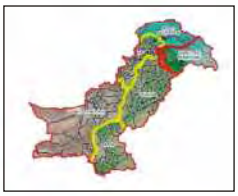
Rodkohis Torrential Flood in Rojhan Tehsil of Rajanpur



DERA GAZI KHAN DISTRICT FLOOD / RAINS 2012

Thematic Map - Affected Agriculture





District Boundary
Tehsil Boundary

Inundated Infrastrucrture

Flooded Area	582 Sq Km
Cropped Area	81 Sq Km

This map presents prelimnary analysis of flood affected areas.
This analyis is based on post disaster satellite imagery collected by SPOT sensors on 25-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.

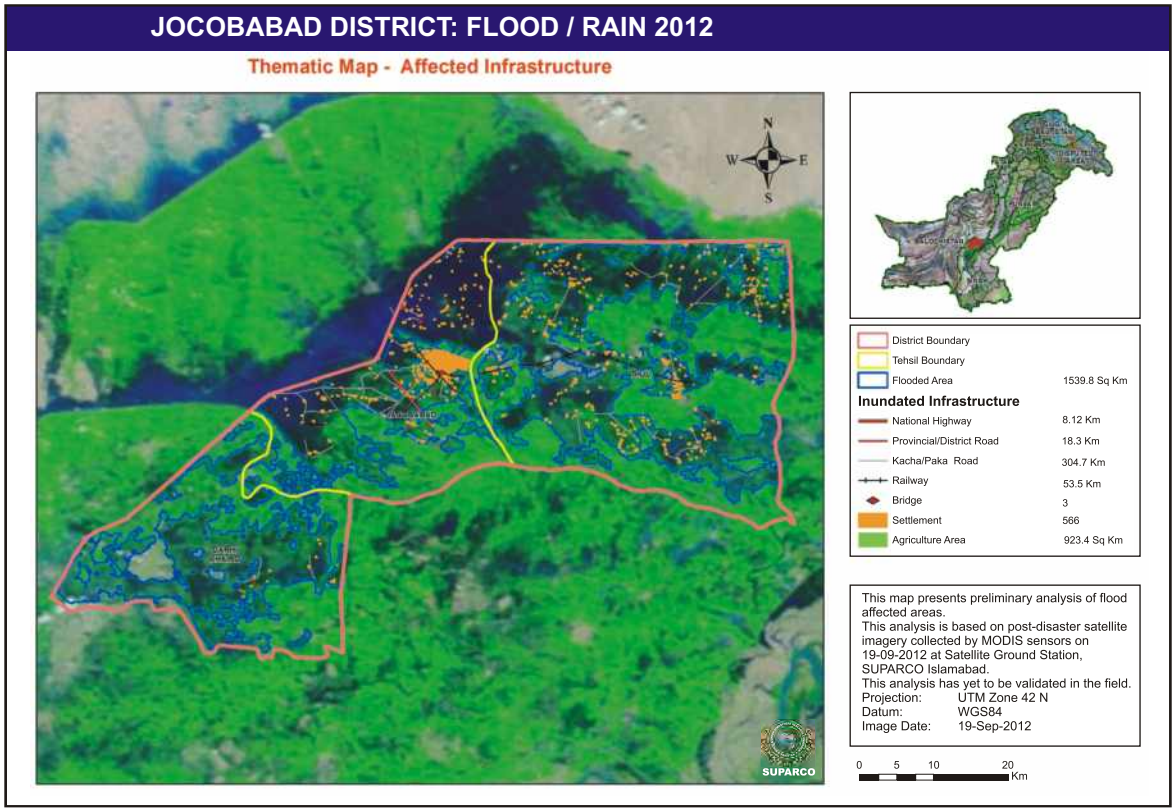
Projection;	UTM Zone 42 N
Datum:	WGS84
Image date:	25-09-2012

0 5 10 20 30 40 Km

6.4 Flash floods

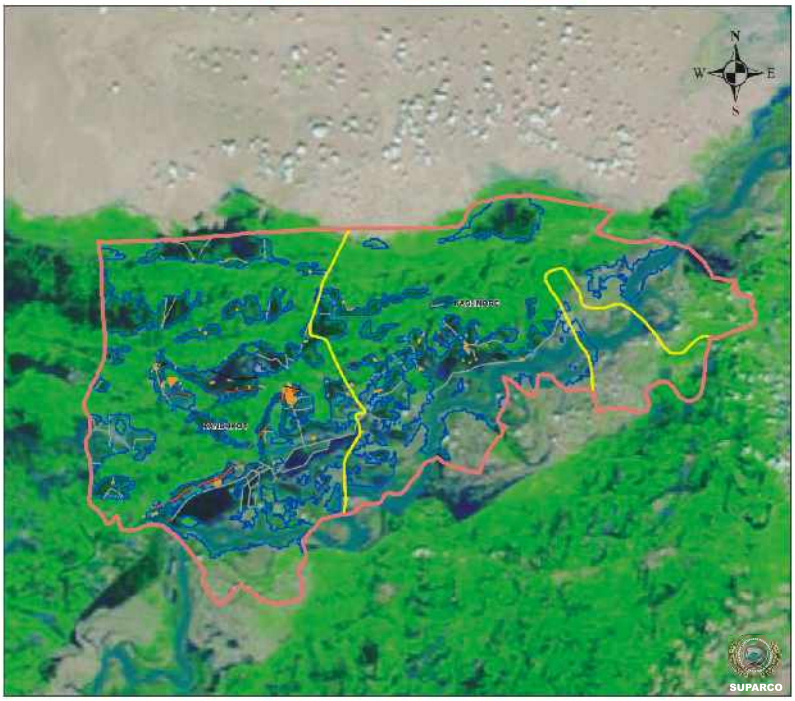
Large areas in Shikarpur, Jacobabad, Jafarabad, Nasirabad and Jhal Magsi were affected by the startling heavy downpour. This geographic entity has a history of breaches from the previous floods, this was also repeated again. Given the topography of the area, the water recession is slow and inundating water ponds in localized pockets or keeps moving downstream at a sluggish pace for months. This casts shadows on sowing of subsequent crops with consequential heavy economic losses to farming communities.

Flood affected field at Jacobabad



KASHMORE DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



District Boundary
Tehsil Boundary
Flooded Area 1617.4 Sq Km

Inundated Infrastructure

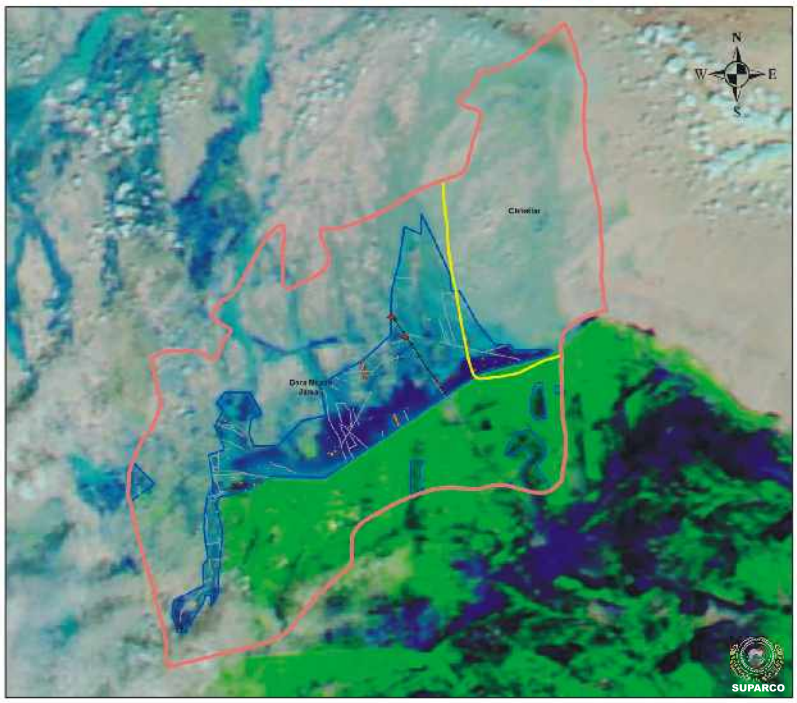
National Highway	16.4 Km
Provincial/District Road	11.9 Km
Kacha/Paka Road	222.9 Km
Railway	14.9 Km
Bridge	0
Settlement	83
Agriculture Area	491 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by MODIS sensors on 19-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 19-Sep-2012

0 5 10 20 Km

NASIRABAD DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



District Boundary
Tehsil Boundary
Flooded Area 668.7 Sq Km

Inundated Infrastructure

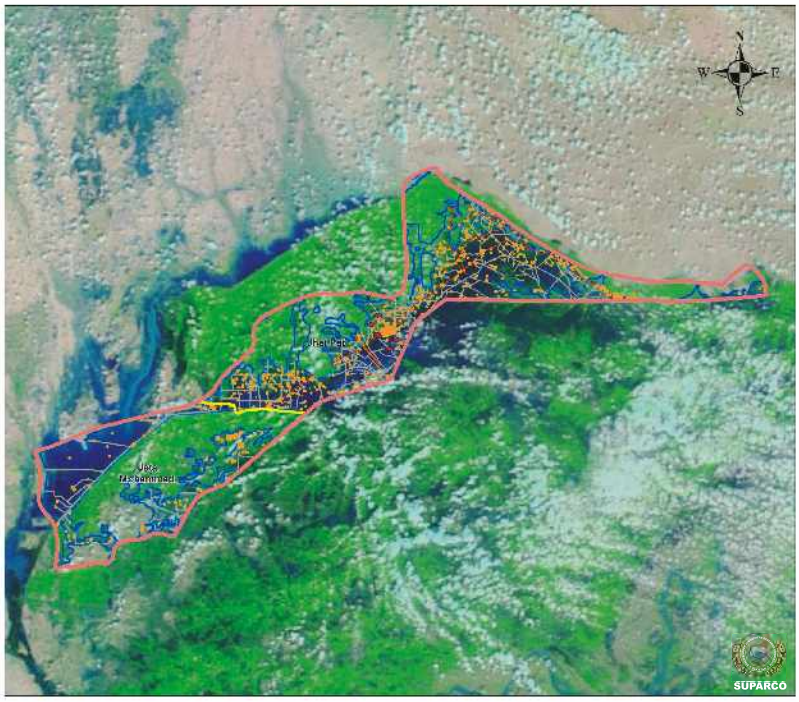
National Highway	4.9 Km
Provincial/District Road	5.2 Km
Kacha/Paka Road	194.5 Km
Railway	14.8 Km
Bridge	2
Settlement	96
Agriculture Area	494.5 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by MODIS sensors on 12-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 12-Sept-2012

0 5 10 20 Km

JAFARABAD DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



District Boundary
Tehsil Boundary
Flooded Area 1237.2 Sq Km

Inundated Infrastructure

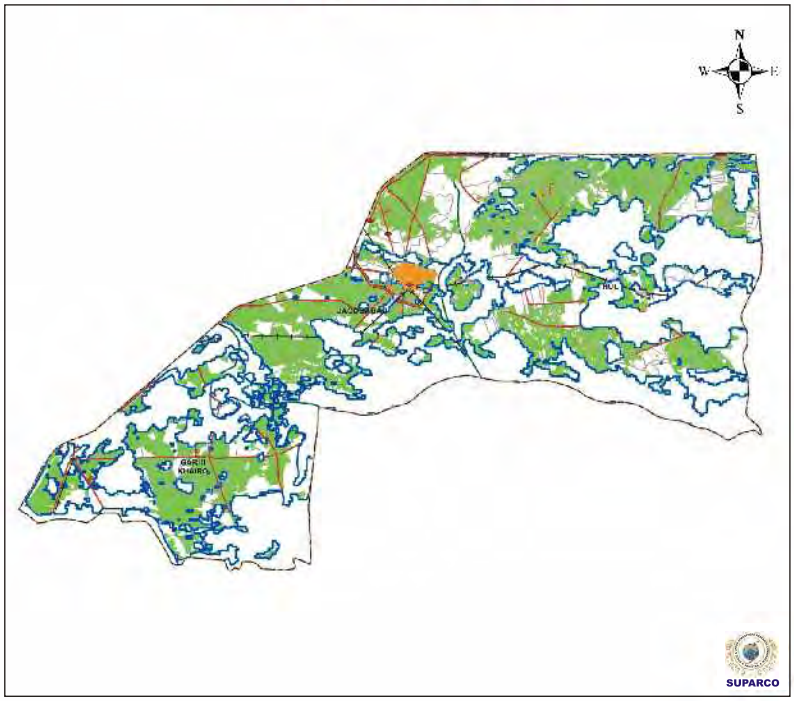
National Highway	10.9 Km
Provincial/District Road	96.6 Km
Kacha/Paka Road	666.2 Km
Railway	14.12 Km
Bridge	6
Settlement	569
Agriculture Area	483 Sq Km

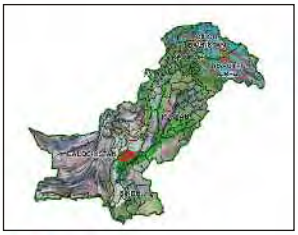
This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by MODIS sensors on 17-09-2012 at Satellite Ground Station SUPARCO Islamabad.
This analysis has yet to be validated in the field
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 17-Sep-2012

0 12.5 25 50 Km

JACOBABAD DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure





District Boundary
Tehsil Boundary
Flooded Area 1620.6 Sq Km

Inundated Infrastructure

National Highway	12.2 Km
Provincial/District Road	277.5 Km
Kacha/Paka Road	598 Km
Railway	63.5 Km
Bridge	3
Settlement	710
Agriculture Area	923.4 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station SUPARCO Islamabad.
This analysis has yet to be validated in the field
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km

JACOBABAD DISTRICT: FLOOD / RAIN 2012

TEHSIL - JACOBABAD

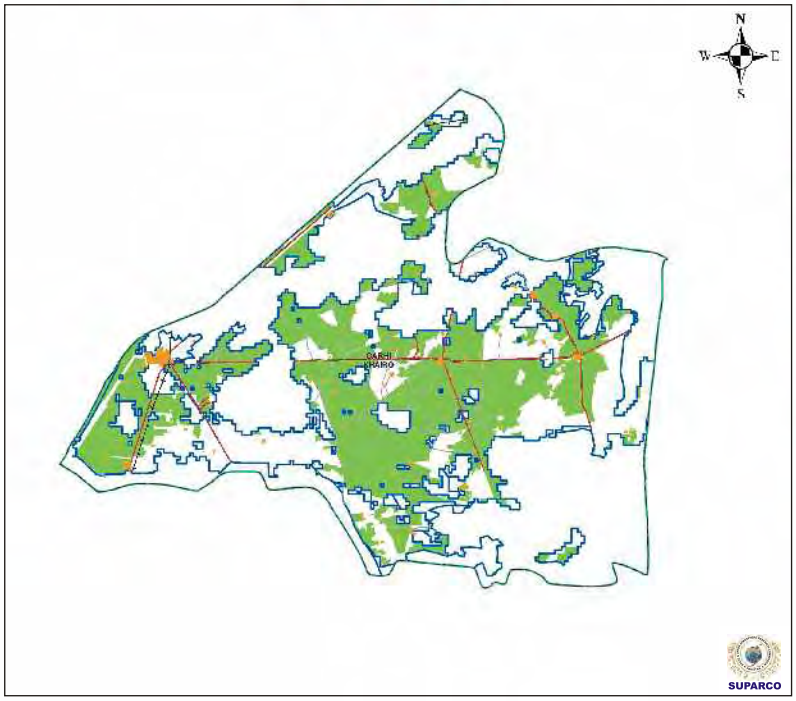
District Boundary	
Tehsil Boundary	
Flooded Area	457 Sq Km
Inundated Infrastructure	
National Highway	12.2 Km
Provincial/District Road	98 Km
Kacha/Paka Road	270 Km
Railway	25 Km
Bridge	3
Settlement	216
Agriculture Area	276 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disater satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station SUPARCO Islamabad.
This analysis has yet to be validated in the field
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 2.5 5 10 Km

JACOBABAD DISTRICT: FLOOD / RAIN 2012

TEHSIL - GARHI KHAIRO



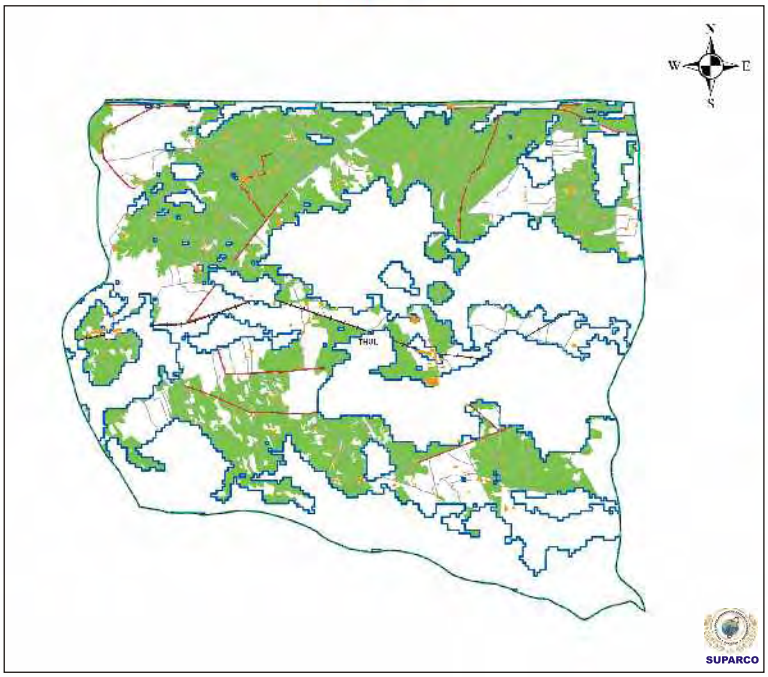
District Boundary	
Tehsil Boundary	
Flooded Area	403.6 Sq Km
Inundated Infrastructure	
National Highway	0 Km
Provincial/District Road	80.5 Km
Kacha/Paka Road	119 Km
Railway	12.5 Km
Bridge	0
Settlement	136
Agriculture Area	223.4 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disater satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station SUPARCO Islamabad.
This analysis has yet to be validated in the field
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 2.5 5 10 Km

JACOBABAD DISTRICT: FLOOD / RAIN 2012

TEHSIL - THUL



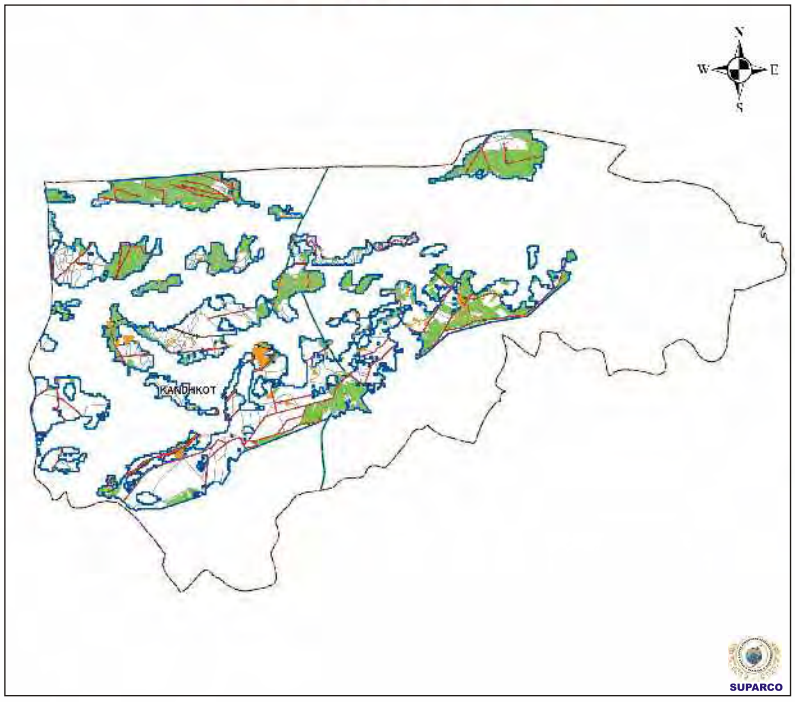
District Boundary	
Tehsil Boundary	
Flooded Area	760 Sq Km
Inundated Infrastructure	
National Highway	0 Km
Provincial/District Road	99 Km
Kacha/Paka Road	209 Km
Railway	26 Km
Bridge	0
Settlement	358
Agriculture Area	424 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 2.5 5 10 Km

KASHMORE DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



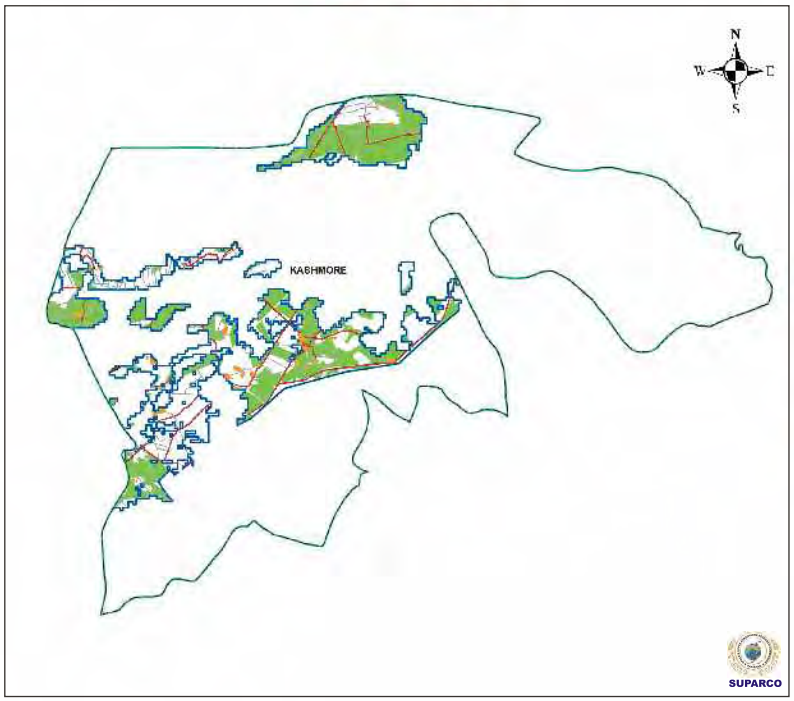
District Boundary	
Tehsil Boundary	
Flooded Area	699 Sq Km
Inundated Infrastructure	
National Highway	19.4 Km
Provincial/District Road	286 Km
Kacha/Paka Road	710 Km
Railway	14.9 Km
Bridge	0
Settlement	144
Agriculture Area	491 Sq Km

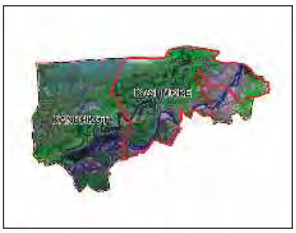
This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 26-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 26-Sep-2012

0 5 10 20 Km

KASHMORE DISTRICT: FLOOD / RAIN 2012

TEHSIL - KASHMORE





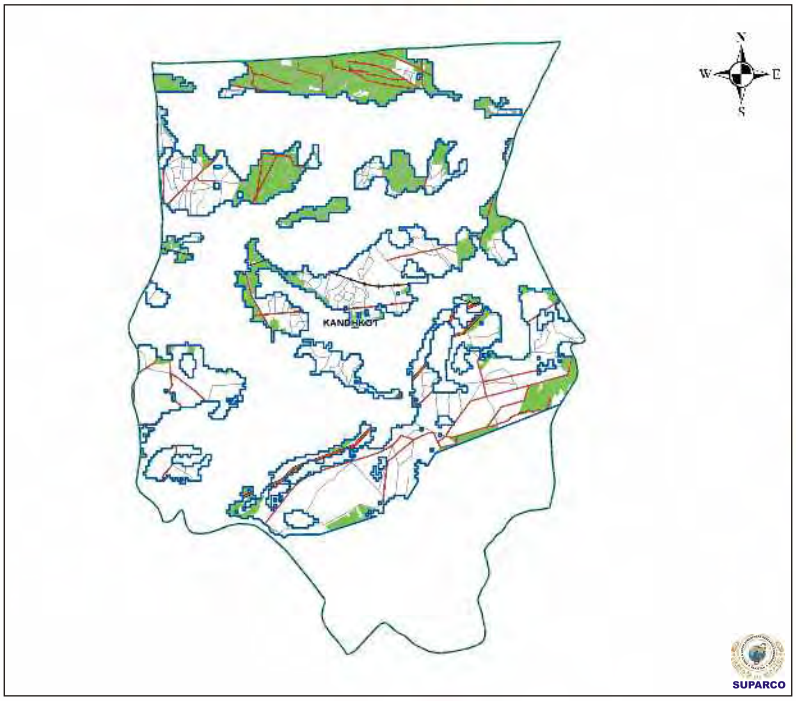
District Boundary	
Tehsil Boundary	
Flooded Area	229 Sq Km
Inundated Infrastructure	
National Highway	1.5 Km
Provincial/District Road	98 Km
Kacha/Paka Road	218 Km
Railway	1.6 Km
Bridge	0
Settlement	60
Agriculture Area	211 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km

KASHMORE DISTRICT: FLOOD / RAIN 2012

TEHSIL - KANDH KOT



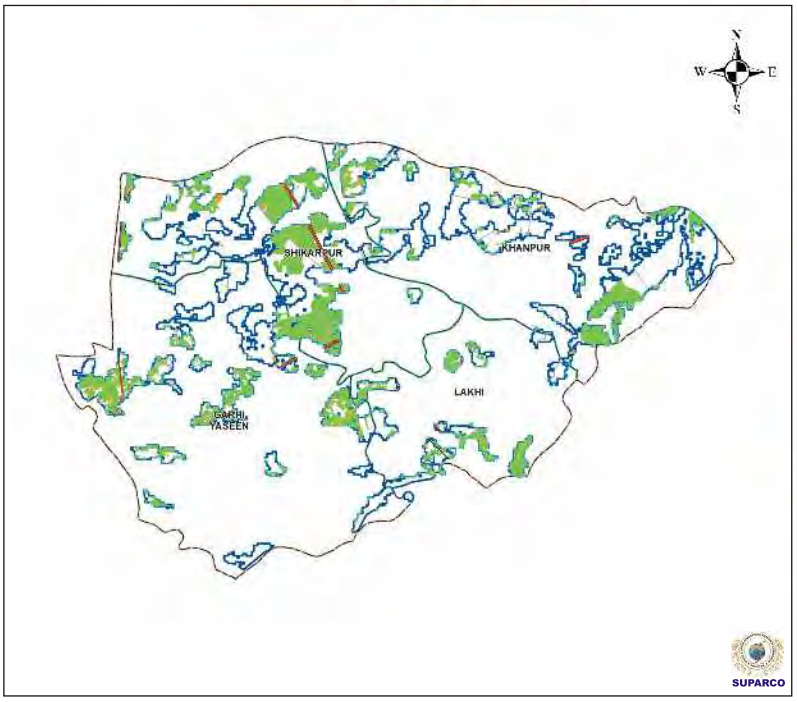
District Boundary	
Tehsil Boundary	
Flooded Area	470 Sq Km
Inundated Infrastructure	
National Highway	17.9 Km
Provincial/District Road	188 Km
Kacha/Paka Road	492 Km
Railway	13.3 Km
Bridge	0
Settlement	84
Agriculture Area	280 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km

SHIKAR PUR DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



District Boundary	
Tehsil Boundary	
Flooded Area	644 Sq Km
Inundated Infrastructure	
National Highway	8.1 Km
Provincial/District Road	59 Km
Kacha/Paka Road	471 Km
Railway	8.9 Km
Bridge	0
Settlement	230
Agriculture Area	317 Sq Km

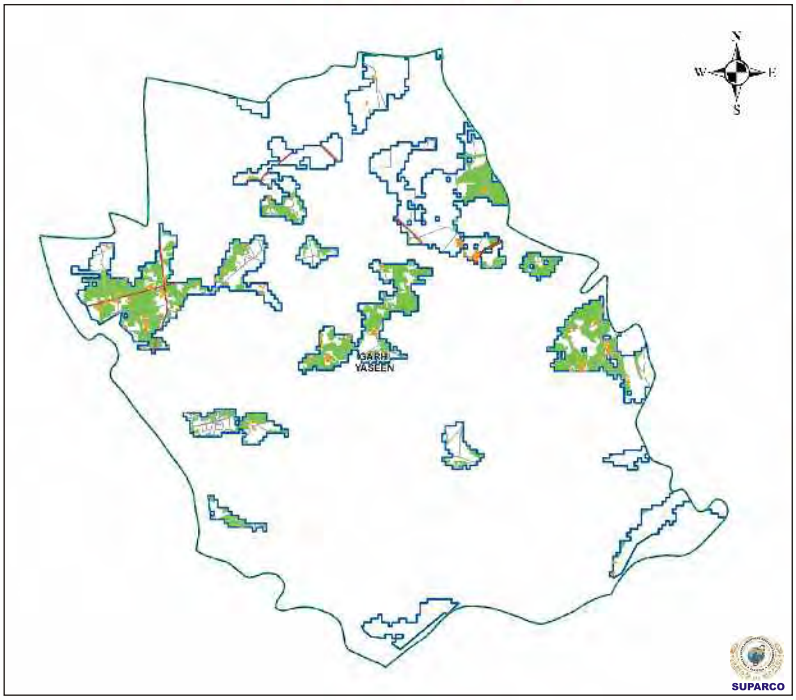
This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 26-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.

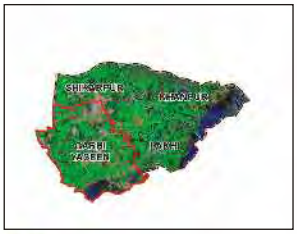
Projection:	UTM Zone 42 N
Datum:	WGS84
Image Date:	26-Sep-2012

0 5 10 20 Km

SHIKAR PUR DISTRICT: FLOOD / RAIN 2012

TEHSIL - GARHI YASEEN





District Boundary	
Tehsil Boundary	
Flooded Area	165 Sq Km
Inundated Infrastructure	
National Highway	2.1 Km
Provincial/District Road	18.4 Km
Kacha/Paka Road	214 Km
Railway	0.4 Km
Bridge	0
Settlement	81
Agriculture Area	83 Sq Km

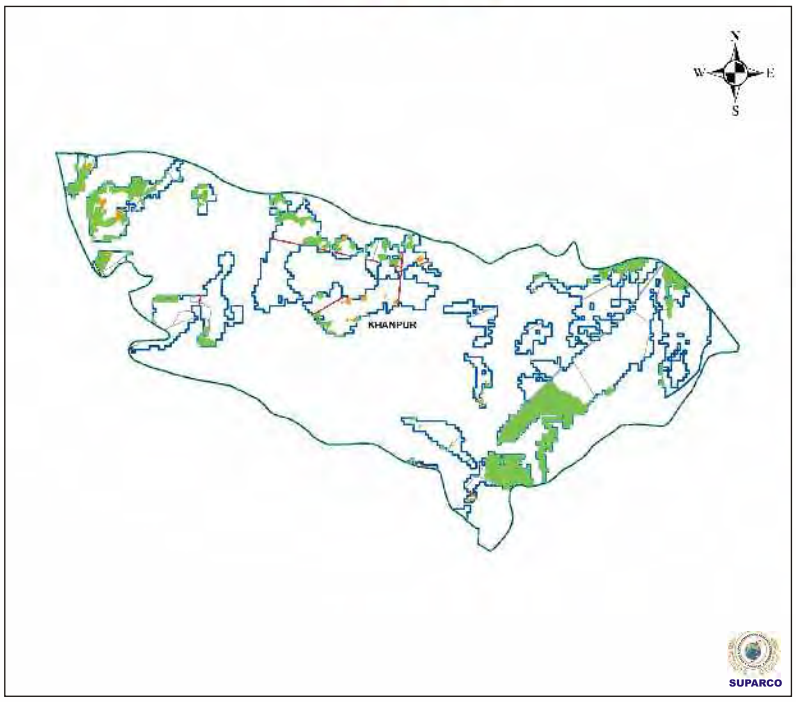
This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.

Projection:	UTM Zone 42 N
Datum:	WGS84
Image Date:	15-Sep-2012

0 3.75 7.5 15 Km

SHIKAR PUR DISTRICT: FLOOD / RAIN 2012

TEHSIL - KHAN PUR



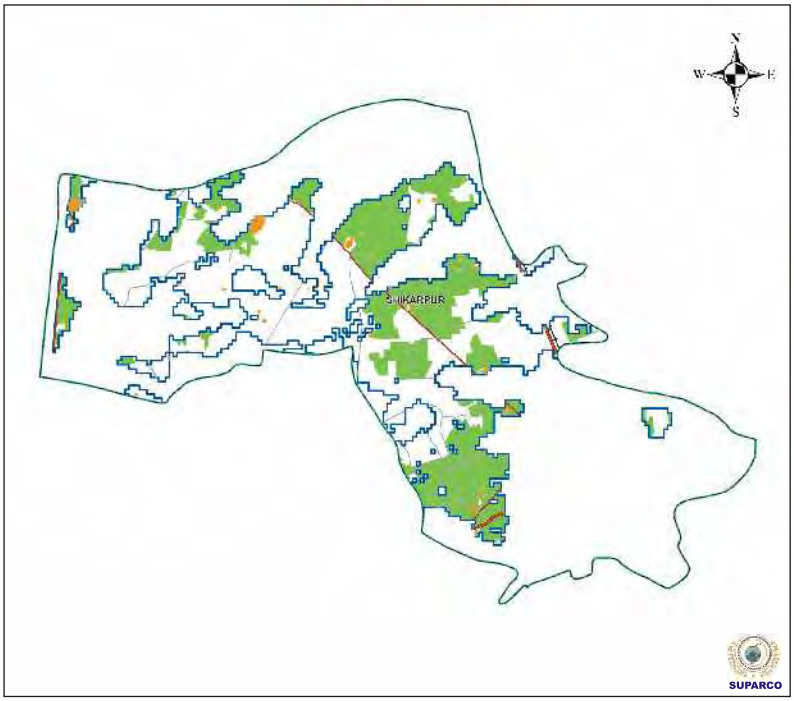
District Boundary	
Tehsil Boundary	
Flooded Area	205 Sq Km
Inundated Infrastructure	
National Highway	0 Km
Provincial/District Road	17.7 Km
Kacha/Paka Road	93 Km
Railway	1.8 Km
Bridge	0
Settlement	48
Agriculture Area	68 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 4.5 9 18 Km

SHIKAR PUR DISTRICT: FLOOD / RAIN 2012

TEHSIL - SHIKAR PUR



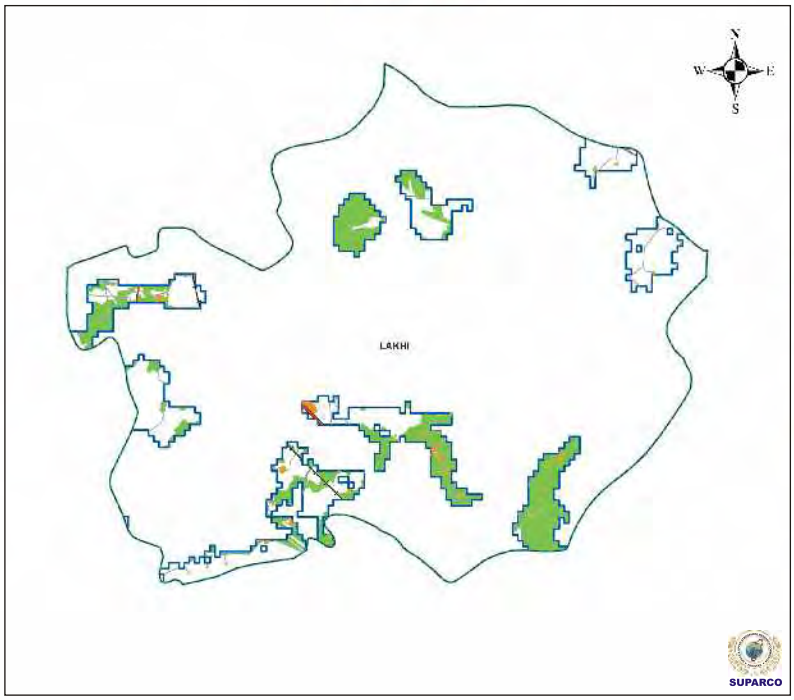
District Boundary	
Tehsil Boundary	
Flooded Area	216 Sq Km
Inundated Infrastructure	
National Highway	4.9 Km
Provincial/District Road	21.4 Km
Kacha/Paka Road	97 Km
Railway	2.2 Km
Bridge	0
Settlement	64
Agriculture Area	130 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 3.5 7 14 Km

SHIKAR PUR DISTRICT: FLOOD / RAIN 2012

TEHSIL - LAKHI



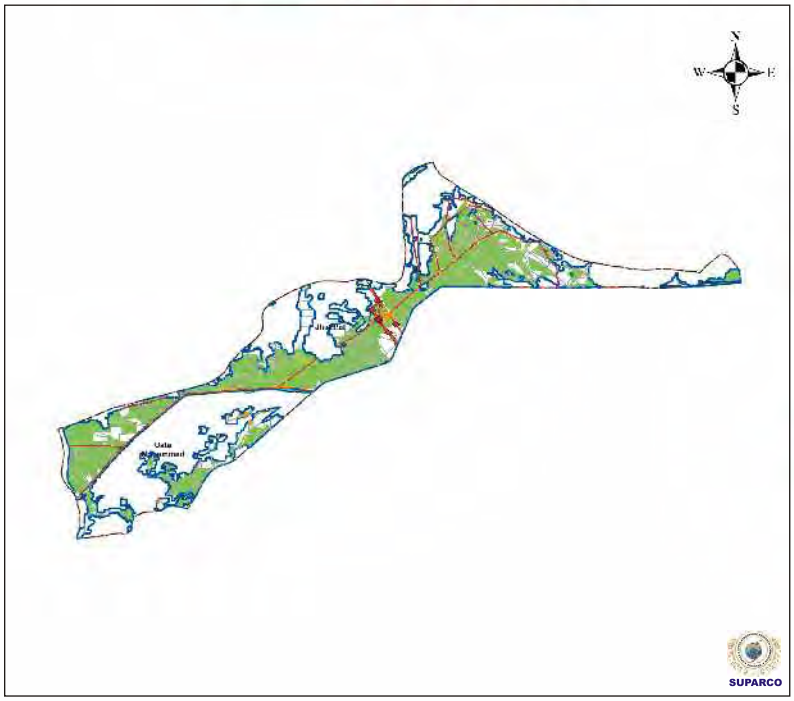
District Boundary	
Tehsil Boundary	
Flooded Area	58 Sq Km
Inundated Infrastructure	
National Highway	1.1 Km
Provincial/District Road	1.5 Km
Kacha/Paka Road	62 Km
Railway	4.5 Km
Bridge	0
Settlement	37
Agriculture Area	36 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 2.5 5 10 Km

JAFARABAD DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



District Boundary	
Tehsil Boundary	
Flooded Area	1342 Sq Km
Inundated Infrastructure	
National Highway	14.8 Km
Provincial/District Road	247 Km
Kacha/Paka Road	209 Km
Railway	26 Km
Bridge	0
Settlement	358
Agriculture Area	424 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 12.5 25 50 Km

JAFARABAD DISTRICT: FLOOD / RAIN 2012

TEHSIL - JHAT PAT

District Boundary
Tehsil Boundary
Flooded Area 922 Sq Km

Inundated Infrastructure

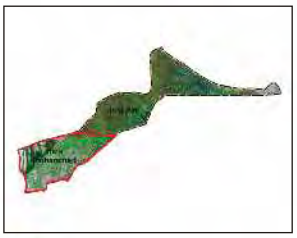
National Highway	14.8 Km
Provincial/District Road	178 Km
Kacha/Paka Road	927 Km
Railway	14.12 Km
Bridge	6
Settlement	496
Agriculture Area	328.4 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km

JAFARABAD DISTRICT: FLOOD / RAIN 2012

TEHSIL - USTA MUHAMMAD



District Boundary
Tehsil Boundary
Flooded Area 420 Sq Km

Inundated Infrastructure

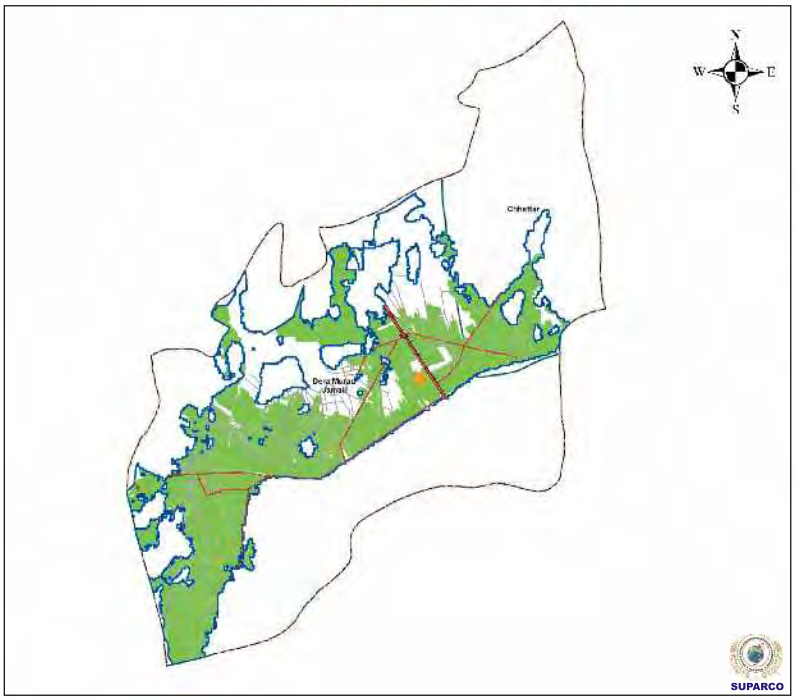
National Highway	0 Km
Provincial/District Road	69 Km
Kacha/Paka Road	380 Km
Railway	0 Km
Bridge	0
Settlement	70
Agriculture Area	154.6 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km

NASIRABAD DISTRICT: FLOOD / RAIN 2012

Thematic Map - Affected Infrastructure



District Boundary
Tehsil Boundary
Flooded Area 1254 Sq Km

Inundated Infrastructure

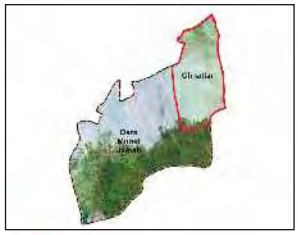
National Highway	16 Km
Provincial/District Road	122 Km
Kacha/Paka Road	822 Km
Railway	14.48 Km
Bridge	3
Settlement	145
Agriculture Area	97.5 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km

NASIRABAD DISTRICT: FLOOD / RAIN 2012

TEHSIL - CHHATAR



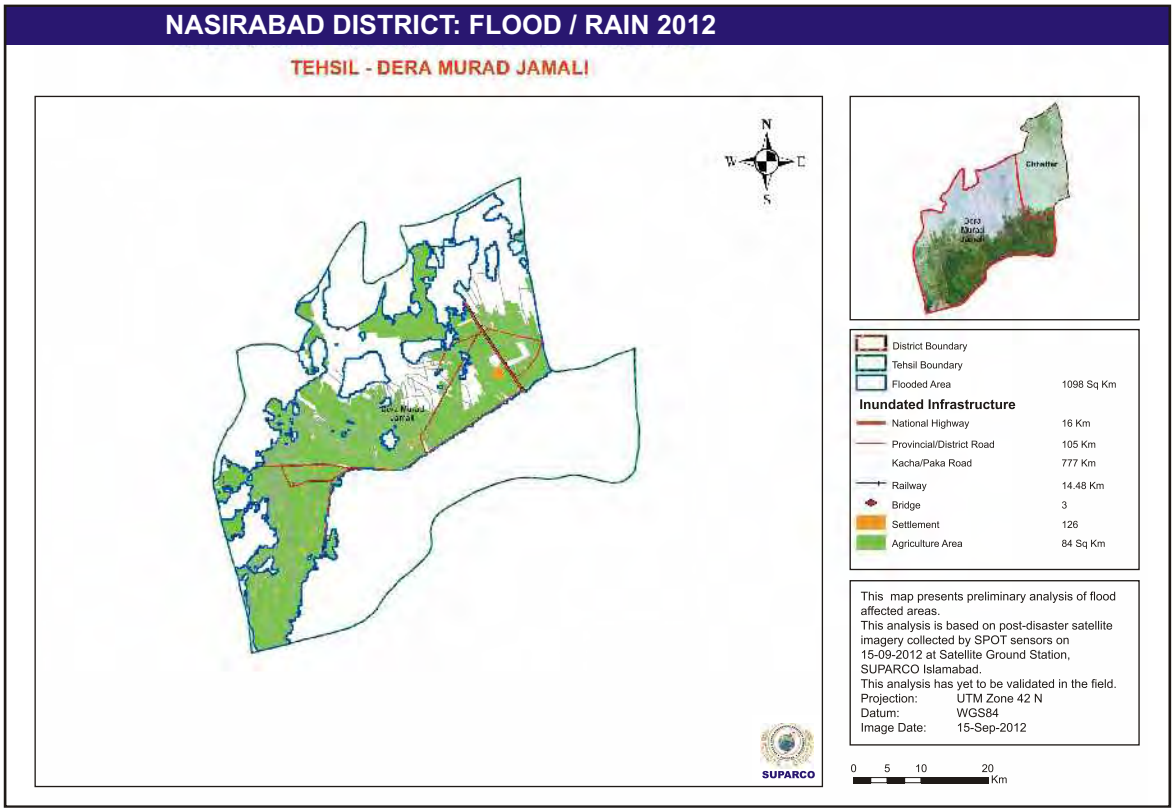
District Boundary
Tehsil Boundary
Flooded Area 156 Sq Km

Inundated Infrastructure

National Highway	0 Km
Provincial/District Road	17 Km
Kacha/Paka Road	45 Km
Railway	0 Km
Bridge	0
Settlement	19
Agriculture Area	13.5 Sq Km

This map presents preliminary analysis of flood affected areas.
This analysis is based on post-disaster satellite imagery collected by SPOT sensors on 15-09-2012 at Satellite Ground Station, SUPARCO Islamabad.
This analysis has yet to be validated in the field.
Projection: UTM Zone 42 N
Datum: WGS84
Image Date: 15-Sep-2012

0 5 10 20 Km



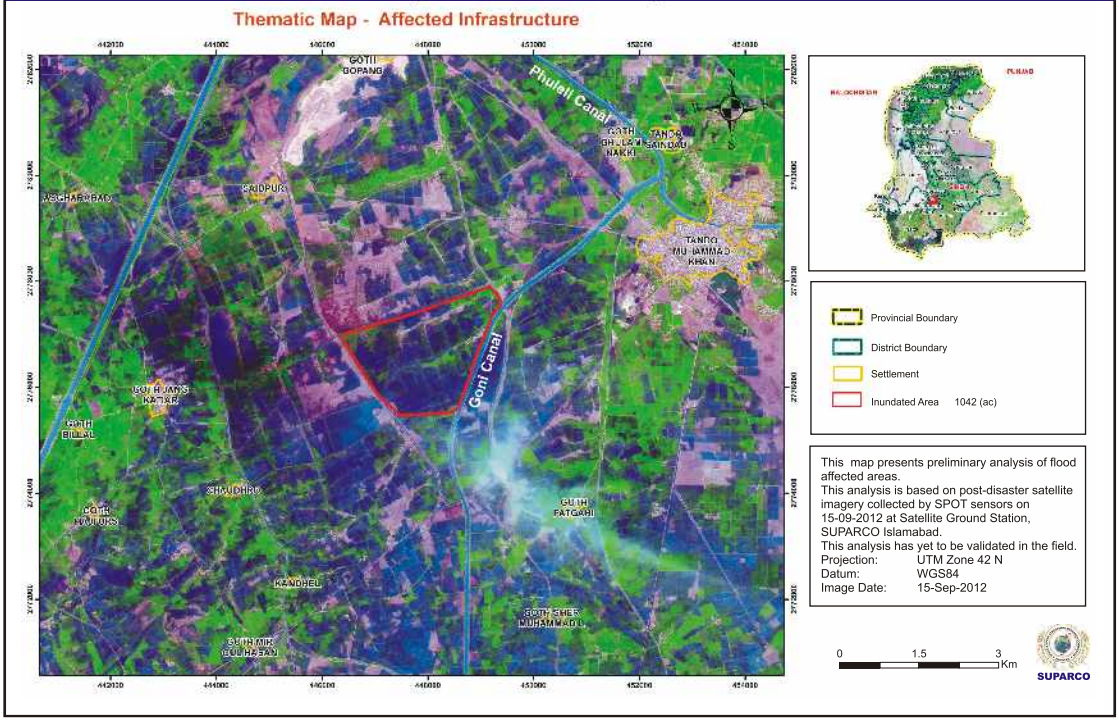
6.5 Canal breaches

There were a number of canal breaches in Sindh from May onwards even without flash floods. The areas affected were local and limited.

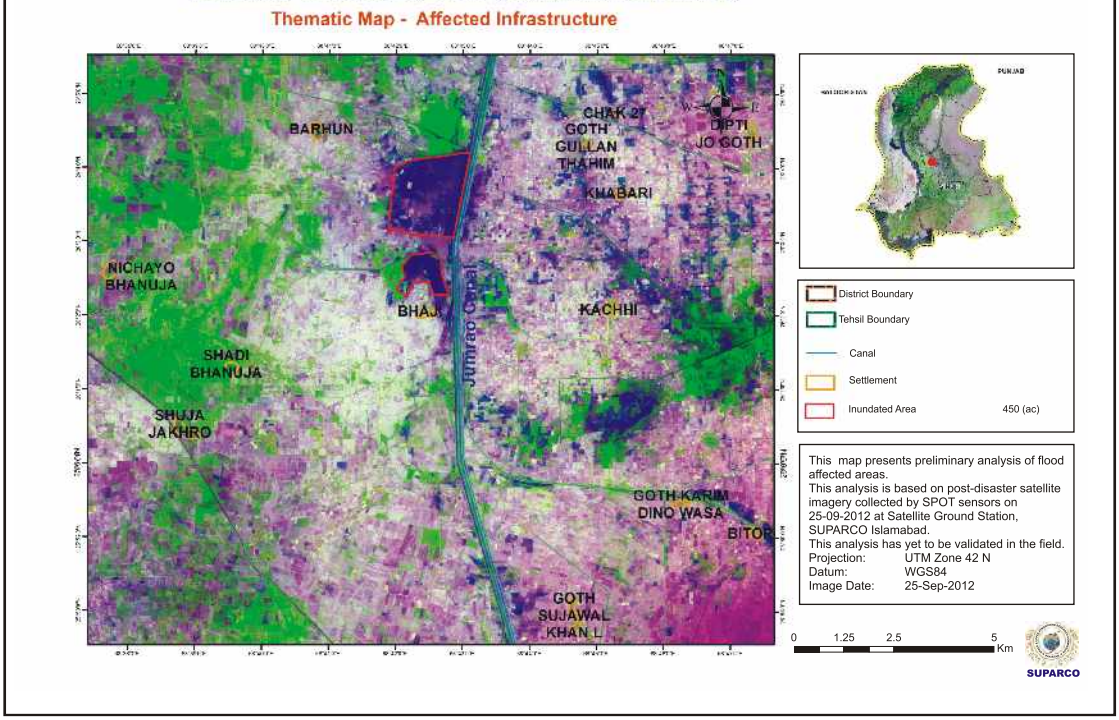
District	Tehsil	Breach Location Lat/Long	Breach (meter)
Jafarabad	Jhat Pat	68.17 , 28.23	349.0
Jafarabad	Jhat Pat	68.36 , 28.31	120.0
Jafarabad	Jhat Pat	68.17 , 28.23	73.9
Jafarabad	Jhat Pat	68.15 , 28.23	50.9
Jafarabad	Usta Muhammad	67.84 , 28.17	203.0
Kashmore	Kashmore	69.46 , 28.44	30.0
Jacobabad	Jacobabad	68.21 , 28.24	86.9

The images of breaches and ensuing flooding are as under:

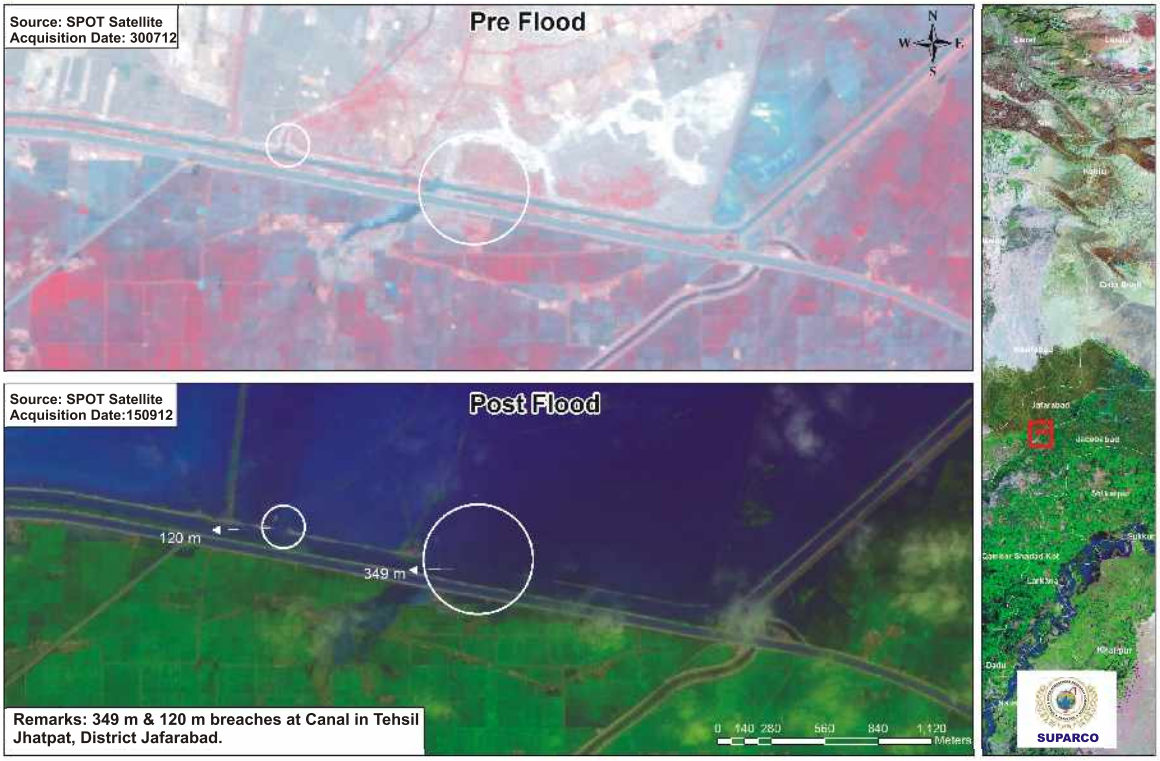
GONI CANAL BREACH (T.M. KHAN DISTRICT)



JUMRAO CANAL BREACH (SANGHAR DISTRICT)

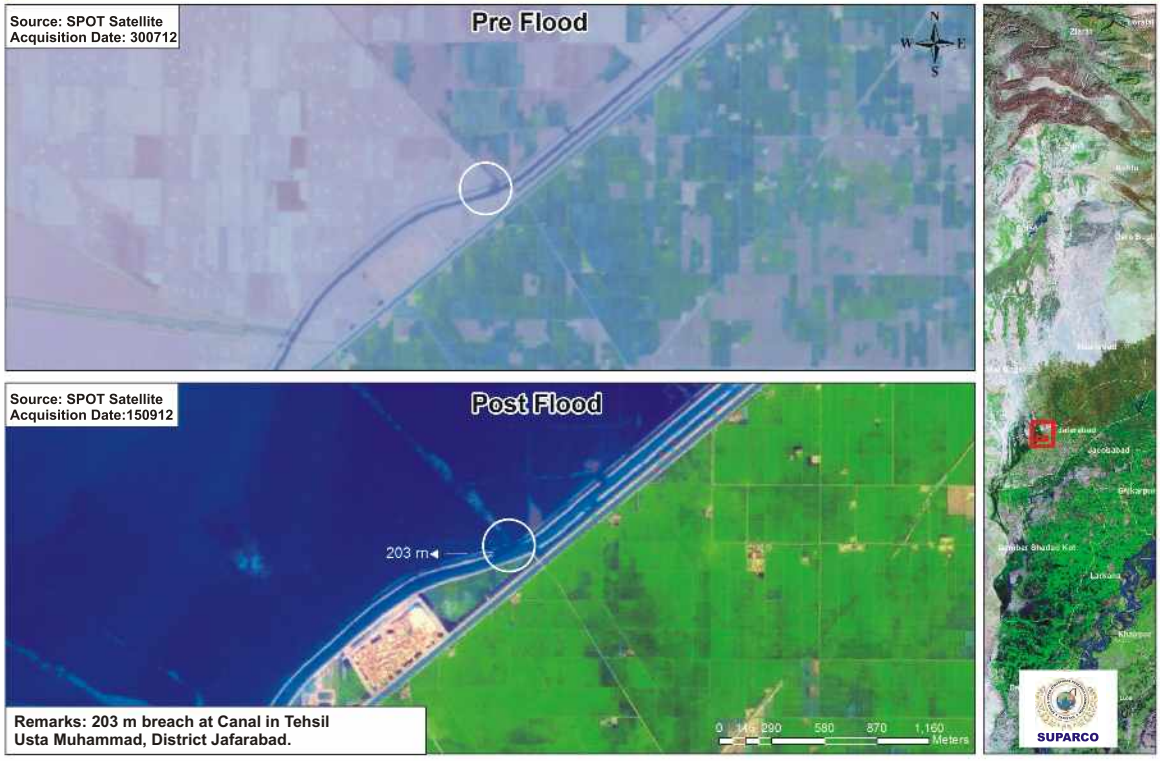


Canal Breaches - District Jafarabad



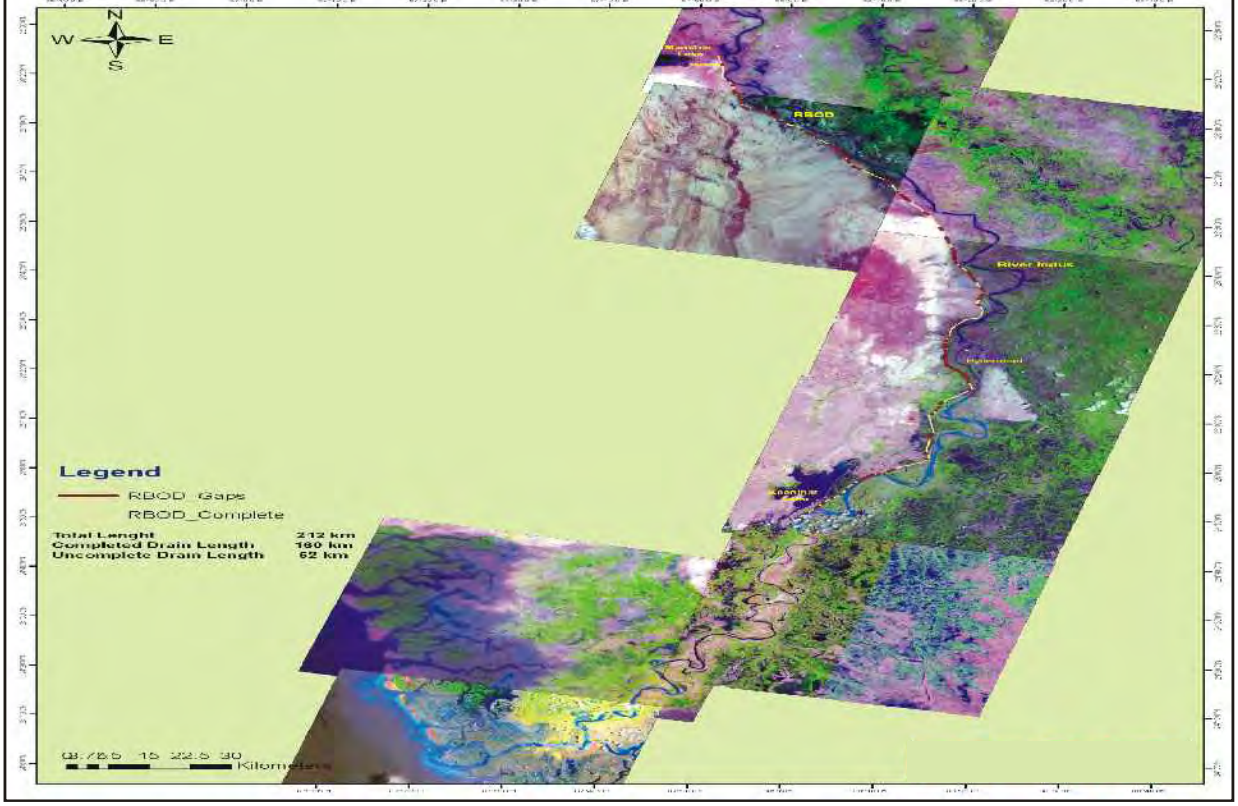
Remarks: 349 m & 120 m breaches at Canal in Tehsil Jhatpat, District Jafarabad.

Canal Breaches - District Jafarabad



Remarks: 203 m breach at Canal in Tehsil Usta Muhammad, District Jafarabad.

RIGHT BANK OUTFALL DRAIN



7. Crop situation

7.1 Kharif crops

The main crops grown are cotton, sugarcane, rice, fodders, vegetables and fruits. The total flood extent was 752.8 thousand ha viz Punjab 196.8 thousand ha, Sindh 296.4 thousand ha and Balochistan 259.6 thousand ha. The district wise flood extent and kharif crop area innundated is shown in the table:

Flooded Extent and Crop Inundated Area

Provinces	Districts	Flood Extent	Kharif Crop Area Inundated
		000 ha	
Punjab	Sialkot/Narowal	9.6	6.9
	Rajanpur	129.0	18.5
	Dera Ghazi Khan	58.2	8.1
	Subtotal	**196.8**	**33.5**
Sindh	ShikarPur	64.4	31.7
	Jacobabad	162.1	92.3
	Kashmore	69.9	49.1
	Subtotal	**296.4**	**173.1**
Balochistan	Nasirabad	125.4	9.8
	Jafarabad	134.2	48.3
	Subtotal	**259.6**	**58.1**
Total		**752.8**	**264.7**

The crop wise description is as follows:

7.1.1 Cotton crop 2012-13

The cotton area has shown variability over years depending upon (a) fluctuations in prices of seed cotton (b) intensity of pests and diseases especially cotton leaf curl virus and (c) situation of floods and rains. The average area of cotton during the year 2006 to 2011 was 2.9 million ha, yield at 718 kg/ha and the production was 12.4 million bales.

Damaged cotton field in Rajanpur

The deviations from the average during this period ranged between ± 0.2 million ha, yield ±96 kg/ha and production ± 1.2 million bales. The crop forecast by SUPARCO for the year 2012-13 is as follows:

Provinces	Area	Yield	Production-Million bales
	000 ha	Kg/ha	170 kg bales
Punjab	2622	650	10.1
Sindh	780	820	3.8
Balochistan	40	500	0.1
Total	**3442**	**687**	**14.0**

During the current Kharif season, the early sowing of cotton crop started in February both in Punjab and Sindh. The main constraint in sowing of cotton was low levels of surface irrigation water supplies. The sowing of the crop has been completed and the cotton is estimated at 3.19 million hectare, using MODIS 250 m resolution satellite data.

The area under cotton is undersized than the sown area of the last year. The reasons for this, in addition, rundown supplies of surface irrigation water include (a) low returns from the crop during 2011-12 dropped to about one half from last year (b) the likely probability of flood risk in Sindh (c) shy farmers in the presence of a monsoon forecast at 5 to 15 percent plus over the norm (d) some substitution of cotton area by sugarcane crop in Sindh.

There were torrential rains in Punjab and Sindh in major crop growing ecosystems including cotton. The crop was at picking stage during August-September. The damage to cotton crop was bi-fold as follows:

7.1.1.1 Physical damage to cotton

The physical damages to standing crops, mainly cotton, by rains and Rodkohis, accrued in the districts of Dera Ghazi Khan and Rajanpur. The total area under flood water in these districts, estimated by MODIS 250 m satellite resolution data, was 187.2 thousands ha. The cropped area inundated, as estimated

Cotton at Matiari

Cotton field at Saidabad, Matiari

through satellite image classification of SPOT 5 data of 5 m resolution, was 26.6 thousand ha.

The cotton area damaged in these districts is worked through trend line and has been estimated at 17.2 thousand ha. The cotton yield in this area is around 5 bales per ha. Some of the cotton was picked prior to rains. In addition, the mature bolls of cotton open even under flooded conditions.

Taking these points in consideration, it was assumed that about half of this cotton was realized and other half (2.5 bales per ha) was lost. The expected production from this affected area was about 86 thousand bales and 43 thousand bales were lost due to physical damage by flash floods. The flood-crop statistics in these two districts is as follows:

District	Cropped area damaged	Cotton area damaged	Yield loss	Product-ion loss
	000 ha		bales/ ha	000 bales
Rajanpur	18.5	12.0	2.5	30.0
D. G Khan	8.1	5.2	2.5	13.0
Total	26.6	17.2	2.5	43.0

The cotton rates on 9th October 2012 at Karachi Cotton Association (KCA) ranged between Rs. 5800 to 6283 per 40 kg with an average of Rs. 6042. At this average rate, the loss per bale of 170 kg is estimated at about Rs. 25700. The total loss of 43 thousand bales is estimated at Rs. 1105 million. The ensuing loss from banola (cotton seed) is estimated at 15 thousand tons. The value of this banola at a rate of Rs. 20 per kg is worth Rs. 300 million. The worth of the physical damage adds up to Rs. 1405 million or Rs. 1.4 billion.

7.1.1.2 Depreciation of cotton quality

In addition, the quality of cotton was affected in all cotton growing areas of the country by soaking in rainfall. The quality of this fine grade, open boll cotton, of a size of about 10 percent at around 1.4 million bales was depreciated. The farmers got a discounted price ranging from Rs. 500 to 800 per 40 Kg, scaling down phutti prices from Rs. 2600 to 2700 accordingly. At 35 percent of Ginning Out Turn (GOT) 486 kg of phutti is required to yield one bale of 170 kg lint.

The average loss to farming community is around Rs. 650 per 40 kg of phutti. The loss per bale stemming from 486 kg is around Rs. 7893.

The total loss to farming community through markdown in quality is about Rs. 11 billion. The total damage to cotton both physical and of quality is about Rs. 12.4 billion.

7. 1. 2 Sugarcane crop

The sugarcane area has shown variability over years depending upon (a) fluctuations in prices of cane (b) irrigation water availability and (c) situation of floods and rains. The statistics of sugarcane crop during the years 2006-11 show that the average area under sugarcane crop was 1.05 million ha, yield at 53 tons/ha and production around 55.3 million tons.

Sugarcane field at Uderolal

The deviations from this area during the above time lines ranged between ±0.2 million ha, yield ±4 tons /ha and production ±8.6 million tons. The currents rains have generally benefitted the crop. The production figures are as follows:

Provinces	Area	Yield	Production
	000 ha	Kg/ha	000 Tons
Punjab	850.7	56.0	47.6
Sindh	290.2	56.8	16.5
Khyber Pakhtunkhwa	99.4	43.7	4.3
Total	**1240.3**	**55.2**	**68.4**

7.1.3 Rice crop

The area under rice crop has shown variability over years depending upon (a) fluctuations in prices of the commodity in national /international market (b) irrigation water availability and (c) situation of floods and rains. The statistics of rice crop during the years 2006-11 show that the average area under the crop during the above period was 2.6 million ha yield at 2248 kg/ha and production was 6.0 million tons. The deviations from this average behavior is area ±0.3 million ha, yield ±210 kg/ha and production ±1.1 million tons.

Provinces	Area	Yield	Production
	000 ha	Kg/ha	000 Tons
Punjab	1990	2097	4173
Sindh	810	3134	2539
Khyber Pakhtunkhwa	73	1910	139
Sindh	109	3249	354
Total	**2982**	**2416**	**7205**

The rice crop was affected by flash floods in Jacobabad, Kashmore, Shikarpur, Jafferabad, Nasirabad and some other areas. The damages mostly accrued in the low lying areas which are submerged under water. A ground validation team of SUPARCO visited these areas during 2-4th October 2012 along with the local authorities of Agriculture Extension and Crop Reporting Services of Sindh Government based in Shikarpur and Jacobabad districts.

Rice field at Shikarpur

The team visited Larkana, Kamber Shadad Kot, Shikarpur and Jacobabad districts. Through the analysis of Modis 250 m imagery data, it was noted that the areas under 3-4 feet deep water, apparent from the deep blue color of the satellite imagery, worked at 42 percent. The crop in this area is totally lost. In addition,

some peripheral areas were also damaged. The overall loss has been taken at 60 percent of the affected areas.

The rice crop damages have been worked at about 406 thousand tons viz.301 thousand tons in Sindh, 92 thousand tons in Balochistan and 13 thousand tons in Punjab. The value of the damage at Rs. 1000 per 40 kg of paddy or Rs.1500 for IRRI (milled) rice (Rs.37500 per ton) is estimated at Rs.15.2 billion.

The impact on total rice production is likely to be offset, at least partly, by better crop in other rice growing areas. The statistics of cropped, inundated area and rice area damaged are as follows:

Damaged rice field at Jacobabad

Flood Damage of Rice Crop 2012-13					
Provinces	**Districts**	**Rice Area Inundated**	**Rice Area Damaged**	**Rice Yield Loss**	**Rice Production Loss**
		000 ha		**tons per ha**	**000 tons**
Punjab	Sialkot	2.0	0.6	2.0	1.2
	Narowal	4.2	2.5	2.0	5.0
	Dera Ghazi Khan	2.0	2.0	3.5	7.0
	Subtotal	**8.2**	**5.1**	**2.6**	**13.2**
Sindh	Shikarpur	23.8	14.3	3.6	51.4
	Jacobabad	69.2	41.5	4.0	166.1
	Kashmore	36.8	22.1	3.8	83.9
	Subtotal	**129.8**	**77.9**	**3.9**	**301.4**
Balochistan	Nasirabad	7.4	4.4	3.5	15.5
	Jafarabad	36.2	21.7	3.5	76.0
	Subtotal	**43.6**	**26.1**	**3.5**	**91.6**
Total		**181.6**	**109.1**	**3.7**	**406.2**

7.1.4 Other kharif crops

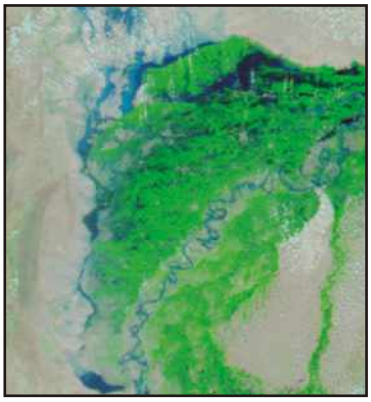
The rains, by and large, have resulted in an affirmative impact on growth of sugarcane, maize, vegetables, chilies, onions, orchards and other crops.

Guava orchard at Moro

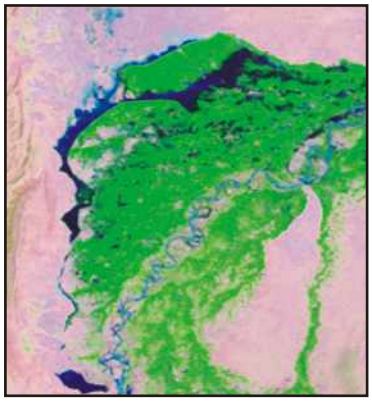
7.2 Rabi crops 2012-13: prospects

With floods in Jacobabad and neighboring upper districts, the flood water generally kept flowing down the ancient bed of river Indus, through the 350 km stretch of Kirthar range for extended periods. Interrupted by barriers of roads, canals, railway lines and other elevated spatial features, the free flow of water became stationary at around two feet depth. The options thereafter are two-fold i.e. either the water evaporates / infiltrates or farmers can pump water to low lying areas at a high cost. These options are generally limited in scope. Farmers generally lose their wheat / Rabi season crops. The temporal MODIS satellite data show that the flowing rainwater has arrived near Hamal Lake in Wara Taluka of Qamber Shahdadkot. These images and timeline flows of ponded rainwater in Jacobabad and adjoining Balochistan districts are shown below :

Sindh: Flood 2012



Sep 14, 2012



Sep 22, 2012

Oct 07, 2012

Oct 15, 2012

It is likely that this water keeps flowing down the ancient bed of river Indus along the Kirthar range for long times and affected farmers may lose their wheat / Rabi crop season.The water is draining at a slow pace.

Ground survey by SUPARCO

7.2.1 Losses

Large areas are likely to be under water even beyond sowing timelines of Rabi crops. Based on historical trend, the distribution of this area and projected losses are as follows:

Provinces	Crops	Area	Yield	Production	Unit Value	Total value
		000 Ha	Kg/ha	000 tons	Rs./40 kg	Rs. million
Sindh	Wheat	27	3390	91	1100	2492.0
	Chick pea	11	946	10	4000	993.4
	Oil seed	4	1031	4	2600	241.3
	Others	3	6557	19	-	-
	Subtotal	**45**	**-**	**-**	**-**	**-**
Balochistan	Wheat	27	2116	57	1100	1566.2
	Chick pea	7	828	5	4000	541.1
	Oil seed	6	540	3	2600	200.1
	Others	2	4400	8	-	-
	Subtotal	**42**	**-**	**-**	**-**	**2307.4**
Total		**87**	**-**	**-**	**-**	**6034.1**

7 .2 .2 Gains

The rains on country wide scale, short of limited inundated areas, are highly valuable for sowing of Rabi crops as vegetables, oilseeds and other crops. The sowing operation of Rabi season has already set in from mid-September onwards and there is sufficient soil moisture to cater for sowing requirements of crops. The residual moisture from rains will also be especially useful for sowing of wheat and other Rabi crops, above all, in rain fed areas. Farmers have already started planking and other operation to conserve soil moisture. Given a good start for sowing of Rabi crops, the prospects of national food security are seemingly bright.

8. Damages to Infrastructure

The province wise details of damages of infrastructure: railways, roads, bridges and settlements are given on next page ;

Flood / Rain 2012 DAMAGES TO INFRASTRUCTURE								
Province	District	Inundated Area (sq Km)	Damaged Roads (Km)			Railway (Km)	Bridge	No. of Settlements
			National	Provincial	Kacha Pakka			
Punjab	Rajanpur	1290	51	105.5	594	13.1	0	458
	DG Khan	582	5.4	22.6	231	0	0	325
	Subtotal	1872	56.4	128.1	825	13.1	0	783
Sindh	Jacobabad	1620.6	12.2	277.5	598	63.5	3	710
	Kashmore	699	19.4	286	710	14.9	0	144
	Shikarpur	644	8.1	59	471	8.9	0	230
	Subtotal	2963.6	39.7	622.5	1779	87.3	3	1084
Balochistan	Nasirabad	1254	16	122	822	14.48	3	145
	Jafarabad	1342	14.8	247	1307	14.12	6	566
	Subtotal	2596	30.8	369	2129	28.6	9	711
Total		**7431.6**	**126.9**	**1119.6**	**4733**	**129**	**12**	**2578**