



# **DISTRICT PROFILES**

Badin district is situated along the coast in the east of the Indus River. Numerous shrines of Sufi saints are located in Badin including Saman Shah. The climate is generally hot and humid in summer, and mild in winter. The region is damp and fertile for growing rice. Main crops of the district are rice, wheat, sugarcane, oilseeds and seasonal vegetables. There are five tehsils in the district: Badin, Matli, Shaheed Fazil Rahu, Talhar and Tando Bago. The district headquarter is situated at Badin.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Calcareous material of deltaic and tidal plains
<b>Dominant Soil Series</b>	Dhand, Golarchi, Gujo, Matli, Nabipur
<b>pH</b>	7.4 – 10.5 (Average 8.22)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 47.2 (Average 3.65)
<b>Organic Matter (%)</b>	0.1 – 2.13 (Average 0.84)
<b>Available Phosphorus (ppm)</b>	1 – 32 (Average 3.42)
<b>Extractable Potassium (ppm)</b>	38 – 400 (Average 211)
<b>Farmers availing soil-test facility (%)</b>	7
<b>Farmers availing water-test facility (%)</b>	0

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	281,067
<b>Total Non-cultivated Area (hectares)</b>	170,692
<b>Total Area under Irrigation (hectares)</b>	273,119
<b>Major Rabi Crop(s)</b>	Wheat, Fodders
<b>Major Kharif Crop(s)</b>	Rice, Sugarcane
<b>Total Livestock Population</b>	2,256,070

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

# DADU

Dadu district is situated on the western side of Indus River. The district is famous for Gorakh; a hill station at an altitude of 1,734 meters. The climate is hot and dry during the summer and moderately cold in the winter. Main crops of the district Dadu include rice, wheat, cotton, vegetables and fodders. There are four tehsils in the district: Mehar, Khairpur Nathan Shah, Dadu and Johi. The district headquarter is located at Dadu.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Alluvial deposits of piedmont and river plains
<b>Dominant Soil Series</b>	Jacobabad, Jhatpat, Matli, Nabipur, Shahdara
<b>pH</b>	7.6 – 9.1 (Average 8.20)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.2 – 10.8 (Average 1.59)
<b>Organic Matter (%)</b>	0.2 – 1.6 (Average 0.81)
<b>Available Phosphorus (ppm)</b>	1 – 15 (Average 2.60)
<b>Extractable Potassium (ppm)</b>	40 – 400 (Average 176)
<b>Farmers availing soil-test facility (%)</b>	2
<b>Farmers availing water-test facility (%)</b>	0

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	133,710
<b>Total Non-cultivated Area (hectares)</b>	12,688
<b>Total Area under Irrigation (hectares)</b>	128,361
<b>Major Rabi Crop(s)</b>	Wheat, Fodders
<b>Major Kharif Crop(s)</b>	Rice, Cotton
<b>Total Livestock Population</b>	2,825,540

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Ghotki is located in the northern part of Sindh. It is the bordering district between Sindh and Punjab. Jamia Masjid Ghotki is a historical grand mosque in the district. The climate is that of a desert with hot summers and mild winters. The main crops include cotton, wheat, sugarcane and vegetables. Ghotki is also well known for production of mangoes, dates and vegetables. There are five tehsils in the district: Daharki, Ghotki, Mirpur Mathelo, Ubauro and Khangarh. The district headquarter is situated at Mirpur Mathelo.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	193,082
<b>Total Non-cultivated Area (hectares)</b>	19,493
<b>Total Area under Irrigation (hectares)</b>	192,217
<b>Major Rabi Crop(s)</b>	Wheat
<b>Major Kharif Crop(s)</b>	Cotton, Sugarcane
<b>Total Livestock Population</b>	1,453,133

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Recent and sub-recent alluvial deposits and rolling sand ridges
<b>Dominant Soil Series</b>	Adilpur, Dungi, Pacca, Pitafi, Shahpur
<b>pH</b>	7.6 – 10.9 (Average 8.34)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 14.8 (Average 0.91)
<b>Organic Matter (%)</b>	0.1 – 1.78 (Average 0.64)
<b>Available Phosphorus (ppm)</b>	1 – 22 (Average 3.40)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 186)
<b>Farmers availing soil-test facility (%)</b>	20
<b>Farmers availing water-test facility (%)</b>	8

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# HYDERABAD

Hyderabad district is situated in the east of River Indus. There are two famous forts located in Hyderabad: Pakka (bricks) and Kacha (mud blocks) fort. Climate is arid subtropical continental with hot summer and mild winter. Main crops of the district include wheat, cotton, orchards and vegetables. Hyderabad city is well known for the bangle production. There are four tehsils in the district: Hyderabad city, Hyderabad rural, Latifabad and Qasimabad. The district headquarter is located at Hyderabad.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed alluvial deposits
<b>Dominant Soil Series</b>	Jacobabad, Jarwar, Nabipur, Pacca, Shahdara
<b>pH</b>	7.4 – 9.9 (Average 8.19)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.08 – 29 (Average 1.55)
<b>Organic Matter (%)</b>	0.11 – 2.5 (Average 0.77)
<b>Available Phosphorus (ppm)</b>	1 – 30 (Average 4.30)
<b>Extractable Potassium (ppm)</b>	30 – 400 (Average 181)
<b>Farmers availing soil-test facility (%)</b>	10
<b>Farmers availing water-test facility (%)</b>	5

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	72,940
<b>Total Non-cultivated Area (hectares)</b>	26,195
<b>Total Area under Irrigation (hectares)</b>	71,583
<b>Major Rabi Crop(s)</b>	Wheat, Fodders, Orchards
<b>Major Kharif Crop(s)</b>	Orchards, Cotton
<b>Total Livestock Population</b>	1,045,031

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Jacobabad, founded in 1847 by General John Jacob, is located on the border of Baluchistan. The district has hot desert climate with extremely hot summers and mild winters. Main crops of the district include wheat, rice, pulses, oilseeds, and vegetables. There are three tehsils in the district: Ghari Khairo, Jacobabad and Thul. The district headquarter is located at Jacobabad.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	97,972
<b>Total Non-cultivated Area (hectares)</b>	10,909
<b>Total Area under Irrigation (hectares)</b>	97,698
<b>Major Rabi Crop(s)</b>	Wheat, Pulses
<b>Major Kharif Crop(s)</b>	Rice
<b>Total Livestock Population</b>	3,019,814

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Alluvial deposits of piedmont and river plains
<b>Dominant Soil Series</b>	Jacobabad, Jhatpat, Shahdara, Sindhelianwali, Sultanpur
<b>pH</b>	7.8 – 10.2 (Average 8.18)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.3 – 25.6 (Average 2.63)
<b>Organic Matter (%)</b>	0.1 – 2.1 (Average 0.66)
<b>Available Phosphorus (ppm)</b>	1 – 25 (Average 3.16)
<b>Extractable Potassium (ppm)</b>	34 – 400 (Average 189)
<b>Farmers availing soil-test facility (%)</b>	-
<b>Farmers availing water-test facility (%)</b>	-



Map source: Information Management Unit, FAO Pakistan

# JAMSHORO

Jamshoro lies at right bank of Indus River and is famous for its educational institutes. The shrine of Lal Shahbaz Qalandar, a well known saint is located in Jamshoro district. Manchar Lake, one of the largest lakes in Asia, is also located in Jamshoro. Climate is arid subtropical continental with hot summer and mild winter. Main crops include wheat, gram, sorghum and onion. There are four tehsils in the district: Sehwan Sharif, Manjhand, Kotri, Jamshoro and Thano Bula Khan. The district headquarter is Kotri.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Medium and coarse textured material and narrow river valleys of Kirthar range
<b>Dominant Soil Series</b>	Nabipur, Naodero, Pacca, Shahdara, Petaro
<b>pH</b>	7.5 – 8.9 (Average 8.11)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 10.7 (Average 0.79)
<b>Organic Matter (%)</b>	0.1 – 1.85 (Average 0.47)
<b>Available Phosphorus (ppm)</b>	1 – 35 (Average 3.53)
<b>Extractable Potassium (ppm)</b>	30 – 400 (Average 129)
<b>Farmers availing soil-test facility (%)</b>	5
<b>Farmers availing water-test facility (%)</b>	3

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	65,021
<b>Total Non-cultivated Area (hectares)</b>	22,965
<b>Total Area under Irrigation (hectares)</b>	41,983
<b>Major Rabi Crop(s)</b>	Wheat, Gram, Onion
<b>Major Kharif Crop(s)</b>	Sorghum
<b>Total Livestock Population</b>	1,184,670

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Karachi is the provincial capital of Sindh. It is the largest city of Pakistan with the highest population density. It is Pakistan's main seaport and center of banking, industry, economic activity and trade. Karachi is the 3rd largest city in the world by population (within city limits) and the 11th largest urban agglomeration. The district has a moderate climate, hot and humid in summer and cold and dry in winter. Main crops include vegetables and fodders.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Piedmont alluvium derived from Kirthar range
<b>Dominant Soil Series</b>	Khair, Matli, Pacca
<b>pH</b>	-
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	-
<b>Organic Matter (%)</b>	-
<b>Available Phosphorus (ppm)</b>	-
<b>Extractable Potassium (ppm)</b>	-
<b>Farmers availing soil-test facility (%)</b>	10
<b>Farmers availing water-test facility (%)</b>	8

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	14,715
<b>Total Non-cultivated Area (hectares)</b>	8,680
<b>Total Area under Irrigation (hectares)</b>	13,324
<b>Major Rabi Crop(s)</b>	Vegetables
<b>Major Kharif Crop(s)</b>	Vegetables, Fodders, Orchards
<b>Total Livestock Population</b>	1,763,059

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan



# KASHMORE

Kashmore district is situated in the northern part of Sindh, surrounded by Ghotki, Jacobabad, Shikarpur and Sukkur districts. The south-eastern side of Kashmore district is covered with forest of Kacho area that supports wildlife. The climate is hot and dry during the summer and moderately cold in the winter. Main crops grown in the district are wheat, rice, gram and vegetables. There are three tehsils in the district: Kashmore, Kandhkot and Tangwani. The district headquarter is located at Kashmore.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed calcareous alluvium
<b>Dominant Soil Series</b>	Shahdara, Sultanpur, Pacca, Jacobabad, Sindhelianwali
<b>pH</b>	7.8 – 10.6 (Average 8.40)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.3 – 13.9 (Average 1.96)
<b>Organic Matter (%)</b>	0.2 – 1.67 (Average 0.89)
<b>Available Phosphorus (ppm)</b>	1 – 13 (Average 2.40)
<b>Extractable Potassium (ppm)</b>	134 – 400 (Average 261)
<b>Farmers availing soil-test facility (%)</b>	5
<b>Farmers availing water-test facility (%)</b>	0

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	99,743
<b>Total Non-cultivated Area (hectares)</b>	10,002
<b>Total Area under Irrigation (hectares)</b>	99,602
<b>Major Rabi Crop(s)</b>	Wheat, Gram
<b>Major Kharif Crop(s)</b>	Rice
<b>Total Livestock Population</b>	1,232,526

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Khairpur district is situated in the south of Sukkur district and is famous for Kot Diji Fort. The north western part of Thar desert lies in Khairpur district. The climate is that of a desert with hot summers and mild winters. Khairpur is well known for production of dates, cotton, banana and strawberry. There are eight tehsils in the district: Faiz Ganj, Gambat, Khairpur, Kingri, Kot Diji, Mirwah, Nara and Sobho Dero. The district headquarter is located at Khairpur.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	184,976
<b>Total Non-cultivated Area (hectares)</b>	19,856
<b>Total Area under Irrigation (hectares)</b>	183,642
<b>Major Rabi Crop(s)</b>	Wheat, Fodders, Orchards
<b>Major Kharif Crop(s)</b>	Cotton, Orchards, Sorghum
<b>Total Livestock Population</b>	3,546,697

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Calcareous river alluvium
<b>Dominant Soil Series</b>	Gambat, Shahdara, Sultanpur, Pacca, Sindhelianwali
<b>pH</b>	7.0 – 10.4 (Average 8.18)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 39.2 (Average 1.32)
<b>Organic Matter (%)</b>	0.1 – 2.1 (Average 0.73)
<b>Available Phosphorus (ppm)</b>	1 – 49 (Average 4.28)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 176)
<b>Farmers availing soil-test facility (%)</b>	7
<b>Farmers availing water-test facility (%)</b>	0

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# LARKANA

Larkana district is located in the north-western part of Sindh province. The climate is hot and dry in summers and moderately cold in winters. Main crops of the district include rice, wheat and oilseeds besides sugarcane, vegetables and guava. Moenjo-Daro, one of the largest settlements of the ancient Indus Valley Civilization, and one of the world's earliest major urban settlements is also located in this district. There are four tehsils in the district: Dokri, Baqrani, Larkana and Ratodero. The district's headquarter is located at Larkana.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Alluvial deposits of piedmont and river plains
<b>Dominant Soil Series</b>	Jacobabad, Jhatpat, Matli, Nabipur, Shahdara
<b>pH</b>	7.5 – 8.2 (Average 7.95)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.17 – 0.9 (Average 0.4)
<b>Organic Matter (%)</b>	0.36 – 1.32 (Average 0.88)
<b>Available Phosphorus (ppm)</b>	2 – 8 (Average 4.74)
<b>Extractable Potassium (ppm)</b>	78 – 266 (Average 156)
<b>Farmers availing soil-test facility (%)</b>	31
<b>Farmers availing water-test facility (%)</b>	32

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	87,187
<b>Total Non-cultivated Area (hectares)</b>	8,628
<b>Total Area under Irrigation (hectares)</b>	87,030
<b>Major Rabi Crop(s)</b>	Wheat, Oilseeds
<b>Major Kharif Crop(s)</b>	Rice
<b>Total Livestock Population</b>	2,021,031

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Matiari district was established in 2005 out of Hyderabad district. It is surrounded by Sanghar on the east, Jamshoro on the west, Shaheed Benazirabad on the north and Hyderabad and Tando Allah Yar on the south. Indus River flows alongside the western border of the district. The climate is hot in summers and mild in winters. Main crops of the district are cotton, wheat, sugarcane and fruits. There are three tehsils in the district: Saeedabad, Hala and Matiari. The district headquarter is situated at Matiari City.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	62,560
<b>Total Non-cultivated Area (hectares)</b>	5,922
<b>Total Area under Irrigation (hectares)</b>	62,139
<b>Major Rabi Crop(s)</b>	Wheat, Fodders, Orchards
<b>Major Kharif Crop(s)</b>	Sugarcane, Cotton
<b>Total Livestock Population</b>	1,119,229

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed calcareous alluvium
<b>Dominant Soil Series</b>	Jarwar, Miani, Nabipur, Pacca, Shahdara
<b>pH</b>	7.3 – 10.7 (Average 8.17)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 27.3 (Average 1.28)
<b>Organic Matter (%)</b>	0.1 – 2.21 (Average 0.91)
<b>Available Phosphorus (ppm)</b>	1 – 48 (Average 3.80)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 184)
<b>Farmers availing soil-test facility (%)</b>	36
<b>Farmers availing water-test facility (%)</b>	26

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# MIRPUR KHAS

Mirpur Khas is bounded by Umer Kot on the east, Sanghar on the north, Tando Allah Yar on the west, Badin on the south-west and Tharparkar on the south. The climate is that of a desert with hot summers and mild winters. Main crops include wheat, rice, sugarcane and cotton. The district is renowned for its mango orchards. The district has a well-established canal irrigation system. It has six tehsils, namely Mirpur Khas, Sindhri, Digri, Hussain Bux Mari, Kot Ghulam Muhammad and Jhuddo. The district headquarter is located at Mirpur Khas.

## SOIL ATTRIBUTES

<b>Parent Material</b>	River alluvium
<b>Dominant Soil Series</b>	Sultanpur, Matli, Miani, Rustam, Sindhelianwali
<b>pH</b>	7.15 – 9.7 (Average 8.20)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.08 – 36.8 (Average 2.10)
<b>Organic Matter (%)</b>	0.1 – 2.11 (Average 0.81)
<b>Available Phosphorus (ppm)</b>	1 – 52 (Average 4.90)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 203)
<b>Farmers availing soil-test facility (%)</b>	29
<b>Farmers availing water-test facility (%)</b>	19

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	206,482
<b>Total Non-cultivated Area (hectares)</b>	118,244
<b>Total Area under Irrigation (hectares)</b>	202,837
<b>Major Rabi Crop(s)</b>	Wheat, Orchards
<b>Major Kharif Crop(s)</b>	Sugarcane, Cotton, Fodders
<b>Total Livestock Population</b>	1,554,256

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Nausharo Feroze is located on the eastern bank of Indus River. The district has a hot desert climate with extremely hot summers and mild winters. There is very little rain, which mainly falls in the monsoon season from July to September. Main crops of the district include cotton, sugarcane, fruits and vegetables. There are five tehsils in the district: Moro, Naushahro Feroze, Bhiria, Kandiaro and Mehrabpur. The district headquarter is situated at Naushahro Feroze.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	187,694
<b>Total Non-cultivated Area (hectares)</b>	16,551
<b>Total Area under Irrigation (hectares)</b>	186,892
<b>Major Rabi Crop(s)</b>	Wheat, Fodders, Orchards
<b>Major Kharif Crop(s)</b>	Cotton, Sugarcane
<b>Total Livestock Population</b>	2,710,415

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mainly loamy and clayey soils of sub-recent river plains
<b>Dominant Soil Series</b>	Rustam, Matli, Shahdara, Sindhelianwali, Sultanpur
<b>pH</b>	7.5 – 10.4 (Average 8.28)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.12 – 54.3 (Average 2.95)
<b>Organic Matter (%)</b>	0.1 – 2.09 (Average 0.80)
<b>Available Phosphorus (ppm)</b>	1 – 36 (Average 3.86)
<b>Extractable Potassium (ppm)</b>	32 – 400 (Average 206)
<b>Farmers availing soil-test facility (%)</b>	14
<b>Farmers availing water-test facility (%)</b>	5

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# KAMBAR SHAHDADKOT

Qambar Shahdadkot was the part of Larkana District until December 2004. It is located in the north-west of Sindh province near Hamal lake. The climate is hot and dry in summers and moderately cold in winters. Main crops are wheat, rice, oilseeds and vegetables. There are seven tehsils in the district: Qambar Ali Khan, Warah, Meero Khan, Nasirabad, Sujawal Junejo, Qubo Seed Khan and Shahdadkot. The district headquarter is located at Qambar.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Alluvial deposits of piedmont and river plains
<b>Dominant Soil Series</b>	Jacobabad, Jhatpat, Matli, Nabipur, Shahdara
<b>pH</b>	7.5 – 8.8 (Average 8.16)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.18 – 13 (Average 2.95)
<b>Organic Matter (%)</b>	0.23 – 1.65 (Average 1.02)
<b>Available Phosphorus (ppm)</b>	1 – 16 (Average 3.12)
<b>Extractable Potassium (ppm)</b>	60 – 400 (Average 205)
<b>Farmers availing soil-test facility (%)</b>	8
<b>Farmers availing water-test facility (%)</b>	0

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	90,175
<b>Total Non-cultivated Area (hectares)</b>	3,738
<b>Total Area under Irrigation (hectares)</b>	89,743
<b>Major Rabi Crop(s)</b>	Wheat, Oilseeds
<b>Major Kharif Crop(s)</b>	Rice
<b>Total Livestock Population</b>	2,318,157

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Sanghar district is situated in the western part of Sindh province. The climate is that of a desert with hot summers and mild winters. Main crops of the district include cotton, sugarcane, oilseeds, fruits and vegetables. There are six tehsils in the district: Jam Nawaz Ali, Khipro, Sanghar, Shahdadpur, Sinjhero and Tando Adam. The district headquarter is located at Sanghar.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	298,364
<b>Total Non-cultivated Area (hectares)</b>	71,081
<b>Total Area under Irrigation (hectares)</b>	283,612
<b>Major Rabi Crop(s)</b>	Wheat, Fodders, Orchard
<b>Major Kharif Crop(s)</b>	Sugarcane, Cotton, Millet
<b>Total Livestock Population</b>	1,966,097

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	River alluvium and rolling sand ridges
<b>Dominant Soil Series</b>	Bagh, Jarwar, Nabipur, Pacca, Sultanpur
<b>pH</b>	7.1 – 10.5 (Average 8.21)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.11 – 49 (Average 2.05)
<b>Organic Matter (%)</b>	0.1 – 2.19 (Average 0.79)
<b>Available Phosphorus (ppm)</b>	1 – 39 (Average 3.78)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 190)
<b>Farmers availing soil-test facility (%)</b>	48
<b>Farmers availing water-test facility (%)</b>	8

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan



# SHAHEED BENAZIRABAD

The name of the district was changed from Nawabshah to Shaheed Benazirabad district in April 2008. The district is situated on the left bank of the Indus River. The climate is generally hot and dry in summer and mild in winter. There are two irrigation water supply divisions called “Nusrat Division” and “Dad Division” in the district. The main crops include cotton, sugarcane, fruits and vegetables. There are four tehsils in the district. The district headquarter is located at Nawabshah.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed calcareous alluvium
<b>Dominant Soil Series</b>	Jarwar, Miani, Nabipur, Pacca, Shahdara
<b>pH</b>	7.2 – 10.2 (Average 8.10)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 46 (Average 1.50)
<b>Organic Matter (%)</b>	0.1 – 1.99 (Average 0.83)
<b>Available Phosphorus (ppm)</b>	1 – 28 (Average 4.0)
<b>Extractable Potassium (ppm)</b>	30 – 400 (Average 179)
<b>Farmers availing soil-test facility (%)</b>	19
<b>Farmers availing water-test facility (%)</b>	28

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	169,820
<b>Total Non-cultivated Area (hectares)</b>	45,993
<b>Total Area under Irrigation (hectares)</b>	168,026
<b>Major Rabi Crop(s)</b>	Wheat, Orchard
<b>Major Kharif Crop(s)</b>	Cotton, Sugarcane
<b>Total Livestock Population</b>	1,713,343

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Shikarpur district is surrounded by Larkana, Jacobabad, Kashmore, Khairpur and Sukkur districts.

Shikarpur was a fortified city with seven gates. The climate is hot and dry during the summer and moderately cold in the winter. Main crops of the district include rice, wheat, oilseeds and vegetables. It is also well-known for pickle production. There are four tehsils in the district: Garhi Yasin, Khanpur, Lakhi Ghulam Shah and Shikarpur. The district headquarter is situated at Shikarpur.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	96,191
<b>Total Non-cultivated Area (hectares)</b>	3,343
<b>Total Area under Irrigation (hectares)</b>	94,530
<b>Major Rabi Crop(s)</b>	Wheat, Pulses, Oilseeds
<b>Major Kharif Crop(s)</b>	Rice
<b>Total Livestock Population</b>	2,823,437

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Recent and sub-recent river alluvium
<b>Dominant Soil Series</b>	Kambar, Miani, Kandare, Kandhkot, Shahdara
<b>pH</b>	7.5 – 10.5 (Average 8.40)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 37.2 (Average 2.19)
<b>Organic Matter (%)</b>	0.1 – 1.95 (Average 0.75)
<b>Available Phosphorus (ppm)</b>	1 – 42 (Average 4.28)
<b>Extractable Potassium (ppm)</b>	30 – 400 (Average 192)
<b>Farmers availing soil-test facility (%)</b>	56
<b>Farmers availing water-test facility (%)</b>	24

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# SUJAWAL

Sujawal is a new district of the Sindh province, which was previously a part of Thatta district. It is bordered in the northwest by the Indus River and Badin on the east. Indus River separates it from Thatta District. This district has a moderate climate, hot in summer and cold in winter. Main crops of the district are wheat, oilseeds, rice, sugarcane and vegetables. There are five tehsils in the district: Jaati, Mirpur Bathoro, Shah Bunder, Kharo Chan and Sujawal.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Calcareous material of deltaic and tidal plains
<b>Dominant Soil Series</b>	Matli, Nabipur, Jarwar, Rustam, Shahdara
<b>pH</b>	-
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	-
<b>Organic Matter (%)</b>	-
<b>Available Phosphorus (ppm)</b>	-
<b>Extractable Potassium (ppm)</b>	-
<b>Farmers availing soil-test facility (%)</b>	6
<b>Farmers availing water-test facility (%)</b>	-

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	-
<b>Total Non-cultivated Area (hectares)</b>	-
<b>Total Area under Irrigation (hectares)</b>	-
<b>Major Rabi Crop(s)</b>	Wheat, Oilseeds
<b>Major Kharif Crop(s)</b>	Rice, Fodders, Sugarcane
<b>Total Livestock Population</b>	-

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Sukkur is located in the northeast of Sindh province and is renowned for its date orchards. The climate is that of a desert with hot summers and mild winters. Main crops of the district include cotton, wheat, sugarcane, oil seeds, fruits and vegetables. The most famous historical landscapes are Sukkur barrage and Lansdowne Bridge Rohri. The district has one of the ancient railway junctions, the Rohri junction. There are five tehsils in the district: New Sukkur, Sukkur, Rohri, Salehpat and Pano Aqil. The district headquarter is at Sukkur.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	110,957
<b>Total Non-cultivated Area (hectares)</b>	8,489
<b>Total Area under Irrigation (hectares)</b>	109,955
<b>Major Rabi Crop(s)</b>	Wheat, Orchard, Gram
<b>Major Kharif Crop(s)</b>	Cotton
<b>Total Livestock Population</b>	1,160,799

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed calcareous alluvium
<b>Dominant Soil Series</b>	Jarwar, Miani, Nabipur, Pacca, Shahdara
<b>pH</b>	7 – 10.8 (Average 8.37)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.11 – 55.6 (Average 2.28)
<b>Organic Matter (%)</b>	0.1 – 1.92 (Average 0.69)
<b>Available Phosphorus (ppm)</b>	1 – 50 (Average 3.73)
<b>Extractable Potassium (ppm)</b>	28 – 400 (Average 183)
<b>Farmers availing soil-test facility (%)</b>	21
<b>Farmers availing water-test facility (%)</b>	4

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# TANDO ALLAH YAR

Tando Allah Yar district is renowned for its mango orchards. A variety of mangoes are grown in the district. The climate is hot in summers and mild in winters. Main cash crops of the district are sugarcane, wheat, onions and cotton. The district is also well known for the production of large quantity of sugarcane. There are three tehsils in the district: Chamber, Jhando Mari and Tando Allah Yar. The district headquarter is located at Tando Allah Yar.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed alluvial deposits
<b>Dominant Soil Series</b>	Jacobabad, Jarwar, Nabipur, Pacca, Shahdara
<b>pH</b>	7.1 – 9.9 (Average 8.24)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.11 – 40.3 (Average 1.36)
<b>Organic Matter (%)</b>	0.1 – 1.99 (Average 0.82)
<b>Available Phosphorus (ppm)</b>	1 – 53 (Average 5.26)
<b>Extractable Potassium (ppm)</b>	30-400 (Average 200)
<b>Farmers availing soil-test facility (%)</b>	10
<b>Farmers availing water-test facility (%)</b>	5

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	133,382
<b>Total Non-cultivated Area (hectares)</b>	25,718
<b>Total Area under Irrigation (hectares)</b>	130,003
<b>Major Rabi Crop(s)</b>	Wheat, Gram
<b>Major Kharif Crop(s)</b>	Sugarcane, Cotton
<b>Total Livestock Population</b>	679,165

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

# TANDO MUHAMMAD KHAN

Tando Muhammad Khan is located on south of Hyderabad. The climate is hot in summers and mild in winters. Main crops of the district include rice, sugarcane, wheat and cotton. There are three tehsils in the district: Tando Muhammad Khan, Bulri Shah Karim and Tando Ghulam Hyder. The district headquarter is situated at Tando Muhammad Khan.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	58,969
<b>Total Non-cultivated Area (hectares)</b>	13,021
<b>Total Area under Irrigation (hectares)</b>	55,023
<b>Major Rabi Crop(s)</b>	Wheat, Onion
<b>Major Kharif Crop(s)</b>	Rice, Sugarcane, Cotton
<b>Total Livestock Population</b>	626,320

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Mixed alluvial deposits
<b>Dominant Soil Series</b>	Maitli, Shahdara, Pacca, Jarwar, Nabipur
<b>pH</b>	7.5 – 10.5 (Average 8.35)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 35 (Average 1.82)
<b>Organic Matter (%)</b>	0.1 – 1.93 (Average 0.83)
<b>Available Phosphorus (ppm)</b>	1 – 26 (Average 4.47)
<b>Extractable Potassium (ppm)</b>	38 – 400 (Average 169)
<b>Farmers availing soil-test facility (%)</b>	2
<b>Farmers availing water-test facility (%)</b>	2

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan

# THARPARKAR

A vast portion of the district is occupied by Thar desert, and there are very few agricultural areas. The beauty of Tharparkar is enhanced due to Karronjhar hills located in Nagarparkar tehsil. The climate is that of a desert with hot summers and mild winters. Handicrafts and livestock rearing are the key business activities in Mithi, which is the district headquarter. There are six tehsils in the district: Chachro, Diplo, Islamkot, Mithi, Dahli and Nagarparkar.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Reworked old sandy deposits
<b>Dominant Soil Series</b>	Bhakkar, Bhareri, Bijnot, Hyderabad, Jhakkar
<b>pH</b>	7.7 – 8.2 (Average 7.93)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.16 – 1.21 (Average 0.31)
<b>Organic Matter (%)</b>	0.13 – 1.39 (Average 0.86)
<b>Available Phosphorus (ppm)</b>	1 – 5 (Average 2.10)
<b>Extractable Potassium (ppm)</b>	56 – 330 (Average 185)
<b>Farmers availing soil-test facility (%)</b>	7
<b>Farmers availing water-test facility (%)</b>	3

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	156,684
<b>Total Non-cultivated Area (hectares)</b>	31,192
<b>Total Area under Irrigation (hectares)</b>	21,305
<b>Major Rabi Crop(s)</b>	Fodders
<b>Major Kharif Crop(s)</b>	Millet, Fodders
<b>Total Livestock Population</b>	4,857,029

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

Thatta has served as a capital of Sindh and center for Islamic arts in the ancient period. The district has a moderate climate, hot in summer and cold in winter. It is famous for hand-printed fabrics, glass bangles and Sindhi embroidery. Main crops of the district include rice, wheat, sugarcane, oilseeds and vegetables. Famous Shah Jehan Mosque built by Mughal Emperor Shah Jahan is also situated in this district. There are four tehsil in the district: Mirpur Sakro, Ghorabari, Thatta and Keti Bander. The district headquarter is located at Thatta.

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	155,006
<b>Total Non-cultivated Area (hectares)</b>	75,924
<b>Total Area under Irrigation (hectares)</b>	153,829
<b>Major Rabi Crop(s)</b>	Wheat, Oilseeds
<b>Major Kharif Crop(s)</b>	Rice, Sugarcane
<b>Total Livestock Population</b>	2,297,937

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006

## SOIL ATTRIBUTES

<b>Parent Material</b>	Calcareous material of deltaic and tidal plains
<b>Dominant Soil Series</b>	Dhand, Gujo, Matli, Rustam, Shahdara
<b>pH</b>	7.4 – 10.2 (Average 8.23)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.1 – 53 (Average 4.09)
<b>Organic Matter (%)</b>	0.11 – 2.21 (Average 0.80)
<b>Available Phosphorus (ppm)</b>	1 – 32 (Average 4.32)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 206)
<b>Farmers availing soil-test facility (%)</b>	6
<b>Farmers availing water-test facility (%)</b>	-

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Services Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)



Map source: Information Management Unit, FAO Pakistan



# UMER KOT

Umer Kot district was previously known as Amarkot, which was the capital of Greater Sindh Province. It also included some parts of present Rajasthan state of India. The Mughal king Akbar was born in Umer kot. The climate is that of a desert with hot summers and mild winters. Main crops include red chili, wheat, cotton and fodders. There are four tehsils in the district; Umer Kot, Samaro, Pithoro and Kunri. The district headquarter is situated at Umer Kot, which is famous for historical fort and museum.

## SOIL ATTRIBUTES

<b>Parent Material</b>	Reworked old sandy deposits
<b>Dominant Soil Series</b>	Bhambro, Dungi, Bijnot, Hyderabad, Jhakkar
<b>pH</b>	7.5 – 10.6 (Average 8.20)
<b>Electrical Conductivity (dSm<sup>-1</sup>)</b>	0.12 – 48.6 (Average 3.74)
<b>Organic Matter (%)</b>	0.1 – 2.14 (Average 0.77)
<b>Available Phosphorus (ppm)</b>	1 – 28 (Average 4.17)
<b>Extractable Potassium (ppm)</b>	26 – 400 (Average 190)
<b>Farmers availing soil-test facility (%)</b>	7
<b>Farmers availing water-test facility (%)</b>	3

Source:  
 District Soil Survey Reports, Soil Survey of Pakistan  
 Farm Advisory Services Centers, Fauji Fertilizer Company Limited (FFCL)  
 Rapid Fertilizer Use Assessment, FAO (2015)  
 Land Cover Atlas of Sindh (FAO, SUPARCO and Government of Sindh)

## AGRICULTURAL INFORMATION

<b>Total Cultivated Area (hectares)</b>	136,590
<b>Total Non-cultivated Area (hectares)</b>	171,224
<b>Total Area under Irrigation (hectares)</b>	131,990
<b>Major Rabi Crop(s)</b>	Wheat, Chili
<b>Major Kharif Crop(s)</b>	Cotton, Fodder
<b>Total Livestock Population</b>	1,196,131

Source: Crop Reporting Services, Sindh; Agriculture Census 2010; Livestock Census 2006



Map source: Information Management Unit, FAO Pakistan

# KEY MESSAGES

## SOIL HEALTH MANAGEMENT AND CROP PRODUCTIVITY

As a result of intensive cropping and high yields over the years, most agricultural soils in Sindh have become deficient in various nutrients required for healthy plant growth. Consequently, adoption of Fertilizer Best Management Practices (FBMP) is essential for sustainable crop production and maintenance of soil health as per the prevailing farming system(s) in Sindh. Therefore, following recommendations are formulated for the benefit of farming communities.

In various cropping zones, Management Practices differ according to the soil conditions and farming systems; therefore, the fertilizers (nutrients) should be applied following the guiding principles of 4R Stewardship, as described below:

- Right source
- Right rate
- Right time
- Right placement

01

### **Soil and Water Testing**

Soil and Water Testing facilities are available at district level and provided by both the government and private sectors (especially the fertilizer companies), free of cost or with nominal charges. Farmers should get their soil and water samples analyzed before crop planting, and use optimum and balanced fertilizer based on the soil test values for maximum profitability.

02

### **Ensure Use of Quality Fertilizers**

Unless fertilizers are of good quality, the money and effort to correct soil-plant nutrient deficiencies cannot be remunerative. Therefore, farmers are advised to purchase quality fertilizers from trusted/authorized dealers appointed by the reputed manufactures. Special care is recommended while purchasing phosphate and potash fertilizers.

# KEY MESSAGES

03

## **Integrated Plant Nutrient Management System**

Balanced and integrated nutrient management is the key to soil health, crop productivity, and farmers' profitability. It is highly recommended to integrate the use of inorganic fertilizers with other sources of nutrients (organic fertilizers: green manure, farm yard manure, compost, poultry waste, etc.) including bio-fertilizers to enhance nutrient use efficiency, improve soil fertility and organic matter, soil physical and chemical properties, and ensure sustainable crop production.

04

## **Minimization of Urea Losses**

In light textured soils, always apply urea in 2 or more splits, but never use more than the recommended rates. Apply urea in the late afternoon when temperature is low to avoid volatilization losses. In case of rice crop, special best management practices should be followed to enhance fertilizer use efficiency. Excessive use of urea may damage the crop likely through more vulnerability to insect pest attack and depressed fruiting because of excessive vegetative growth that might also lead to crop lodging.

05

## **Phosphorus Management**

Farmers can reduce P fixation in soils through application of farm yard manure and such other organic sources including poultry manure. Placement of phosphatic fertilizer at 2-5 cm away from the seeding rows and 5 cm below the soil surface can also help reduce fertilizer requirement by way of improved fertilizer use efficiency, particularly in narrow-rowed crops such as wheat. In case, phosphatic fertilizer is missed at sowing, it can be applied through fertigation during the first irrigation (or even with second irrigation under special circumstances). Fertigation of phosphatic fertilizers especially in row crops is highly efficient on calcareous soils and can enhance grain yield by 15%.

06

## **Crop Residue Management**

Crop residues are an excellent source of nutrients. Instead of burning, as is usually practiced, crop residues should be recycled for improving crop nutrition and soil fertility and organic matter contents. For example, banana residues abundantly available in Sindh are not recycled into the soil. Burning of residues of banana and other crops like paddy/sugarcane trash, etc., should be discouraged; instead these should be incorporated into the soil directly or through compost made out of these residues. There is a dire need to develop an economical technology to utilize banana residues either directly by crushing into micro-sized residues or by developing value-added compost products for improving soil fertility and organic matter and to sustain high productivity of soils.

# KEY MESSAGES

07

## Management of Salt-affected Areas

In case of salt-affected soils, first priority should be given to soil and water testing. Management practices differ according to the category of salt-affected soil, i.e., saline soils would only need good quality irrigation for reclamation and drainage whereas saline-sodic and sodic soils would require gypsum or acid treatment. A special attention should also be given to right source of nutrients; the fertilizers containing both nitrogen and phosphorus, and possibly calcium as well may be preferred in saline-sodic soils. Integrated use of soil amendments and organic fertilizers (farm manure, compost, green manuring, etc.) improves efficiency of inorganic fertilizers. Farmers are recommended to consult literature published by Agriculture Department in local language to gain further knowledge about reclamation of such soils.

08

## Use of Gypsum

The application of gypsum is an efficient way to preserve soil moisture and also meet calcium and sulfur requirements of crops in arid areas. Since it has no negative impact on soils and crops, farmers may even apply gypsum @ 20 bags per acre to normal soils after every 3 years in the absence of soil testing facility. However, for reclamation of saline-sodic and sodic soils, gypsum application is highly recommended since it is at least five times cheaper than acid. Where available, the rate of gypsum application should be based on gypsum requirement according to exchangeable sodium percentage of soil and availability of irrigation water. Sulfur is very useful for those areas where oil seed crops and peanuts are grown.

09

## Improving Produce Quality

Potassium is the quality nutrient element. Use of potash fertilizers on K deficient soils and for high value fruit and vegetable crops is recommended. Sandy soils and soils irrigated with tube-well water are often deficient in potassium. Under situation where high crop yields are harvested through application of enhanced rates of nitrogen and phosphate fertilizers, it becomes essential to apply potash fertilizers as well for balanced nutrition and produce quality. Zinc can also improve grain quality through meeting much needed zinc.

10

## Brackish Water Management

Management of brackish water is very important factor with reference to the water quality for optimal crop production, particularly under salinity stress conditions. Therefore, brackish water should be used in cyclic manner, i.e., one or two irrigations with brackish water should be followed by canal water application at critical growth stages of the crop. In Sindh, this aspect is very important during canal water shortage at the tail end. Quality of brackish water, soil salinity status, and the crop grown are the guiding factors to be considered in brackish water management.

# KEY MESSAGES

11

## Use of Micronutrients

Few well-known micronutrient deficiencies in Pakistan are: Zinc (Zn) deficiency in rice, boron (B) deficiency in cotton, and iron (Fe) chlorosis in deciduous fruits, citrus and other orchards. Deficiency of micronutrient(s) may be catered through soil application or foliar spray, for example:

i. Wheat grains in Pakistan are generally low in zinc ( $25 \text{ mg Zn kg}^{-1}$ ). Since more than 65% of calorific needs of the poor are met by wheat flour alone; therefore, it is highly recommended that farmers are educated about enrichment of their grains while using micronutrient fertilizers. Zinc concentration in wheat grains can be increased effectively at farmers' fields by applying two foliar sprays of Zn (350 gram of zinc sulfate 33% Zn dissolved in 100 liter of water is sufficient for 1 acre spray) – preferably at booting stage, i.e., within 15 days before head emergence. In case one kg of Urea fertilizer is also mixed in 100 liter of water (being used for foliar zinc spray) that would further enhance Zn translocation towards grains.

ii. Boron (B) deficiency in cotton crop promotes premature flower abortion and in rice crop results in empty panicles on lower end of the ears. Application of boron (B) may help reduce boll drop in cotton and sterility in rice. Uptill now, no toxicity of boron has been reported in Pakistan.

iii. Most fruit orchards in Sindh, for example mango and banana crops, suffer from Zn deficiency which may be corrected by applying 2 to 3 foliar sprays of Zn as well as by soil application (maintenance dose). Research data about Fe deficiency in orchards across Sindh is lacking. In a study, only 16% soils of banana orchards were found deficient in Zn. Only foliar application of Fe is considered effective and economical.

Soil applications of micronutrient fertilizers leave beneficial residual effects on soil that can last for 3 to 6 subsequent crops, in certain cases. Therefore, it is not necessary to apply micronutrient fertilizer each season to each and every crop. However, periodic soil testing is recommended to ascertain the need for micronutrient application to subsequent crops in the same field.