

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

IN THE NAME OF ALLAH
THE BENEFICENT, THE MERCIFUL

SPATE IRRIGATION & LAND DEGRADATION IN PAKISTAN



History of Spate Irrigation in Pakistan



Some bunds in Balochistan are more than 5000 years old

The construction of spurs and bunds in the Bolan river (Balochistan) during dry period was one of first opportunities to control surface flows, develop and improve soils and resulted in strong human settlements In 2600 BC

Source: French Archeological Mission



Spate Irrigation - Globally

| Country | Year of Irrigation | Total Irrigated Area (ha) | Spate Irrigated Area(ha) | Spate Irrigation as % of Total Irrigation |
|----------|--------------------|---------------------------|--------------------------|---|
| Algeria | 1992 | 555,500 | 110,000 | 19.8 |
| Eritrea | 1993 | 28,124 | 15,630 | 55.6 |
| Libya | 1987/1997 | 470,000 | 53,000 | 11.3 |
| Morocco | 1989 | 1,258,200 | 165,000 | 13.1 |
| Pakistan | 1990 | 15,729,448 | 1,402,448 | 8.9 |
| Somalia | 1984 | 200,000 | 150,000 | 75.0 |
| Sudan | 1997/1987 | 1,946,000 | 280,000 | 14.4 |
| Tunisia | 1991 | 385,000 | 30,000 | 7.8 |
| Yemen | 1987/1997 | 485,000 | 193,000 | 39.8 |

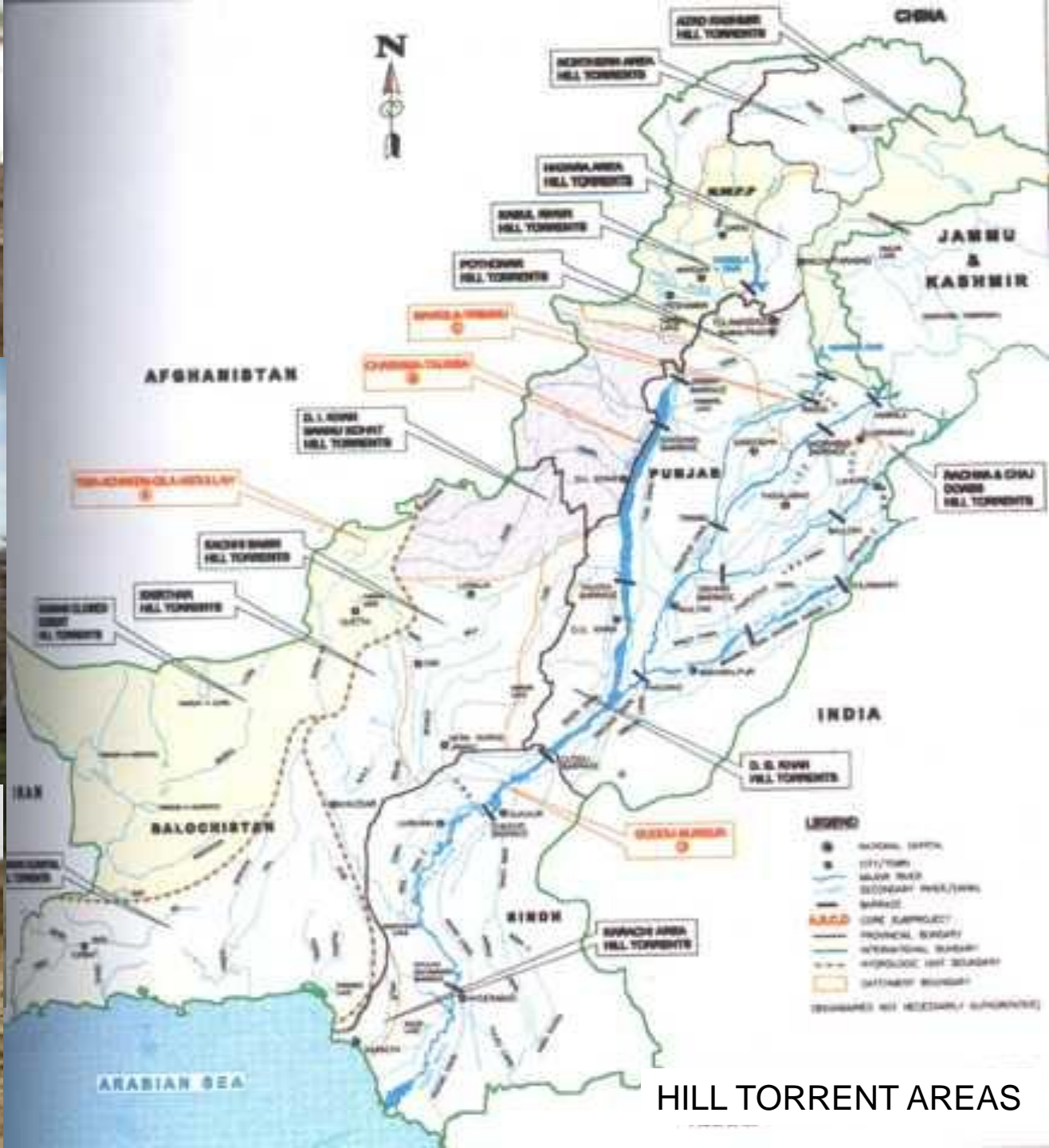
Source: FAO Aquastat; Hadera 2001; Kohler 1999

Pakistan has the single largest area under spate irrigation. The area is 9% of the total irrigated area – most of it lies in foothills of Suleman Range and Kithar Range, Balochistan, Tribal Areas. Even so – it is completely ignored in terms of institutional support.

Spate Irrigation in Pakistan – where?

| | Major areas |
|--|---|
| Tribal Areas | All Tribal Belt |
| Khyber Pakhtunkhwa | DI Khan, Tank, Laki Marwat, Bannu, Karak |
| Punjab (West of Indus and Tribal Area of DG Khan) | DG Khan, Rajanpur |
| Sindh | Dadu, Larkana, Jamshoro, Shahdad Kot, Thatta, Karachi |
| Balochistan | Entire Balochistan - Kacchi, Sibi, Jal Magsi, Kharan, Dera Bugti, Kohlo, Qila Saifullah, Musakhel, Barkhan, Loralai, Las Bela, Mekran, Chaghi, Pishin, Chaman, Quetta, Kalat, Mastung, Khuzdar |





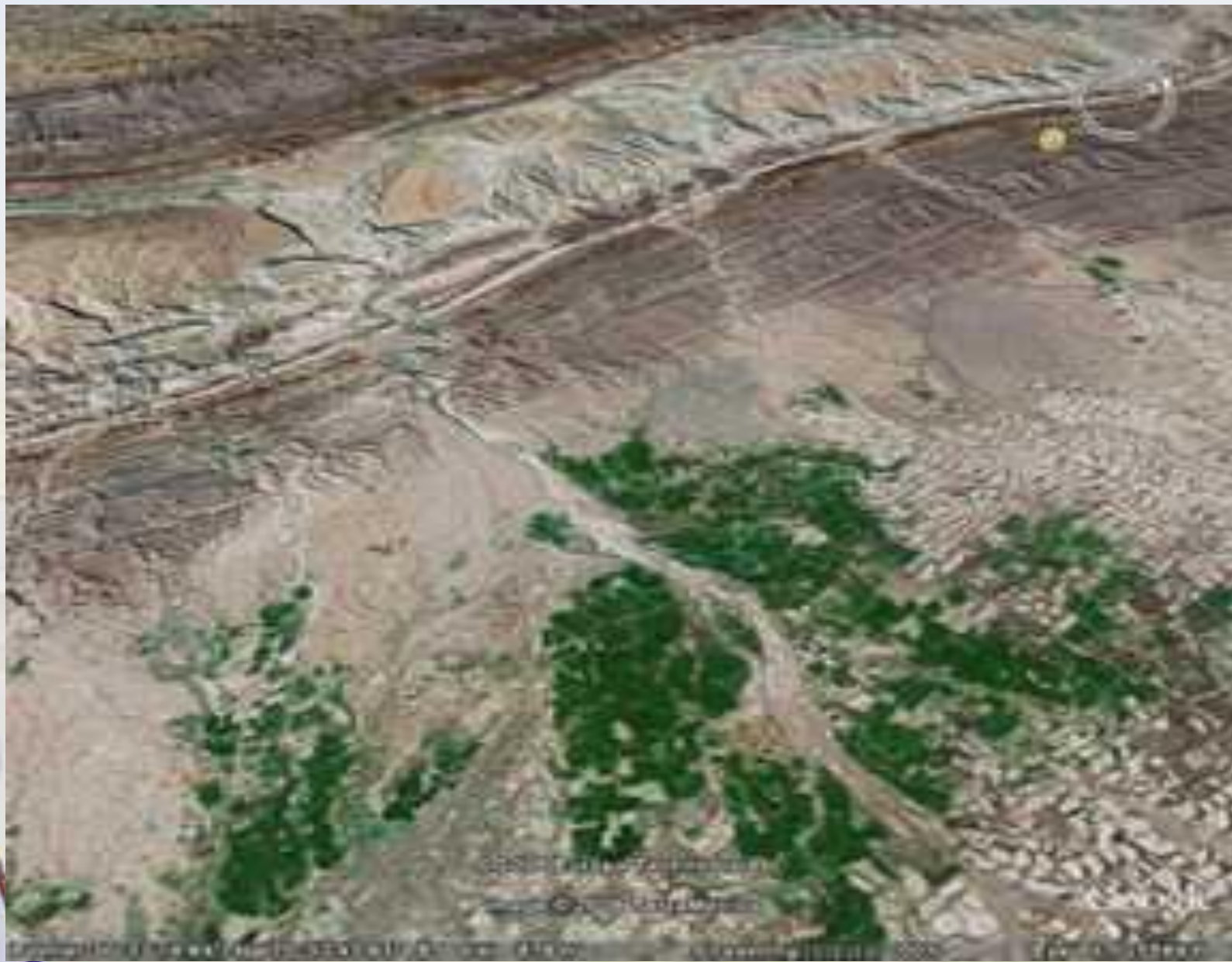
DI KHAN



TANK



TAUNSA AREA



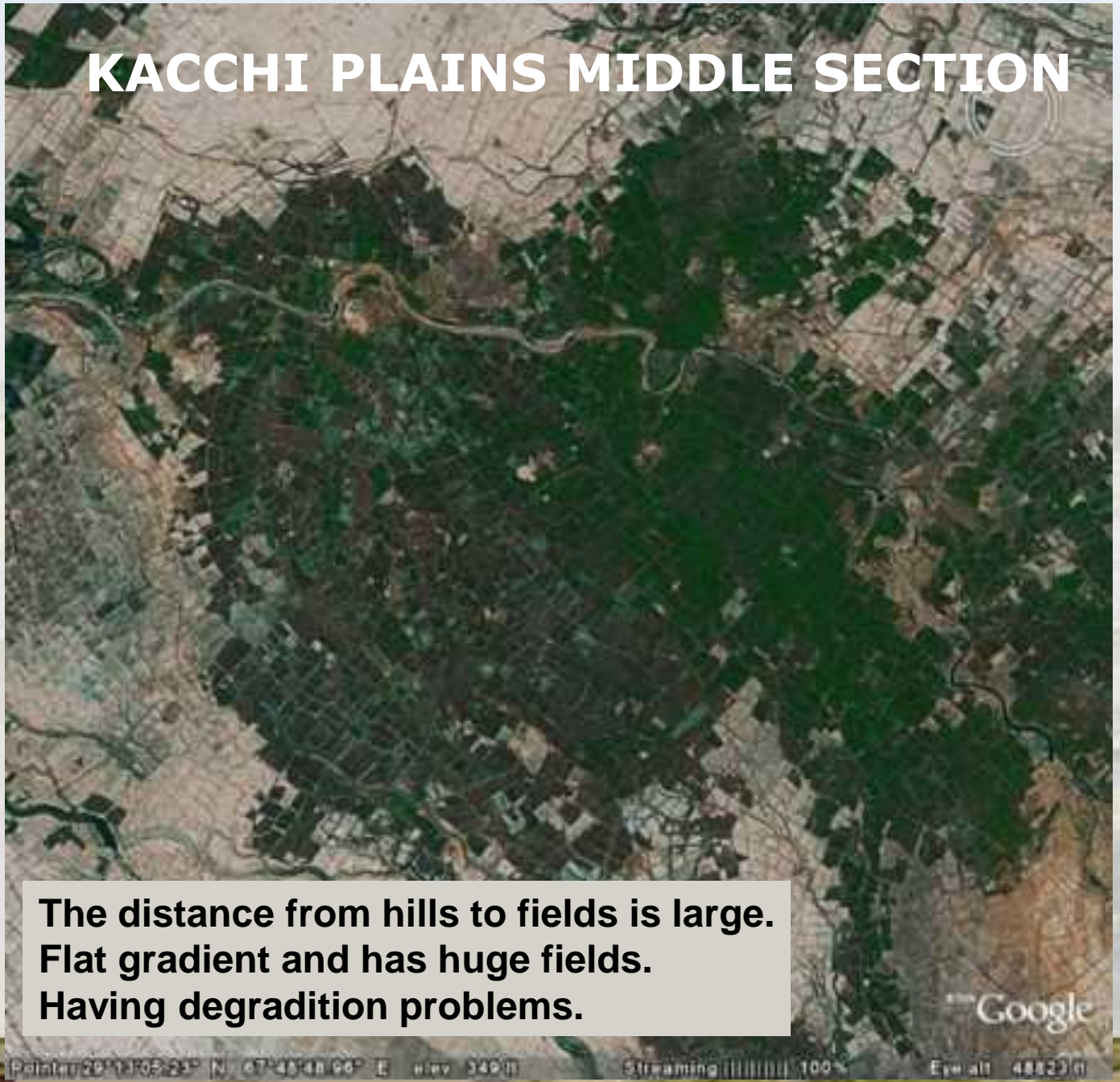
DG KHAN



KACCHI PLAINS



KACCHI PLAINS MIDDLE SECTION



**The distance from hills to fields is large.
Flat gradient and has huge fields.
Having degradation problems.**

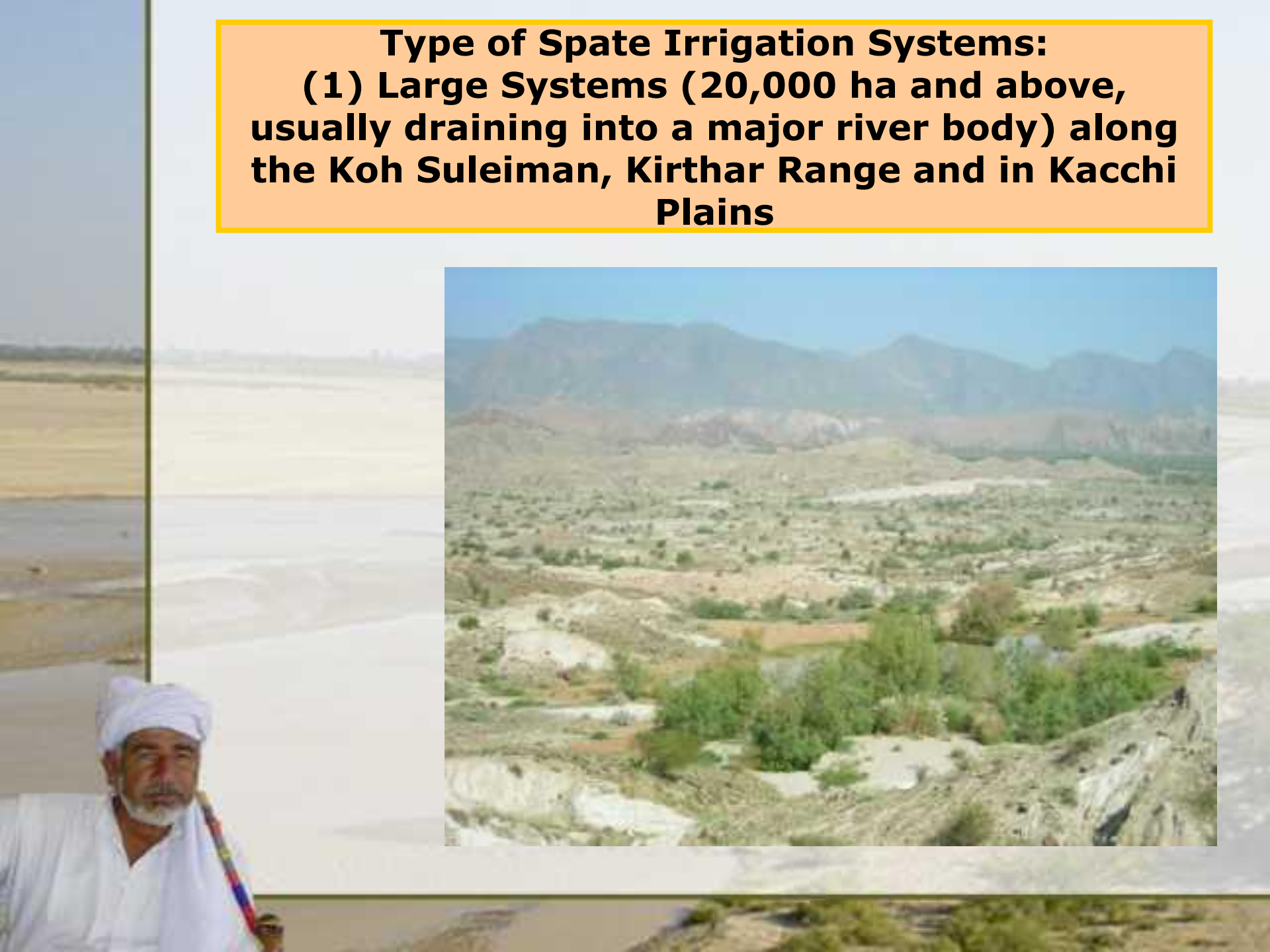
Google

Pakistan 60°00'00"E 24°00'00"N 4000m

Streaming 100%

Eye alt 4000m

**Type of Spate Irrigation Systems:
(1) Large Systems (20,000 ha and above,
usually draining into a major river body) along
the Koh Suleiman, Kirthar Range and in Kacchi
Plains**



**Type of Spate Irrigation (2)
Medium Systems (between 1,000 to 5,000
ha) coastal Las Bela, interior Balochistan,
smaller rivers from Koh-i-Sulaiman and
Kirthar Range**

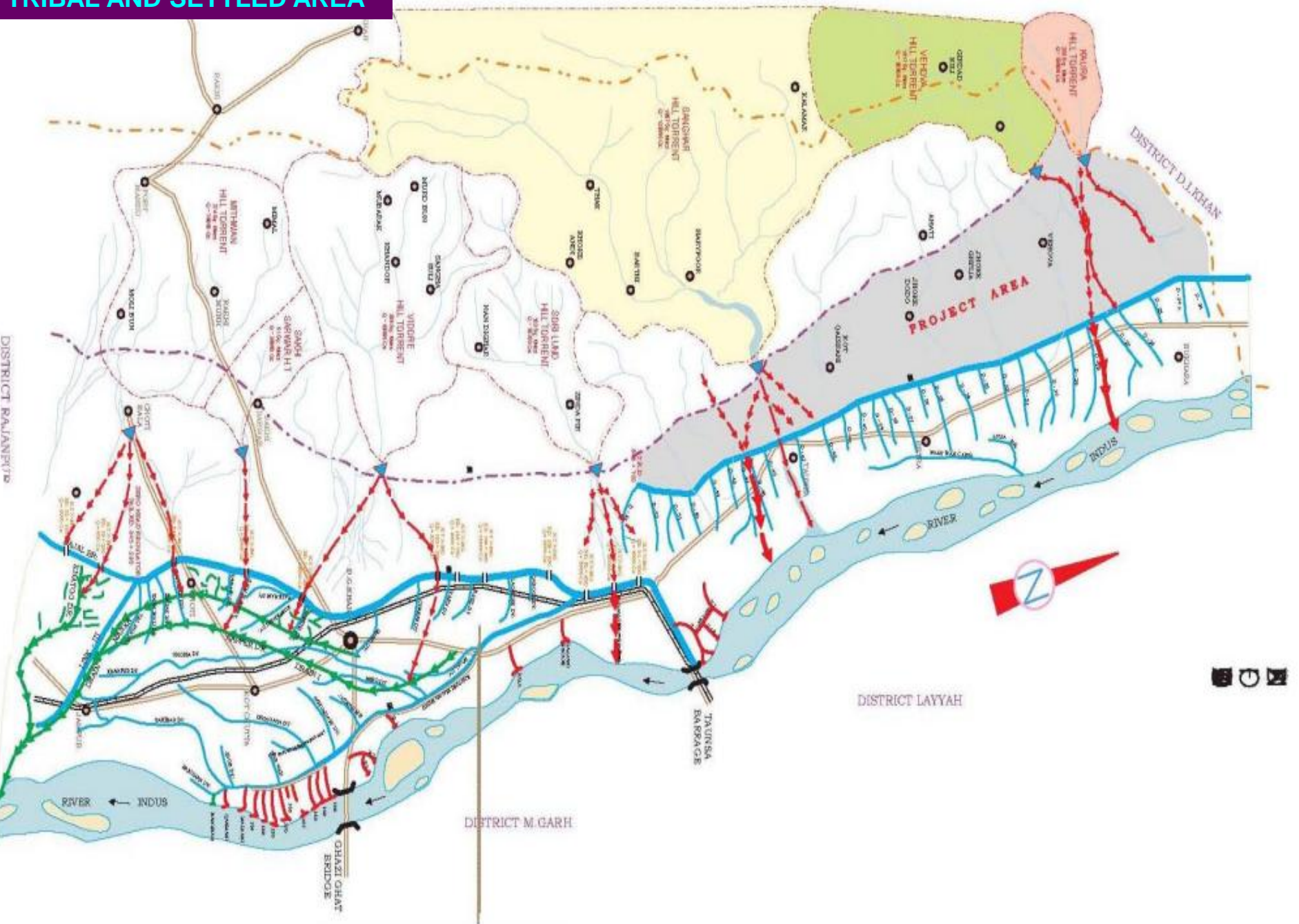


Type of Spate Irrigation
(3) Small or mini systems (upto 1,000 ha) – mountain systems, Tribal Areas



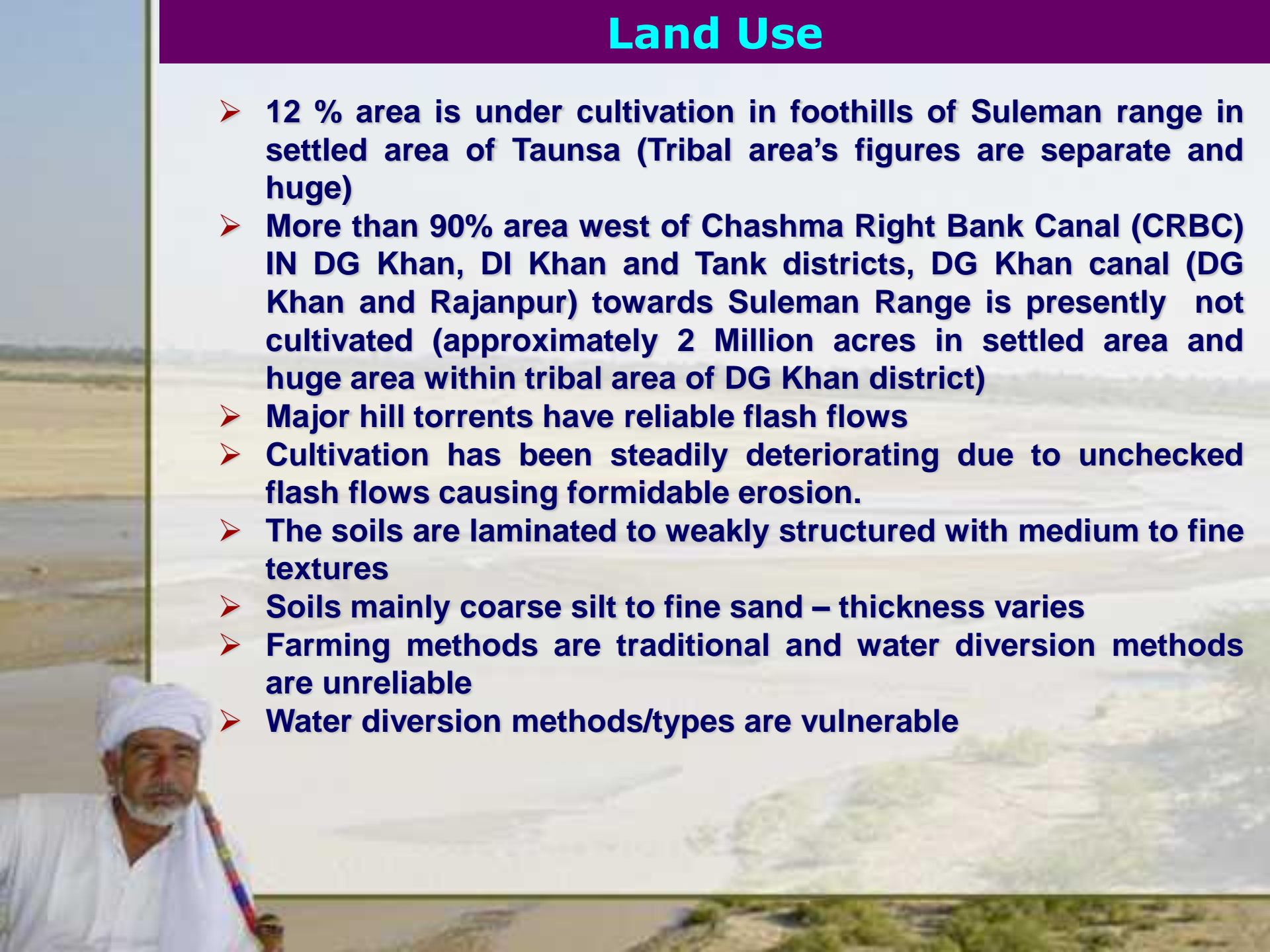
SPATE SYSTEM IN DG KHAN TRIBAL AND SETTLED AREA

BALUCHISTAN



Land Use

- 12 % area is under cultivation in foothills of Suleman range in settled area of Taunsa (Tribal area's figures are separate and huge)
- More than 90% area west of Chashma Right Bank Canal (CRBC) IN DG Khan, DI Khan and Tank districts, DG Khan canal (DG Khan and Rajanpur) towards Suleman Range is presently not cultivated (approximately 2 Million acres in settled area and huge area within tribal area of DG Khan district)
- Major hill torrents have reliable flash flows
- Cultivation has been steadily deteriorating due to unchecked flash flows causing formidable erosion.
- The soils are laminated to weakly structured with medium to fine textures
- Soils mainly coarse silt to fine sand – thickness varies
- Farming methods are traditional and water diversion methods are unreliable
- Water diversion methods/types are vulnerable



GENERAL TYPOLOGY

Spate irrigation in Pakistan:

- World's largest area under spate irrigation: 1.4 M ha! With water rights about 2 M Ha, potential of further 2 million Ha equivalent to 9% of irrigated area
- Completely neglected in terms of investment, policy, research
- Major poverty pocket in the country (least developed districts)
- All zones have land degradation issues – catchments, command and drainage zones
- Very low productivity, although high potential
- Important environmental functions (organic farming and no energy use)
- Heavy sedimentation in spate flows

Special characteristics

- Based on large earthen bunds, deflectors and fallow and unused lands
- Large areas – command as well as catchment areas have further potential of spate irrigation and development
- Few spate flows or large spate flows every year
- Mainly flat and sandy areas devoid of vegetation coverage presently
- Community based resource management system

Interventions

- Based on failed civil engineering concepts not appropriate to spate system – high failure rate (65%)
- Development works were confined to command area and not much done in catchment area
- Lost its dynamism – no new development
- Role of local government in management was positive but is weakened
- Spate irrigation seen as nuisance (flash flow damage taken as flood damage) not as potential

POTENTIALS

Potential/Opportunities are large: Inter-Provincial/Regional Strategy to address the issues

Water management: To utilise the country's largest underdeveloped area and this area is our last hope as food basket

- **Revive and resource local management by communities and local government**
- **Ensure affordable availability of bulldozers/earth moving machinery in public or private sector**
- **Stay away from inappropriate civil engineering solutions, such as weirs and flood storage dams. Instead – attenuate and regulate flash flow patterns**
- **Appropriate civil engineering solutions are: Based on use of local material and expertise - flow dividers, fixing flood canal inlets, bed stabilizers, improved/ strengthened earthen bunds (gabion sections, abutments), guide bunds, controlled field inlets and overflow structures**
- **Improve drinking water supply – improved shallow ponds and subsurface dams**
- **Combine spate irrigation with groundwater use and recharge**



LAND AND WATER POTENTIAL – 3 HILL TORRENTS IN ONE TEHSIL – TAUNSA

| Sr. No | Hill Torrent | Land Potential (acres) | | Water Potential 25 Year (ac-ft) | |
|--------|--------------|------------------------|--------------------------|---------------------------------|----------------|
| | | Arable Land | Existing Cultivated area | Available | Exploitable |
| 1 | Kaura | 30,935 | 3,830 | 70,000 | 62,200 |
| 2 | Vehova | 37,680 | 4,723 | 403,500 | 112,800 |
| 3 | Sanghar | 33,310 | 4,601 | 71,8700 | 224,500 |
| | Total | 101,925 | 13,154 | 1,192,200 | 420,500 |

A review of Table reveals that of the total runoff of 1.19 maf, about 420,500 acres-feet can be utilized by proper management facilities.

Source: NESPAK Study of Three hill torrents in DG Khan (ADB Technical Study Report December 2007)



| Ser | Hill Torrent | Villages | Area (Acres) | |
|----------------------------|----------------------|-------------------|----------------|----------------|
| | | | Total Area | Haqooq Area |
| Major Hill Torrents | | | | |
| 1 | Kaura , | | 44,987 | 24,479 |
| 2 | Vehova | | 75,993 | 41,178 |
| 3 | Sanghar | | 23,035 | 17,871 |
| 4 | Sori Lund | | 14,460 | 1,460 |
| Total | | | 174,016 | 110,185 |
| Minor Hill Torrents | | | | |
| 5 | Mithawan Sheikh Para | Litra | 5,174 | 4,267 |
| 6 | Litra | Litra | 31,373 | 27,768 |
| 7 | Bathi/Para North | Chatta Maih Ghatt | 22,235 | 19,894 |
| 8 | Qaisrani | Jhok Bodo | 3,006 | 2,520 |
| 9 | Kahnwan | Kot Qaisrani | 21,083 | 13,598 |
| 10 | Chit Bantri/Chitpani | Chitpani | 8,626 | 7,324 |
| 11 | Mahoi/Trutti | Jhok Rohal | 13,662 | 11,279 |
| 12 | Rakyani | Rakyani | 1,589 | 596 |
| Total | | | 106,746 | 87,239 |
| Grand Total | | | 280,762 | 197,424 |

POTENTIALS

Potential is large:

Agronomy and Livestock:

- Improved soil moisture conservation (mulching, ploughing, improved equipment)
- Improve yield of major crops such as sorghum by better varieties and better soil moisture conservation – in Some African countries yield of sorghum is 3 times more!!
- Better marketing and processing of promising minor crops (oil seeds, guar, sesame for instance)
- Improve prospects for native vegetables and medicinal plants
- Spate irrigated forestry (gum arabica) and Non Timber Forest Products (mazri etc.)
- Improve local livestock varieties (Bagh Nari, Dajal, Rojhan, Lohani)
- Improved fodder for livestock



POTENTIALS

Potential is large, if managed well:

Environment

- Stabilizes the area, avoid desertification
- Recharge of groundwater
- Local wetlands and lakes
- High biodiversity, indigeneous plants
- Low external input (organic) farming

Watershed

- Civil works, Biological Work, Social Aspects - working with communities
- Control of erosion, fuel wood, economic value plantation, water recharge





Spate Irrigation Network PAKISTAN

PARC
Pakistan Agricultural Research Council

