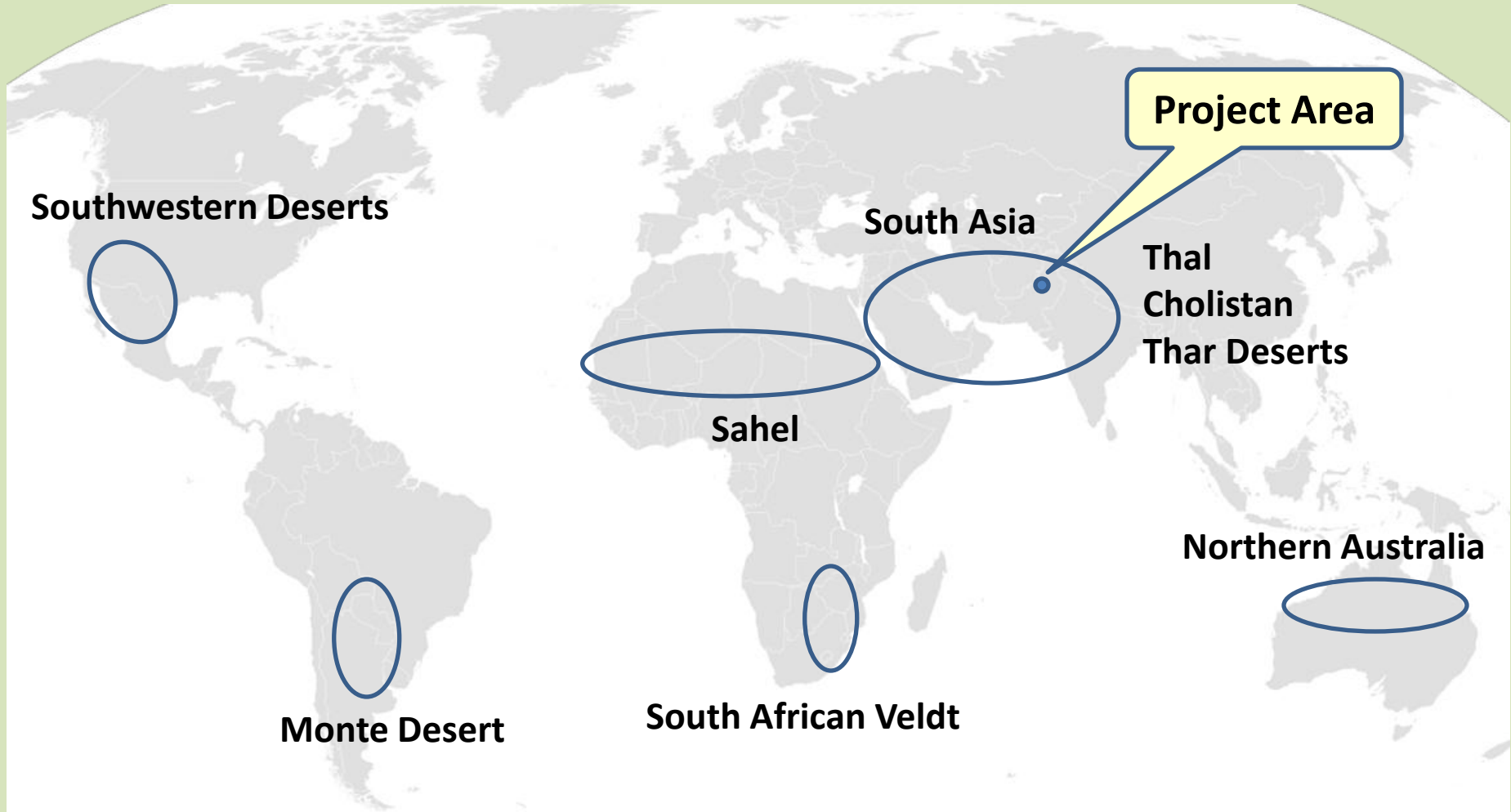


Revegetating Degraded Rangelands Using Native and New Drought Resistant Grasses



**Workshop on Watershed Management and Land Rehabilitation in the
Northwest Frontier Region of Pakistan
December 6-8, 2010 Islamabad, Pakistan**

Arid Rangelands with Summer (Monsoon) Rainfall Pattern



Most frequently used drought tolerant grasses on arid monsoon rangelands

Cenchrus ciliaris (dhaman)

South Asia, North Africa, South Africa, Australia, North America, South America

Bothriochloa ischaemum

South Asia, Australia, North America

Panicum antidotale (murat)

South Asia, North Africa, South Africa, Australia, North America

Dichanthium annulatum

South Asia, Australia, North America

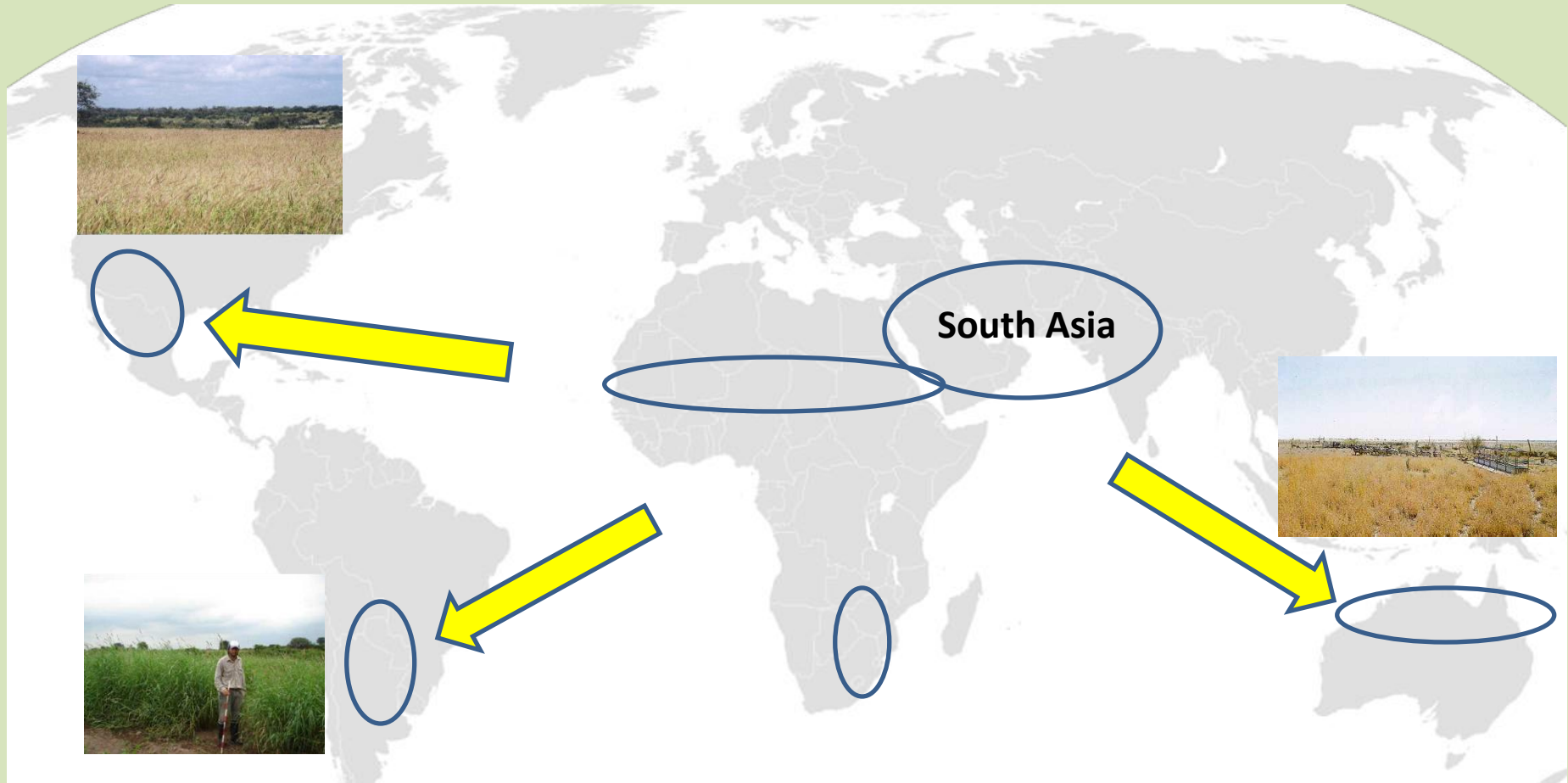
Lasiurus scindicus (ghorka)

South Asia, North Africa

Cynodon dactylon (khabbal)

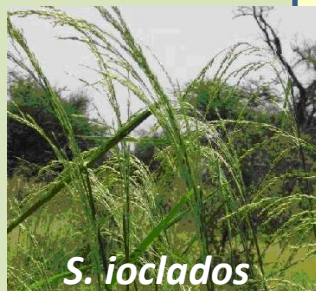
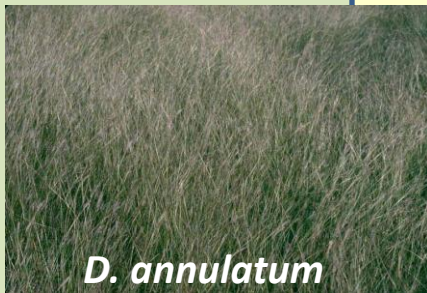
South Asia, North Africa, South Africa, Australia, North America

The origin of arid monsoon grasses for large scale rangeland seeding has been South Asia and Africa



The primary drought tolerant grasses are native to Pakistan and the project area

Ten drought tolerant grasses for the project area



Cenchrus ciliaris (Dhaman)

Lasiurus scindicus (Ghorka)

Panicum antidotale (Murat)

Cynodon dactylon (Khabbal)

Dichanthium annulatum

Bothriochloa ischaemum

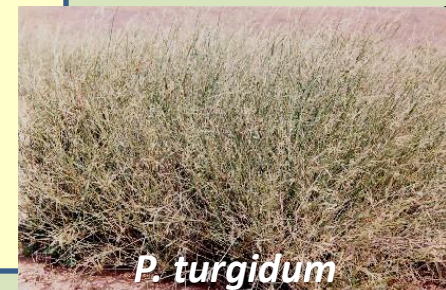
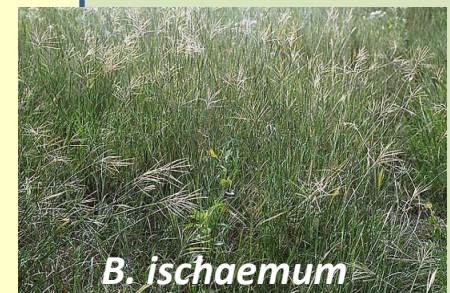
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Panicum turgidum (Murat)

Sporobolus ioclados

Cymbopogon jwarancusa (Khavi)

Ochthochloa compressa (Chimber)





Non Arable Rangeland

Range Seeding

Adapted grasses

- *Cenchrus ciliaris* (dhaman)
- *Lasiurus scindicus* (ghorka)
- *Panicum antidotale* (murat)
- *Panicum turgidum* (murat)
- *Cymbopogon jwarancusa* (khavi)

Silvi-Pasture Planting

Adapted grasses (same as above right)

Adapted woody plants, e.g.

- *Ziziphus mauritana* (ber)
- *Prosopis cineraria* (jand)
- *Calligonum polygonoides* (phog)
- *Withania coagulans* (paneer)
- *Suaeda fruticosa* (lana)





Sandy Outwash

Sand Dune Stabilization Planting

Adapted grasses, e.g.

- *Lasiurus scindicus* (ghorka)
- *Panicum turgidum* (murat)

Adapted Woody Plants, e.g.

- *Tamarix aphylla* (frash)
- *Haloxylon salicornicum* (lana)
- *Rhazya stricta* (senhwar)

Rainfed Loamy Sands

Dryland Pasture Planting

Adapted grasses, e.g.

- *Cenchrus ciliaris* (dhaman)
- *Lasiurus scindicus* (ghorka)
- *Panicum antidotale* (murat)

Convert to Silvi-Pasture if deep moisture available for woody plants





Rod Kohi Fields

Perennial Pasture/Fodder Planting

Adapted grasses, e.g.

- *Cynodon dactylon* (khabbal)
- *Panicum antidotale* (murat)
- *Dichanthium annulatum*
- *Bothriochloa ischaemum*
- *Sporobolus ioclados* (saline)
- *Bothriochloa pertusa*

Frequently Fallow Fields

Perennial Pasture/Fodder Planting

Adapted grasses, e.g. *C. ciliaris*, *L. scindicus*, *P. antidotale*, *B. ischaemum*, *D. annulatum*, *C. dactylon*

Consider converting to Silvi-Pasture to increase biodiversity and multi-purpose benefits



Gullies near Tank

Critical Area Planting

Adapted grasses, e.g.

- *Cynodon dactylon* (khabbal)
- *Ochthochloa compressa* (chimber)
- *Panicum antidotale* (murat)

Adapted woody plants, e.g.

- *Tamarix aphylla* (frash)



Manzai Badlands

Critical Area Planting

No suggested species at this time

Small scale trials to determine whether any plants can be successfully established, e.g.

- *Panicum turgidum* (murat)
- Annual grasses for forbs
- Shrub access to deep moisture

Proposed Seed Storage and Processing Facility

- Seed storage building (ICARDA specifications)
- Area for drying and threshing seed (e.g. cement slab)
- Field for foundation sources of seed
- Field for small scale evaluation trials to test potential new plants
- Initial focus on *Cenchrus ciliaris*, *Lasiurus scindicus*, and *Panicum antidotale* seed production
- Cooperating farmers grow and harvest seed



Information Resources (Sample)

Ahmed, J. and R.A.U. Khan. 1999. Rangeland development in Dera Ghazi Khan. Rangelands 10(6):258-62.

Bishaw, Z. et al. 2006. Technical guidelines for quality seed production. ICARDA. 23 p.

Khan, C.M.A. 1968. Sand dune rehabilitation in Thal, Pakistan. Handbook.

Khan, M.F. et al. 1999. Preliminary results from reseeding degraded Dera Ghazi Khan rangeland to improve small ruminant production in Pakistan. Small Ruminant Research 32:43-49.

Khan, T.N. et al. 2006. Biomass potential of perennial grass species in Cholistan Desert, Pakistan. J. Ag. & Soc. Sci. 2(3):189-91.

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Suleman, S. et al. 1995. Development of a rainwater harvesting system for increasing soil moisture in arid rangelands of Pakistan. J. Arid Environments 31:471-481.

Revegetation Related Tasks

1. Design and construct seed storage and processing facility
2. Design and build mobile seed cleaning equipment
3. Collect and process local sources of seed and vegetative material
4. Establish and maintain initial seed/plant increase fields
5. Harvest and process seed throughout growing season
6. Grow nursery stock for vegetative plantings
7. Cooperating farmers grow seed in quantity for project demonstrations
8. Establish and maintain initial evaluation nurseries for potential new plants
9. Prepare project demonstration sites for planting
10. Plant seed or vegetative material at a demonstration site
11. Monitor and maintain plantings at demonstration sites
12. Inventory project area for priority sites needing revegetation
13. Keep records of revegetation project activities, including photographs
14. Develop information and training material
15. Conduct workshops

Information Needed to Refine Revegetation Strategy

- 1. Amount and pattern of sediment buildup in rod kahi fields**
- 2. Length of time a rod kahi field typically contains standing water**
- 3. Groundwater depths, flows, and quality in the project area**
- 4. Pattern of salinity in the project area**
- 5. Nature and extent of the informal seed industry in the project area**
- 6. Nature and extent of nursery production of trees and shrubs**
- 7. Communal grazing practices in the project area**
- 8. Availability of irrigated sites within the project area for seed/plant production**

Demonstration Project Area and Sites

