Opportunities and constraints in pastoral and agro-pastoral livestock systems: the ICARDA/ILRI experience

Animal production in the United Arab Emirates – Status and Perspectives

Azaiez Ouled Belgacem[1], Mounir Louhaichi[1] & Isabelle Baltenweck[2]

CGIAR RESEARCH PROGRAM ON Livestock

ICARDA Science for resilient livelihoods in dry areas

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR on the ground and mandate: 15 research centres; over 70 countries

SUSTAINABLE DEVELOPMENT GOALS

CGIAR

Reduce poverty

food and nutrition

Improve natural resources and ecosystem services

ILRI

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Agenda 2030's Sustainable Development Goals

Livestock, including in pastoral systems, contribute to all 17 of the SDGs and directly to at least 8 of the goals.

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Opportunities and challenges in the livestock sector

Provides food and nutritional security
BUT overconsumption is often associated with obesity and non-communicable diseases

Powers economic development
BUT equitable development can be a challenge

Improves human health
BUT animal-human/emerging diseases and unsafe foods need to be addressed

Enhances the environment
BUT pollution, land/water degradation, GHG emissions and biodiversity losses must be greatly reduced


ILRI/Stevie Mann

Characteristics of pastoral and agro pastoral systems

Livestock performs multiple functions:

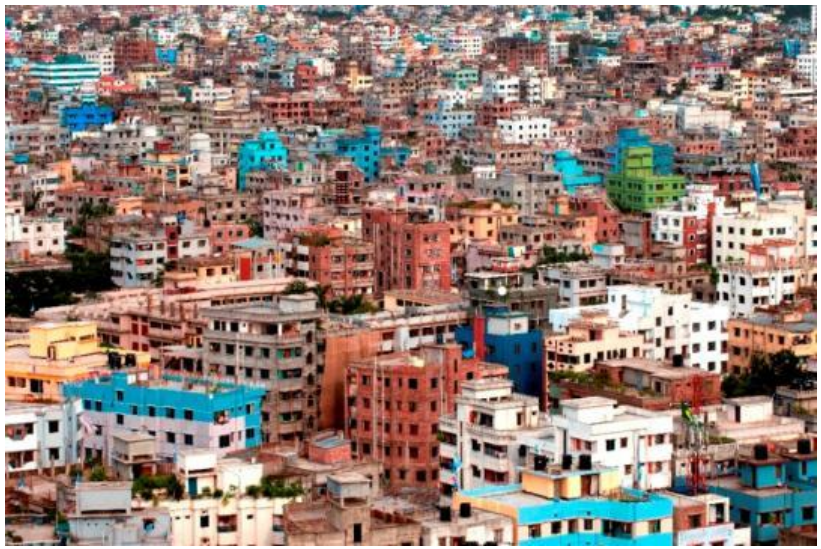
- Livestock for food, for sale, for prestige, for social functions, as an asset to store wealth, to protect against shocks
- These systems make use of natural vegetation and other natural resources
- They play a key role in the protection and maintenance of ecosystems goods and services

There is a large heterogeneity across systems

- Livestock as the main livelihoods option
- Mixed agro-pastoral systems with integration with cropping
- Off-farm income plays a significant and increasing role in some areas

THE CHALLENGES

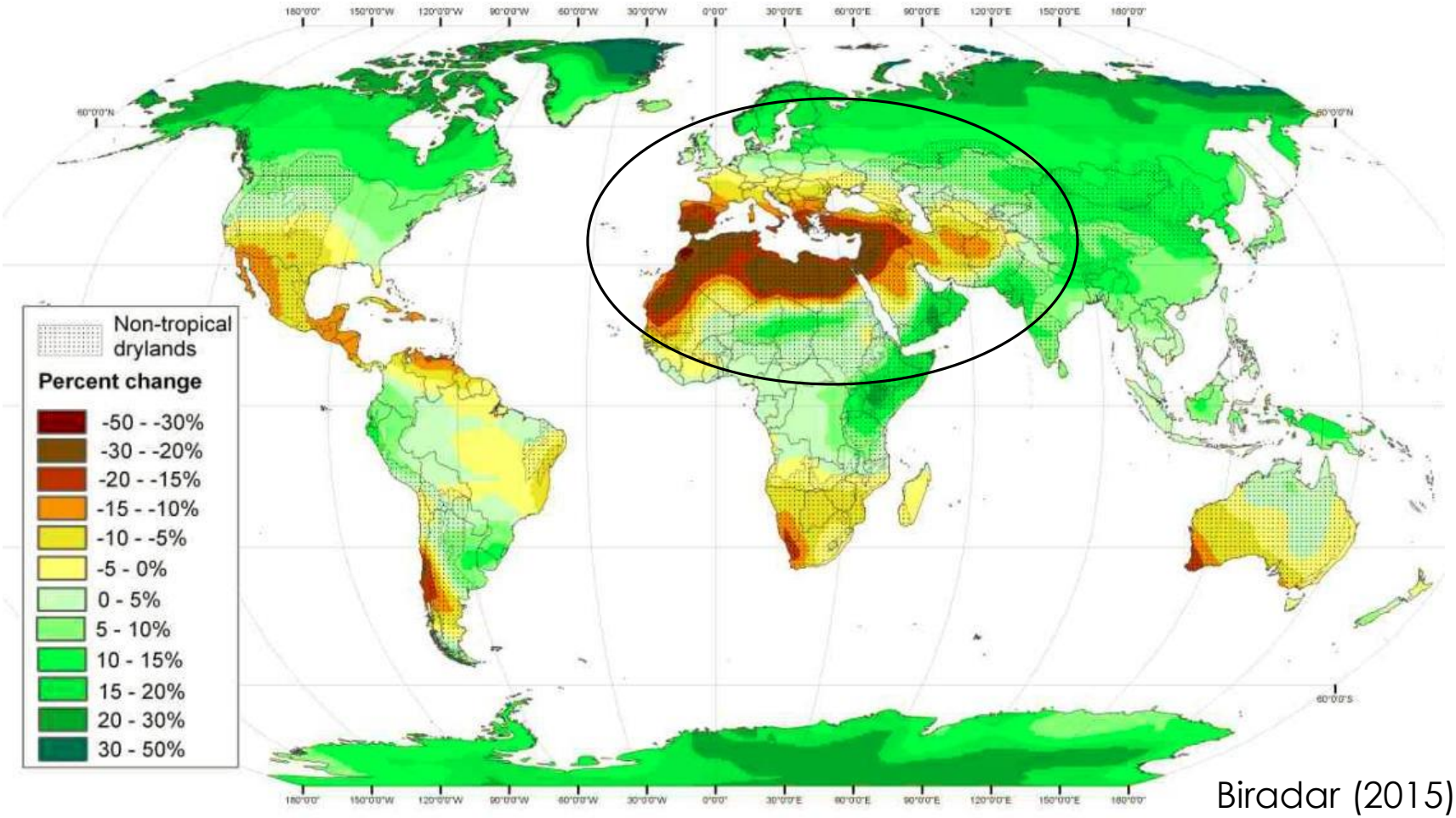
- Climate change (quantity and quality of food)
- Food insecurity and malnutrition
- Natural resources degradation/depletion
- Socio-political instability
- Urbanization
- Infrastructure/markets



THE CHALLENGES

Relative Change in Mean Annual Precipitation

Based on IPCC Scenario A1B, Average of 21 GCMs (1980/99 to 2080/99)



Biradar (2015)

THE CHALLENGES

CLIMATE CHANGE – THE MOST LIKELY SCENARIO

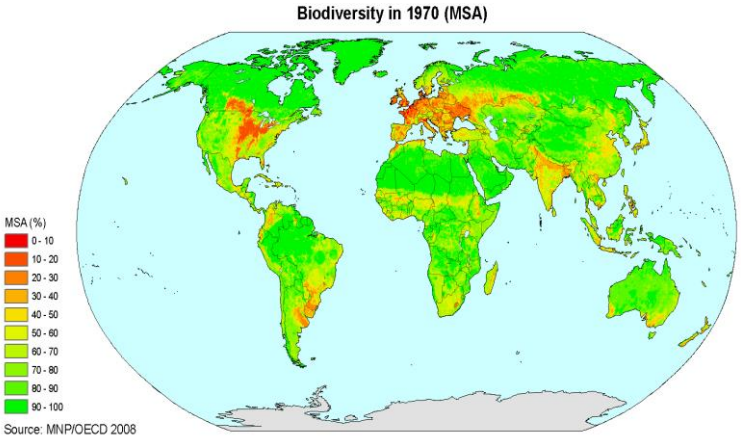
- Higher temperatures
- Increase in CO_2 concentration
- Extreme weather and unpredictability
- Increase frequency of drought
- Increase in areas affected by salinity
- Shift in occurrence and severity of biotic stress

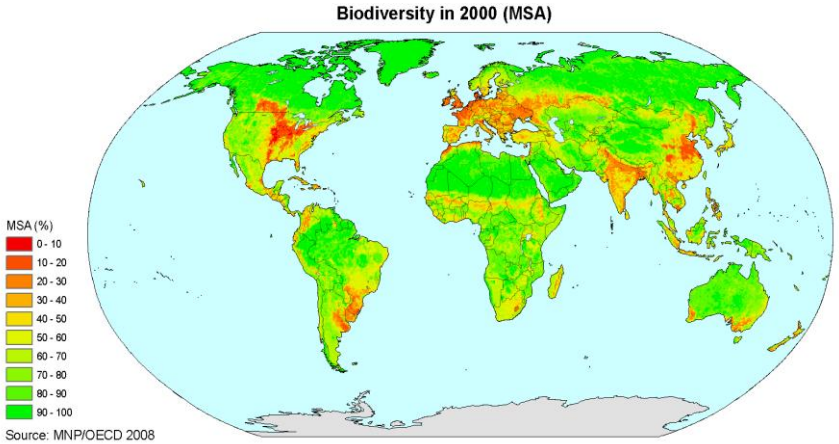
THE CHALLENGES

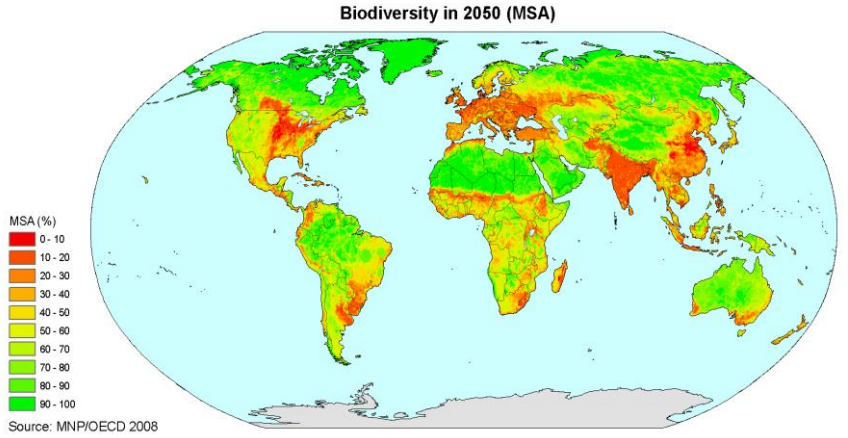
Diminishing genetic resources

Biodiversity Loss since 1970: The Scale of the Problem

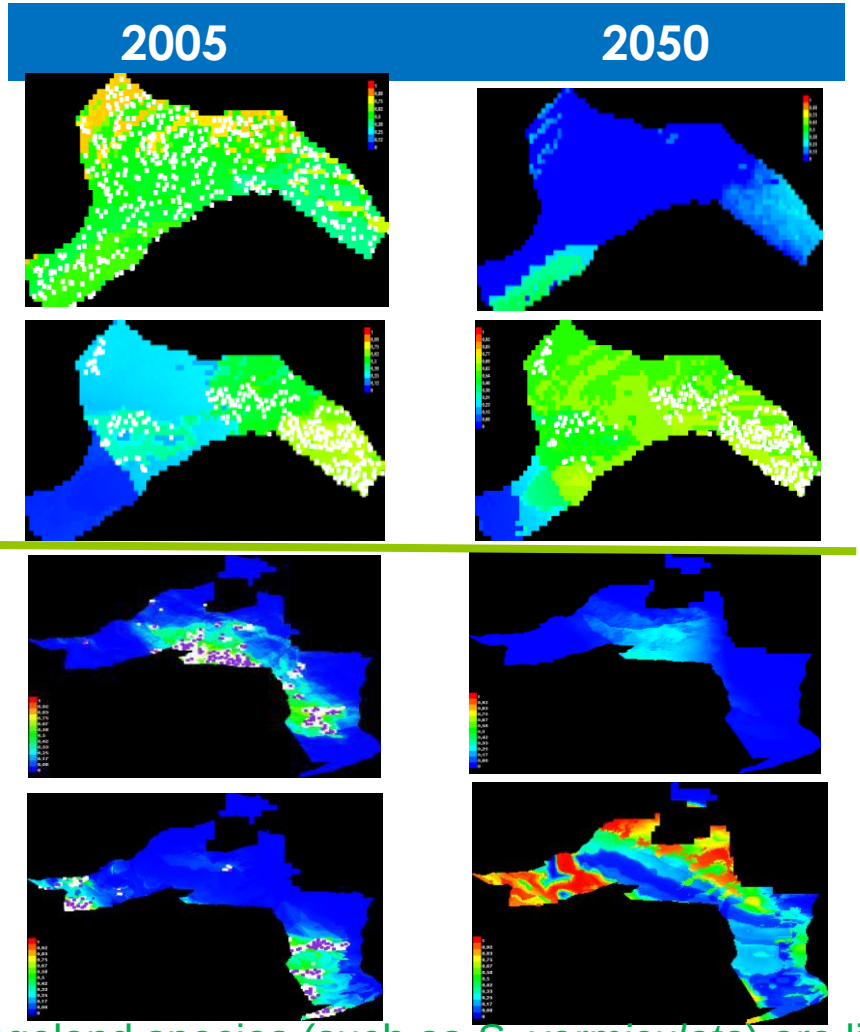
Baseline 1970







Vulnerability of rangeland ecosystems to Climate Change



***Salsola vermiculata* & *Haloxylon salicornicum* in the Syrian Badia**

***Salsola vermiculata* & *Haloxylon salicornicum* in S. Tunisia**

Already threatened rangeland species (such as *S. vermiculata*) are likely to come under greater danger and present a very high vulnerability to climate change (blue: absence, red: high abundance)

Causes of Rangeland Degradation

Improper grazing practices: Overgrazing and early grazing

- Too many animals (high SR)
- Bad timing: early grazing or prolonged grazing period

The destruction of woody plant species

(uprooting)

- Medicinal use
- Fire (energy)

Causes of Rangeland Degradation

Disruption of the traditional grazing system: Use of vehicles for transportation of water to the herds and of the animals to new pastures fosters prolonged grazing on rangelands and uncontrolled movement of the herds.

Causes of Rangeland Degradation

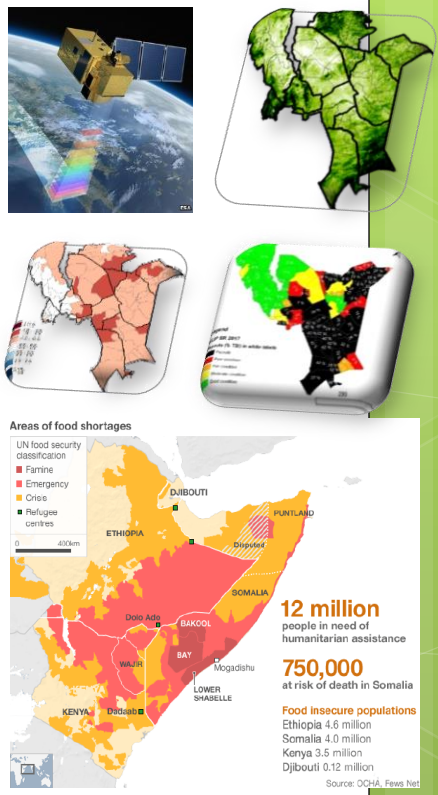
Conversion of the best rangeland sites to cropland

Causes/challenges of Pastoral Ecosystems Degradation in the Drylands

- Lack of policy and weak institutions
- Land tenure (access & governance)
- Globalization (way of life)

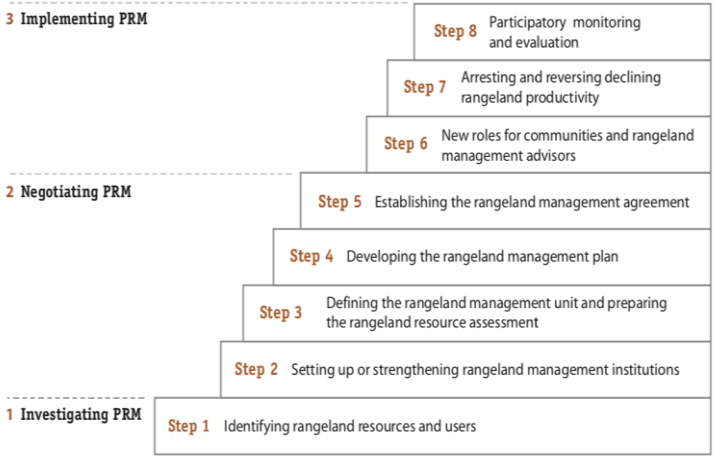
Examples of ILRI-supported innovations: IBLI (index-based livestock insurance)

- **Index-Based Livestock Insurance (IBLI): An innovation in insurance design suitable to the drylands**
  - Exploiting satellite data on forage availability to design precise and cheap drought-risk management contracts
  - Product designed specifically for pastoralists in the arid and semi-arid lands
  - Satellite imagery is used to assess forage availability and detect drought related forage scarcity
  - Unit areas of insurance takes in account livestock migration patterns
  - Compensation provided early in the season to minimize livestock losses by supporting drought coping strategies
  - Product distributed commercially by insurance companies in both Ethiopia and Kenya with close to 30,000 clients
- **Sustainable Index-based Livestock Insurance can:**
  - Prevent downward slide of vulnerable populations
  - Allows focus humanitarian resources on the needy
  - Crowd-in investment and accumulation by the poor
  - Has been adopted by the Government of Kenya as the Kenya Livestock Insurance programme since 2015 as a social protection programme covering about 18,000 households



Examples of ILRI-supported innovations: participatory rangeland management (PRM)

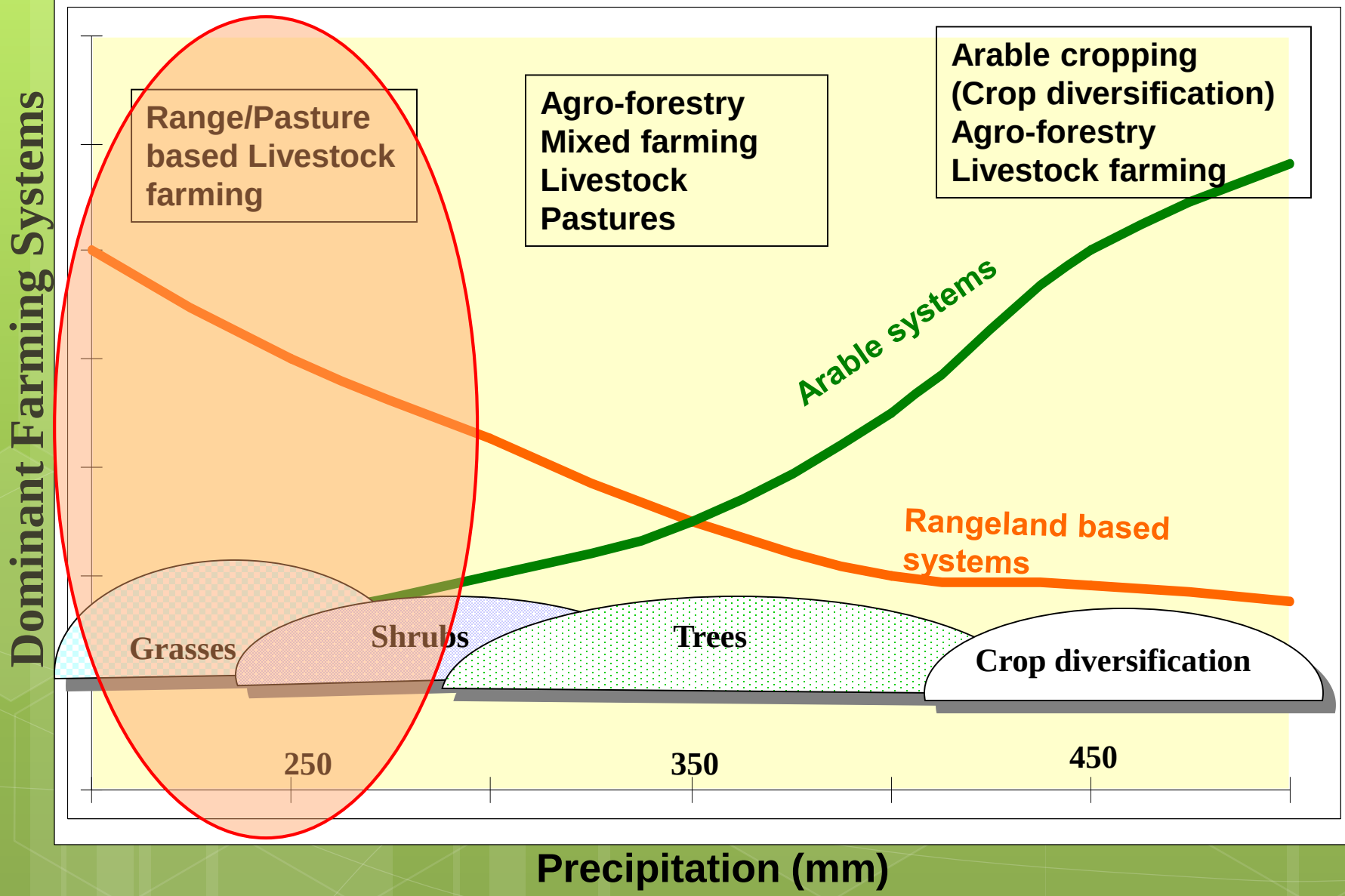
- Developed to address land and resource tenure securities and improve management of these in a context of reducing authority of customary institutions.
- Piloted in Ethiopia, then scaled-up with support of NGOs.
- Now being piloted in Kenya and Tanzania .



Pastoral production system

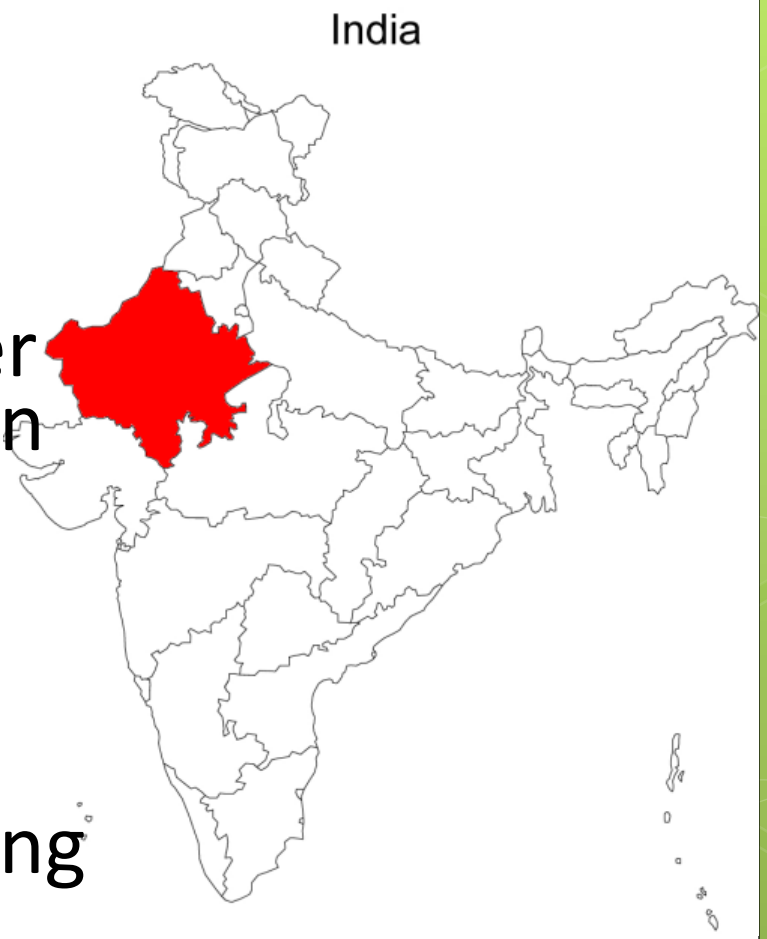
(India)

Main farming systems in drylands



Facts about Rajasthan state

- Rajasthan is the largest State in India.
- About 55% of the total area of the State is under Thar Desert (Great Indian Desert).
- More than 80% of rural HHs keep animals which continue to provide subsistence income during scarcity.



Pastoralists of Rajasthan, India

- The Raika people represent the majority of the migratory stock growers in western Rajasthan.
- For the Raika, domestic animals are living assets contributing to HH income, food security and health.
- Their pastoral system, evolved over the last 5 centuries, and has been centered on the use of large tracts of uncultivable and marginal land coupled with seasonal use of rain-fed cropland.
- Changing demographics, climate, and environmental awareness is changing their migration patters and land use.

Pastoralists of Rajasthan, India

- Many Raika are very poor and many, especially women, are illiterate.
- The migration group generally comes from the same village.
- During long distance migration generally 10 to 20 person move together with their animals for the sake of safety.
- A respected village leader acts as group leader (NAMBARDAR). His main task is to finalize the locations for grazing after talking to different officials/communities in other locations.

Key issues and challenges

The main constraints faced at the herders during migration were as follows:

- **Shortage of common grazing resources**
  - **Rapid decline of common grazing (quality and quantity)**
    - Crop encroachment (cultivation of the best RNG sites)
    - Proliferation of invasive species (*Prosopis juliflora)* in common lands
    - Restrictions to livestock grazing on land controlled by the forestry department/conservation purposes (parks).

Key issues and challenges

- **Institutional support (Services and infrastructure)**
  - Little or no access to support services (veterinary, insurance, extension, credit, etc.).
  - Lack of infrastructure for processing and production of value-added livestock products. Dependence on middlemen for marketing of products.
  - Communication gaps between migratory herders and government officials.
- **Conflicts during migration**
  - Farmers' unwillingness to allow grazing on their fallow lands and harvested fields.
  - Theft of animals during residence in other states.



Pastoral

way of life



Millet bread is a staple of the migrating herders

Milk from livestock is mixed with millet bread

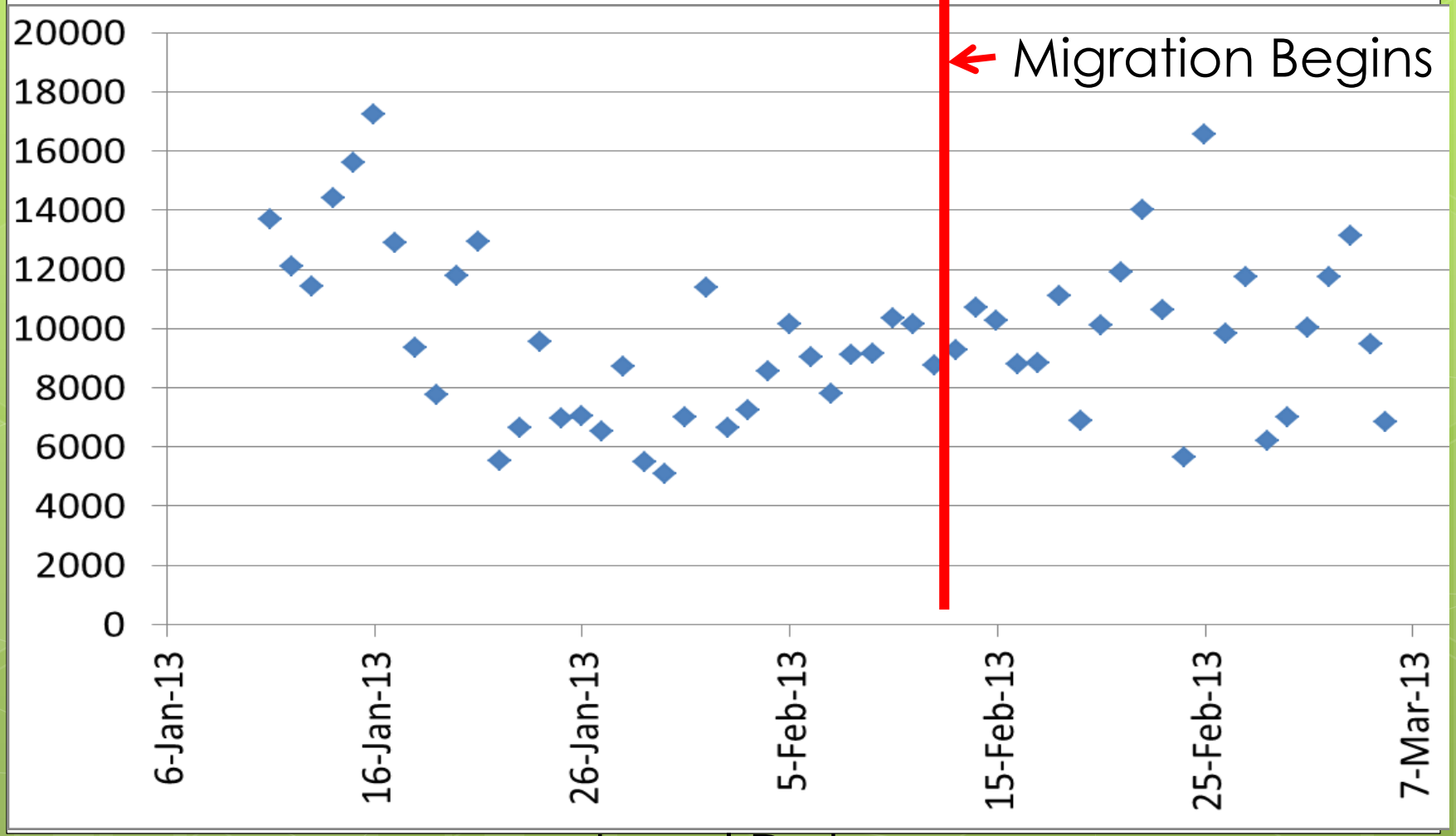
Cattle Positions Showing Migration Route

Migration from the Home Area begins on 13 February 2013

Migration distance is approximately 550 km in 63 days

Daily Travel Distance

Cattle travelled an average of **7.09 km day^{-1} before migration** began, **8.8 km day^{-1} during migration**, and 8.71 km day^{-1} averaged across the entire observation period.

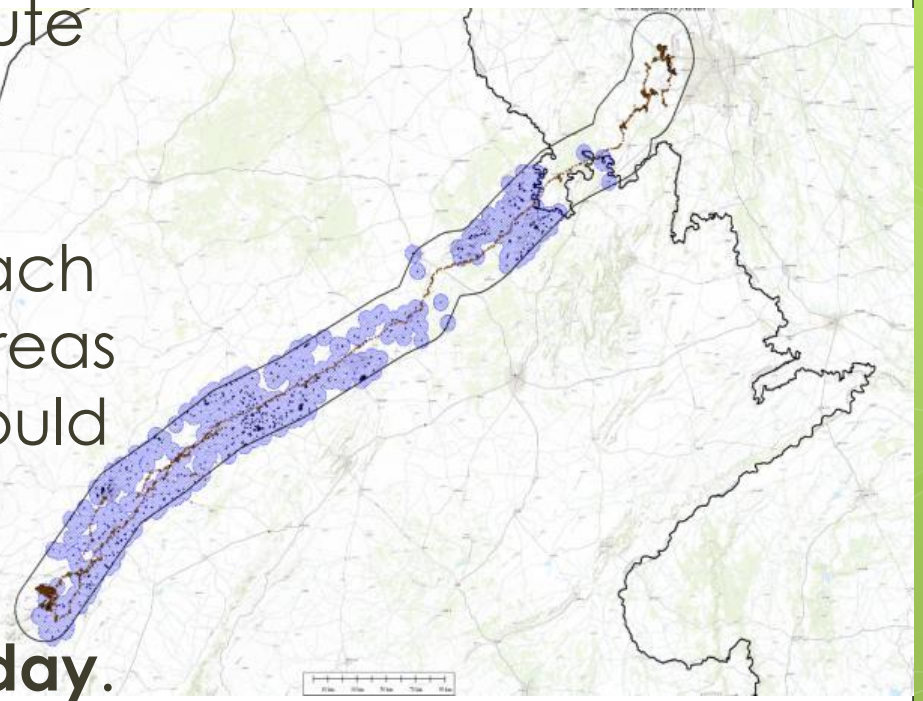


Migration & Water

- Migration routes depend on availability of water and pasture land.
- Water can be from wells or water retention basins.

5 km Buffer on Known Watering Points

- Known water sources along the migration route were identified.
- 5 km buffers were constructed around each water source so that areas with water limitation could be identified.
- Cattle traveled approximately **10 km/day**.
- Cattle watered near noon on most days.



Policy Recommendations

- **Improving the condition of the common grazing lands** and religious trust-owned pastures with community participation could provide better forage resources that fulfil the nutritional requirements of migrating animals.
- **Rangeland improvement projects**, *dissemination of near real-time information* about the condition and abundance of forage resources and availability of crop aftermath/fallow fields would facilitate the migration process and increase efficiencies.

Policy Recommendations

- **Institutional support (services & Infrastructure)**:
  - Creation of *livestock watering points on different migratory routes* will help to enhance the productivity.
  - Provision of *market infrastructure* in production regions to facilitate sale of animals at remunerative prices.
  - The interventions of state agencies through *provision of mobile veterinary services* and quality medicines on different migratory routes will help reducing losses to livestock owners.
  - *Control of criminals* shall provide a healthy space to livestock owners in different regions and ensure safety of people engaged in this enterprise.
  - Special program should be in place to look after woman & children in the absence of male (*gender*).

Agropastoral production system

(Tunisia)

Revival of traditional grazing system

Rangeland Himas contributes to poverty reduction and economic growth as well as protection of habitat and conservation of endangered species

Rest/Deferred Grazing

Advantages

- Easy to implement,
- Low cost,
- Rest technique to improve rangelands productivity

Southern Tunisia/ Average rainfall: 100 mm

Impact of resting technique on rangeland productivity of the communal rangelands of Chenini, Tunisia (Ouled Belgacem et al., 2008)

Indicators	Free grazing	Protected
Plant cover (%)	38.7	52.4
Species richness (%)	22	52
Biomass production (kg DM/ha)	236	2135
Range value (FU/ha)	32	120

50,000 ha of collective rangelands are already under rest… and managed fully by CBOs

The option of using local feed resources (shrubs, promising forages, crop residues, by-products)

- More economic than the use of concentrates
- More ecological as they integrate the animal to its environment and can improve soil and water conservation
- More sustainable than grain (cropping or import)

Local Solution for a Global Problem

icarda.org

Alternative Feed Resources (valorizing farm by products)

There is great scope to reduce areas under fodder crops by using, innovating and developing alternate animal feed resources;

- utilizing agricultural and agro-industrial by-products as feed blocks, silage and/or mixed with the ration.
- Feed block technology is simple and does not require sophisticated equipment.
- Blocks are easy to handle, transport and can be made at the farm levels using the family labor.

Different formulae with different levels of urea, binders and a wide range of agro-industrial by-products, which are available locally mainly date palm by-products are under study in close collaboration between ICARDA and NARS.

Spineless cactus: a strategic fodder bank for the arid areas

- Drought tolerant
- Evergreen habit
- Easy to establish, to maintain & to use
- Multipurpose use
- Fodder potential
- Resolve livestock watering
- High palatability & high in soluble carbohydrates

Biomass production: 40 tons DM/ha

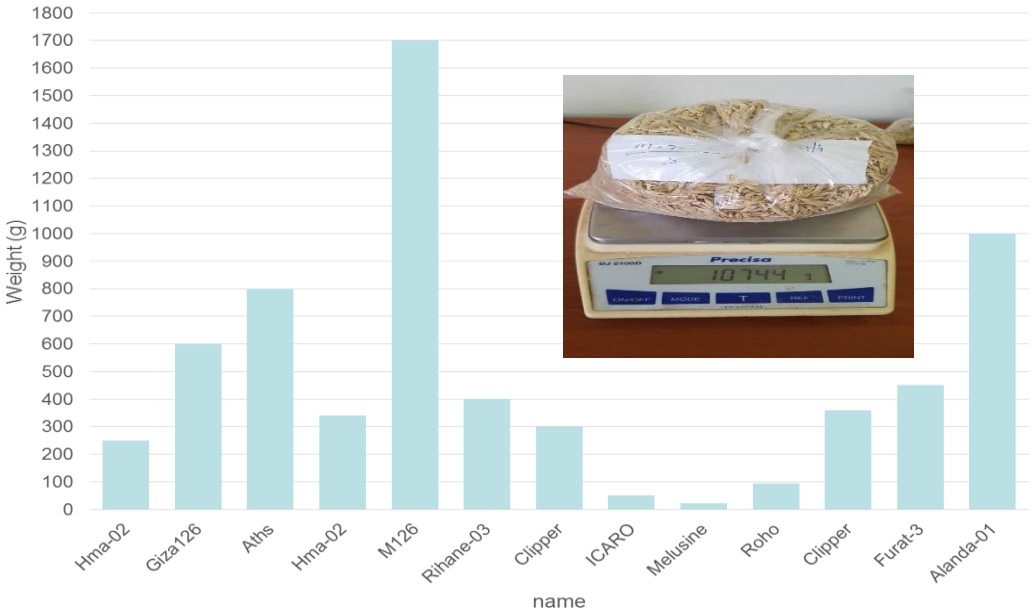
Introduction of 38 accessions od spineless cactus which showed high adaption to the Arabian Peninsula environment

- Source of energy, minerals and vitamins for animal feeding
- With relatively very low water requirement (5000 m3/ha/year in the Northern KSA
- the biomass production exceeds 40Kg/plant/year and the fruit production is about 30Kg
- Source of drinking water for livestock: Consuming 300g Dry Matter by small ruminants cover the water requirements

Multipurpose barley

- Green barley grazing (Livestock)
- Grain production (Human, Livestock)
- Straw production (Livestock)
- Stubble grazing (Livestock, Soil mulch)

Introduction and evaluation of 13 heat tolerant genotypes of barley (selected by ICARDA) under UAE environment



Sustainable Development of agro-pastoral production systems

Success Factors:

- Multi-stakeholder engagement and institutional collaborations that leverage resources and knowledge and improve overall efficiency of the actions
- Long-term investments by financing agencies and long-term commitment by actors
- Favorable and supportive national and local policy processes
- Use of local practices and knowledge in the implementation scheme
- Empowerment of the community to own the process

Use of a particular intervention in the restoration of degraded agro-silvopastoral site is site specific – no one single rule to apply anywhere!!

Achievements & Impacts: Enhancing food production and water security

Buffel grass: water saving forage production

Arabian Peninsula (AFESD, IFAD)

Challenges:

-Necessity to cover the increasing animal requirements from forages

-Cultivation by farmers of high water consuming exotic forages (Rhodes grass and Alfalfa): about 40000m3/ha/year

Development and introduction of native less water consuming forages such as Buffel grass (water requirements less than 15000m3/ha/year

IFAD
Investing in rural people

Buffle Grass: high-nutrition forage crop with less water requirements.

- **Huge water savings in water scarce countries**: switching to Buffel Grass (Libid) for forage reduces water requirement by 50%
  - Oman growers produce 418,366 tons of Green Rhodes grass, with 228 million m3 of water.
  - For producing same amount of forage with Buffel grass, only 116 million m3 of water was required.

Potential national water savings: 112M m3.

Opportunities

- Rangelands represent largest land use
- They contribute to the living of the poorest populations (pastoral communities)
- Provide various ecosystem services and goods to society
- Resilient system
  - Pastoralists are the most capable to adapt to CC
- Pastoralism is an efficient production system
  - Low input
  - If it is properly executed it sustains healthy ecosystems

Opportunities

- Digital revolution in agriculture (mobile phone, drones, GPS, remote sensing, sensors, etc.)
  - Mobile technology
  - Knowledge exchange
  - Market integration
  - Timely access to inputs to follow recommendations
  - Convergence of multiple actors along the value chain

- Climate change predictions
- Renewed attention to nutrition – livestock essential part of dietary diversity
- Agribusiness enterprises
- Partnership for synergy and innovation

Thank you for your kind attention

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