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Livestock and Climate

Challenges of the 21st Century: Implications for Sustainable Rangeland Restoration in the Dry Areas

EXPLORING WORLD AGRICULTURE (AGRI 438)

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Guest Lecture
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Oregon State
University

Outline



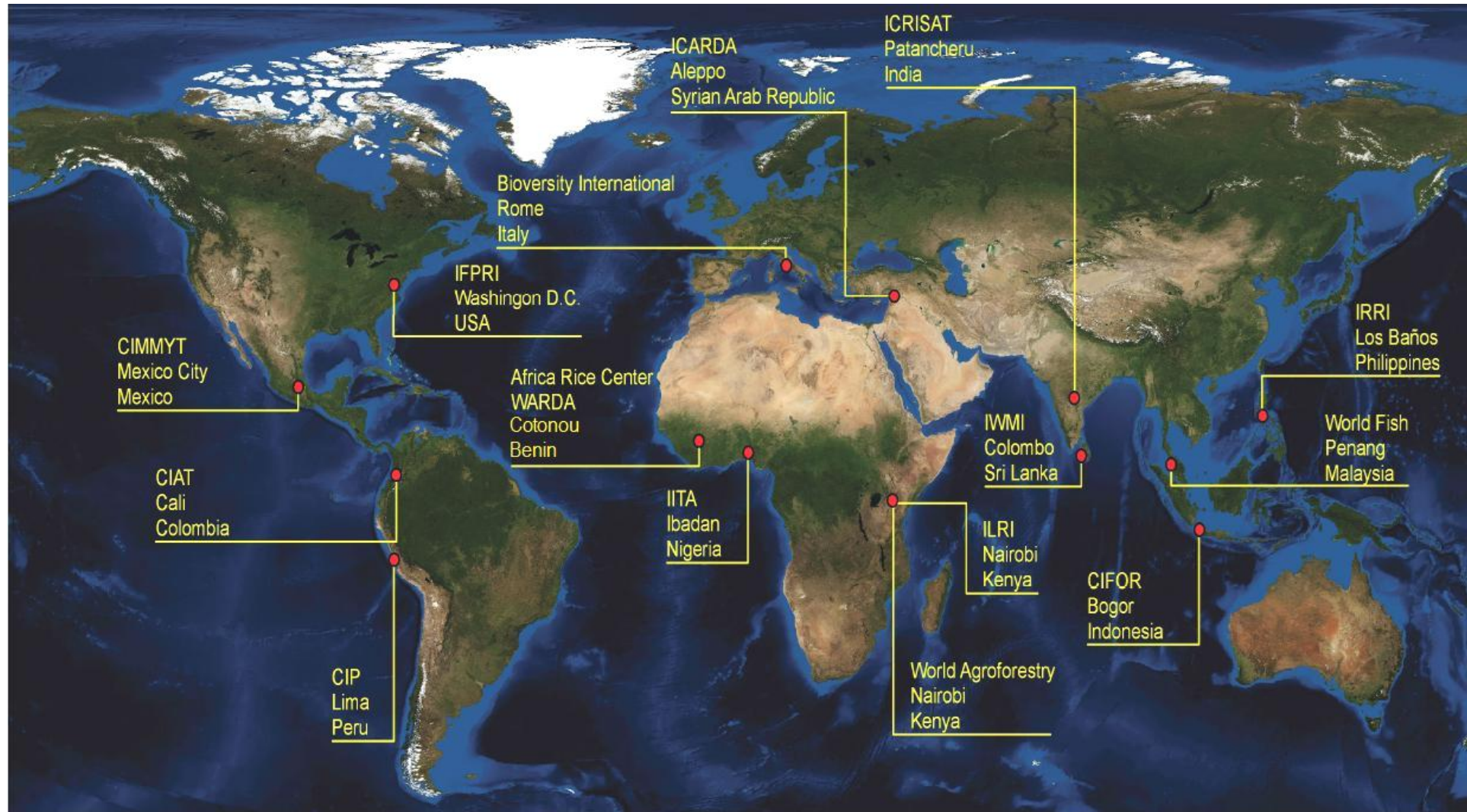
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- **ICARDA/OneCGIAR**
- **Rangelands?**
- **Global challenges**
- **Limiting factors for large scale rehabilitation**
- **Approach**
- **Concluding remarks**

Consultative Group for International Agricultural Research (CGIAR)



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CGIAR's global network of 15 Research Centers contributes to an unrivalled mix of knowledge, skills and research facilities able to respond to emerging development issues.

3,000+ partners

Unequalled partnerships network of more than 3,000 partners from national governments, academic institutions, global policy bodies, private companies and NGOs.

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We have a local presence in 89 countries with a deep knowledge of customs, values and market operations in developing countries.

50 years experience

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Why Rangelands?



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What are rangelands?



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- Land that is not farmed (cropped) or irrigated
- Land that is not forested
- Land not covered by glaciers, solid rock, concrete or asphalt
- Rangelands include grasslands, savannas, tundra and open woodland
- Is a “kind” of land ~ not a land use



How much rangeland is there?



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54% of the EARTH is rangeland



36% of the US is rangeland



53% of Western States is rangeland

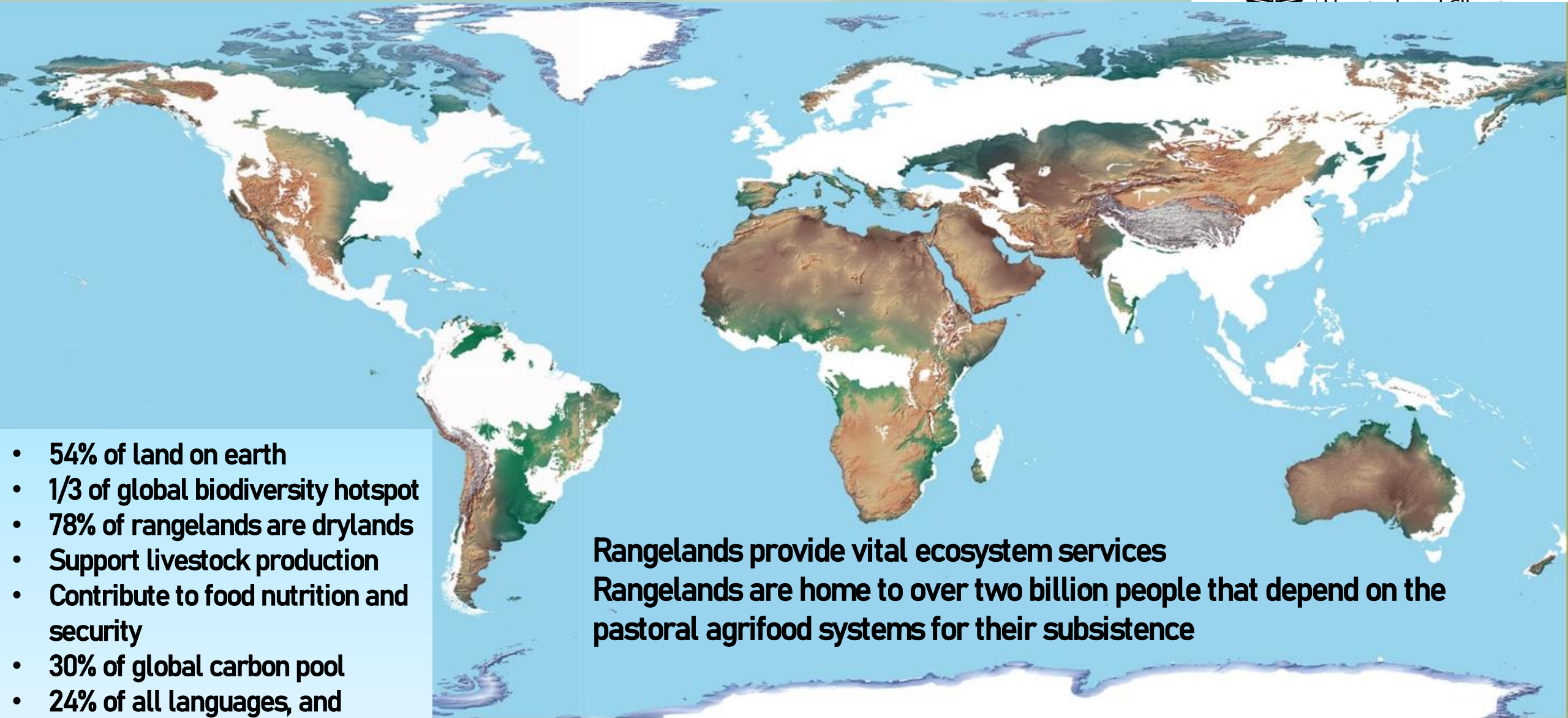


Over 70% of MENA region

Rangelands and Pastoralists are important!



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- 54% of land on earth
- 1/3 of global biodiversity hotspot
- 78% of rangelands are drylands
- Support livestock production
- Contribute to food nutrition and security
- 30% of global carbon pool
- 24% of all languages, and numerous world heritage sites

Rangelands provide vital ecosystem services
Rangelands are home to over two billion people that depend on the pastoral agrifood systems for their subsistence

Facts about rangelands & Pastoralism in MENA region



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Areas: Represent largest land use

Land tenure: Mostly state or tribal (communal)

Condition: Advanced degree of degradation

Rainfall: Low and erratic rainfall (arid and semi-arid)

Soils: poor shallow soils

Contribution to livestock feeding dropped from over 80% in early 1980s to less than 20% nowadays

Governance: Poor communities with weak institutional support

Mobility of livestock is essential to maintain the health of dryland ecosystems

Pastoralism is one of the most **sustainable food systems** in the world — particularly in marginal (semi-)arid lands

Global Challenges of the 21 Century



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Challenges and Threats to Rangelands

Rangelands are facing climatic and anthropogenic pressures, which are resulting in natural resource degradation, productivity losses, land-related conflicts and insecurities, poverty of land users, and displacement and sedentarization of populations.

In 2019, the average rate of rangeland degradation was 18.5% globally, ranging from 10% in North America to 32% in the Middle East and 35% in South America.



Challenges and Threats to Rangelands

Rangeland conversion

**20% of the world's native rangelands
have been converted to croplands**



Global drivers leading to rangeland degradation

Climate change

- Higher temperatures
- Increase frequency of drought
- Extreme weather and unpredictability (recent floodings)
- Increase in CO₂ concentration
- Increase in areas affected by salinity
- Shift in occurrence and severity of biotic stress



Global drivers leading to rangeland degradation

Population growth

- Growing population – 9 billion by 2050

Urbanization

Globalization

Ineffectual governance





Drivers leading to rangeland degradation



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- **Low appreciation of the values of rangelands**
 - **Main focus on free access to grazing land**
- **Knowledge and technology gaps**
- **Neglect of rangelands in restoration actions**
 - **Due to high cost**
- **Underinvestment**



Human induced practices leading to rangeland degradation



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Unbalanced grazing of livestock: Overgrazing and early grazing

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



Human induced practices leading to 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.



Sustainable pastoral systems are **more efficient, productive and resilient** than more sedentary agricultural systems in rangelands when all factors and benefits are counted



Human induced practices leading to rangeland degradation



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Removal of vegetation for foraging, fuel and medicinal purposes (uprooting)

Rangelands are the source of wood production for fuel, construction of houses, hedges for protection, livestock pens, making of implements for use in cultivation and houses and small wood as fuelwood for cooking and heating other purposes.



Human induced practices leading to rangeland degradation



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Poor policy and weak institutions

- Poor policy such as subsidized animal feed (barley)
- Weak institutional support (lack/no reinforcement of pastoral code (laws), weak extension services, too many agencies, etc.





As the pressure on our natural resource base increases, today the major challenge is how to achieve **socio-ecological intensification** to be able to sustain the increasing populations without compromising the environmental quality and natural resources that underpin crop and livestock production?



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Approach

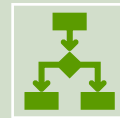


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From whose perspective (social dimension)?



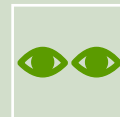
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Who makes the decision on what has to be achieved?



Did we capture the voice of all relevant stakeholders?



Whose vision, is it?



What is the voice
of the people on..

Choice of practices: WHT, SLM
Choice of shrub/tree species
The nature of benefits generated
from the initiatives

“We are not here to rebuild what we have lost,
We are here to BUILD OUR FUTURE.”

Delta Electronics Group

What landscape we want to have?



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- **History:** How did we come to where we are? [What lead to the degradation?] **[diagnostic]**
- **Context:** What is the context within which the restoration or rehabilitation is going to take place? **[objective]**
- **Risks and drivers of change:** What are the risks and drivers of change that we need to take into account? **[climate change, political stability, Covid-19, etc.]**

Keeping in mind these basic questions



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- Is the need for restoration/rehabilitation community driven or driven by outsiders?
- How to mobilize and solicit community support for rehabilitation/restoration programme – management of rehabilitated/ restored area.



Planning



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- Understanding socio-cultural, land tenure, rights to access - rather than focusing only on biophysical and technical aspects.
- Identifying targeted groups (homogenous, less conflict) to start with.
- Setting restoration/rehabilitation priorities and targets.
- What type of intervention, where, how and for what use?

Participatory approach



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- Need to adopt a participatory multidisciplinary approach
 - Conduct land/biological planning
 - Select/implement proven technologies (SLM)
 - choice intervention,
 - choice of species, etc.
 - Type of management (use)
- Capacity building program of concerned parties including farmers, extension specialists, local authority, etc.



Limiting factors for large scale rehabilitation



Limiting factors for large scale rehabilitation



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1. Rangeland governance

Rangeland Hima

Working with communities

Hima means 'protected area' in Arabic. *Hima* is a traditional approach to the conservation of natural resources and has been used in the Arabian Peninsula for more than 1,500 years.



Implementing a *hima* system requires consideration of the land tenure system in place, the biodiversity on the site, and the socioeconomic and cultural context of the community.



The *hima* system is a proven approach that can produce significant positive results in terms of preserving natural resources, conserving ecosystems, restoring biodiversity, and supporting local communities.

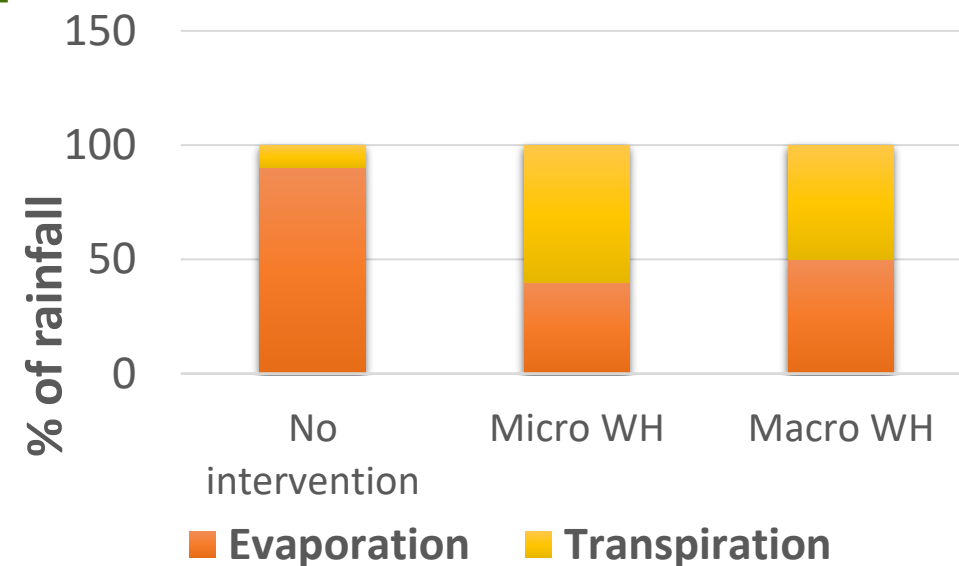


Limiting factors for large scale rehabilitation

2. Water is limiting in arid environments

Water harvesting increases water availability in the rangelands

- 90% of rainfall is lost in evaporation and in salt sinks
- Water harvesting captures runoff and stores it
- Storage in small reservoirs, groundwater and soil profile
- 40-50% water saving



Limiting factors for large scale rehabilitation



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2. Water is limiting in arid environments

Water harvesting techniques

Semi-circular bunds



Limiting factors for large scale rehabilitation

2. Water is limiting in arid environments

Water harvesting techniques

Micro-catchments
Contour ridges

Intermittent



Continuous



Limiting factors for large scale rehabilitation



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2. Water is limiting in arid environments

Water harvesting techniques

Gabion check dam

A gabion is a cage which has a cubic shape filled with stony material of suitable diameter enclosed in metal grating keeping the stones together and stops them from moving under the pressure of water.

The technique of gabion check dam consists in binding different cages together to form a complete gabion unit.



Limiting factors for large scale rehabilitation

2. Water is limiting in arid environments

Water harvesting techniques

Jessours



Jessour is an ancient runoff water harvesting technique widely practiced in the arid highlands

Jessour is the plural of a Jessr which is the hydraulic unit comprising a dyke, spillway, terrace (cropping area: fruit trees and annuals), and impluvium (runoff catchment area) **Photo: van Delden H.**



Limiting factors for large scale rehabilitation



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3. Seeds and seedlings availability



Cuttings made in the
spring, ready to plant in
the fall (after first rains)



Mapping and monitoring rangeland vegetation using Geo-informatics (RS – GIS – GPS)



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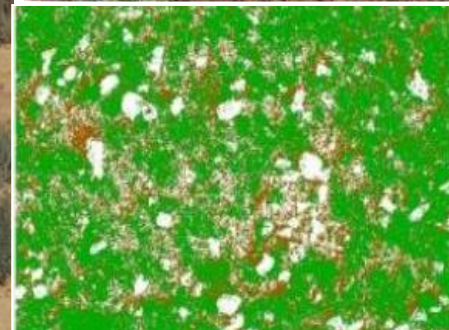
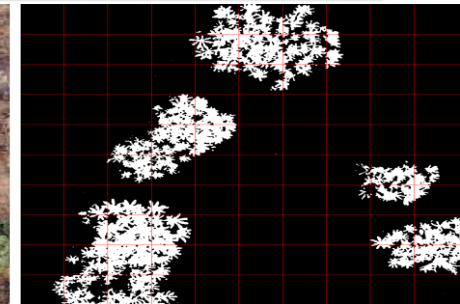
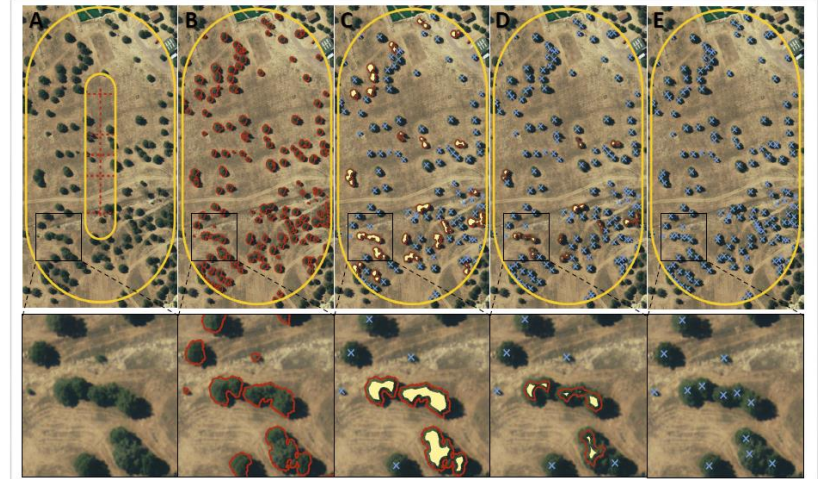
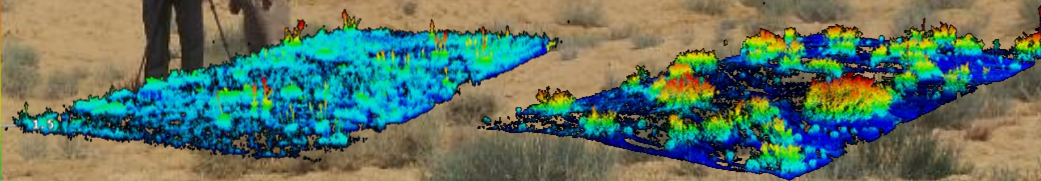
Woody Plant Assessment at the Landscape Scale

LIDAR: LIGHT DETECTION AND RANGING



AGL Height

3.0



Success factors



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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



Six basic steps for restoring / rehabilitating a degraded ecosystem



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1. Set a goal
2. Determine a strategy and methods
3. Remove the source of degradation
4. Restore the physical environment
5. Restore the biota
6. Be patient – restoration takes time



Concluding remarks

- Bottle neck in rangeland restoration is social/policy rather than technical
- Approach should be participatory and multidisciplinary
- Key words: collective action, social fencing, feeling of ownership
- In arid environment, every drop of water does matter (WHT and choice species)
- Use of a particular intervention in the restoration of degraded rangelands is site specific – no one single rule to apply anywhere!
- The more time is invested in the planning phase – more chance for success of the programme.





Oregon State
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ICARDA
Science for resilient livelihoods in dry areas



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