Introduction

- **Dryland agriculture**: characterized by land use systems across the desert, arid, semi-arid and dry sub-humid agro-ecologies.

- Communities living in these “difficult” environments have developed resilient farming systems comprising *interalia*:
  - Use of grasslands that support almost half of livestock globally;
  - niche crop/commodity production systems;
  - forestry/agroforestry – to sustain highly adapted livelihood systems.

- Dryland agriculture constitutes >44% of global agricultural production and contains significant agro-bio-diversity. And drylands **contribute to 50% of the livestock production**, globally.

- Sustainability of agricultural production systems = highly judicious use of resources: knowledge-intensive use of biomass; soil fertility management, efficient water use technologies, and context-appropriate production and protection measures.
Other features of Dryland farming systems:

- Some **33 % of the global human population and 50%** of a range of livestock production systems.

- Plant and animal health is crucial for the production of food for human consumption.

- Plant pests and diseases are important threats to farming community-livelihoods especially in developing countries where agriculture is the main source of income.

- A very high proportion of agriculture production is lost annually due to destructive pests and diseases – (the latest Desert locust plague).
Challenges for Dryland Agriculture

- First and foremost – **limited access to poor quantity and quality of water** = limited biomass

  - Poor soil fertility, inappropriate agricultural practices, leading to:
    - Physical deterioration of (already marginal) natural resources
    - Poor management of the soils and declining soil fertility

- These factors have a combined impact on food productivity and production – leading to huge biological yield gap
Overcoming Challenges & Opportunities

- Traditional sustainable resource management systems are breaking down: demographic pressures; climate change etc.

- Coupled with weak institutions: agricultural advisory services and so, poor access to knowledge of cutting-edge technologies, new practices /techniques for marginal farmers (with no decision tools).

- **Agriculture in the drylands can thrive through:**

  - Innovative cultivation methods and novel technologies
  - Modern smart irrigation technologies
  - Soil fertility management
  - Improved dryland food and feed crop varities

A holistic approach to Food Systems for sustainable production in drylands in order to deliver on SDG 1 & 2 with links to the entire 2030 Agenda.
What can we learn from IFAD’s grant portfolio?

Target groups

- The Fund’s target groups and their household food-security strategies predominantly located in harsh, marginalised agro-ecologies;

Tailored Investments

- Over the past four decades IFAD has invested more than USD 2 billion in the development of best-bet technologies with particular reference to those in remote, risk-prone and marginal areas and marginalised target groups.
Examples in Water Resource management: Alternatives for Smallholder Irrigation

- Emphasis on Demand Management
  - More Crop per Drop

- Renewed interest in provision of supply
  - More Drops on the Crops
More Crop per Drop? Alternatives for Smallholder Irrigation

Community Level Tools for decision making and implementation should include:

- sustainable, healthy, and ecologically sound management of smallholder irrigation
- Smallholders using manpower or pumps
- Small multi-purpose reservoirs
- Larger government sponsored smallholder schemes
Atriplex/barley alley cropping
Adoption of high impact Forage Legumes

- Promotion of rotations of barley with forage legumes (Vicia and Lathyus spp.)
- Improved breeds of small ruminants – better adaptability and more efficient feed conversion
Example of sheep Feeding on Barley Stubble
Innovations in breeding

EFFICIENT FEED CONVERSION

EARLY WEANING
Adapting Spineless Cactus -
Protection technologies in desert conditions with net-houses

- With IFAD and AFESD support ICARDA and NARS have developed net houses throughout the Arabian Peninsula since 2008 (Arabian Peninsula Regional Programme).

- Soil-less agriculture (Hydroponics) in UAE.

- Protected agriculture is very promising (e.g., Afghanistan, Yemen): Net-houses allow vegetable production in desert conditions 8-9 months of the year with high yield. Net benefits same as cooled greenhouses in 12 months due to energy savings.
Technologies for storable, transportable feed

IFAD-supported – development and scale-up of feed-blocks
The promise of new technologies for sustainable food systems in the drylands

Fourth industrial revolution technologies – examples:

- Precision agriculture using AI
- Remote sensing (satellite imagery & ground truthing)
- Drones for better mapping soil structure
- "Good" biotechnologies - molecular markers (breeding efficiency)
- Gene-editing techniques

And much more......