

International Center for Agricultural Research in the Dry Areas

Science for better livelihoods in dry areas



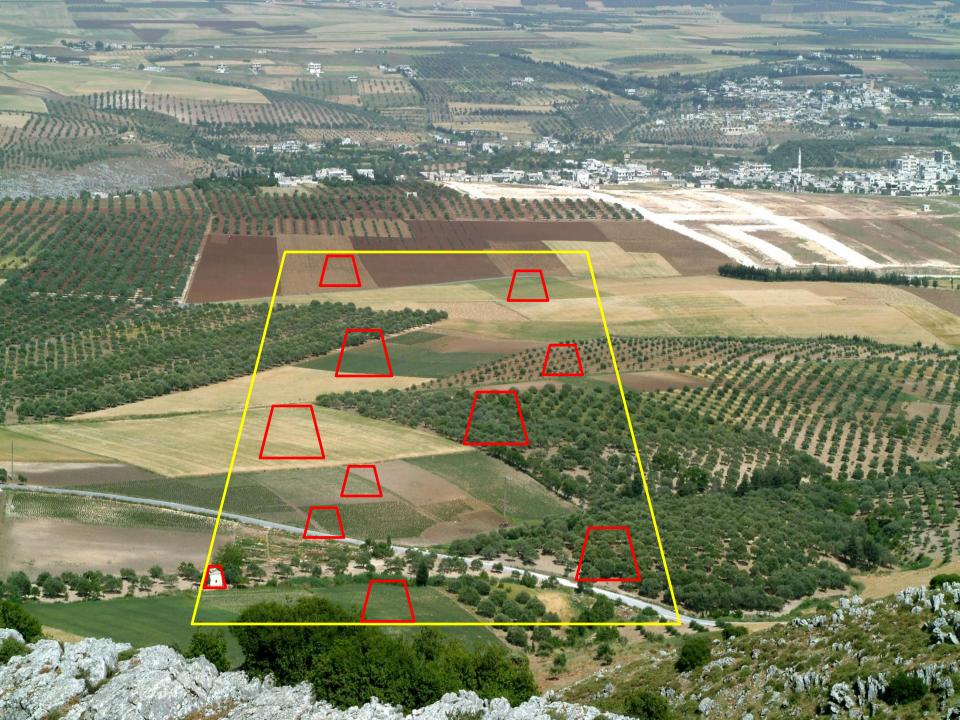






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NASA LCLUC Science Meeting Nov 11-13, Tashkent





uring Security

Role of Geospatial Science, **Technology and Applications** (GeSTA) in Dryland Systems

Specific

mutual-interaction

& synergies

between plant and

animal species and

management

practices



Integrated agroecosystems: innovative approaches and methods for sustainable agriculture, while safeguarding the environment

### Youth & Capacity Dev.

**Engaging and** empowering young gen. by creating opportunities



Remote sensing ■ missions in orbit°

Sensors potential in CRPs/IRPs, etc.

**>6** are free

Mapping present, emerging & future land use /land cover dynamics, cropping patterns, intensities, water use, pest & diseases, climate change & SRT2: Redu impacts

Land degradation & reclamation in existing production systems

Characteristics of

agricultural and

livestock production in

smallholder farming

systems and rural

livelihoods

Characterization of vulnerable areas for increasing resilience and assist in identifying mitigation pathways with biophysical, socioeconomic and stakeholder feedback as well as specific needs &

constraints

1) The West African Sahel and dry

4) Central Asia, and 5) South Asia.

Africa, 3) North Africa and West Asia

savannas, 2) East and Southern

Regions

Startup 35.47m Total 122.7m

Cooperative Research and **Partnerships** 

#### Gender

Address social inequities, greater roles and priorities

Earth's land area

Measuring the

impact at spatial

scales, rate,

magnitude, synergy

among the systems,

CRPs, cross-regional

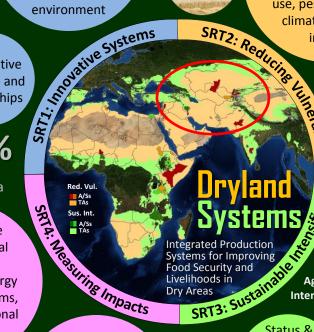
synthesis

Farmers,

stakeholders,

policymakers,

mobilization, &



SRT3: Sustainable Inter Integrated Production Systems for Improving Food Security and Livelihoods in **Dry Areas** 

21% 72% **Agricultural** 

Intensification

trends of

existing

production

systems

Increase in

ood production potential sources

**Cropping Intensity** 

**Arable Land** 

Mapping the extent of existing & traditional practices, indigenous knowledge, diversity, potential areas for modern & improved, productive, profitable, and diversified dryland agriculture, & linkages to markets



**Biodiversity** 

Spatial enrichment

and its role in food

security, risk

mitigation, &

sustainability

Assessing the impact of outcomes in Action Sites, post-project implementation, &



patterns,

Health

health

Delineation of potential, suitable areas for sustainable intensification. diversification of production systems

Livestock

■ Drylands

Live in

Assessment of present, emerging & future droughts, floods, pests & diseases, extreme events, infrastructure,

migration

**CGIAR** 

Geospatial

commons,

KM sharing,

stakeholder

feedback

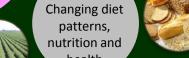
PROGRAM ON

**Dryland Systems** 





M&E



Improved \_ivelihoods

# Crosscutting themes and linkages of CGIAR Research Programs\* (CRPs)



Managing biodiversity in agro-systems. Focused Identification of Germplasm Strategy. Characterization of genetic resources at landscape level.

> Hyper and ultra spectral mapping of genotypic and phenotypic variability

**Climate Change** 

Eco-friendly climate change adoption - strengthening approaches for better management of agricultural risks associated with increased climate variability and extreme events

**CRP CCAFS** 

**CRP** 

WLE

Mapping inter and intra variability at species, field, and farm scales

Water, Land and Ecosystems Improving land and water, productivity, and ecosystem services. Assessment of land degradation, soil health and nutrition, and climate change impact

Innovative tools and techniques for improved agronomic practices and management

**Nutrition and Health** Improving synergies between agriculture, nutrition, and health. Location base services-distribution. access pattern, value chain, and control of zoonotic diseases/pests and risks **CRP** DS

#### **Dryland Systems**

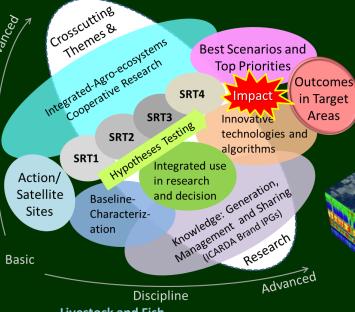
**GB** 

Applications

**CRP** 

N&H

Enhancing productivity and managing risks through diversification, sustainable intensification, and integrated agro-ecosystem approaches



#### Livestock and Fish

Resilience and vulnerability of livestock production under changing climate, land use and markets, identify and address key constraints and opportunities

**CRP** L&F Bio-physical-spectral Location based libraries for mapping services in natural agricultural productivity resource management Policies, Institutions, and Markets Sustainable intensification, challenges

and constraints, integrated crop and pest management practices, and value chain linkages

Integrated pests and

CRP

WHEAT

**CRP** 

GL

**CRP** 

PIM

**CRP** 

DC

## diseases management

#### Wheat

Improving productivity and profitability of wheat, improved resistance to pests and diseases, climate resilient, and increasing yield while reducing inputs

Geo-referenced in situ/field photo and data collection



#### **Grain Legumes**

Sustainable intensificationchallenges and constraints, integrated crop and pest management practices, and value chain linkages

Quantification of trends

# and status of soil fertility, salinity, and degradation,

#### **Dryland Cereals**

Validating high yielding varieties with better pest and disease resistance, tolerance to abiotic stresses, and improved crop management \*ICARDA technologies

Led/Involved

# Remote Sensing of Agro-ecosystems Shift in Paradigm: Landscape to Farmscape

	Platforms	Ground/ <i>in-situ</i>		Airborne		Spaceborne				
	Mode	Hyperspectral	Multispectral	Optical	Lidar		Optical		LiDAR	SAR
RS data characteristics	Sensor	ASD FieldSpec	M× Camera	APs/UAVs	Lidar	WorldView-2	Landsat	MODIS	ICESat*	PALSAR
	Spectral	350-2500nm	4 bands	3-4 bands	1264nm	8 bands	7 bands	7/36 bands*	1264 & 532nm	L band
	Spatial resolution	0.1-1.5m	0.1-0.2m	1-m	20 - 80cm	0.46m Pan;	15m Pan;	250m, 500m,	70m	10m, 20m,
						1.84m MS	30m MS	1000m MS		100m
	Swath	1-4m	2-10m		1-2km	16.4km	185km	2330km		35-250km
	Revisit			3-year		1.1 days	16 days	1 day	91 days	46 days
Biophysical	Plant biomass	×	×		×	×	×	×		×
	Plant height				×				×	×
	LAI, fPAR, LST	×	×			×	×	×		
	NDVI, EVI, LSWI	×	×	×		×	×	×		
Biochemical	Erosion, Salinity	×	×	×	×	×	×	×		
	Soil moisture	×	×	×		× /	×			×
	Chlolophyll	×	×	×		×	x	×		
	Nitrogen	×	×	×		×	×			
	Phosphorous	×	×							
	Plant water	×	×			×		×		
Produc tion	GPP	×	×	×		×		×		
	NPP	×				×	×	×		
CUIC	land cover/use	×	×	×		×	×	×		×
	phenology	×	×				X	×		×
	Irrigation	×	×	×		×	×	×		×
Terrain	DEM		×	×	×	×			×	×
	Derivatives		×	×	×				×	×
Scale	Tier 1 AOIs	×	×	×	×	×	×	×	×	×
	Tier 2 action sites	×	×	×			×	×	×	×
	Tier 3 AEZs	×	×	×				×	×	×
	Tier 4 Target			×				×		×

