TECHNICAL SESSION

Coping with increased water demand for agriculture in dry areas What does it take?

1st Cairo Water Week

Monday 15 October 2018 **12:00 - 13:30** **Nile Ritz-Carlton: Qahira C**

Opening Remarks:

Director General Aly Abousabaa
ICARDA

Special Guest:

Dr. Mahmoud Abu-Zeid
President of the Arab Water Council

Speakers:

Atef Swelam, ICARDA:	Chair of the Session
Theib Oweis ICARDA:	Science and technology to improve land and water productivity
Chandrashekhar Biradar ICARDA:	The bigger picture: Using Big Data in water management
Amgad Elmahdi IWMI:	Improving water productivity at system level
Clemens Breisinger IFPRI:	Enabling environment to enhance water productivity across scale
Harrison Charo Karisa WorldFish:	Towards water efficient integrated agri-aquaculture production systems

Core to the work of four research institutions - ICARDA, IWMI, IFRPI and WorldFish who participating in a joint session in the 1st Cairo Water Week - are the strategic partnerships with key stakeholders and institutions engaged in climate change adaptation and agricultural development. This collaboration ensures contextualized science-based solutions to address vulnerability and societal risk and in order to make communities more food secure and resilient to effects of climate change and population growth.

The CGIAR centers offer access to a comprehensive knowledge base and new technologies. These are shared as public goods and freely available to be utilized to transform traditional agricultural practices to contextualized and cost-effective solutions matching needs of different ecosystems.

ICARDA
Science for resilient livelihoods in dry areas

IWMI
International Water Management Institute

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI

WorldFish

International Center for Agricultural Research in the Dry Areas (ICARDA)
Contact: Dr. Atef Swelam a.swelam@cgiar.org +20 10 02 19 78 21

@icarda

Coping with Increased Water Demand for Agriculture in Dry Areas: What Does it Take?

Speaker and Panelist Bios

Mr. Aly Abousabaa, Director General, ICARDA

Mr. Abousabaa has been Director General of ICARDA since 2016. A civil engineer by training, he brings 33 years of experience to ICARDA, with a focus on strategic leadership in the fields of sustainable development, operational and policy-based lending, as well as project and portfolio management. Previously, Abousabaa served as the Vice President of Agriculture, Water, Human Development, Governance and Natural Resources at the African Development Bank Group (AfDB).

Dr. Mahmoud Abu-Zeid, President of the Arab Water Council

Dr. Abu-Zeid was the Minister of Water Resources & Irrigation of Egypt from 1997-2009. He is Honorary President of World Water Council, a Member of UN Advisory Board on Water Supply and Sanitation, a former President of International Water Resources Association (IWRA), and has held the title as Vice President of International Commission on Irrigation and Drainage (ICID). He holds a BSc in Civil Engineering, MSc in Irrigation Engineering, and a PhD in Groundwater Hydrology from University of California, Davis. Abu-Zaid is Honorary Doctorate From IHE Delft, holder of several awards and prizes, and has authored more than 200 papers and 11 text books. Dr. Abu-Zeid led the move towards on-farm Water Management and Integrated Water Resources Management in Egypt.

Dr. Theib Y. Oweis, Director of Integrated Water, Land Management and Eco-systems, ICARDA

Also Distinguished Guest Professor of Water Management in Agriculture, Tottori University, Japan. Dr. Oweis has worked for ICARDA since 1991. He has over 40 years of experience in international research, development and capacity building focused on water management for agriculture in the dry areas. Previously, he was assistant professor of irrigation and drainage at the University of Jordan. He received his Ph.D. in agriculture and irrigation engineering from Utah State University.

Dr. Chandrashekhar Biradar, Head of Geoinformatics Unit, ICARDA

As a principal agroecosystems scientist he heads the Geoinformatics Unit at ICARDA and work with GeoAgro, Big Data and ICTs for resilient agroecosystems research. He pioneered the world's first satellite sensor-based mapping of rainfed areas, irrigated areas and agricultural water productivity, and has developed remote sensing-based methods and algorithms to address ecological intensification. Current research involves Digital Augmentation for accelerating agroecological intensification for improving food, nutritional and ecological security. Biradar has authored over 200 publications, including 85 peer reviewed journal articles, 24 books and book chapters. He has received numerous awards and honors, including Best Team Initiative, Young Scientist, Outstanding Scientist Award.

Dr. Amgad Elmahdi, Head of Middle East and North Africa, IWMI

Dr. Elmahdi has over 20 years of experience in the fields of hydrology, natural resource management, water accounting and assessment and water information management in operational and research terms. Prior to joining IWMI, Dr. Elmahdi was Section Head: Water Resources Assessment, Climate and Water Division, Bureau of Meteorology in Australia. He holds a PhD in Water Resource Management from the University of Melbourne, Australia, M.Sc. in Land & Water Management from MAIB Institute of Bari, Italy and M.Sc. in Water Pollution and Ecological Value from University of Mansoura, Egypt. Dr Elmahdi represents IWMI in the sub-region and the mission to provide evidence-based solutions to sustainably manage water and land resources for food security, people's livelihoods and the environment.

Dr. Clemens Breisinger, Senior Research Fellow and Country Program Leader, IFPRI

Since 2010, Breisinger also leads the Middle East and North Africa team, which provides knowledge, strengthens capacity and aims at influencing policy and investment decisions for an Arab World free of poverty and malnutrition. The team's academic papers, reports and policy briefs are widely read and quoted by international media. Breisinger's research covers issues related to the roles of agriculture and mineral resources for economic development, building resilience to crises and climate change, and designing policies for improving food and nutrition security. He received his PhD in agricultural economics from the University of Hohenheim in 2006, where he also worked as a research and teaching associate since 2003.

Dr. Harrison Charo Karisa, Country Director for Egypt and Nigeria, WorldFish

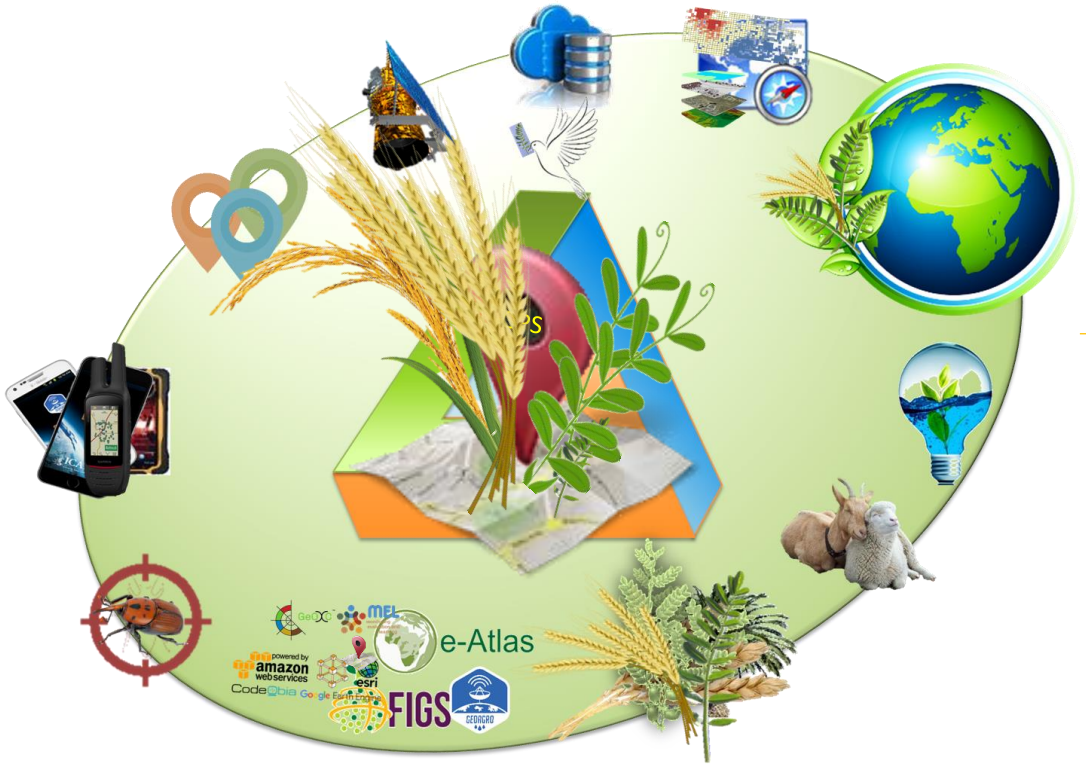
A fish geneticist, Harrison has extensive experience in aquaculture and marine and freshwater capture fisheries management. He holds a PhD in animal sciences from Wageningen University, Netherlands, in 2006 and holds an MSc in biodiversity from the Swedish University of Agricultural Sciences, Sweden, and a BSc Hons from Jomo Kenyatta University of Agriculture and Technology, Kenya. He spent time with WorldFish at Abbassa, Egypt, during his PhD studies, and has held key positions in his native Kenya as director of fisheries resources development and marketing, director of the National Aquaculture Research Development and Training Centre, Sagana, and national chairman of the Aquaculture Development Working Group. He was also assistant director of aquaculture research at the Kenya Marine and Fisheries Research Institute.

Dr. Atef Swelam, Water Management Specialist, ICARDA

Swelam is senior scientist with expertise on irrigation and water management with ICARDA's Water, Land Management, and Ecosystems program. He joined ICARDA in 2009 and focuses on sustainably intensifying and diversifying small-scale farming in large irrigation systems under changing climatic conditions to improve the livelihood and resilience of vulnerable rural communities. He led several regional and international water and land management projects. He holds MSc from IAM-Bari, Italy on water and land management , Ph.D. in agricultural engineering from the University of Zagazig in Egypt and completed his post-doctorate at the University of California, Davis.

ICARDA

Science for resilient livelihoods in dry areas



The bigger picture: using Big Data in Water Management

Copying with increased water demand for agriculture in dry areas: what does it take?

Chandrashekhar Biradar and team

Cairo2018 Water Week

14-18 Oct, 2018, Cairo Egypt

GEOAGRO

Leaflet

amazon web services

Google Earth Engine

esri

CGIAR

Platform for Big Data in Agriculture

WORLD BANK GROUP

CGIAR CSI Consortium for Spatial Information

icarda.org

International Center for Agricultural Research in the Dry Areas

cgiar.org

A CGIAR Research Center

CGIAR

New 9: 5 SRPs + 4 CCTs

Genetic Resources: Mining crop diversity to develop germplasm resistant to heat, drought, cold, disease, higher nutrients; International public goods (open access)

Adaption to Climate Change: Conventional and molecular breeding to develop climate-smart crops and livestock

Building resilience: Integrated crop-livestock farming systems to address economic, social, and environmental conditions

Promoting value chains, policies: Agriculture as an income-generating business for many poor smallholder households

Enhancing water, land productivity: Rainfed, irrigated, and agro-pastoral farming; Reversal of environmental degradation; Enhance intensification

GEOAGRO

CCTs

BigData

Scaling

CapDev

Gender

SRPs-strategic research priorities + CCTs-cross cutting themes

Big Data in Integrated Water Management

DECODING
The Data Ecosystem

GEOAGRO

Integrated Agroecosystems combining **Component** Research & **Systems** Research

A multi-scale and multi-criteria R4D

Global

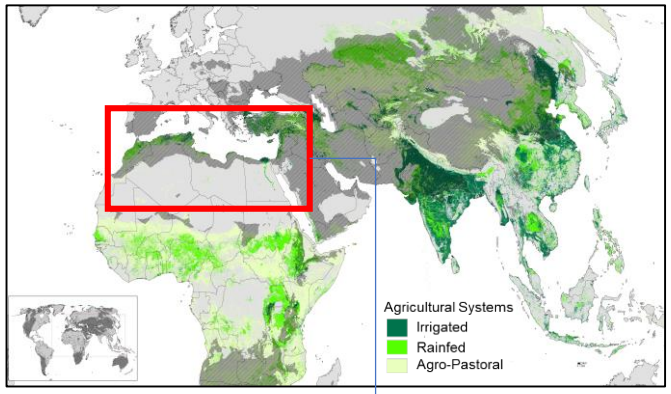
Country

Region

Landscape

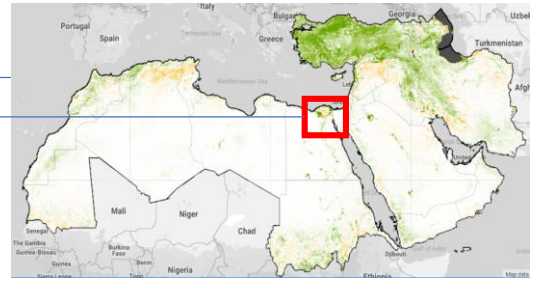
Field

icarda.org

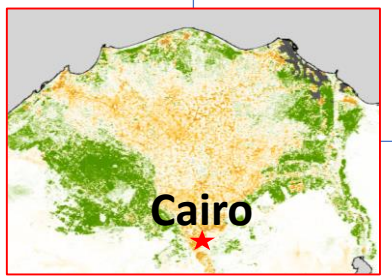


Climate (Variability and Change)

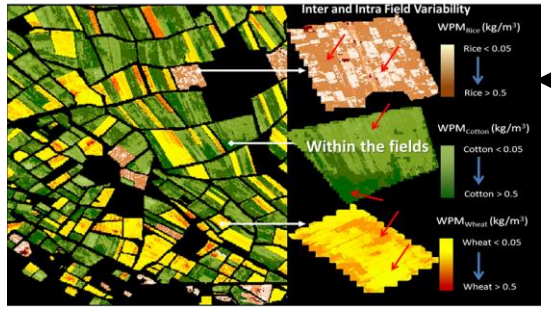
Nutrition Security and Sovereignty



Un-employment
Poverty



NRMs



Functional
Productivity

Farm

Supply Chain

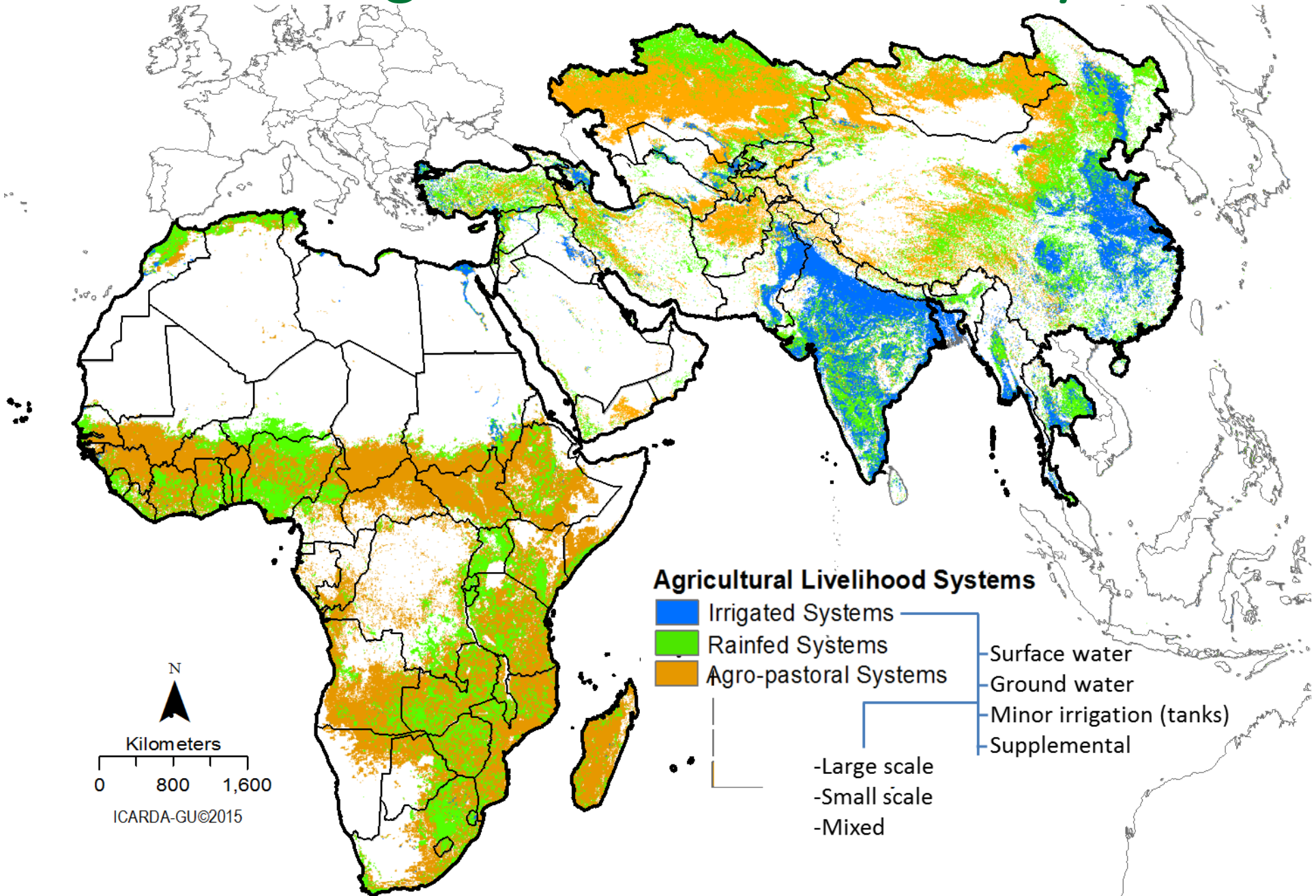
Down

Out

Up

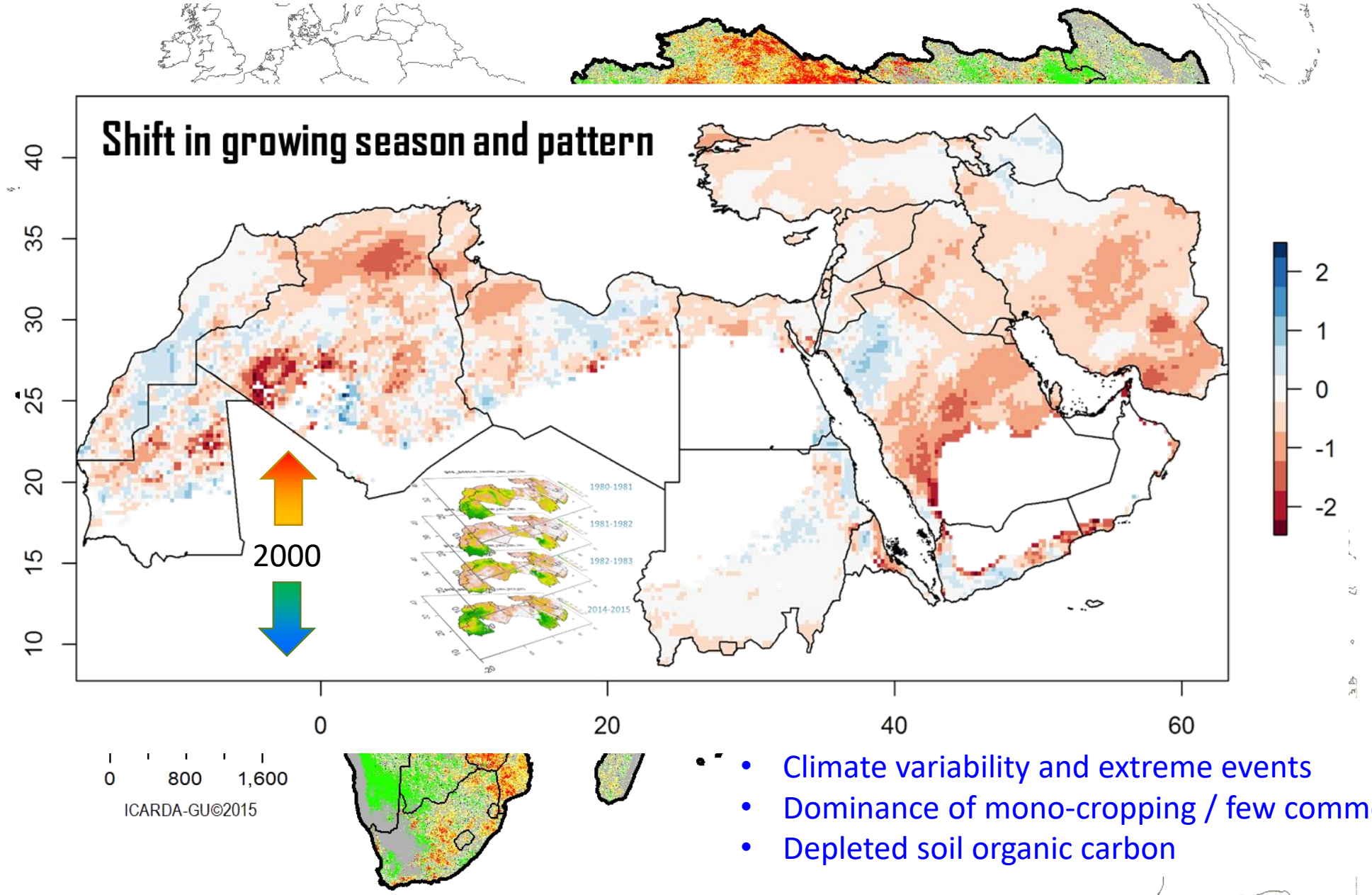
Agricultural Systems
Irrigated
Rainfed
Agro-Pastoral

Active Agricultural Production Systems



Changing Water Balance

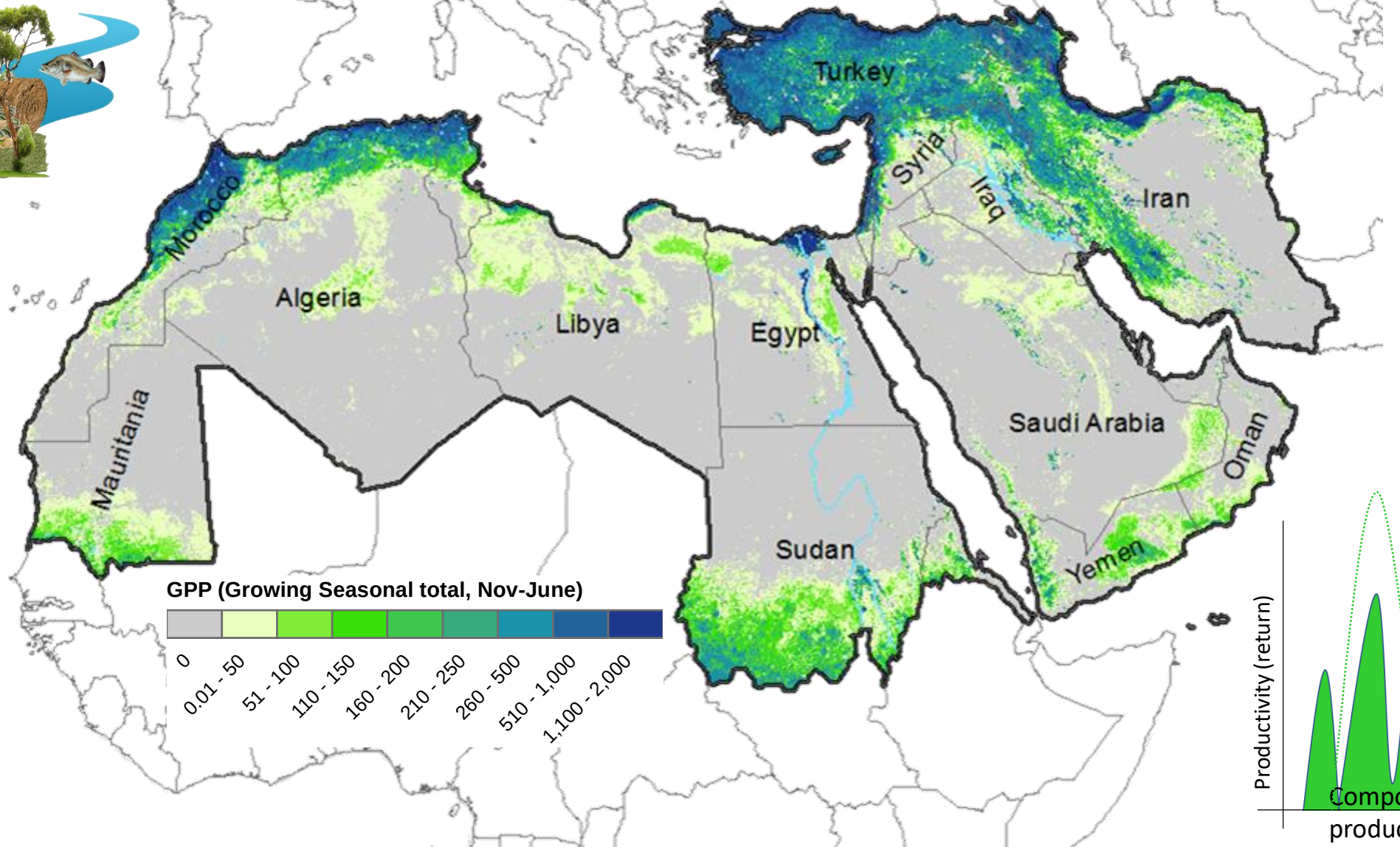
Frequent deviation from long-term averages

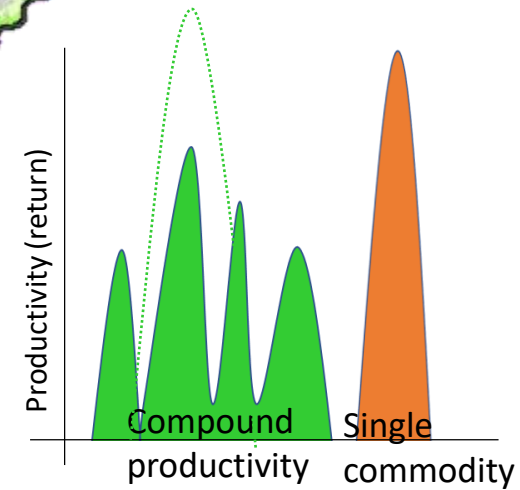


- Climate variability and extreme events
- Dominance of mono-cropping / few commodity focus
- Depleted soil organic carbon

Impact of cropping pattern on yield compounding

Quantification of Water Productivity and Yield Gaps @ multiple-scales

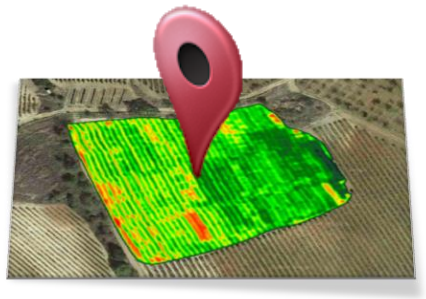




Copying with water demand

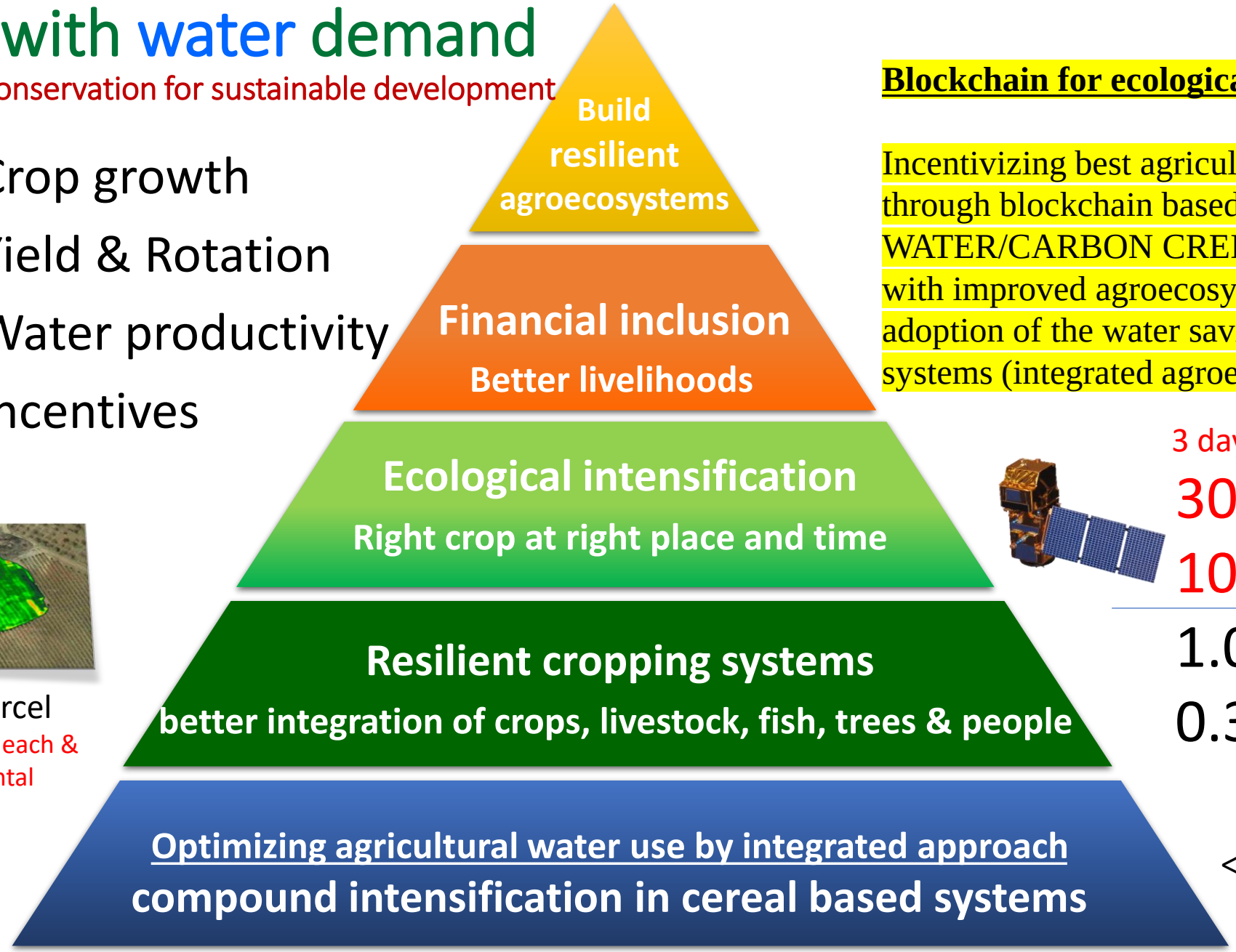
Water conservation for sustainable development

1. Crop growth
2. Yield & Rotation
3. Water productivity
4. Incentives



Pixel/Farm/Parcel

A single entity for each & every developmental entry point



Blockchain for ecological intensification

Incentivizing best agricultural practices through blockchain based WATER/CARBON CREDITS associated with improved agroecosystem health by adoption of the water saving agri-food systems (integrated agroecosystems)

3 days revisit

30m

10m

Open source

1.0m

0.3m

Agreements

<Biggest drivers

Does food legumes can be an option for coping with increased water demand in the dry areas?

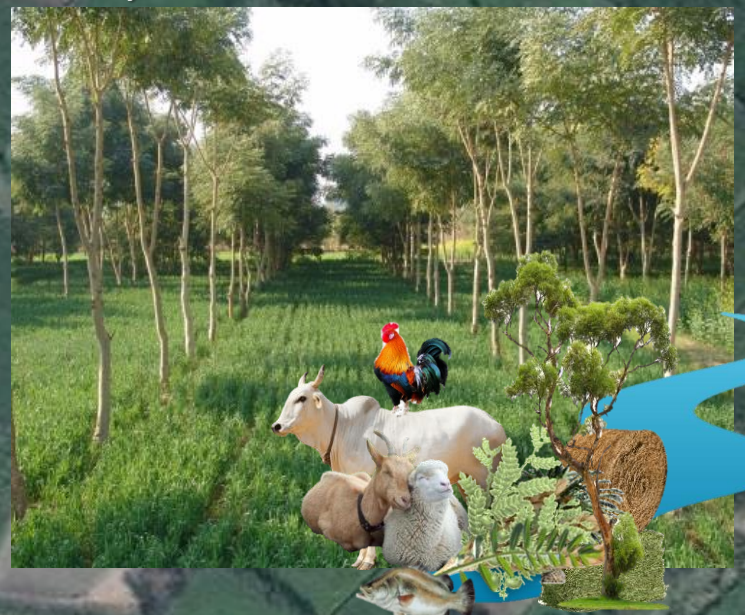
Water productivity of terrestrial food plates (liters/kg)

Daal/Falafal
1,250lt

Chicken
4,325

Mutton
5,520

Beef
13,000



[mixed crops, livestock, fish and trees] –policies

Big-data, Machine Learning and AI algorithms

AI-ML-BigData @ genetics, chemistry, weather, agronomies, trade…

AI
ML

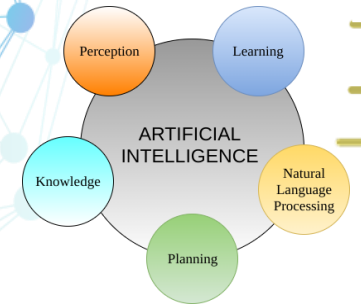
Big
Data

Meta Analytics

deep learning
predictive analytics
machine learning

translation
classification & clustering
information extraction
natural language processing (NLP)

contexts
options
location
typology
Demand driven
Sustainable options



expert systems

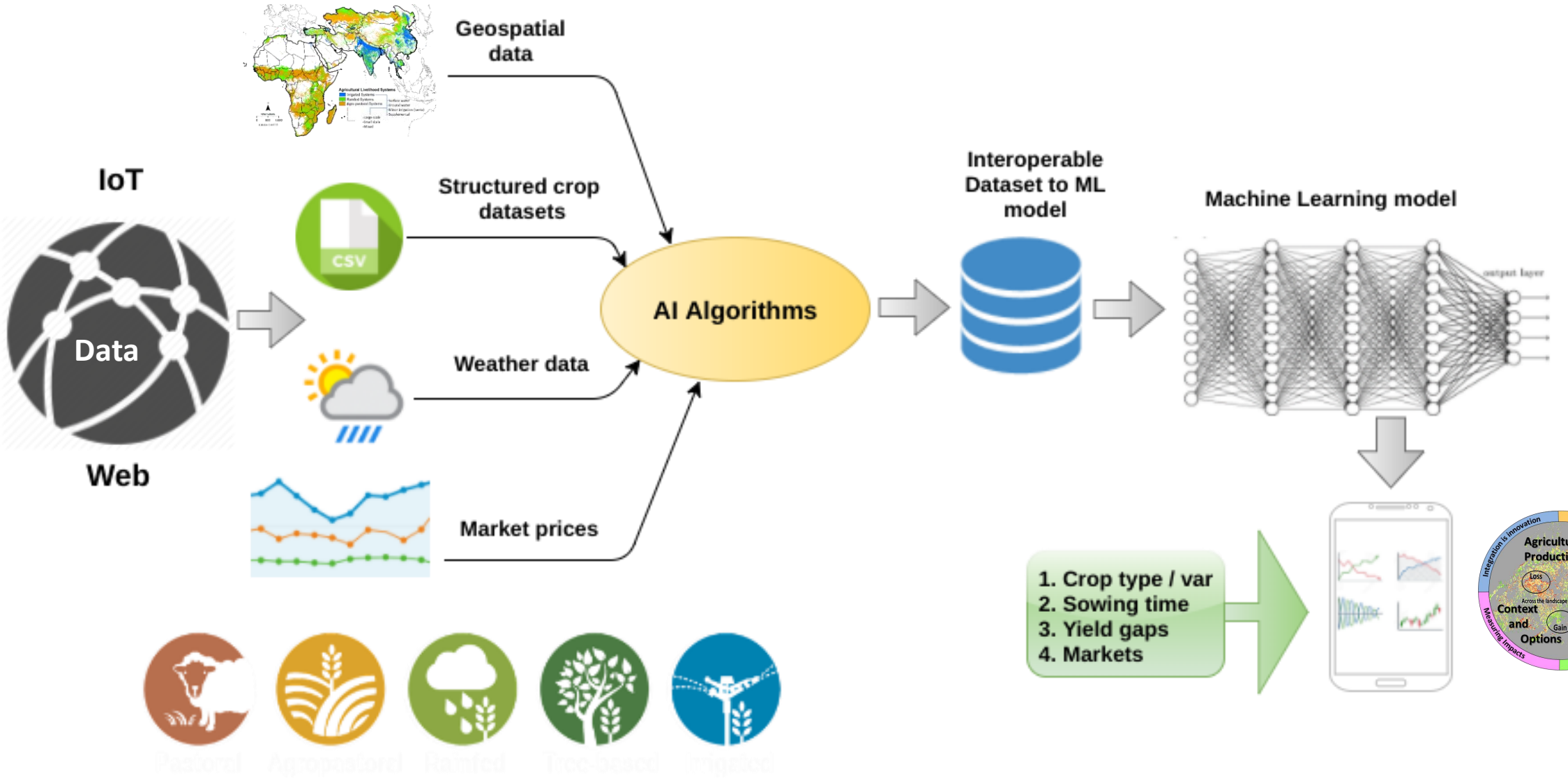
planning, scheduling & optimization

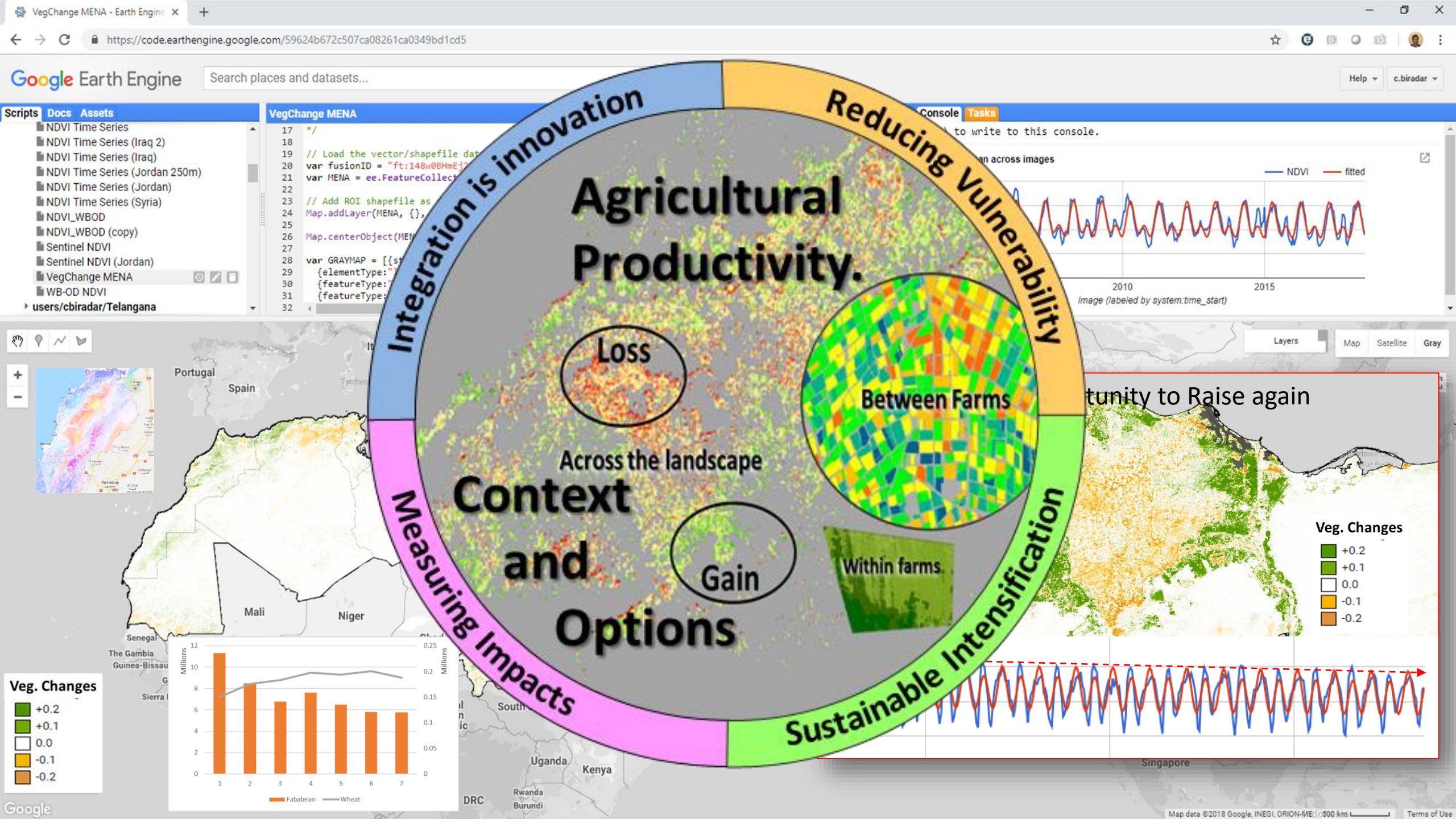
robotics

image recognition
machine vision
vision

Inclusive Agroecosystems

Big-data, Machine Learning and AI algorithms




Integration is innovation
Reducing Vulnerability
Sustainable Intensification
Measuring Impacts
Agricultural Productivity.
Loss
Gain
Between Farms
Within farms
Across the landscape
Context and Options
tunity to Raise again
Veg. Changes
+0.2
+0.1
0.0
-0.1
-0.2
Fababean
Wheat
NDVI
fitted
Image (labeled by system:time_start)
Portugal
Spain
Mali
Niger
Senegal
The Gambia
Guinea-Bissau
Sierra
Uganda
Kenya
Rwanda
Burundi
DRC
Singapore
Layers
Map
Satellite
Gray

Production follows functions

Building functional feedback system through integration of crops, trees and animals

avoid the unmanageable and manage the unavoidable

-IPCC Confronting Climate Change:

Thank You

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Head-Geoinformatics Unit