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CGIAR RESEARCH PROGRAM ON Dryland Systems

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Geospatial Science, Technology and Application (GeSTA) for integrated agro-ecosystems research towards ensuring food and environmental security for better livelihoods in Dry Areas.
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ICARDA **Geo**informatics Portal for **Agro**-Ecosystems (**GeoAgro**), part of its integrated systems research portfolio. This online resource provides comprehensive information encompassing all geospatial genres in a streamlined system: remote sensing, GIS, and spatial modeling.

The unique features of GeoAgro portal include:

1. Unified and streamlined geospatial technologies that can help deliver integrated systems research on time, while maintaining the highest level of fidelity.
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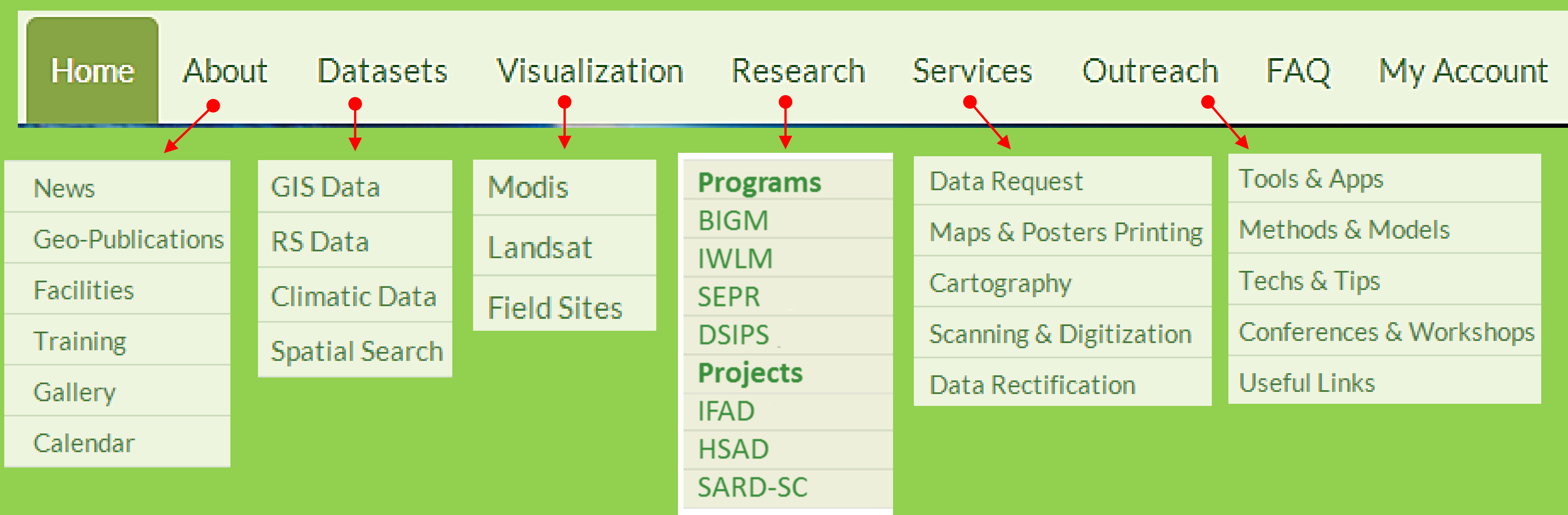
3. Databases, products, and services that support the entire information lifecycle, transforming multi-source content into dynamic information at frequent intervals.



Geo-Publications - Refereed Journal Publications

2015

Jinheng Zhang, Lusheng Zeng, Yonghong Sun, Chaoyu Song, Hui Wang, Jianmei Chen & Chandrashekhar Biradar, 2015, **A pilot study on the effect of Cu, Zn, and Cd on the spectral curves and chlorophyll of wheat canopy at tiller stage**, Toxicological & Environmental Chemistry, 97:3-4, 454-463, DOI: 10.1080/02772248.2015.1050199, [PDF]

Virupakshagowda C. Patil, Khalid A. Al-Gaadi, Rangaswamy Madugundu, ElKamil H. M. Tola, Samy Marey, Ali Aldosari, Chandrashekhar M. Biradar, and Prasanna H. Gowda, 2015, **Assessing Agricultural Water Productivity in Desert Farming System of Saudi Arabia**, IEEE JOURNAL OF SELECTED TOPICS IN APPLIED EARTH OBSERVATIONS AND REMOTE SENSING, VOL. 8, NO. 1, JANUARY 2015, [PDF]

Geli Zhang, Xiangming Xiao, Jinwei Dong, Weili Kou, Cui Jin, Yuanwei Qin, Yuting Zhou, Jie Wang, Michael Angelo Menarguez, Chandrashekhar Biradar, 2015, **Mapping paddy rice planting areas through time series analysis of MODIS land surface temperature and vegetation index data**, ISPRS Journal of Photogrammetry and Remote Sensing 106 (2015) 157–171, [PDF]

Michel Edmond Ghanem, Hélène Marrou, Chandrashekhar Biradar, Thomas R. Sinclair, 2015, **Production potential of Lentil (Lens culinaris Medik.) in East Africa**, Agricultural Systems 137 (2015) 24–38, [PDF]

P.S. Roy, M.D. Behera, M.S.R. Murthy, Arijit Roy, Sarnam Singh, S.P.S. Kushwaha, C.S. Jha, S. Sudhakar, P.K. Joshi, Ch. Sudhakar Reddy, Stutee Gupta, Girish Pujar, C.B.S. Dutt, V.K. Srivastava, M.C. Porwal, Poonam Tripathi, J.S. Singh, Vishwas Chitale, A.K. Skidmore, G. Rajshekhar, Deepak Kushwaha, Harish Karnataka, Sameer Saran, A. Giriraj, Hitendra Padalia, Manish Kale, Subrato Nandy, C. Jeganathan, C.P. Singh, C.M. Biradar , Chiranjibi Pattanaik, D.K. Singh, G.M. Devagiri, Gautam Talukdar, Rabindra K. Panigrahy, Harnam Singh, J.R. Sharma, K. Haridasan, Shivam Trivedi, K.P. Singh, L. Kannan, M. Daniel, M.K. Misra, Madhura Niphadkar, Nidhi Nagbhatla, Nupoor Prasad, O.P. Tripathi, P. Rama Chandra Prasad, Pushpa Dash, Qamer Qureshi, 2015, **New vegetation type map of India prepared using satellite remote sensing: Comparison with global vegetation maps and utilities**, International Journal of Applied Earth Observation and Geoinformation, [PDF]

Weerapong Thanapongtharm, Catherine Linard, Witthawat Wiriyarat, Pornpiroon Chinsorn, Budsabong Kanchanasaka, Xiangming Xiao, Chandrashekhar Biradar, Robert G Wallace, Marius Gilbert, 2015, **Spatial characterization of colonies of the flying fox bat, a carrier of Nipah Virus in Thailand**, BMC Veterinary Research, [PDF]

Jinwei Dong, Xiangming Xiao, PradeepWagle, Geli Zhang, Yuting Zhoua, Cui Jin, Margaret S. Torn, Tilden P. Meyers, Andrew E. Suyker, Junbang Wang, Huimin Yan, Chandrashekhar Biradar, Berrien Moore III, 2015, **Comparison of four EVI-based models for estimating gross primary production of maize and soybean croplands and tallgrass prairie under severe drought**, Remote Sensing of Environment 162 (2015) 154–168, [PDF]

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Remote Sensing and GIS Applications
The course will provide an overview on theories, applications, and practices of modern geospatial information technologies, including Remote Sensing (RS), and Geographic Information Systems (GIS), Ground Truth Data and Geospatial Modeling. Key components of the course include lectures, discussions, interactive and hands-on computer exercises, and projects. For details please visit ICARDA Capacity Development
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Regional
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Global - Poverty

Global drylands and agriculture resource poverty

Agricultural resource poverty is a structural component of environmental poverty, which is principally determined by climatic, topographic and soil constraints, as well as lack of water resources for irrigation, where needed. This global map shows a quantified estimate of the constraints to agriculture as imposed by the biophysical environment, using an index approach, scaled to a range 0-100, with 100 expressing the highest degree of resource poverty. The map has been compiled as a synthesis of individual thematic resource poverty maps (climate, topography, soils and irrigation water resources).

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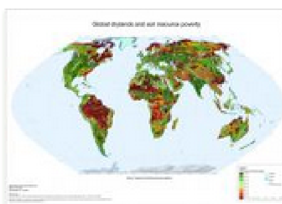

Global drylands and soil resource poverty

The Soil Resource Poverty Index is the percentage of each grid cell occupied by problem soils. Problem soils include the following categories: saline soils, soils with high sodium content, shallow soils, sandy soils, soils with very poor profile development, soils with severe soil structural and/or textural limitations, soils with severe acidity, infertility or Al-toxicity problems, wetland soils, acid sulphate soils.

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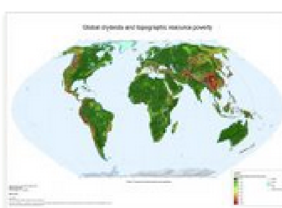

Global drylands and topographic resource poverty

Landscapes that are strongly dissected, i.e. with high elevation differences, contain little land with agricultural value. Where such land exists, it is mostly located in narrow, often disconnected and poorly accessible valleys, On the other hand, flat landforms (plains and plateaux) in general have little land with unsuitable topography. Of course, even in flat areas unsuitable soils or even rock outcrops may occur, but these can be identified from the soil maps and will result in a high Soil Resource Poverty Index . Given the strict separation between topographic and soil resources, the methodology does not allow double counting.

The Topographic Resource Poverty Index (TRPI) is the percentage of each grid cell with slopes above 15%. For areas between 60º N and 60º S, TRPI is obtained from the SRTM DEM by first identifying those areas with slopes > 15%, followed by aggregation of the result raster to a cell size of SRTM30 DEM (0.008333 decimal degrees), using summation as aggregation technique.

For areas above 60º N, SRTM data are not available and the TRPI was calculated by a relationship established between the TRPI and a low-resolution proxy indicator of slope, obtained from a 1-km DEM. The proxy indicator is the range, or the maximum elevation difference between neighbouring pixels, obtained from the global SRTM30 DEM. The range was for these areas converted into estimated values of TRPI by regression

Global Level Database

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CRP 1.1 Level Database

Maps in: North Africa and West Asia

Sort: date | title

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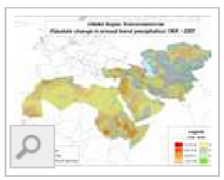

Absolute change in annual trend precipitation 1901-2007

This map is based on the Full Data Reanalysis Product Version 4 of the Global Precipitation Climatology Centre (GPCC). It has been obtained by linear regression fitted to the 107-year time series of annual precipitation of each 0.5x0.5 degree grid cell by the least-squares method and subsequent resampling to 0.008333 degree (about 1 km) spatial resolution. The map shows the average absolute change in mm/year as measured along the trend line between 1901 and 2007. With some exceptions (e.g. parts of the Black Sea coast and the rim of Central Asia mountains) the trend is negative in most of the region.

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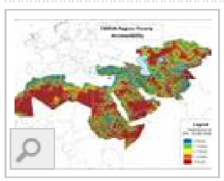

Accessibility to markets

This map shows travel time to cities with at least 50,000 inhabitants as an indicator of accessibility to markets.

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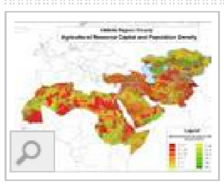

Agricultural Resource Capital and Population Density

A high-potential agricultural resource base can be insufficient for a large rural population, whereas areas with lower potential for agriculture but also lower population densities can be sustainable. This map links agricultural resource poverty to population density.

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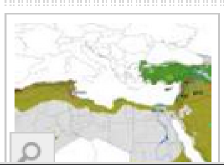
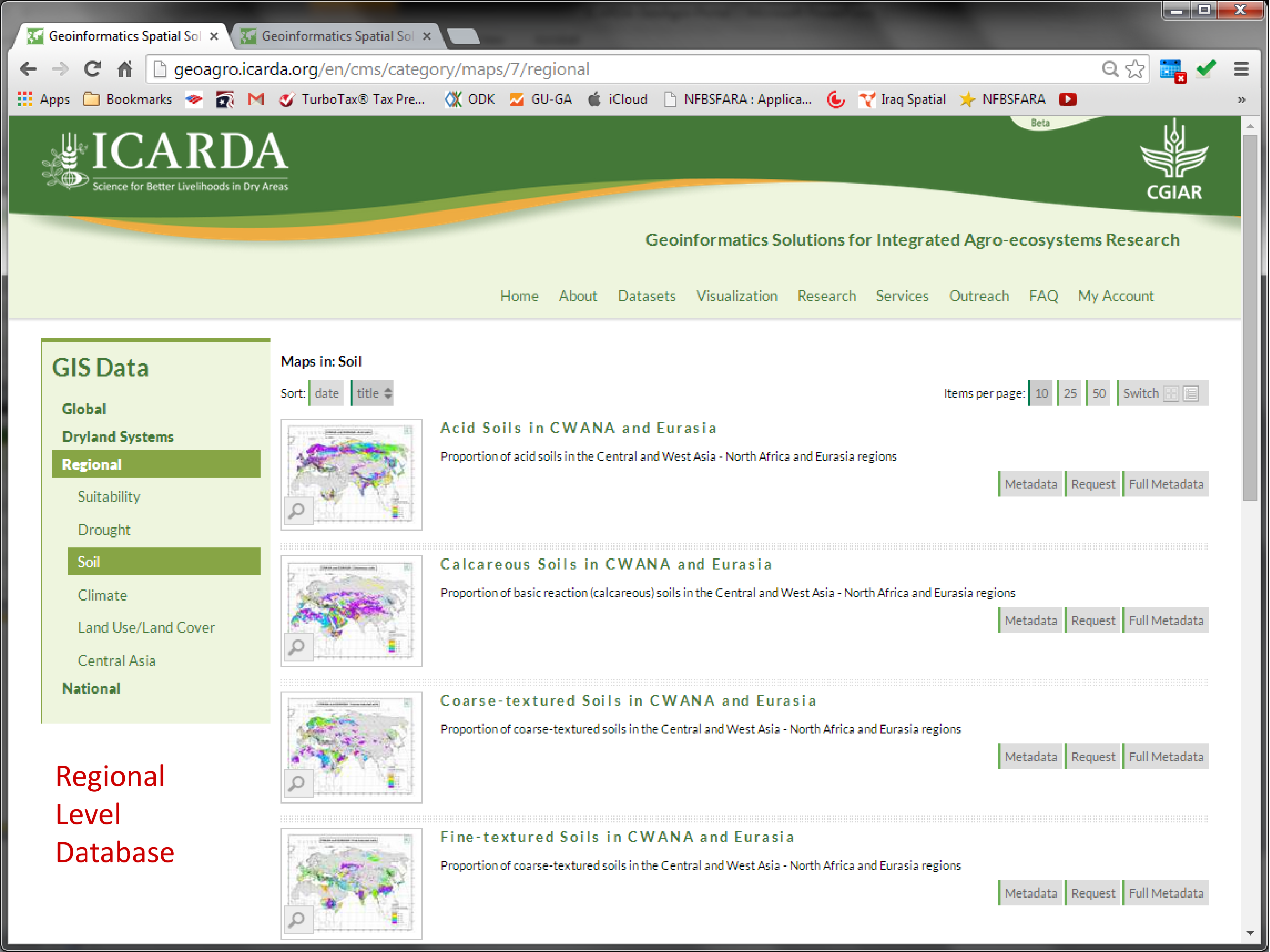


Benchmark areas, action and satellite sites of the West Asia-North Africa target region

The map shows a Benchmark Area in West Asia representing SRT2-conditions, and one in North Africa typical for SRT3-conditions. The West Asia Benchmark Area contains two Action Sites. SRT2-AS1 contains the area where research is conducted on the Rangeland-livestock based system in Jordan and Syria.
SRT2-AS2 contains the area where research is conducted on the low-potential rainfed mixed crop-livestock based system.
The North Africa Benchmark Area contains one Action Site (SRT3-AS1 in Morocco) where research is conducted on sustainable intensification of



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  - Poverty Mapping
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National Level Database

Maps in: Water harvesting

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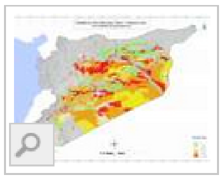

Suitability for Water Harvesting : Macro - Catchment system Areas Suitable for agricultural use

The modeling of suitability for macro-catchments is more complicated than for micro-catchments, because the run-off is generated outside the pixel to be evaluated, and is a largely unknown quantity. The evaluation of suitability for macro-catchments requires the separate evaluation of suitability for a 'catchment' area and for a 'use' area. The criteria for the 'catchment' and 'use' areas are different: - for the catchment area, strongly sloping land with soils that are shallow, rocky, or have poor infiltration capacity is preferable; - for the use area, level or gently undulating land with deep soils and no other limitations to agricultural use is preferable -...

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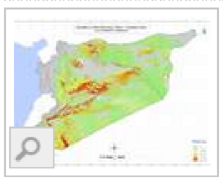

Suitability for Water Harvesting : Macro - Catchment system Areas suitable for catchments

The modeling of suitability for macro-catchments is more complicated than for micro-catchments, because the run-off is generated outside the pixel to be evaluated, and is a largely unknown quantity. The evaluation of suitability for macro-catchments requires the separate evaluation of suitability for a 'catchment' area and for a 'use' area. The criteria for the 'catchment' and 'use' areas are different: - for the catchment area, strongly sloping land with soils that are shallow, rocky, or have poor infiltration capacity is preferable; - for the use area, level or gently undulating land with deep soils and no other limitations to agricultural use is preferable -...

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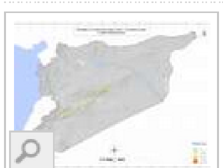

Suitability for Water Harvesting : Micro - Catchment system Contour bench terraces

The systems evaluated include 13 micro-catchment systems, based on combinations of 6 techniques and 3 crop groups, and one generalized macro-catchment system. The environmental criteria for suitability were based on expert guidelines for selecting water-harvesting techniques in the drier environments. They included precipitation, slope, soil depth, texture, and salinity, as well as land use/land cover and geological substratum. The dataset included interpolated surfaces of mean annual precipitation, a high-resolution digital elevation model, a soil map of Syria, a land use/land cover map of Syria, and a geological map of Syria. Contour-bench terraces are constructed on very st...

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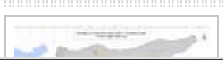

Suitability for Water Harvesting : Micro - Catchment system Contour ridges, field crops

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Dataset

MOD09A1 MODIS/Terra Surface Reflectance 8-Day L3 Global 500m ISIN Grid

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

MODIS Global Datasets (via Sinusoidal Grid)

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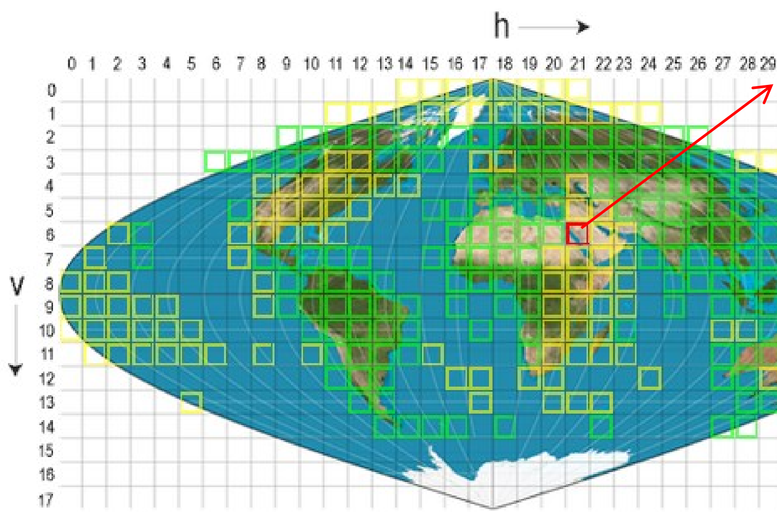

Click on a tile to see data inventory

Viewing: mod09a1 | Horizontal: 21 | Lat min: 20 | Lon
Year: 2000 | Vertical: 6 | Lat max: 30 | Lon max: 46.187

- Tiles are 10 degrees by 10 degrees at the equator.
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Data Inventory for Tile h21v06 - Google Chrome

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Data Inventory for Tile h21v06

Product	Year	Days	Missing	Total
MCD43A4	2000	361	1-353	1
	2002	1	9-361	1
MOD09A1	2000	57-361	1-49	39
	2001	1-161, 177-361	169	45
	2002	1-361		46
	2003	1-361		46
	2004	1-361		46
	2005	1-361		46
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	2007	1-361		46
	2008	1-361		46
	2009	1-361		46
	2010	1-361		46
	2011	1-321, 337-345, 361	329, 353	44
	2012	1-33, 49-273, 289-297, 313-329, 345-361	41, 281, 305, 337	42
	2013	1-17, 33-281	25, 289-361	35
	2000	57-361	1-49	39
	2001	1-161, 177-361	169	45
	2002	1-361		46
	2003	1-361		46
	2004	1-361		46

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Start Period *	Month: 01 Year: 2011
End Period *	Month: 12 Year: 2013

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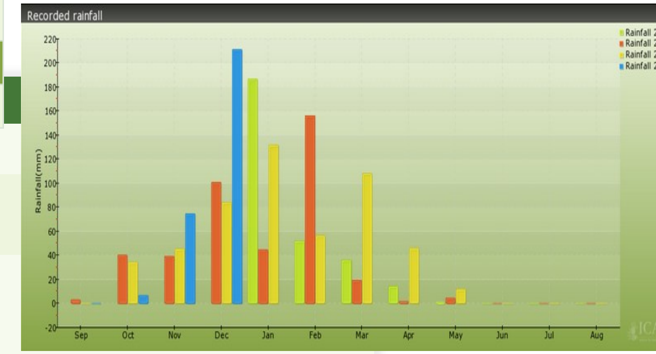

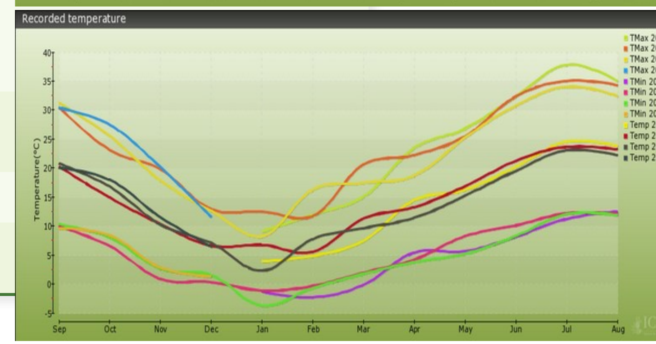

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Temperature, air, max	2011	2	9	9	10	6.5	9	9.5	9	11	12	13	12	13	11	9	9	8	13	17	19	10	11.5	16	16
Temperature, air, max	2011	3	15	19	19	19.2	18.6	19.5	16	12.5	7	6	8	11	14	17	19	21	22	23	21.5	22.2	20	14	14
Temperature, air, max	2011	4	25.8	22.6	19	14	12	16	17	17.8	17.4	14.8	16	11	15	20.2	21	25.4	27.6	29	22	18	17.5	14.8	15.6
Temperature, air, max	2011	5	19	23	24	26	26	22.6	20	21.8	24	25	24.5	25	15	16	20	24	27	27	25	26.8	24.6	25.4	27
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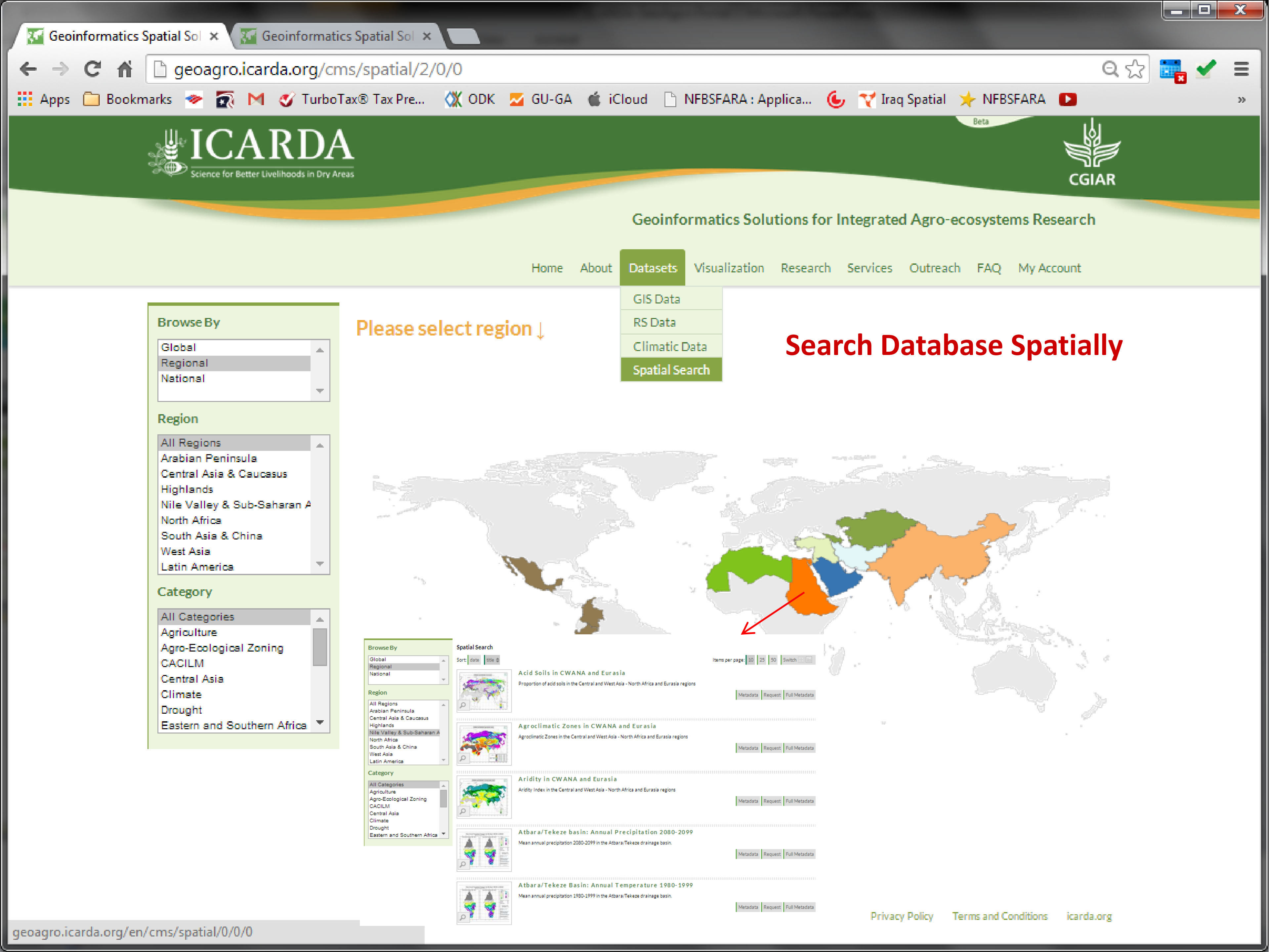
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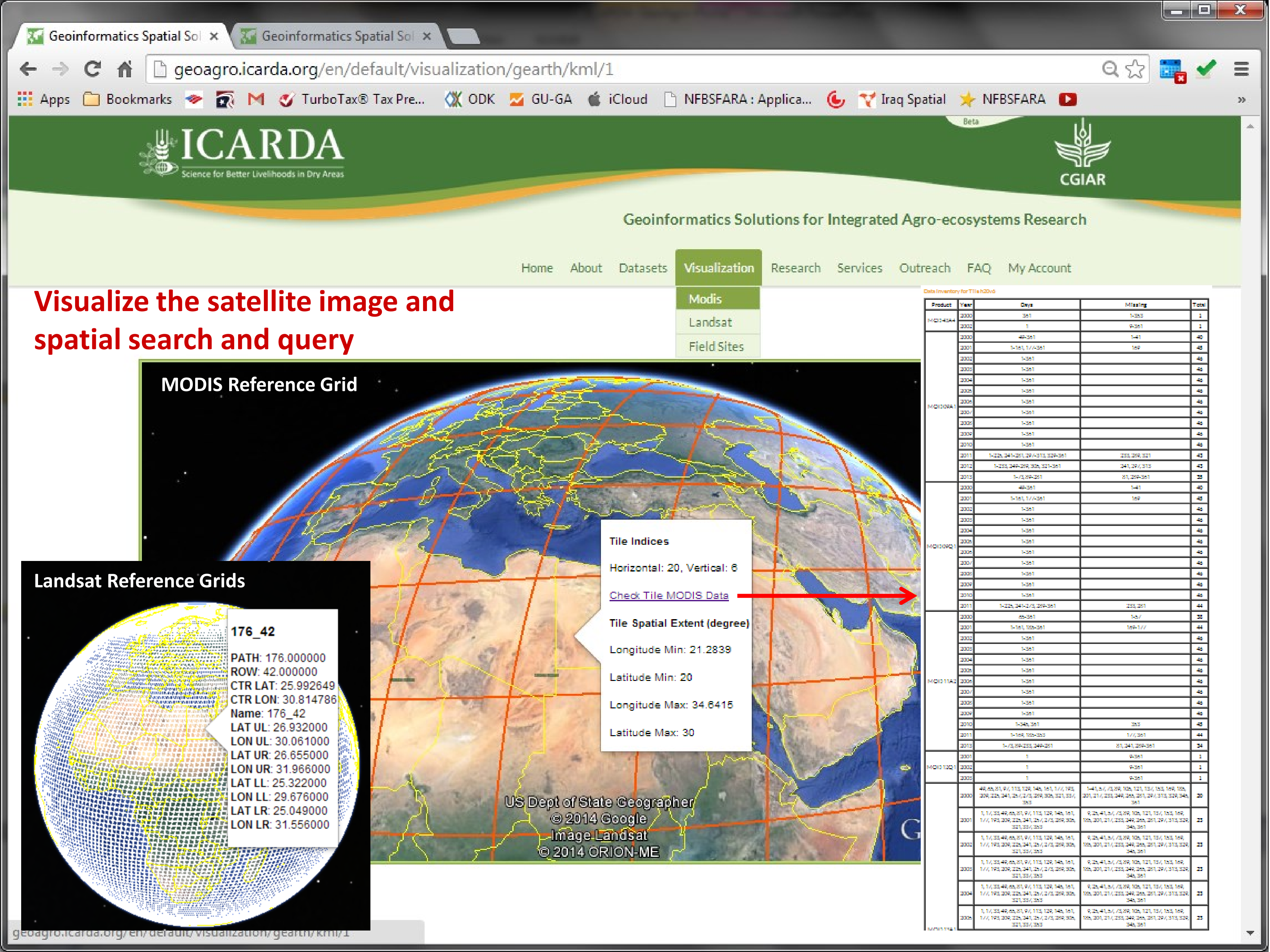
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MODIS Reference Grid
Tile Indices
Horizontal: 20, Vertical: 6
Check Tile MODIS Data
Tile Spatial Extent (degree)
Longitude Min: 21.2839
Latitude Min: 20
Longitude Max: 34.6415
Latitude Max: 30
US Dept of State Geographer
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Image Landsat
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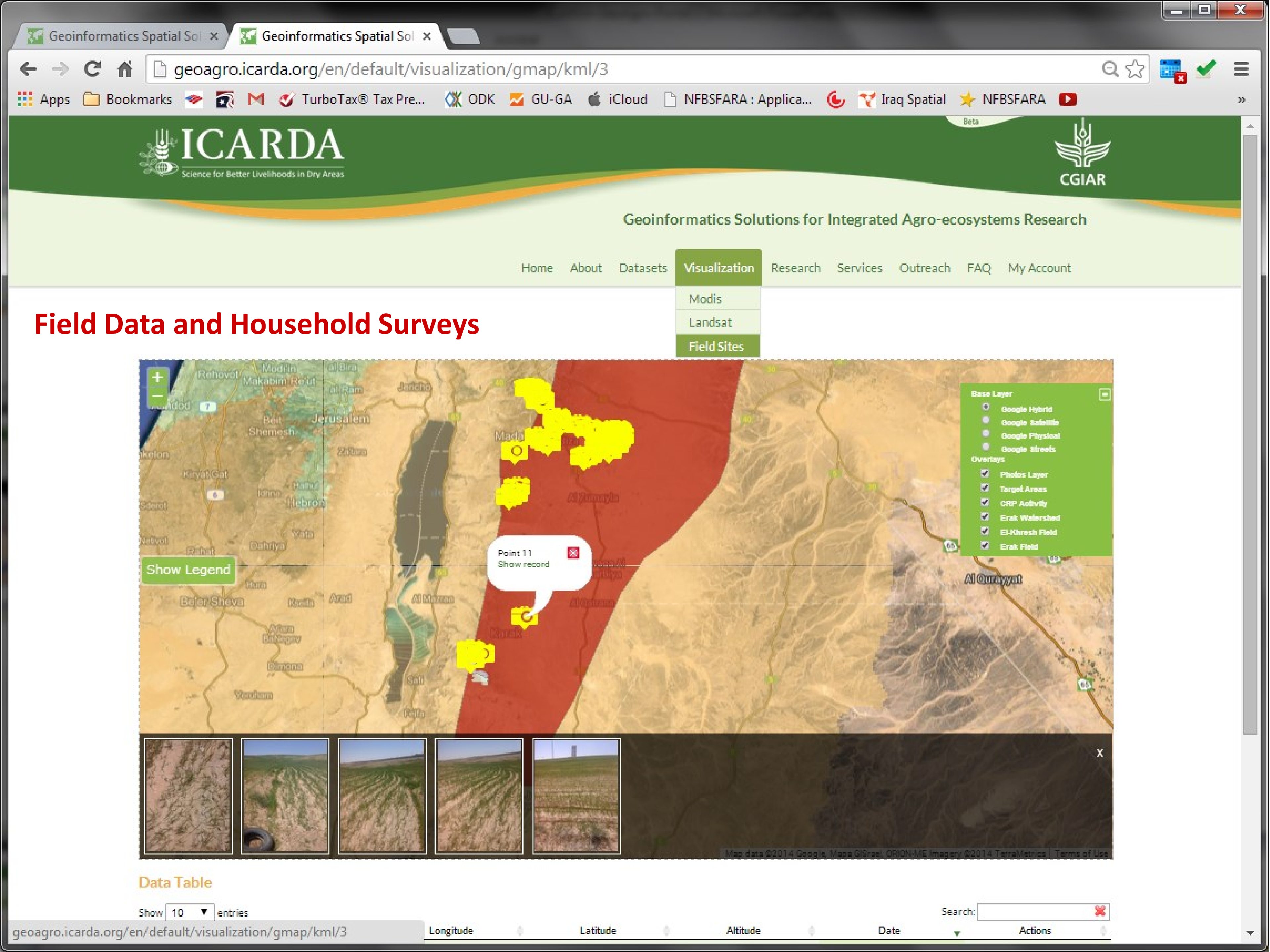
Landsat Reference Grids
176_42
PATH: 176.000000
ROW: 42.000000
CTR LAT: 25.992649
CTR LON: 30.814786
Name: 176_42
LAT UL: 26.932000
LON UL: 30.061000
LAT UR: 26.655000
LON UR: 31.966000
LAT LL: 25.322000
LON LL: 29.676000
LAT LR: 25.049000
LON LR: 31.556000
geoagro.icarda.org/en/default/visualization/gearth/kml/1


Geoinformatics Spatial Sol
Geoinformatics Spatial Sol
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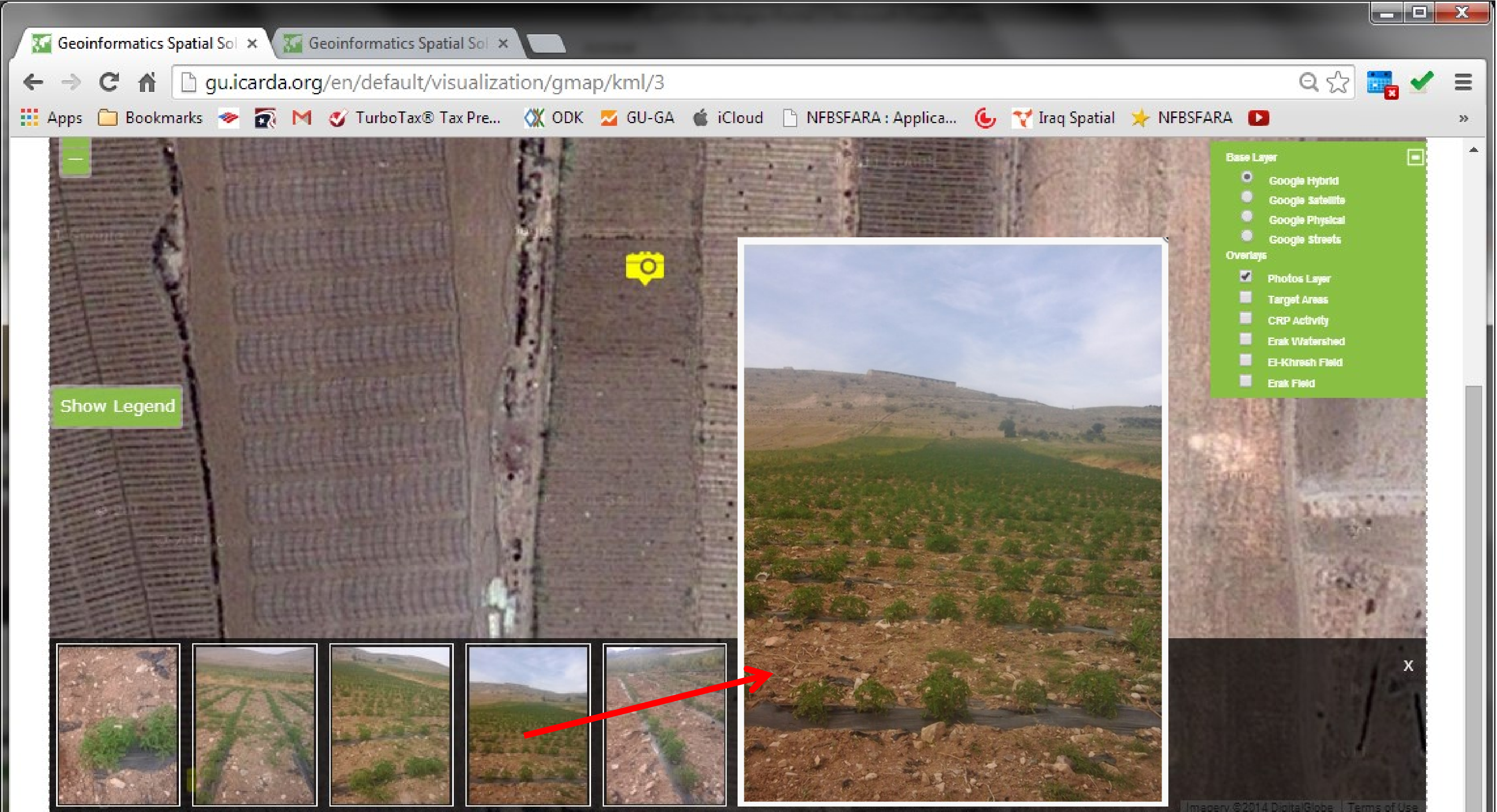
Target Areas
CRP Activity
Erak Watershed
El-Khresh Field
Erak Field
Jerusalem
Hebron
Jericho
Al Qurayyat
Data Table
Show 10 entries
Search:
Longitude
Latitude
Altitude
Date
Actions
geoagro.icarda.org/en/default/visualization/gmap/kml/3



Data Table

Dynamic Field Data Display

Show 10 entries Search:

ID	Longitude	Latitude	Altitude	Date	Actions
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22a04847-4038-446d-982a-d423ca5074f9	35.8629390690	32.5175026199	632.8000000000	2014-04-15 08:33:10	Zoom To | Show Photos
0bfc95dc-60eb-485e-8b08-c0fb04b6410d	35.8665131126	32.5255138334	622.9000000000	2014-04-15 08:32:10	Zoom To | Show Photos
6408d4c6-160a-4fcd-92c6-fb3b8bbe25e8	35.8668613806	32.5261460384	620.2000000000	2014-04-15 08:25:04	Zoom To | Show Photos
217e9b46-a874-4c86-add1-e12f97131546	35.7929547038	31.5707051754	716.3000000000	2014-04-12 14:38:13	Zoom To | Show Photos
99be01b4-d63a-4e3f-acd9-5843e1475a04	35.7852115855	31.5556243295	529.7000000000	2014-04-12 14:09:12	Zoom To | Show Photos
a384d1d5-6f5e-4d26-b137-57d848caa8aa	35.7435396966	31.6170065152	827.7000000000	2014-04-12 13:25:57	Zoom To | Show Photos
2b470642-4087-457f-8620-9dc709892a0c	35.7441195566	31.6194619518	1067.2000000000	2014-04-12 13:14:35	Zoom To | Show Photos

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Research

Programs

- BIGM
- IWLM
- SEPR
- DSIPS

Projects

Coming soon

Integrated Water and Land Management Program

To assist the targeting of water saving technologies, the GISU is developing, in association with the IWLMP, methodologies for assessing the biophysical potential for water harvesting and supplemental irrigation. Map products are currently available for Syria (Fig. 1) but outscaling to the level of all dryland areas is planned in the case of micro-catchment water harvesting techniques.

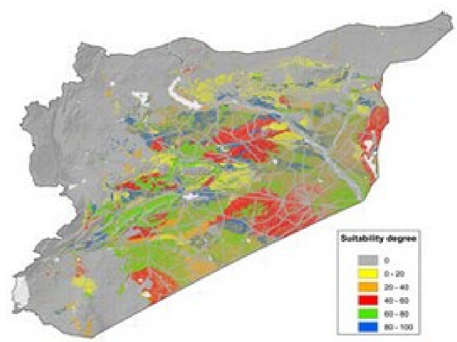
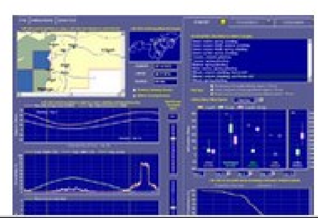


Fig.1. Suitability for water harvesting in Syria, micro-catchment systems, small-runoff basins, tree crops

In collaboration with the Plant Stress and Water Conservation Laboratory of the USDA Agricultural Research System in Lubbock, Texas, a geospatial tool, the ICARDA Agroclimate Tool, was developed, which predicts the risk of climatic stress (drought, heat,cold) for specific environments in CWANA (Fig.2).



Database specific to each research programs, and projects

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- Useful Links

Tools, Apps, Models, etc.

Tools

The ICARDA Agro-Climate Tool

The ICARDA Agro-Climate Tool (hereafter 'the application') is a Visual Basic (6) program that can be run on Windows 98, 2000, and XP operating systems. It should be installed on a PC with a Pentium III or better microprocessor and at least 230 Mbytes of available hard disk space. Monitor screen resolution should be at least 1024 X 768 pixels but no more than 1920 X 1440 pixels. Once installed (download here), instructions for the application's use can be found by left single-clicking on 'Instructions' on the application's upper left corner.

The application's primary daily variables (daily minimum temperature, daily maximum temperature, precipitation) were generated by modified GEM6 (Hanson, et al., 1994)weather generator code. Secondary variables (daily dew point temperature, short-wave surface radiation, net outgoing long-wave radiation, and reference grass evapotranspiration) were derived from primary variables using algorithms drawn from the FAO's 'Guidelines for Computing Crop Water Requirements' (Allen et al., 1998). Crop evapotranspiration values were then derived from the reference grass ET values using the FAO-56 single crop coefficient method.

Bibliography

Allen, R.G., Pereira, L.S., Raes, D., and Smith,M. 1998 Crop Evapotranspiration: Guidelines for computing crop water requirements. FAO Irrig. and Drain. Paper No. 56, Food and Agriculture Organization of the United Nations, Rome, Italy. 300p.

(http://www.fao.org/docrep/X0490E/x0490e00.htm)

Hanson, C.L., Cummings, A., Woolhiser, D.A., and Richardson, C.W. 1994. Microcomputer program for daily weather simulation in the contiguous United States. U.S. Department of Agriculture, Agricultural Research Service, ARS-114.

Download program here

Download Technical Description Here

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Technical information, trips, for example what are latest satellite sensors for farm to regional scales >>

Techs & Tips

Satellite Sensors

High resolution (Upto - 1 m)

Satellite Senors	Pan resolution (m)	Multispectral resolution (m)	Bands	Swath width (km)
GEOEYE-1	0.41	1.65	Blue, Green, Red and Near Infrared + Pan	15.2 / 9.44 Miles at nadir
IKONOS	0.82	3.2	Blue, Green, Red and Near Infrared + Pan	11.3 at nadir, 13.8 at 26o off-nadir
IKONOS stereo	0.8 - 1	3.28	Blue, Green, Red and Near Infrared + Pan	11.3 at nadir, 13.8 at 26o off-nadir
PLEIADES-1A	0.5	2, color 0.5	Blue, Green, Red and Near Infrared + Pan	20 at nadir
PLEIADES-1B	0.5	2, color 0.5	Blue, Green, Red and Near Infrared + Pan	20 at nadir
Quick Bird	0.61	2.44	Blue, Green, Red and Near Infrared + Pan	16.5 at nadir
WorldView-1	0.46	-	Pan	17.6 at nadir
WorldView-2	0.46	1.8	Pan, Coastal, Blue, Green, Yellow, Red, Red-Edge, NIR1, NIR2	16.4 at nadir

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(beta)