

“Research on Irrigation management to increase Water Productivity "

Ministerio de Agricultura

Gobierno de Chile

INIA

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AGRICULTURAL BACKGROUND

Agricultural, livestock and forestry area: 18.4 million ha. In a territory of 75 million ha.

Arable land: 5 million ha.

Irrigated land: 1 million ha.

Southern Hemisphere: off-season agricultural production

Oustanding sanitary conditions

Diversity of climates :diversity of production

What is INIA?

We transform the needs of the Chilean agriculture into technological solutions

The Institute of Agricultural Research (INIA) is a private nonprofit organization, founded on 1964, that belongs to the Ministry of Agriculture of Chile.

Today, INIA leads the knowledge and technology development, to produce innovations and to improve the competitiveness of the national agricultural sector in a sustainable, inclusive and environment-friendly way.

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INIA belongs to the Ministry of Agriculture, it is more than 53 years since its founding and we have a presence throughout Chile

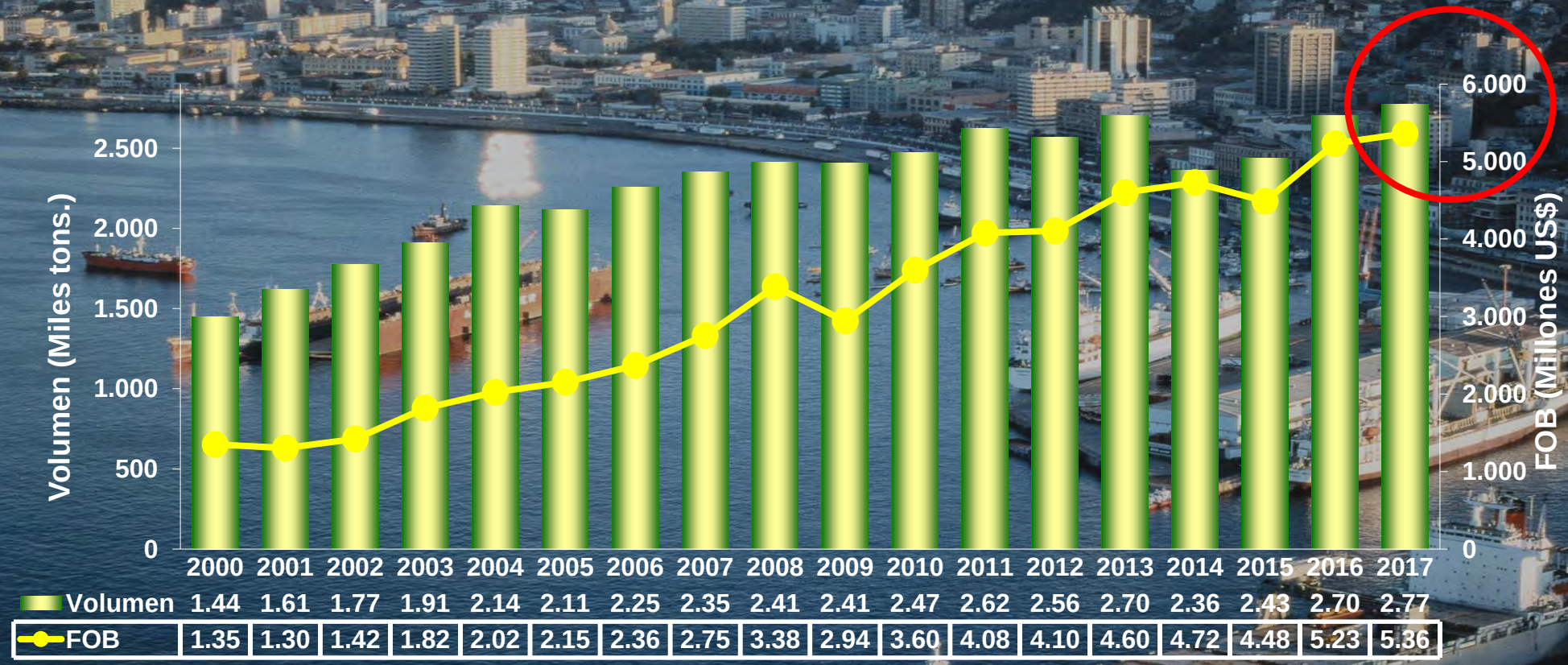
STRATEGIC RESEARCH AREAS

- ***Climate Change***
- Climate Risk Management
- Water use efficiency and Water productivity
- Genetic Resources and plant breeding
- ***Food Security***
- Agriculture with reduced agrochemical usage
- Dynamic, behavior, and risk analysis of the use of agrochemicals
- Plant breeding
- ***Sustainability***
- Land management and use of organic waste

INTERACTION

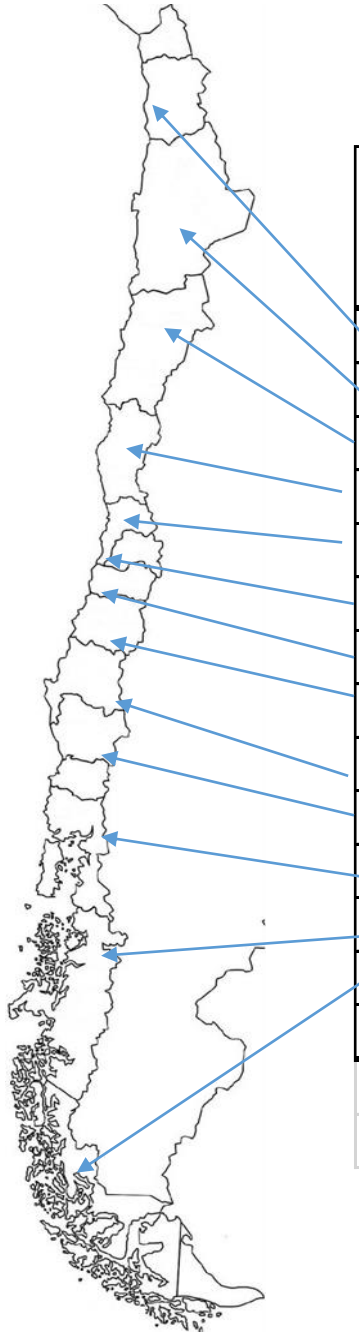
EXTENSION AND TECHNOLOGY TRANSFER
INTERNATIONAL COOPERATION

CHILEAN FRUIT EXPORTATION
Embarquement value vs Volumen



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Volumen	1.44	1.61	1.77	1.91	2.14	2.11	2.25	2.35	2.41	2.41	2.47	2.62	2.56	2.70	2.36	2.43	2.70	2.77
FOB	1.35	1.30	1.42	1.82	2.02	2.15	2.36	2.75	3.38	2.94	3.60	4.08	4.10	4.60	4.72	4.48	5.23	5.36

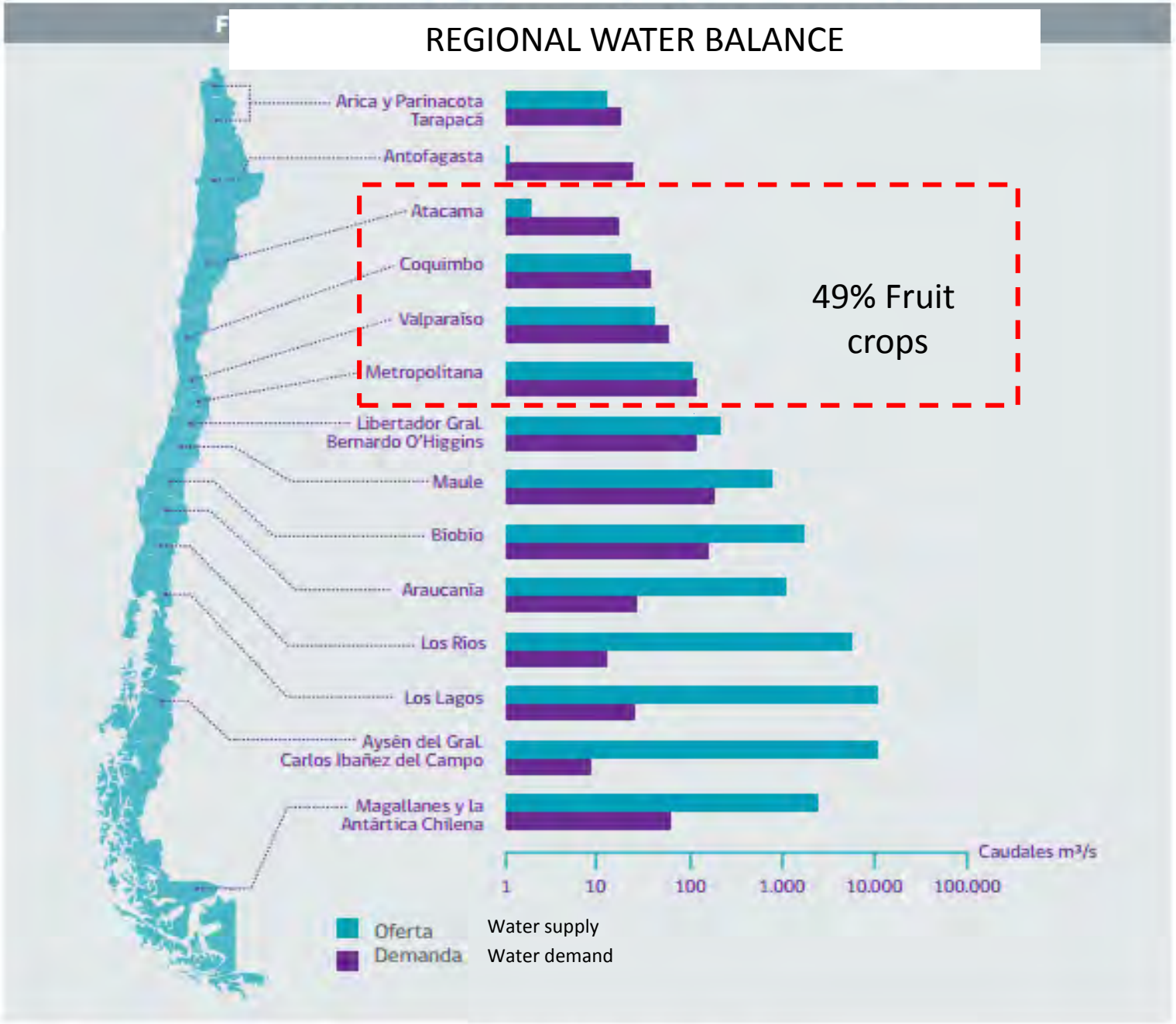
FUENTE : ODEPA



FRUIT CROPS IN CHILE : 285.700 hás

REGION	SUPERFICIE REGADA (Hás)	SUPERFICIE FRUTALES** (Hás)	% Acumulado
ARICA-PARINACOTA	12.301		
ANTOFAGASTA	2.294		
ATACAMA	19.354	10.794	4
COQUIMBO	75.714	29.863	14
VALAPARAISO	86.157	50.855	32
METROPOLITANA	136.757	48.063	49
O´HIGGINS	210.693	75.239	75
MAULE	299.102	48.28	92
BIO-BIO	166.574	11.231	96
ARAUCANIA	49.772	7.302	99
LOS RIOS-LOS LAGOS	12.535	4.073	100
AYSEN	2.717		
MAGALLANES	19.844		
TOTAL	1093814	285700	
Fuente (*) Censo 2006/07			
(**) CIREN 2012			

REGIONAL WATER BALANCE



Fuente: Ministerio del Medio Ambiente, 2011. Informe del estado del medioambiente.

- RESEARCH CHALLANGE:

Increase water use effiency (m^3/ha) and Water productivity (Kg/m^3).

Main research line:

1.- Soil-roots interaction (soil management and rootstock)

2.- Fruit crops water requirements (ETc, Kc, Kc-NVDI relationship)

3.- Irrigation management (soil and plant water threshold, wáter use effiency).

4. –Strategies for reducción fruit crops water use (wáter use effectiveness) .

- **Sustained deficit irrigation(SDI) /Regulated Deficit Irrigation (RDI**
- **Microclimatic modification**
- **Reduction of evaporation losses.**

5. Irrigation Management and fruit quality (postharvest)

6.- Extension activities for Producers and Advisers

1.-SOIL-ROOTS INTERACTION
(SOIL MANAGEMENT AND ROOTSTOCK)

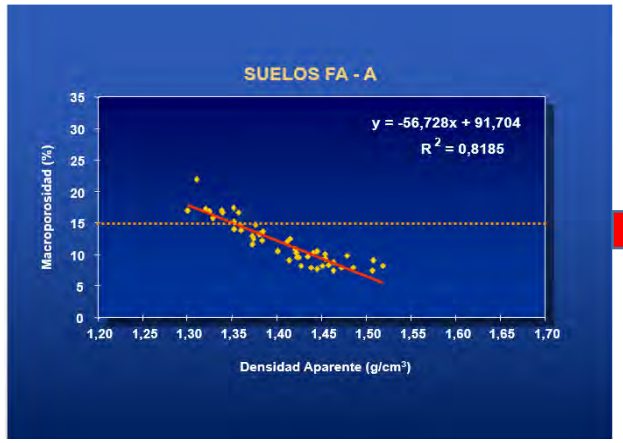
SUBSOILING

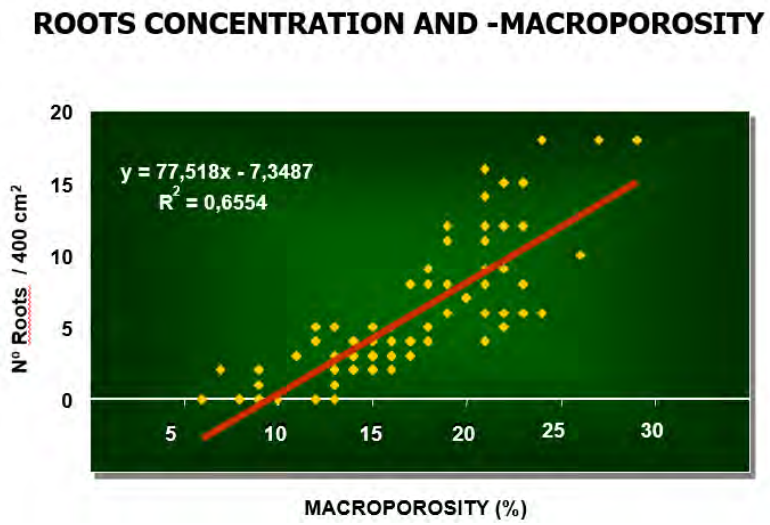
RIDGES

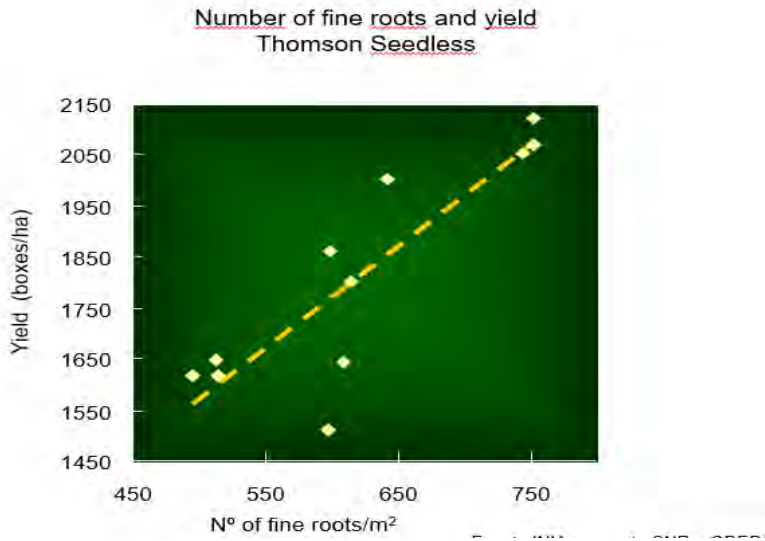
MULCHING

SOIL BIOLOGICAL ACTIVITY

ROOTSTOCK SELECTION







Soil physical properties and roots growth : impact on fruit tree productivity

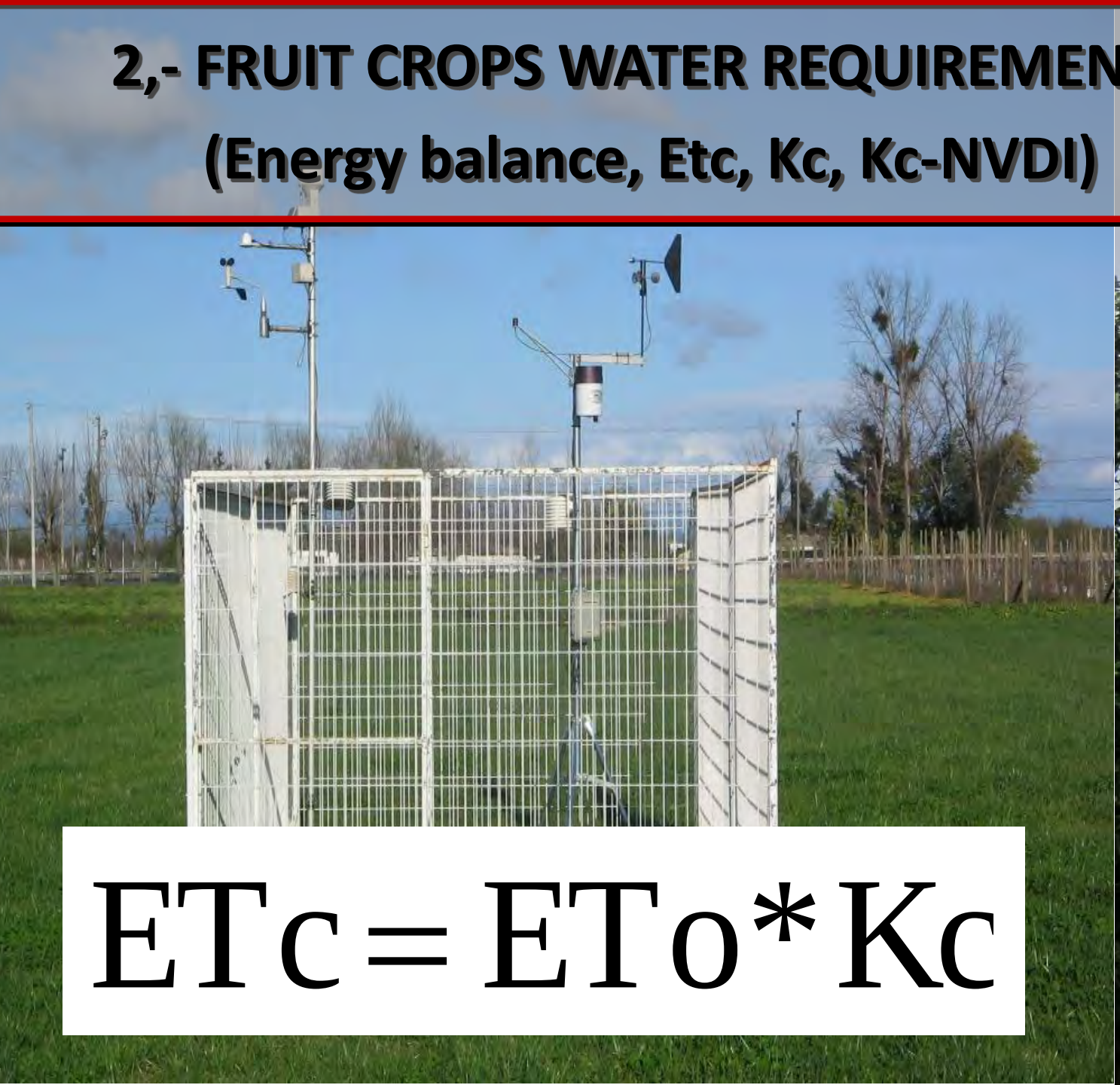
Field discussion with fruits advisers

Soil variability

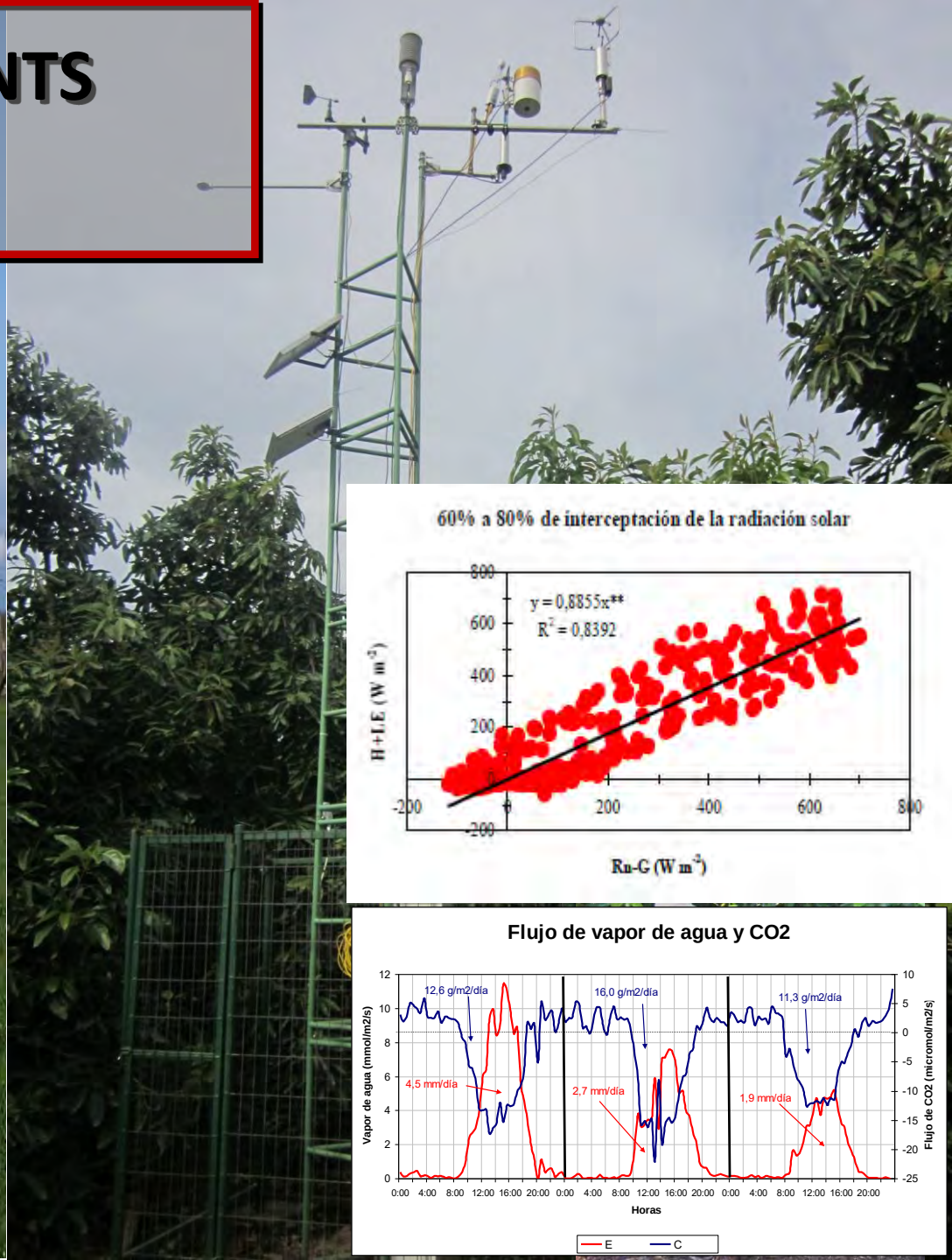
Rootstock selection

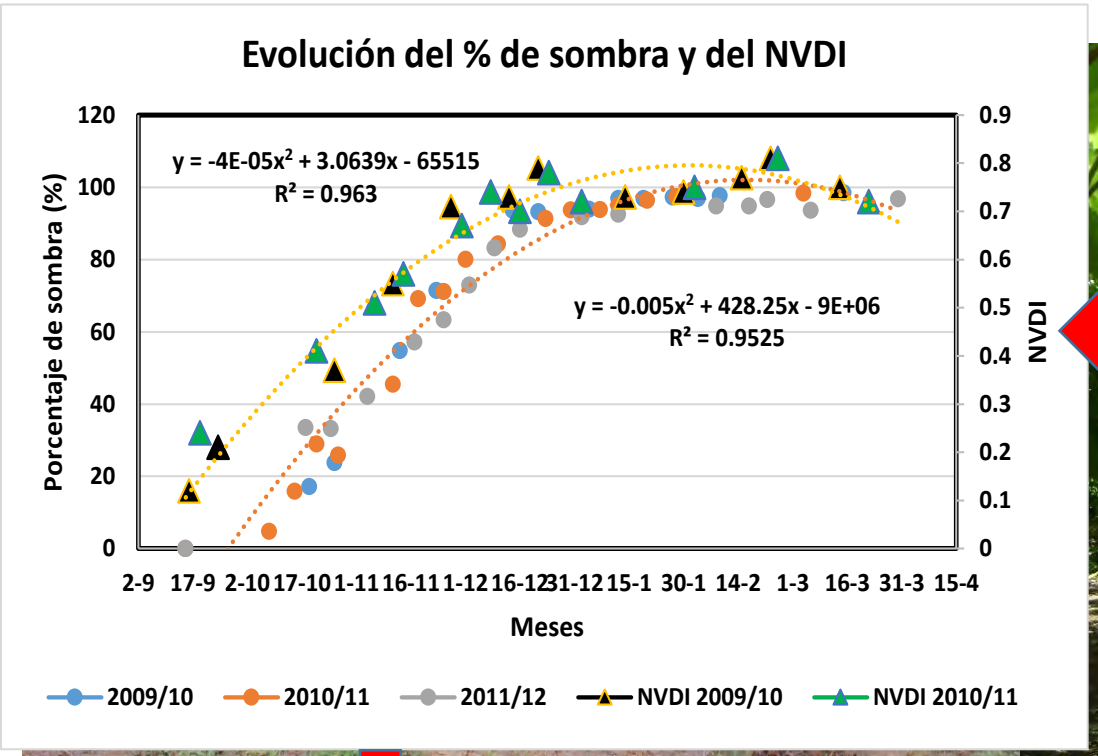
2,- FRUIT CROPS WATER REQUIREMENTS

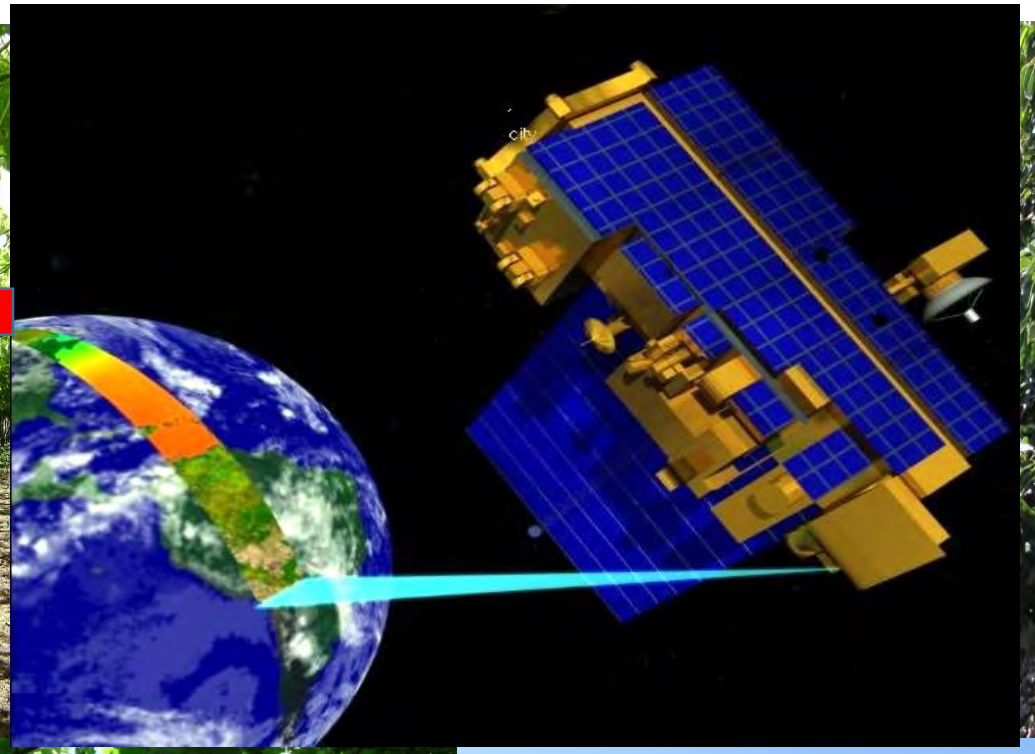
(Energy balance, Etc, Kc, Kc-NVDI)

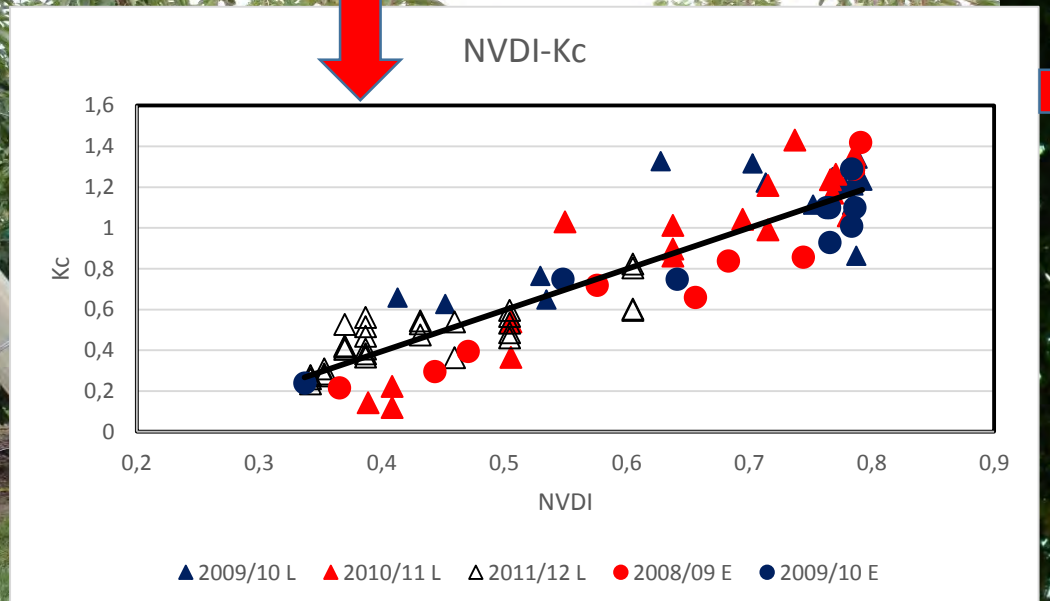


$$ETc = ETo * Kc$$



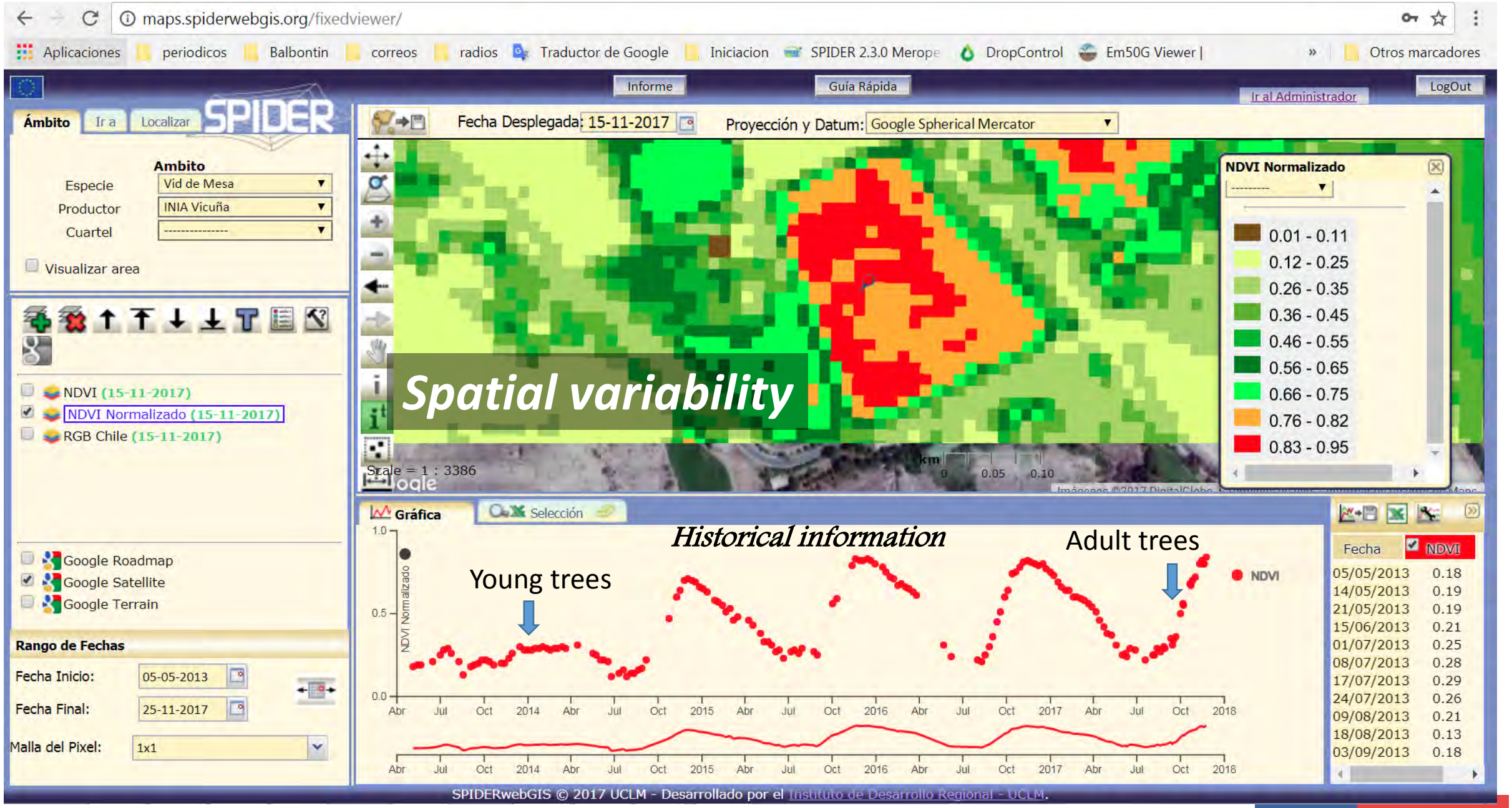

Evolución del % de sombra y del NVDI
y = -4E-05x² + 3.0639x - 65515
R² = 0.963
y = -0.005x² + 428.25x - 9E+06
R² = 0.9525
Porcentaje de sombra (%)
NVDI
Meses
2-9 17-9 2-10 17-10 1-11 16-11 1-12 16-12 31-12 15-1 30-1 14-2 1-3 16-3 31-3 15-4
2009/10 2010/11 2011/12 NVDI 2009/10 NVDI 2010/11




NVDI-Kc
Kc
NVDI
2009/10 L 2010/11 L 2011/12 L 2008/09 E 2009/10 E

$$ETc = ETo * Kc$$

Evolution of NDVI at field scale (web page)



3.-IRRIGATION MANAGEMENT IN LOCALIZED SYSTEMS(DRIP AND MICROSPRINKLER)

- **SOIL WETTED AREA:**

  -Number of driper lines / Soil physical properties

  -Irrigation efficiency

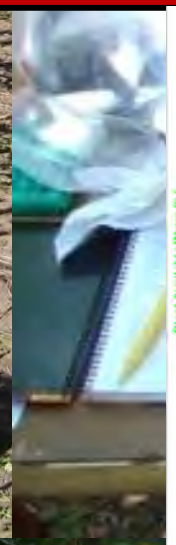
- **IRRIGATION SCHEDULING**

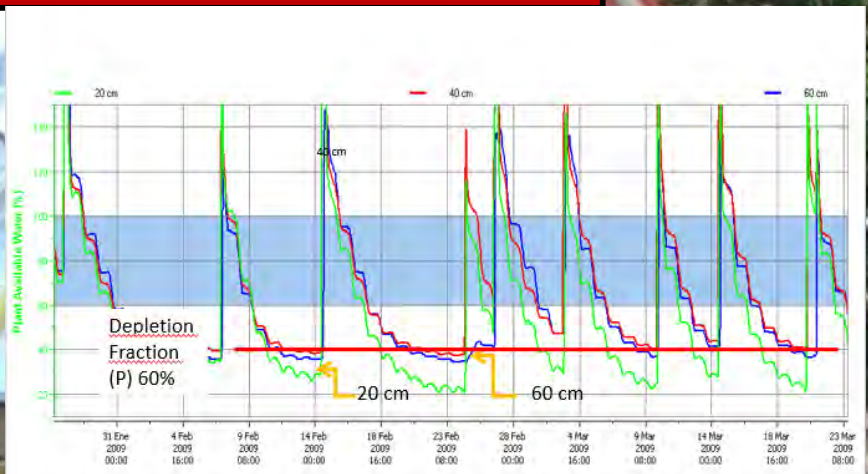
  - Water balance

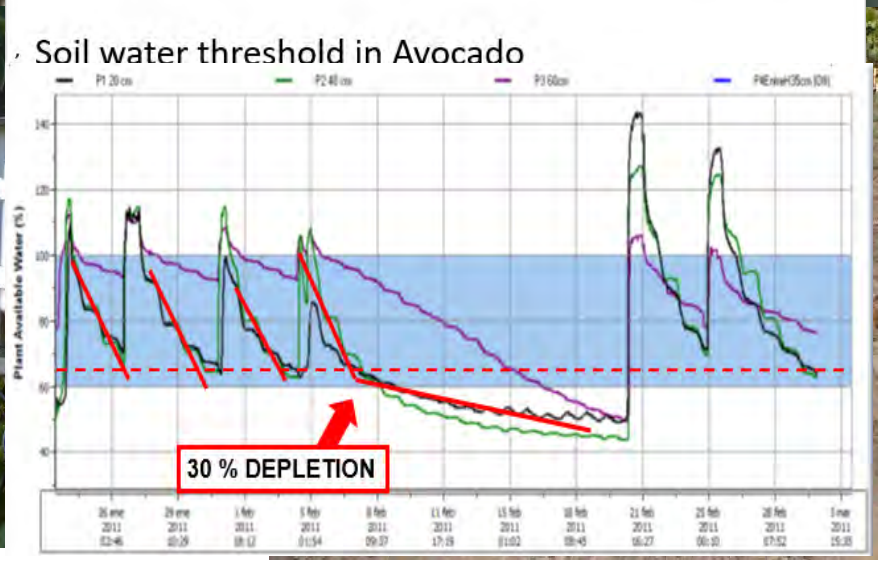
  - Trunk growth (dendrometers)

  - Stem water potential

  - Soil available water

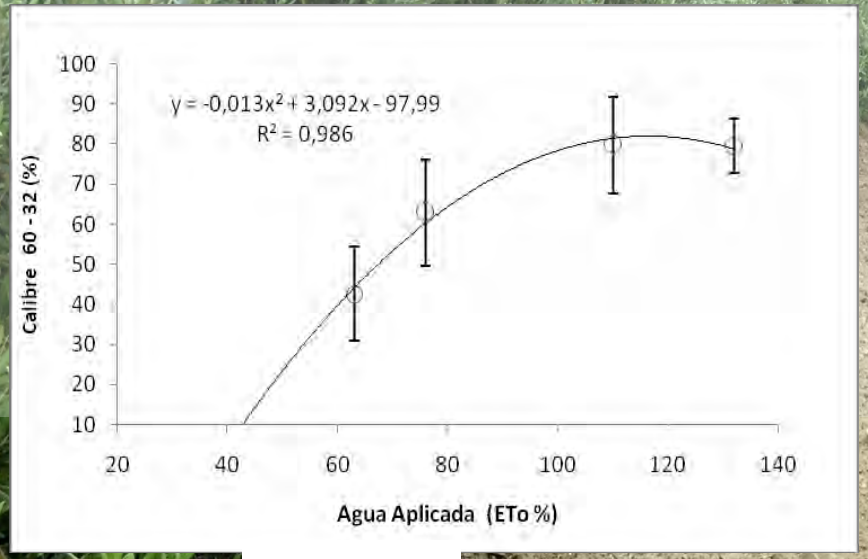






4. –STRATEGIES FOR REDUCCIÓN FRUIT CROPS WATER USE

- **REGULATED DEFICIT IRRIGATION (RDI) :**
- **SUSTAINED DEFICIT IRRIGATION(SDI)**



Avocado

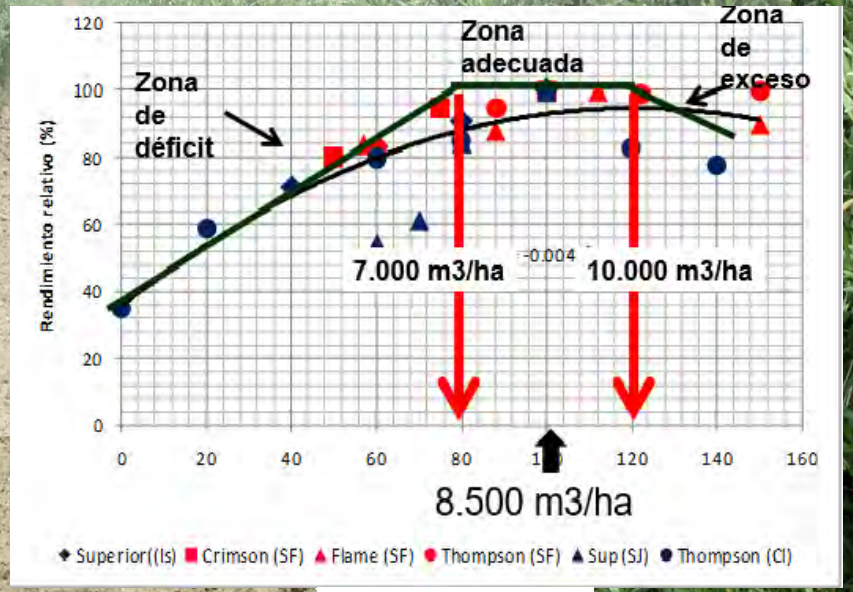


Table grape

4. –STRATEGIES FOR REDUCCIÓN FRUIT CROPS WATER USE

Microclimatic modification : Nets and plastic covers

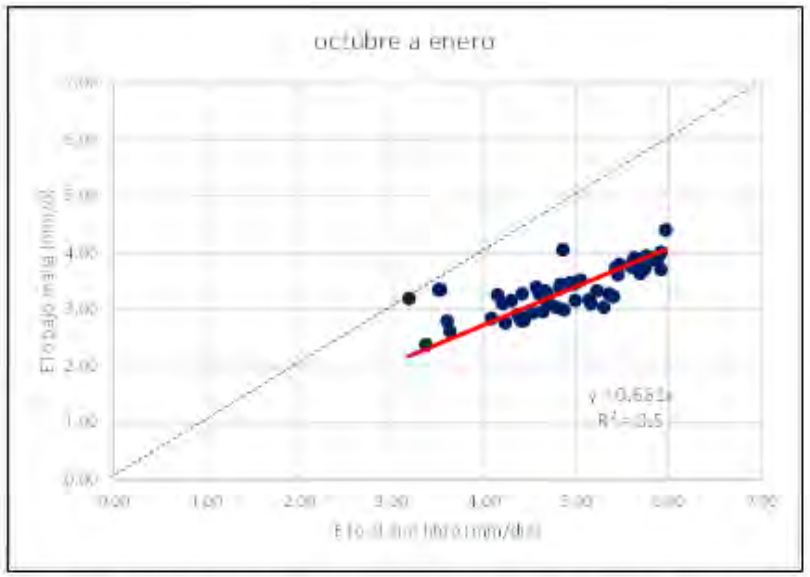
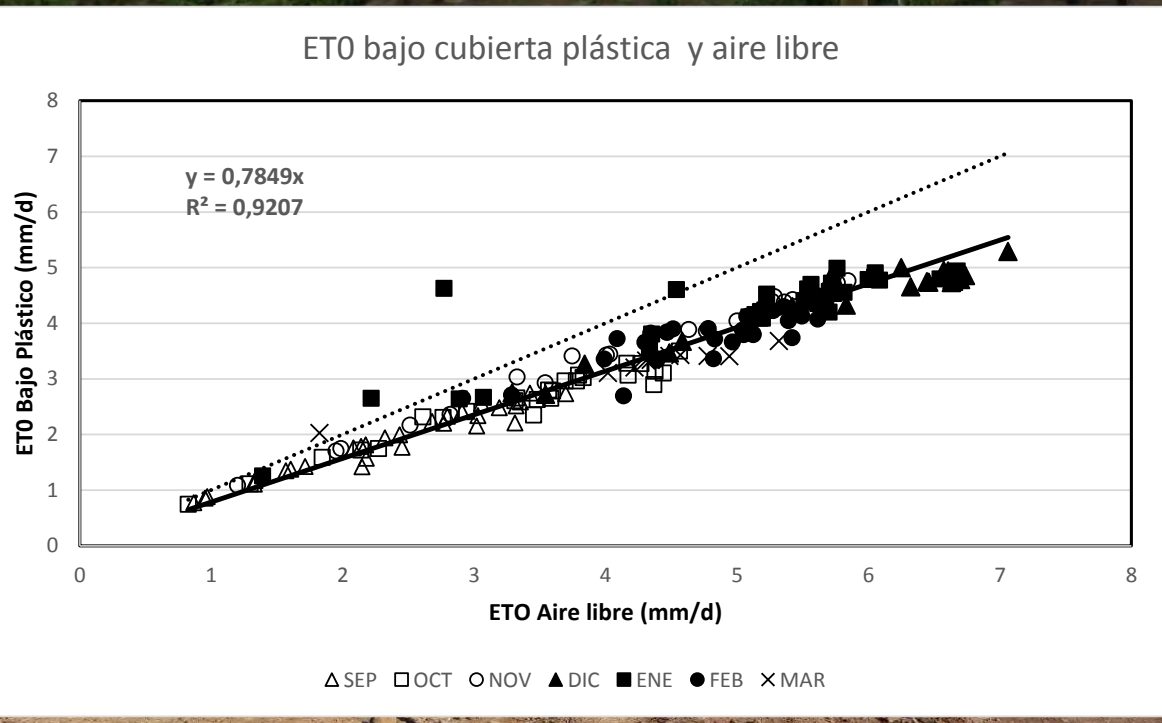
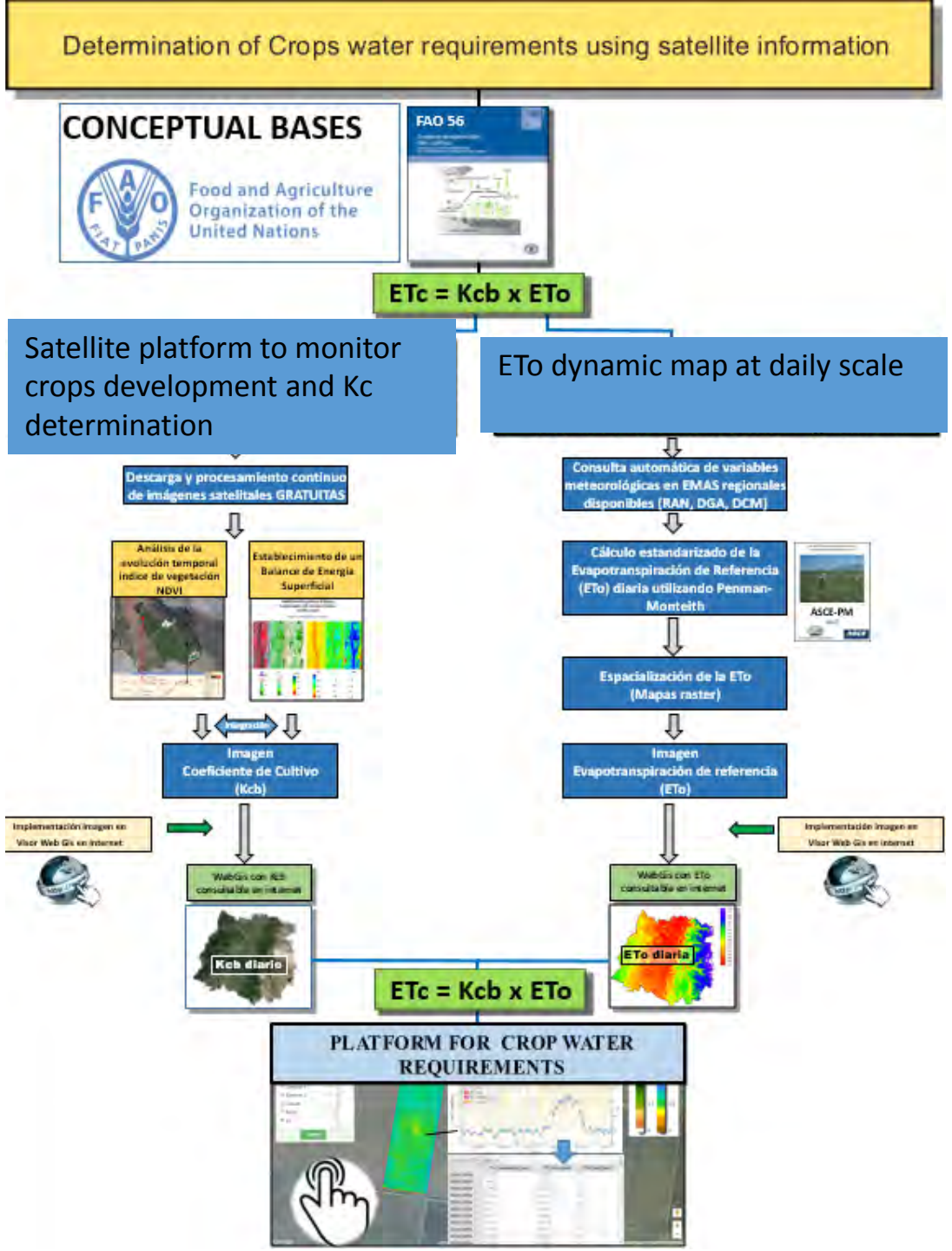


Figura 3. Evapotranspiración de referencia (ETo) al aire libre y bajo malla.



Determination of the water requirements of the main crops using satellite information


Determination of Crops water requirements using satellite information
CONCEPTUAL BASES
Food and Agriculture Organization of the United Nations
FAO 56
ETc = Kcb x ETo
Satellite platform to monitor crops development and Kc determination
ETo dynamic map at daily scale
Descarga y procesamiento continuo de imágenes satelitales GRATUITAS
Análisis de la evolución temporal índice de vegetación NDVI
Establecimiento de un Balance de Energía Superficial
Imagen Coeficiente de Cultivo (Kcb)
Consulta automática de variables meteorológicas en EMAS regionales disponibles (RAN, DGA, DCM)
Cálculo estandarizado de la Evapotranspiración de Referencia (ETo) diaria utilizando Penman-Monteith
ASCE-PM
Espacialización de la ETo (Mapas raster)
Imagen Evapotranspiración de referencia (ETo)
Kcb diario
ETo diaria
ETc = Kcb x ETo
PLATFORM FOR CROP WATER REQUIREMENTS



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