AGRICULTURA DIGITAL COMO HERRAMIENTA DE RESPUESTA FRENTE A LOS DESAFÍOS DEL CAMBIO CLIMÁTICO.

FRANCISCO J. MEZA, CLAUDIO STOCKLE, PIERRE MARTRE, LAV KHOT

X SEMINARIO DE LA ACADEMIA CHILENA DE CIENCIAS AGRONOMICAS

Desafíos y proyecciones en la producción agrícola sostenible frente al cambio climático

Centro UC Cambio Global 10 AÑOS

ACADEMIA CHILENA DE CIENCIAS AGRONOMICAS

PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE

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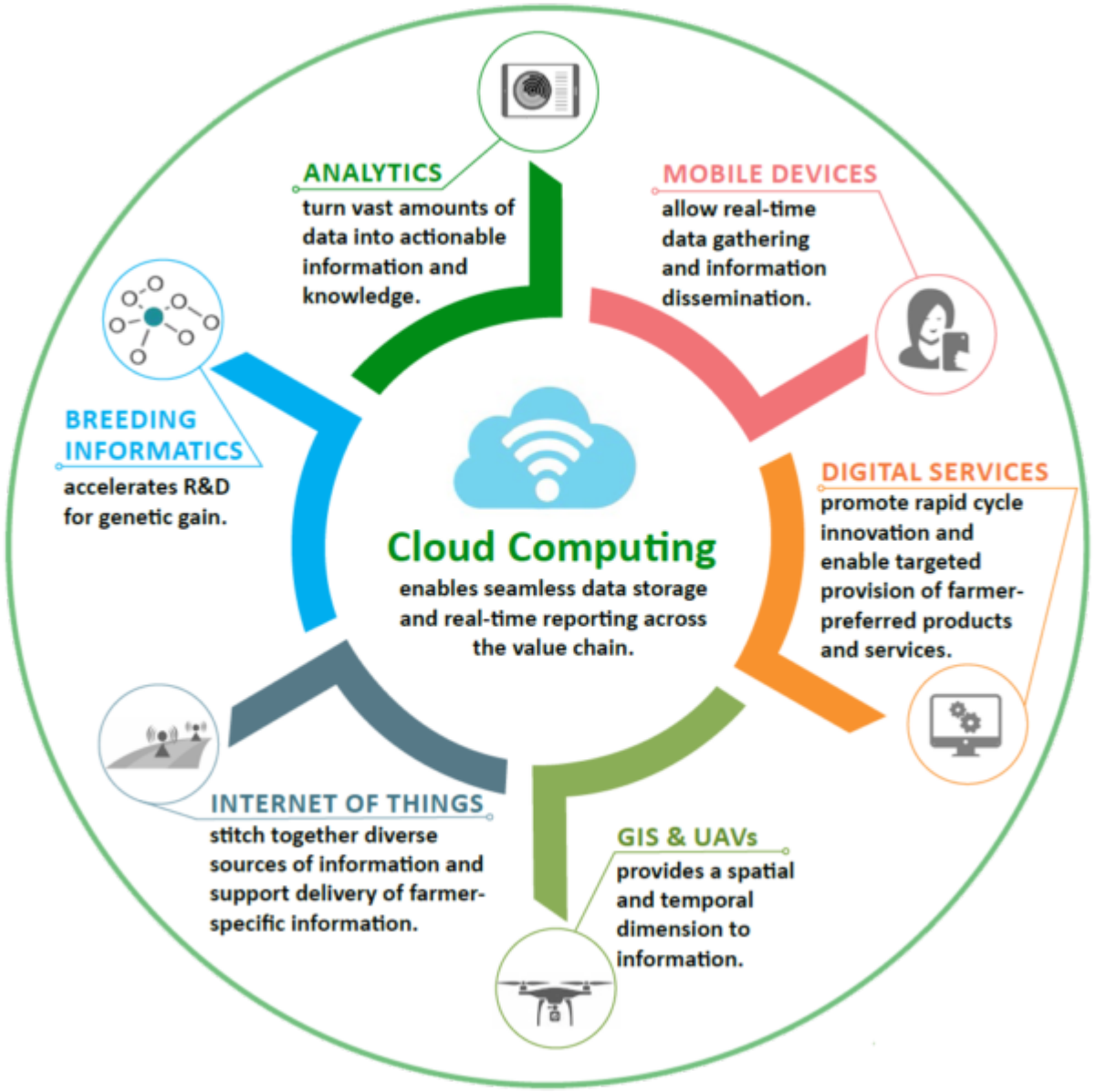
1. ¿QUÉ ENTENDEMOS POR AGRICULTURA DIGITAL?

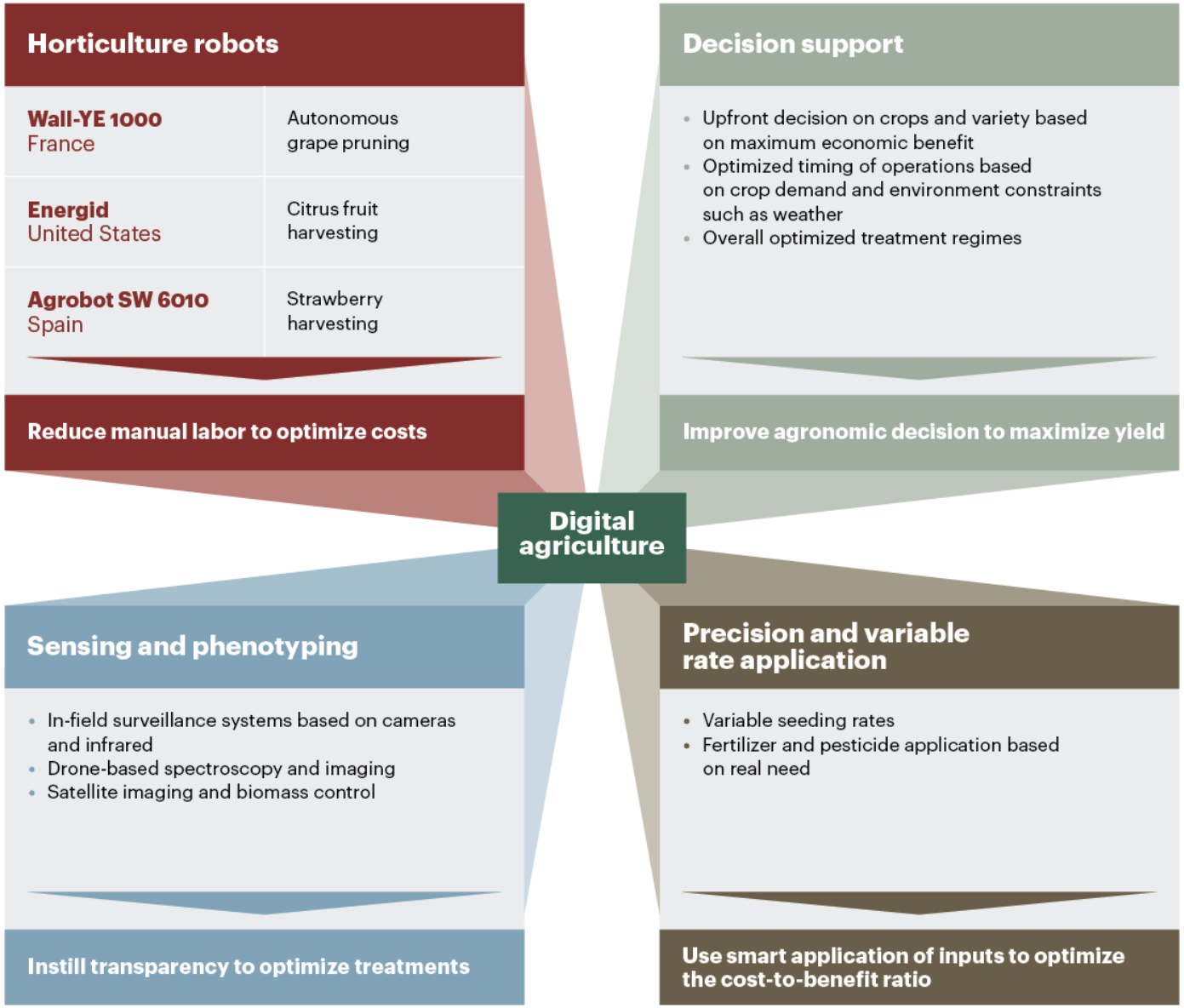
- La aplicación de Tecnologías de la Información y Comunicación en la Agricultura
- Premisa: Manejos específicos y focalizados permiten optimizar productividad respetando el medio ambiente
- Componentes:
  - Agricultura de Precisión
  - Internet de las cosas
  - Uso masivo de sensores y dispositivos remotos de control
  - Big Data
  - Robótica
  - Vehículos (aéreos) no tripulados


ANALYTICS
turn vast amounts of data into actionable information and knowledge.
MOBILE DEVICES
allow real-time data gathering and information dissemination.
BREEDING INFORMATICS
accelerates R&D for genetic gain.
Cloud Computing
enables seamless data storage and real-time reporting across the value chain.
DIGITAL SERVICES
promote rapid cycle innovation and enable targeted provision of farmer-preferred products and services.
INTERNET OF THINGS
stitch together diverse sources of information and support delivery of farmer-specific information.
GIS & UAVs
provides a spatial and temporal dimension to information.

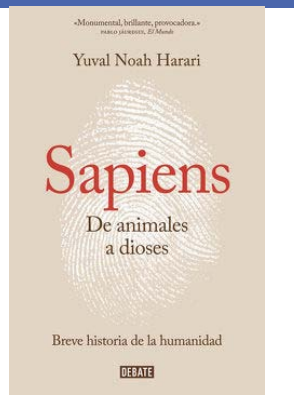
CCAFS, 2018

Figure 7

Innovative technologies are at work in niche markets



REVOLUCIONES



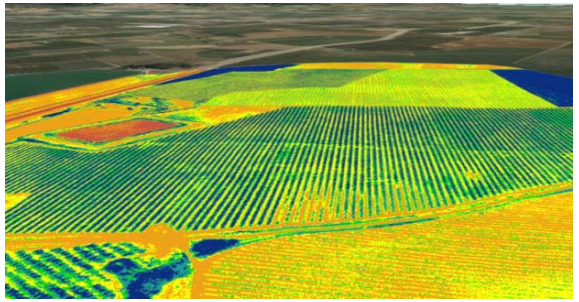
- Agricultura 1.0: El rol de la Agricultura en el desarrollo
- Intensivo en mano de obra (mas de 30% vinculado a actividades productivas
- Incipiente Mecanización

REVOLUCIONES

- Agricultura 2.0: La Revolución Verde
- Mejoramiento Genético, Mecanización, Riego, Uso de Insumos
- Desarrollo de Mercados, Transporte

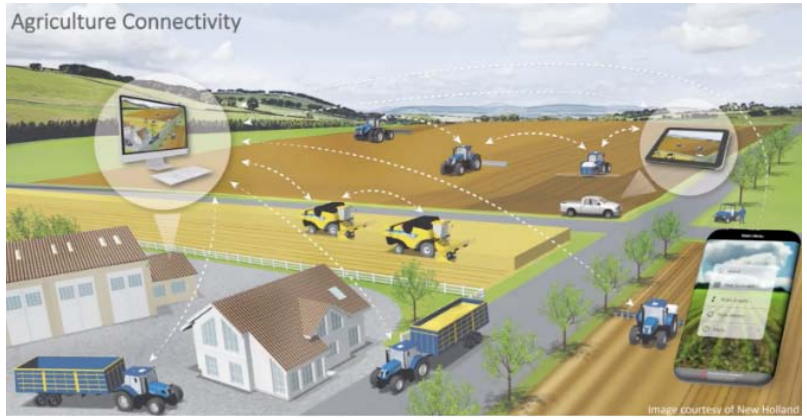
REVOLUCIONES

- Agricultura 3.0: Agricultura de Precisión
- Reconocimiento explícito de la heterogeneidad espacial y variabilidad temporal
- Desarrollo de concepto de manejo sitio específico

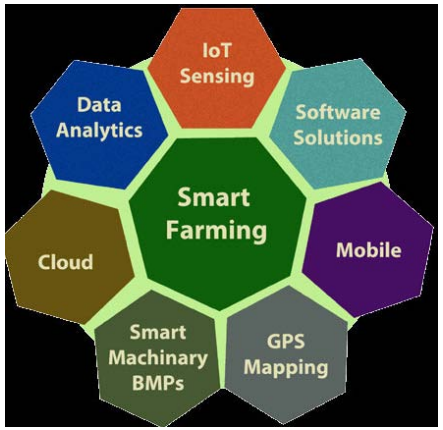


REVOLUCIONES

- Agricultura 4.0: Agricultura Digital ?
- Maximizar el potencial de la agricultura de precisión
- Big Data, Analytics



Tecnologías ya disponibles

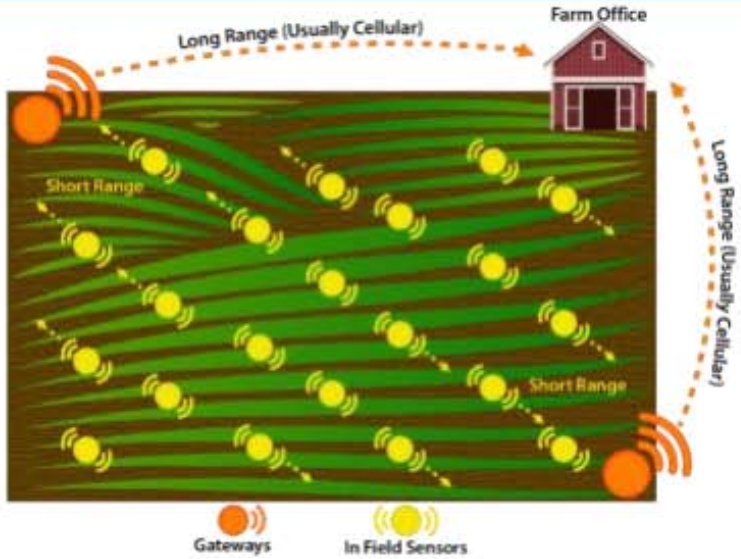


Spraying smart: Bosch and Bayer’s Agricultural Revolution

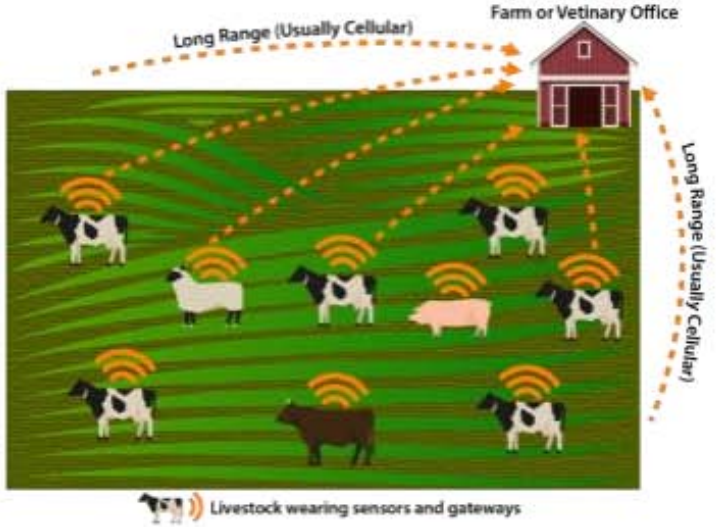
From detection to application, the solution works in 300-millisecond cycles. “The first step is to record images with cameras that cover the entire operating range of the sprayer,” Buchtala explains. “The software recognizes the different weeds in the crop and automatically selects which herbicide to spray, and which part of the sprayer to spray it from.

“Our software analyses the image, including detecting whether a plant is a crop or weed and reading the soil, within about 150 milliseconds, with the spray being applied within another 150 milliseconds. The detection and application is carried out in one step, and this is unique when compared to the alternatives on the market right now.”

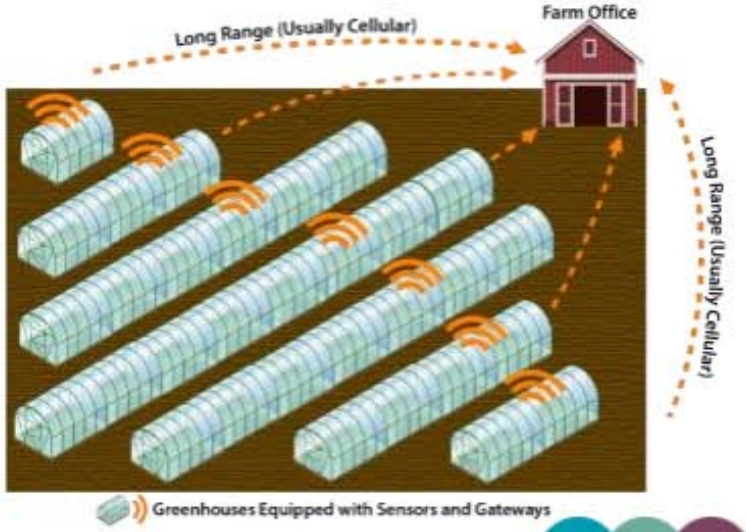
Precision farming



Small-sized field farming

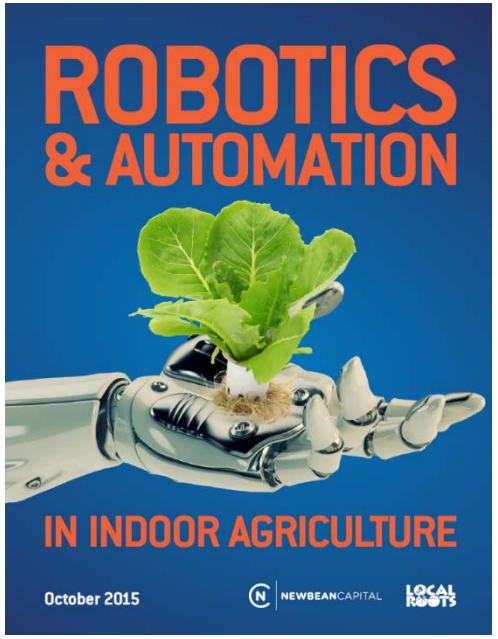


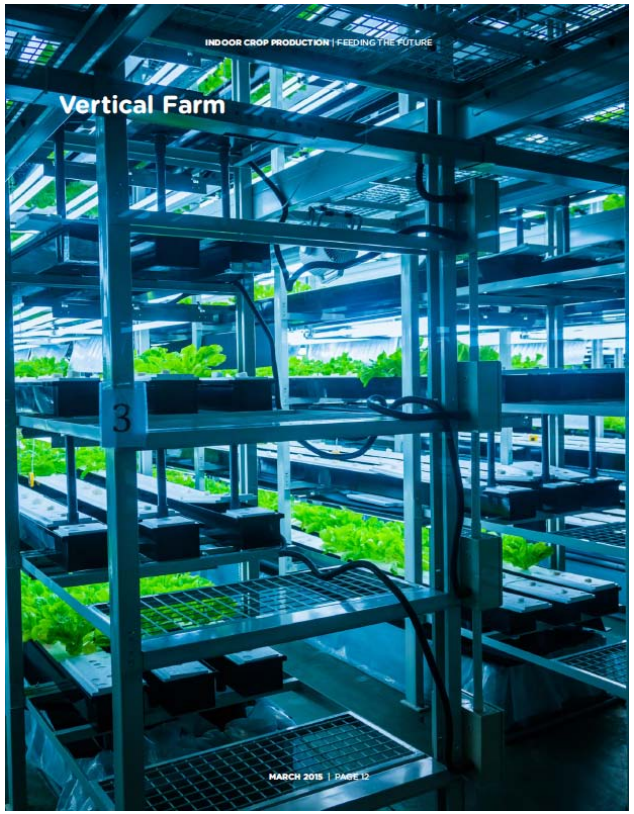
Precision livestock farming

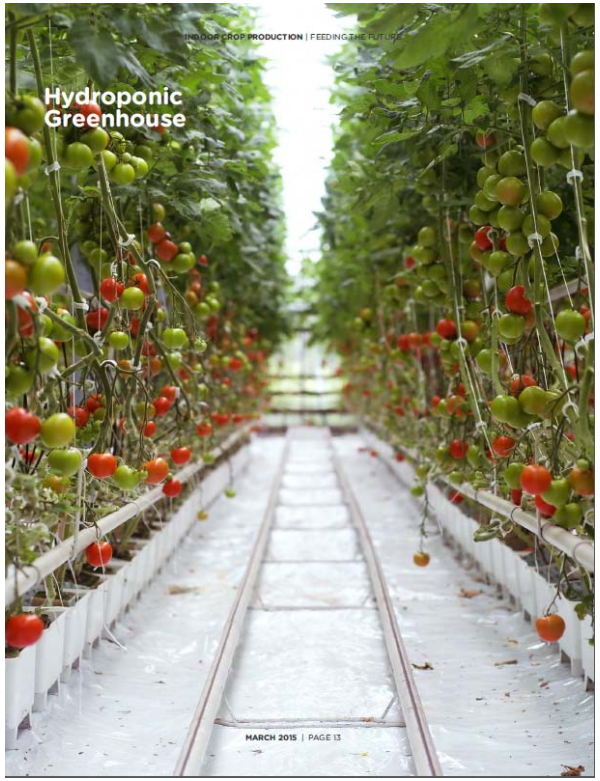


In-door farming

Source: Beecham Research


ROBOTICS
& AUTOMATION
IN INDOOR AGRICULTURE
October 2015
NEWBEANCAPITAL
LOCAL ROOTS


INDOOR CROP PRODUCTION | FEEDING THE FUTURE
Vertical Farm
MARCH 2015 | PAGE 12


INDOOR CROP PRODUCTION | FEEDING THE FUTURE
Hydroponic
Greenhouse
MARCH 2015 | PAGE 13

AGTECH LANDSCAPE 2019

Better Food Ventures

IN-FIELD SENSORS & SYSTEMS

Field Monitoring Sensors & Solutions

SENSOTERRA, Phytech, itk, Tasai, semios, Aker, KEEDA, AGERIS, pycno, DTN, See Tree, Croptimal, ARABLE

Soil Sensing / Analysis

terralytic, TRACE, STENON, FALCON, AGRON, SoilCares, OneSoil, SOILOPTIX

Insect Sensing / Monitoring

The Bee Corp, Aerobotics, BeeHero, trapview, ApisProtect, Farmapp, FaunaPhotonics

Precision Applications

ZASSO, edete, AgOtter, DROPCOPTER, RANTIZO, KIWI, AUGMENTA, Nileworks

IoT Monitoring Platforms

FarmQA, FARMOBILE, UPTAKE, YIELD, WiseConn

Precision Irrigation

HydroPoint, wildeye, groguru, tule, cropx, farm(x), WaterBit, METAPHIX, CropMetrics, HORTAU

Water Monitoring

FlowMetrix, Swiim, AQUAOSO, REDtrac, WEXUS

Labor Management

GANAZ, PAGO, agriculturalista, HY, AgDraft, PRIVATEER

Crop / Farm Management Software

solinftec, Cropia, agrivi, AGVOICE, CropTrak, LeanAgri, Agworld, smag, Aegro, AgKonect, AgDNA, ISAGRI, THE CLIMATE CORPORATION, FarmersEdge, conservis, AGRINAMIA, FARMIS, Strider, FarmLogic, intterra, ExactFarming, farmbrite, AgSpyered, Farmflo, Granular, TRUTERRA, FarmLogs, sicrop, Decisive

Digital Marketplaces

Grainphone, YAGRO, TILLABLE, hello tractor, ricult, AgroStar, AgVend, CSOKO, ABIAN, Agrofy, TRACTOR ZOOM, FarmTrade

Automation/ Robotics

abundant robotics, ASI, BEAR FLAG ROBOTICS, SWARM, ecorobotix, AGROBOT, ROWBOT, HARVEST AUTOMATION, ATC, TARTAN SENSE, naio, HARVEST CROO ROBOTICS, Dynium Robot, RoboticsPlus, Tortuga AgTech, agerris, rootAI, SAGA ROBOTICS, AGER

Processing Technology

QCIFT, PARSABLE, 915, SOFT ROBOTICS, ASEPTOMAT, AGRI NEO, WECO, InspiraFarms, Blendhub, PROTENUS

Post-Harvest Monitoring

INTELLIFARMS, PalleTech, TELESENSE, SCIO, AGNEXT, Centaur, HITELLO LABS, VIBE

Next Gen Logistics

SENSOR TRANSPORT, samsara, NanoThings, TRADELANES, MESH KOREA, WAYCOOL, Jumbotail, LOCUS, flii, Lineage, 八田六世, loadsmart, Frey

Freshness Control

blu.urap, Cambridge Crops, hazel technologies LLC, NOLUMA, wisepack, APEEL SCIENCES

Cold Chain Monitoring

tsenso, metiora, FreshSurety, escaVox, Intelligistics, controlant, LETTUCE BOX, INC., ColdPICK, Infratab

Food Recovery

FULLHARVEST, CSS, FoodMaven, WISErg, copia, Loctipe, SPOILER ALERT

Quality Mgmt / Compliance

RedLine, nzepaint, Produce, TRAQTION, Cosnspect, ICIX, TraceGains, Labpath, iFood

ERP Specialty

AgCode, Prophet, FAMOUS, LINKFRESH, ExtendAg, justfoodERP

ERP Commodity

agrimaster, conservis, EFC SYSTEMS, AgVision, Granular, COMPASS, agrifio, Agvance, CULTURA

Yield Forecasting

AGROGRAPH, AGRIDATA, FruitSpec, logiclab

Supply Analytics

DecisionNext, Trellis, Engage3, PRAEDICTUS, eka, cmdty, ec2ce, supply shift, agtools, sourcemap

Crop Marketing / Trading Platforms

arrangoo, BOSHEL, ninjacart, FARMgay, Aggregator, FARMLEAD, agree, fruits app, crofarm, The Seam, AMERICAS, Graindex

Finance & Insurance

PRODUCE PAY, FarmDrive, Samunnati, trAive, STABLE, AGVESTO, FarmOp, TRUACRE, GROWERS EDGE

POST-HARVEST MONITORING & EFFICIENCY

VALUE CHAIN ENABLERS

Blockchain

arc.net, agri digital, Xpansiv, GRAINCHAIN, bext360, GRAIN, AGRICHAIN, bart

Food Safety Detection

phylagen, CORVIUM, ND-GLY20, Clear Labs, SNAPDNA, INSPECTO

Food Safety Track & Trace

FoodLogiQ, PROVISION ANALYTICS, rfxcel, HarvestMark

Integrated Solutions (Platform)

FARMERS EDGE, DeHaat, indigo

Data Aggregators

aWhere, AGRIAN, AGRIDIGITICS, AGI, Farmapper, FARM MARKET ID, LANDIQ, GREENBOOK, ACDATA, DTN

Data Analytics (Platform)

HFG, ClearAg, BOOST ROBOTICS, DYNAMIC, prospera, CiBO

Imagery Analytics

ceres imaging, elio, Orbital Insight, SLANTRANGE, EIO, plantle, TARANIS, Farmblit, planet, IntelinAir

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Seana Day
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RESEARCH ARTICLE

High-Throughput 3-D Monitoring of Agricultural-Tree Plantations with Unmanned Aerial Vehicle (UAV) Technology

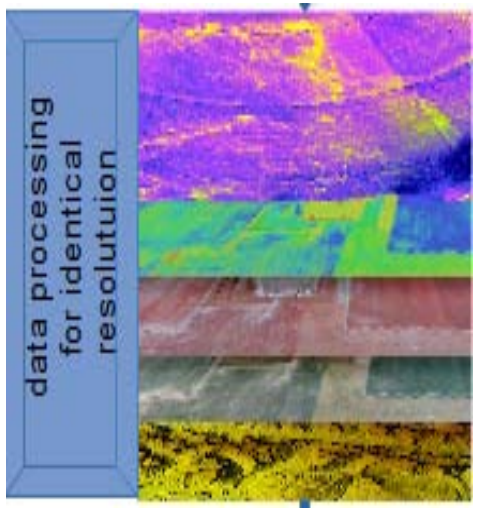
Jorge Torres-Sánchez[1], Francisca López-Granados[1], Nicolás Serrano[2], Octavio Arquero[2], José M. Peña[1]*

1 Department of Crop Protection, Institute for Sustainable Agriculture (IAS-CSIC), Cordoba, Spain,
2 Institute of Agricultural Research and Training (IFAPA-Alameda del Obispo), Cordoba, Spain

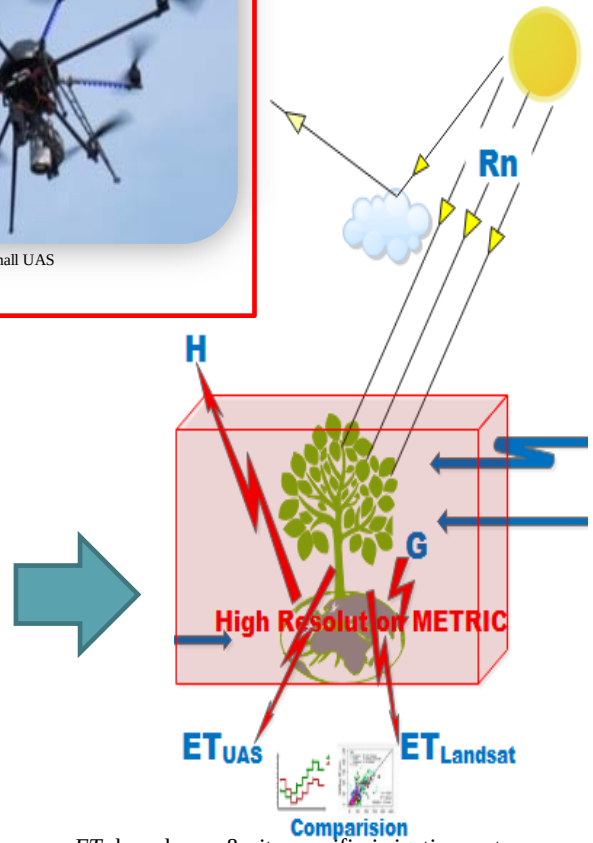
* jmpena@ias.csic.es

Low orbiting satellites

Small UAS



Year-2

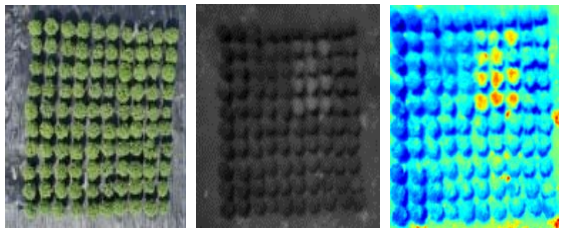


ET_a based crop & site-specific irrigation water management

Thermal infrared sensor

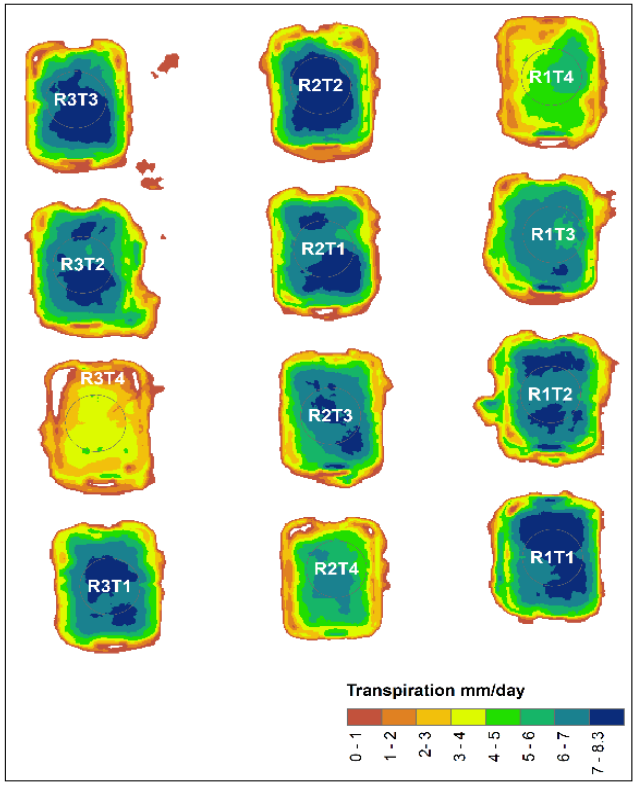
Multispectral sensor

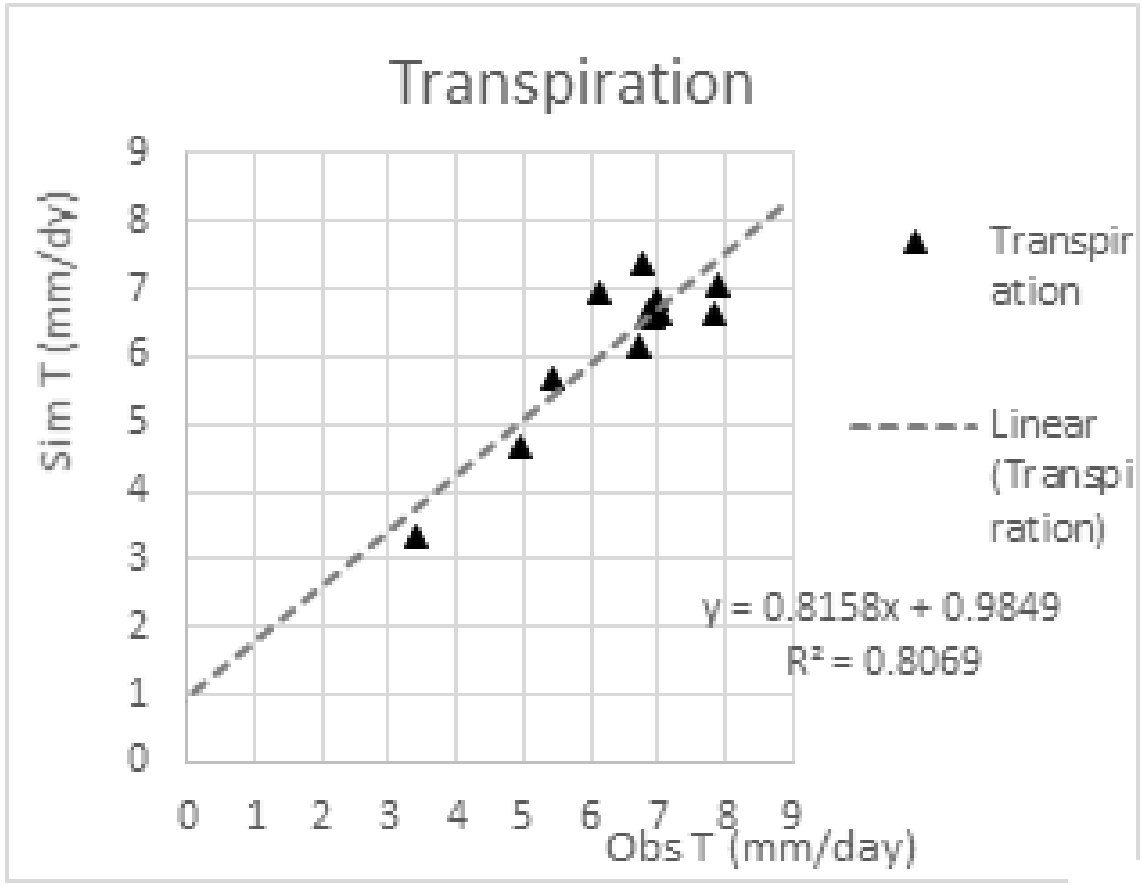
Ground based sensing



Year-1

WASHINGTON STATE UNIVERSITY





WASHINGTON STATE UNIVERSITY

Workshop on Digital Agriculture
Facultad de Agronomía e Ingeniería Forestal (FAIF)
Pontificia Universidad Católica de Chile
2 October, 2019

From plant phenotyping to crop modeling and genomic prediction

Pierre Martre
LEPSE, Université Montpellier, INRA, Montpellier SupAgro, Montpellier, France

Deconvoluting G x E x M interactions

Crop simulation models can help deconvolute these interactions and identify traits to improve crop adaptation in target environments.

Inputs

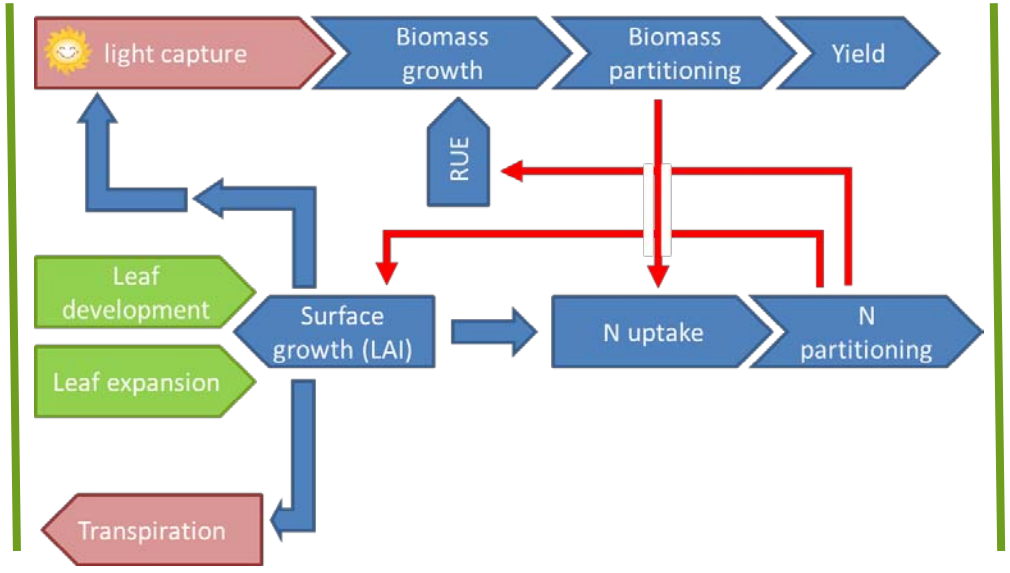
Crop Management
- Sowing date
- N fertilization
- Irrigation
- ….

Soil
- Hydraulic characteristics
- % organic matter
- pH
- ….

Weather
- Temperature
- Radiation
- Precipitation
- …

Genotype
- Radiation use efficiency
- Phyollochon
- Potential grain size
- Fruiting efficiency
- ……

Process-based simulation model



Simulations

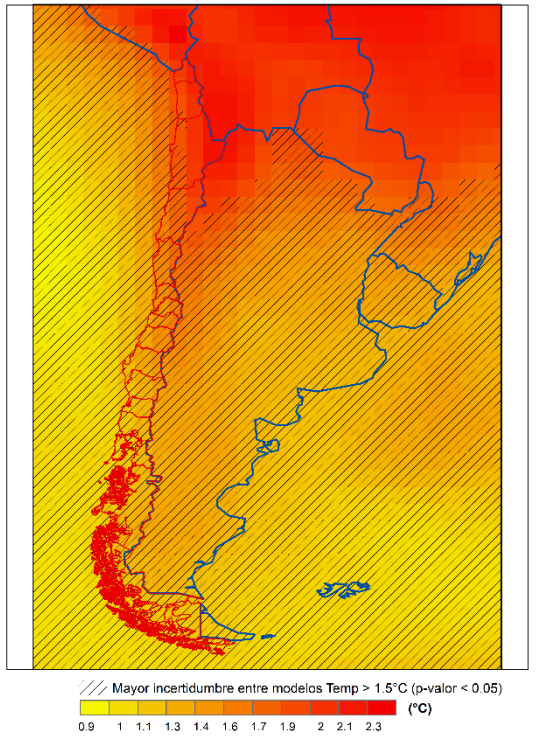
- Grain yield
- % Proteins
- GPD
- NUE
- WUE
- ….

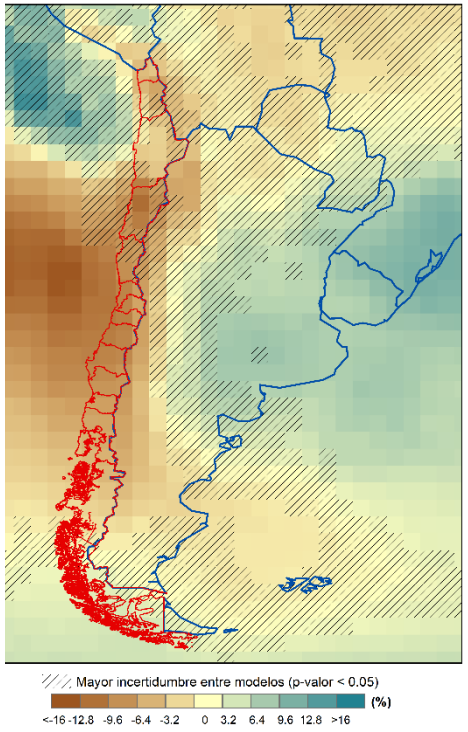
- El cambio climático supone complejos escenarios presentes y futuros para la producción y sostenibilidad de la agricultura, con alto nivel de incertidumbre.

Impactos

Reducción de Rendimientos
Adelantamiento de desarrollo
Estrés hídrico
Pérdida de calidad
Pérdida de aptitud
Aumenta competencia por agua
Deterioro de suelos
Emergencia de plagas y malezas

Pérdidas por 25.000 Millones US (CEPAL, 2012)

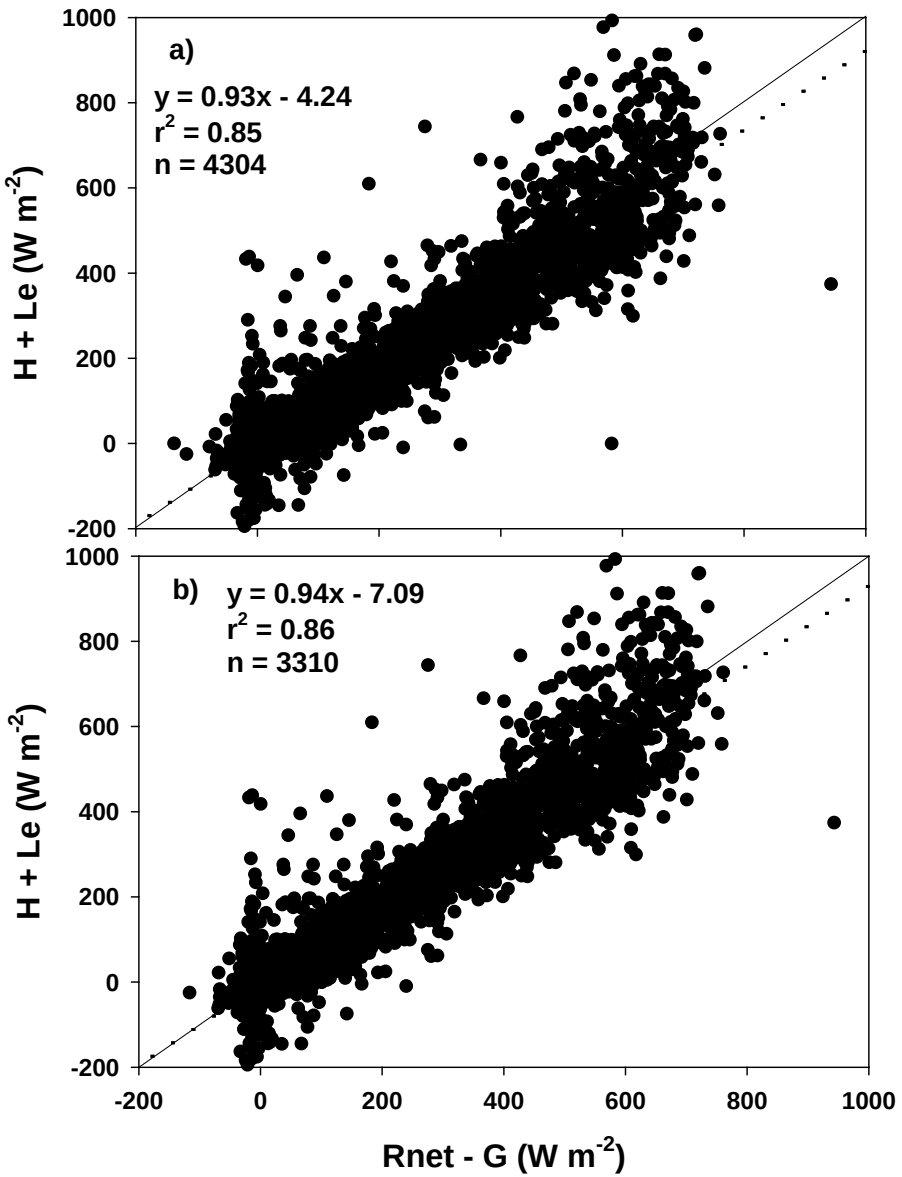


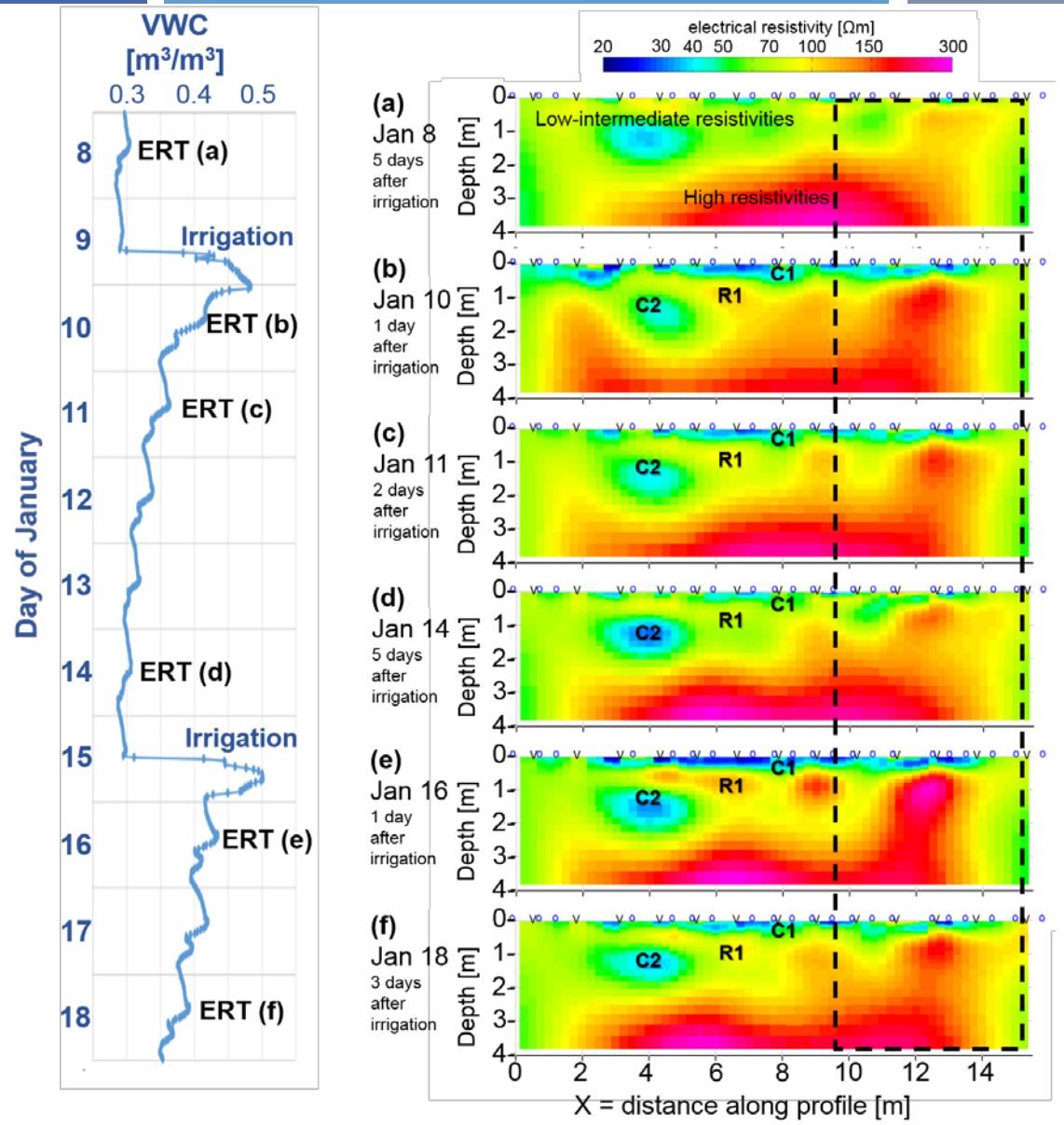


INSTRUMENTACIÓN DE ALTA RESOLUCION

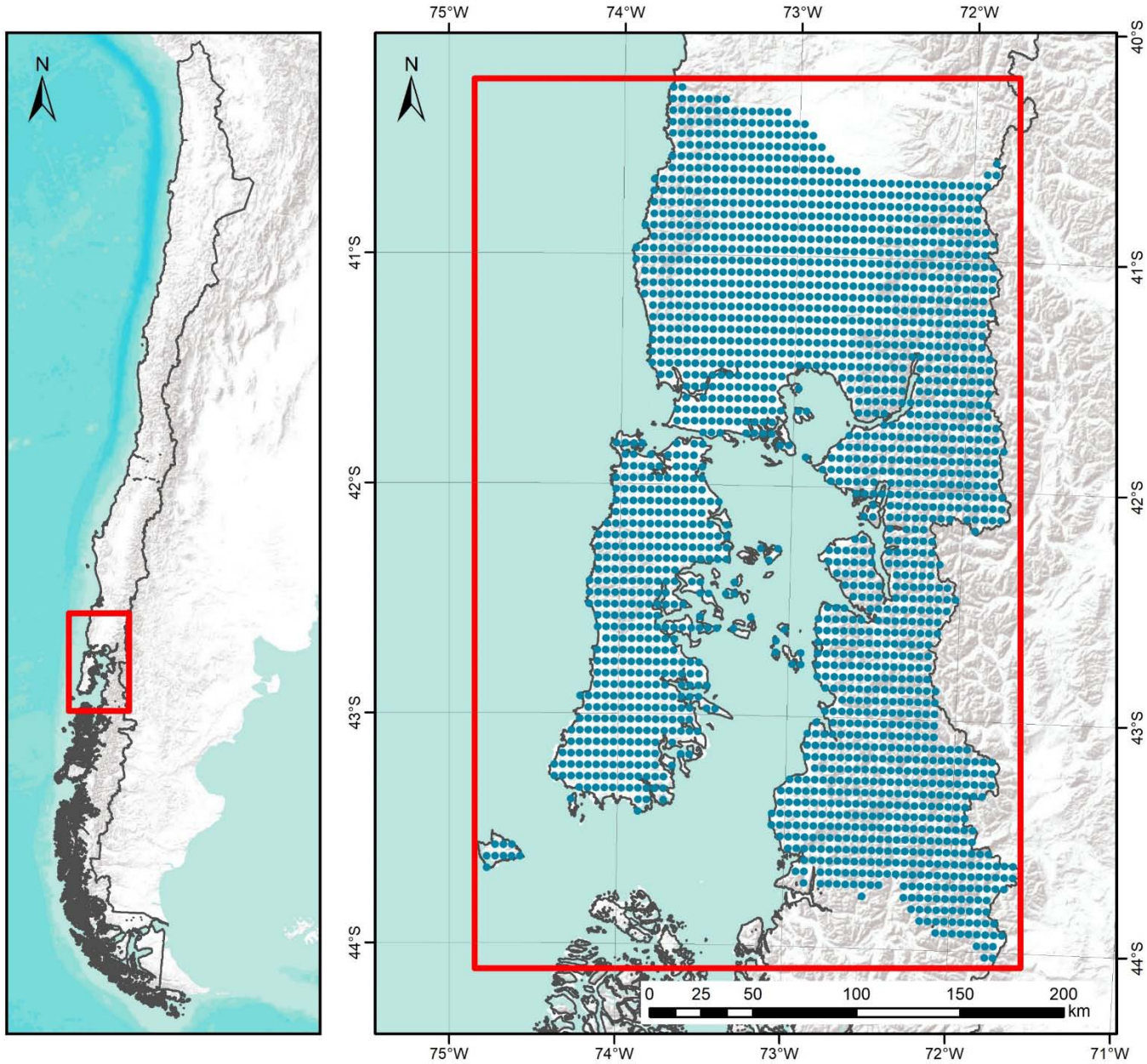
- Anemómetro Sónico
- Open path Gas Analyzer
- Higrómetro
- Termocupla
- Datalogger

Cierre del Balance de Energía





Araya et al. En progreso



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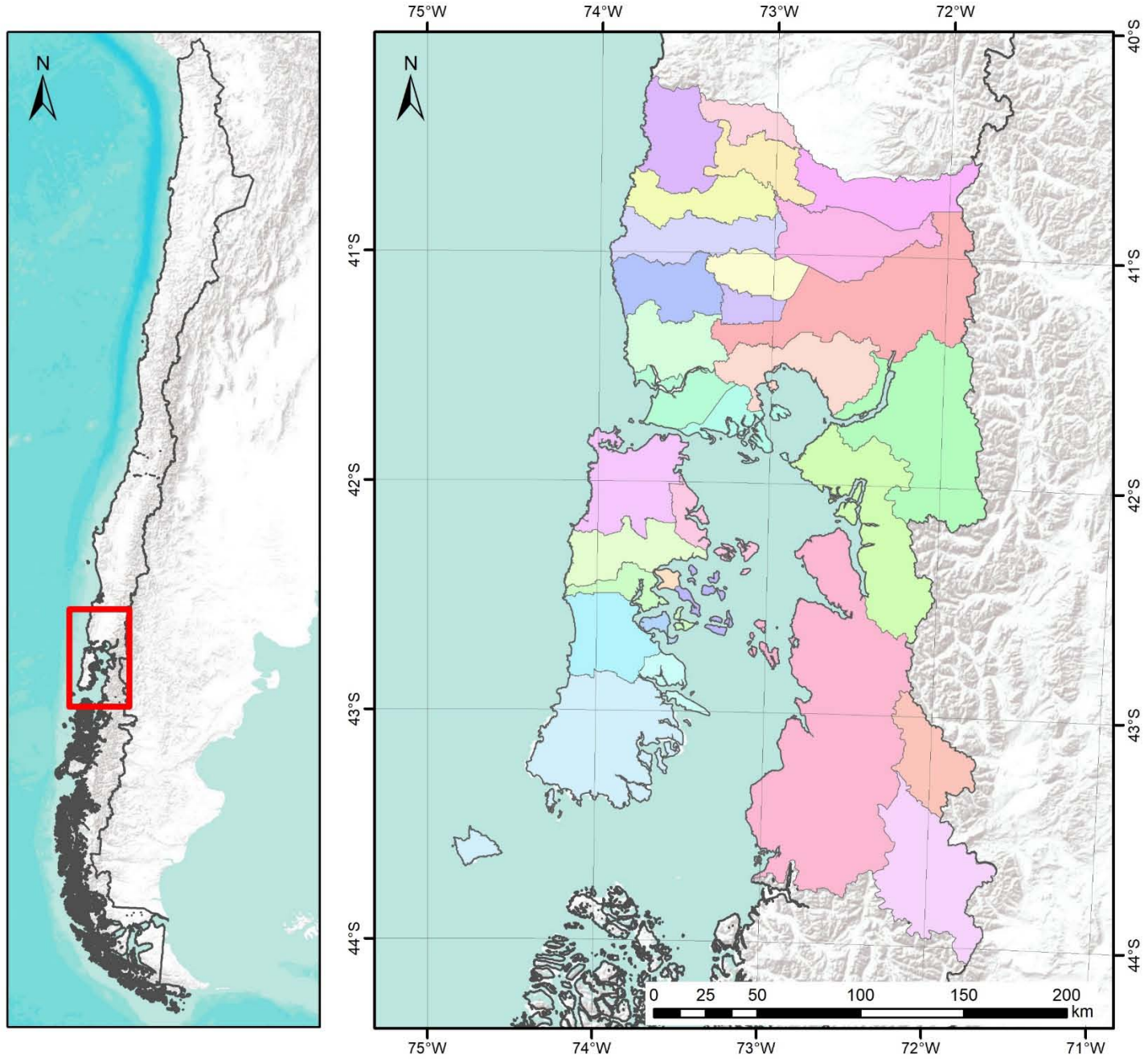

Comunas Región de Los Lagos

- Ancud
- Calbuco
- Castro
- Chaitén
- Chonchi
- Cochamó
- Curaco de Vélez
- Dalcahue
- Fresia
- Frutillar
- Futaleufú
- Hualaihué
- Llanquihue
- Los Muermos
- Maullín
- Osorno
- Palena
- Puerto Montt
- Puerto Octay
- Puerto Varas
- Puqueldón
- Purranque
- Puyehue
- Queilén
- Quellón
- Quemchi
- Quinchao
- Río Negro
- San Juan de la Costa
- San Pablo

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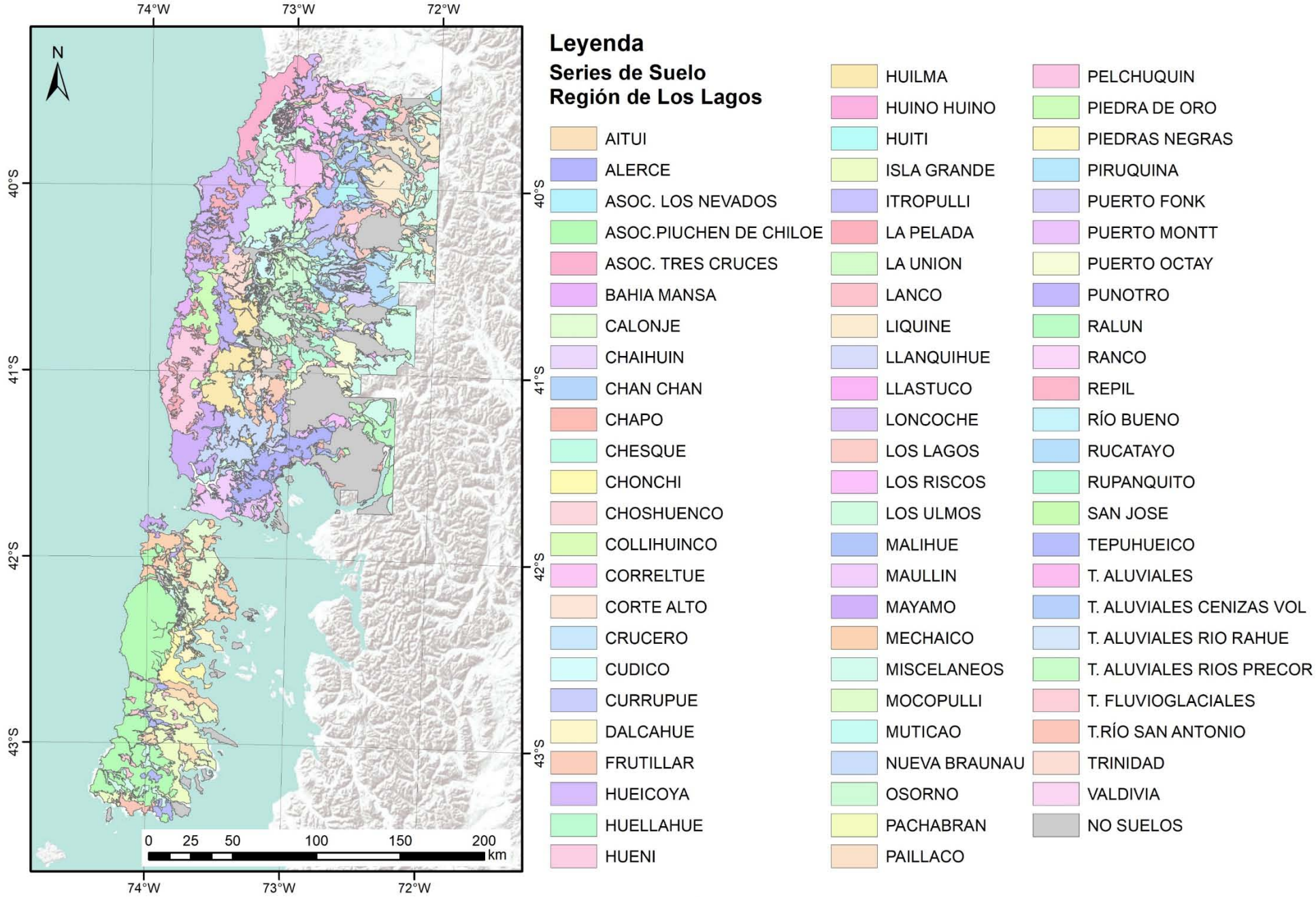

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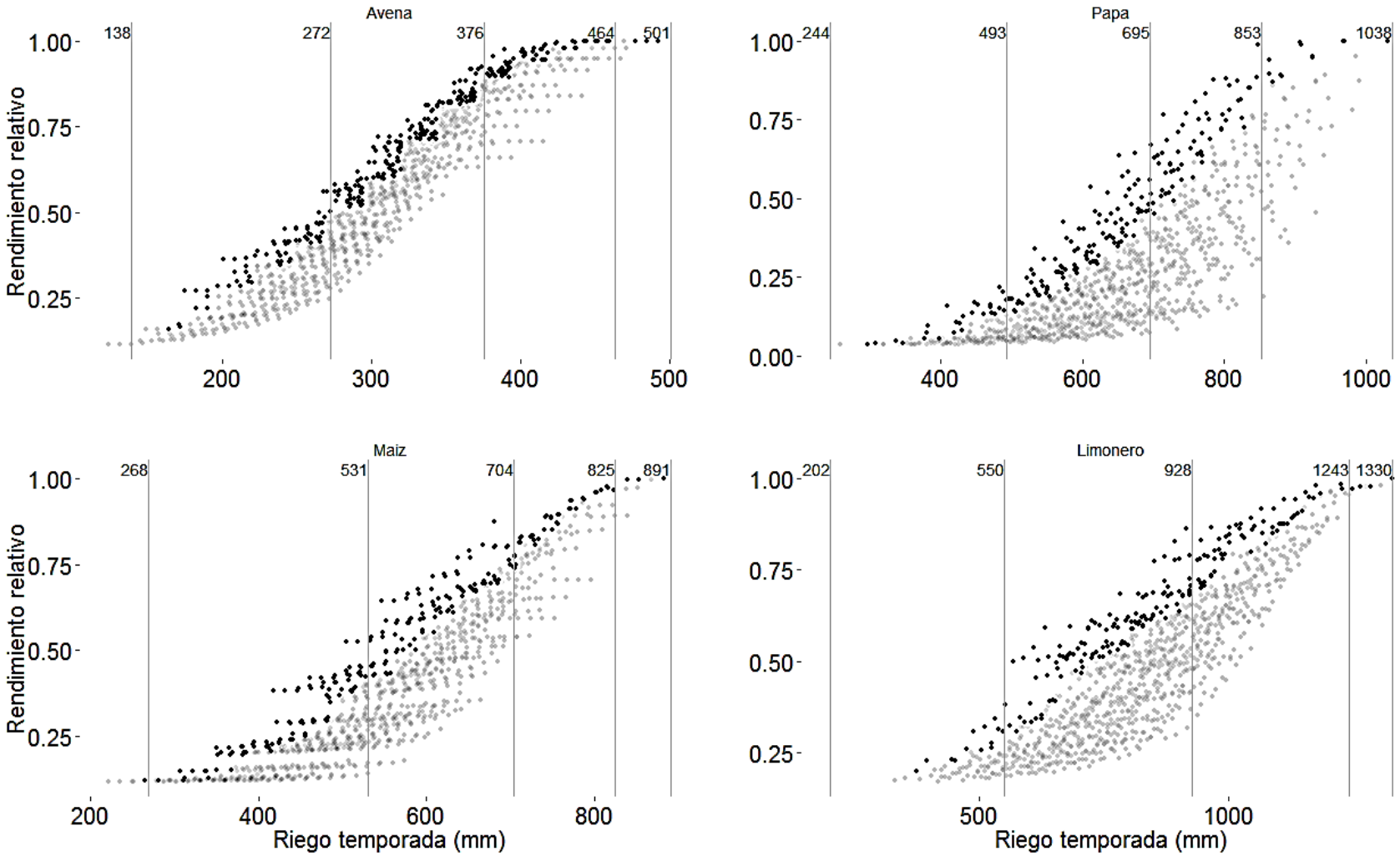
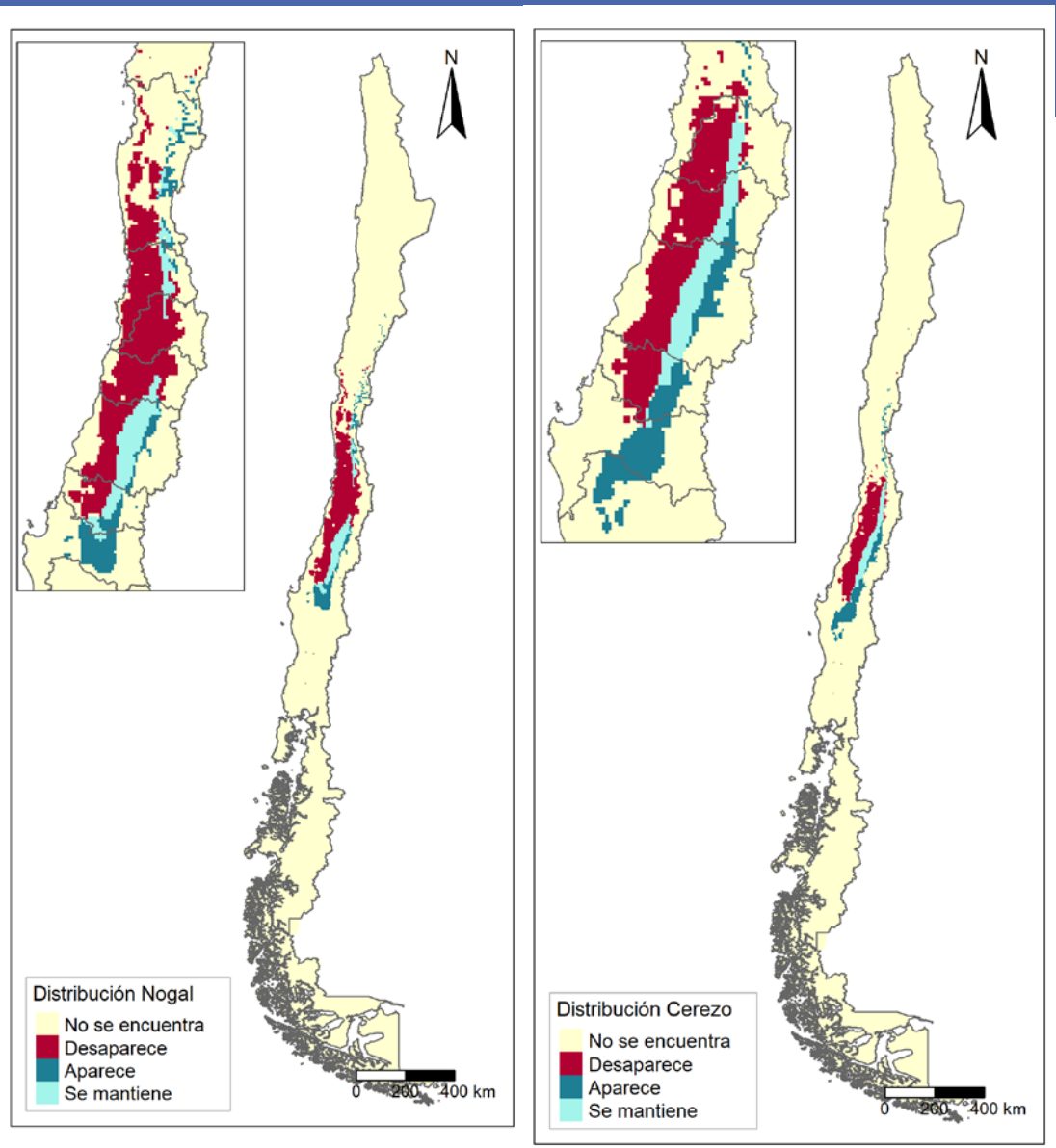
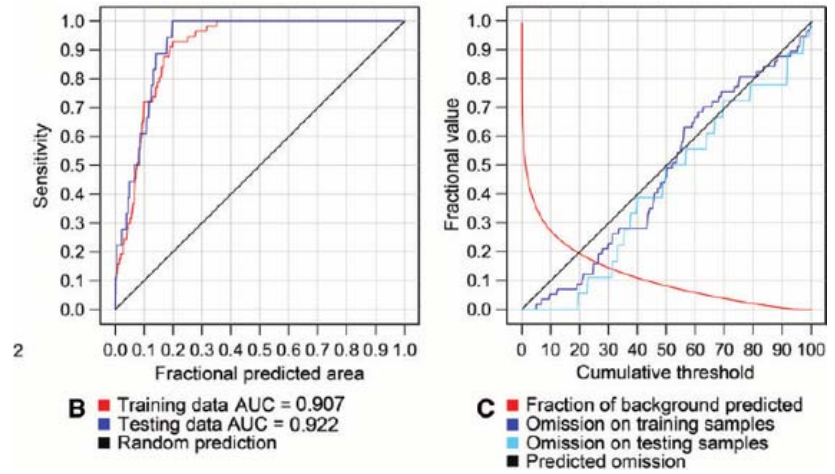
MODELACION DE CULTIVOS



Gonzalez y Meza (En preparación)



MAXENT



COMENTARIOS FINALES

- AGRICULTURA DIGITAL:
- OPORTUNIDAD PARA EVALUAR DE MANERA INTEGRADA LOS IMPACTOS DEL CAMBIO CLIMATICO
- OPORTUNIDAD PARA DISEÑAR Y EVALUAR DE MANERA EXANTE LAS ESSTARTEGIAS DE ADAPTACION
- OPORTUNIDAD PARA FORMAR ESTUDIANTES Y PROFESIONALES CON MAYOR DESARROLLO DE HABILIDADES ANALITICAS/CUANTITATIVAS
- OPORTUNIDAD PARA HACER UN NUEVO TIPO DE ACADEMIA: MAS ABIERTA, COLABORATIVA E INCLUSIVA