WINROCK INTERNATIONAL

Biofuels, water and scale: The case for monitoring outcomes

World Biofuel Markets Conference

The Water Debate

Jessica Chalmers

March 14th 2013

WINROCK INTERNATIONAL

Acknowledgements

- David Seckler – ex Director General of the International Water Management Institute

- Kevin Fingerman – Humboldt State University, California

Winrock Objectives

- Non-profit organisation that aims to:
  - Empower the disadvantaged and accelerate economic development opportunities through effective management of natural resources
  - Build local and regional capacity to apply and improve available technology
  - Mobilize investment
  - Use robust science and economics to inform its work

Why bioenergy & biofuel?

- Development benefits of bioenergy
  - New sources of revenue and jobs for rural areas
  - Strengthened rural infrastructure (roads, communications, technical services, production inputs, governance)
  - Increase quantity and reliability of local energy supply

Winrock International

Enterprise & Agriculture

- Supports growth of small & medium-sized enterprises
- Enhance productivity & connect farmers to markets
- Develops public & private partnerships

Environment: Forestry, Energy & Ecosystem Services

- GIS techniques & imagery for natural resource management
- Carbon stock surveys & measurement
- Watershed management

Empowe-rment & civic engage-ment

US Programs: Specific focus on domestic development challenges facing rural communities

The Henry A. Wallace Center for Agricultural and Environmental Policy

Agriculture Unit

Forestry & Natural Resources Management

Ecosystem Services

Clean Energy
- Promotion of commercially viable RE systems

Civil Society strengthening

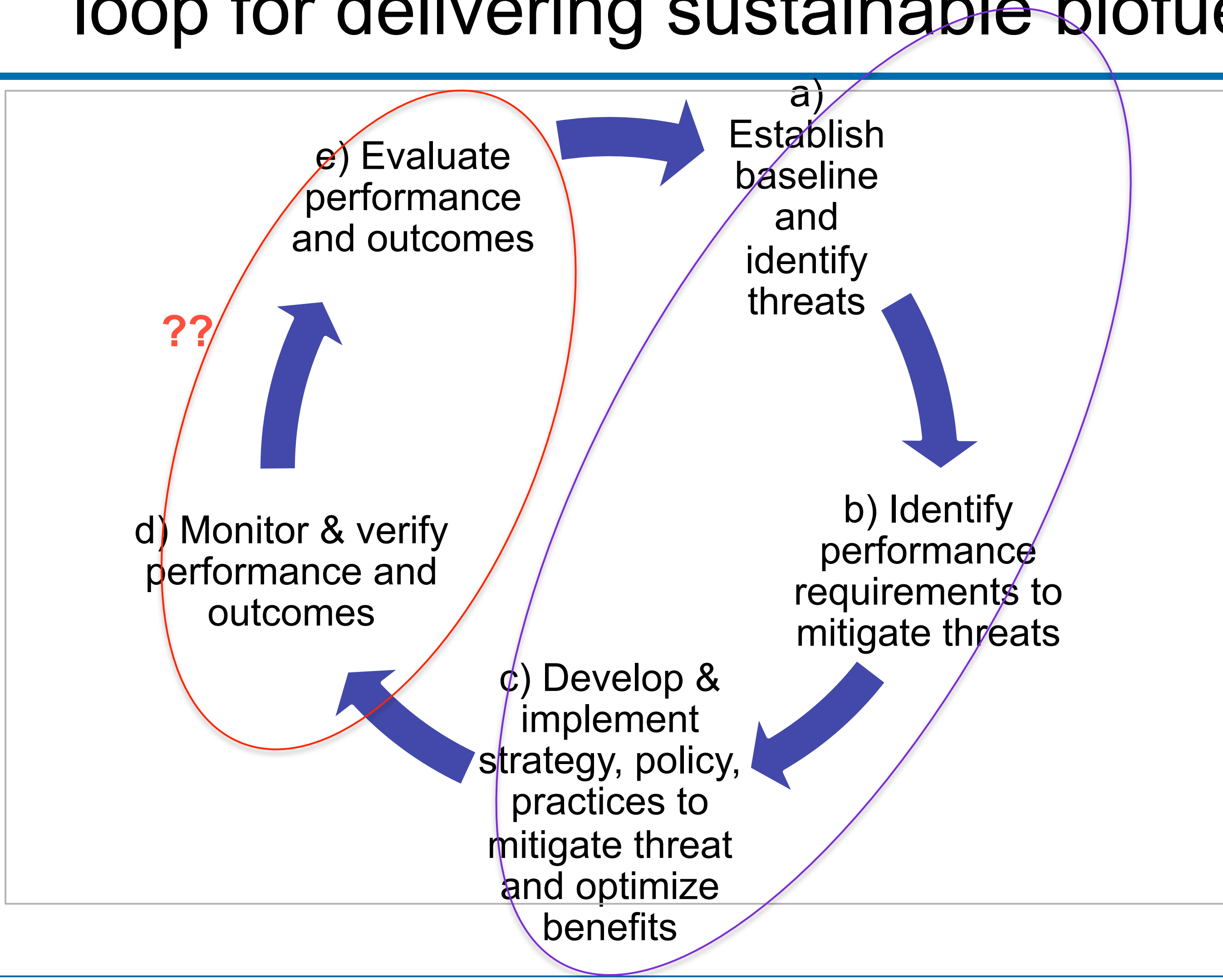
Women's empowerment

Youth leadership & education

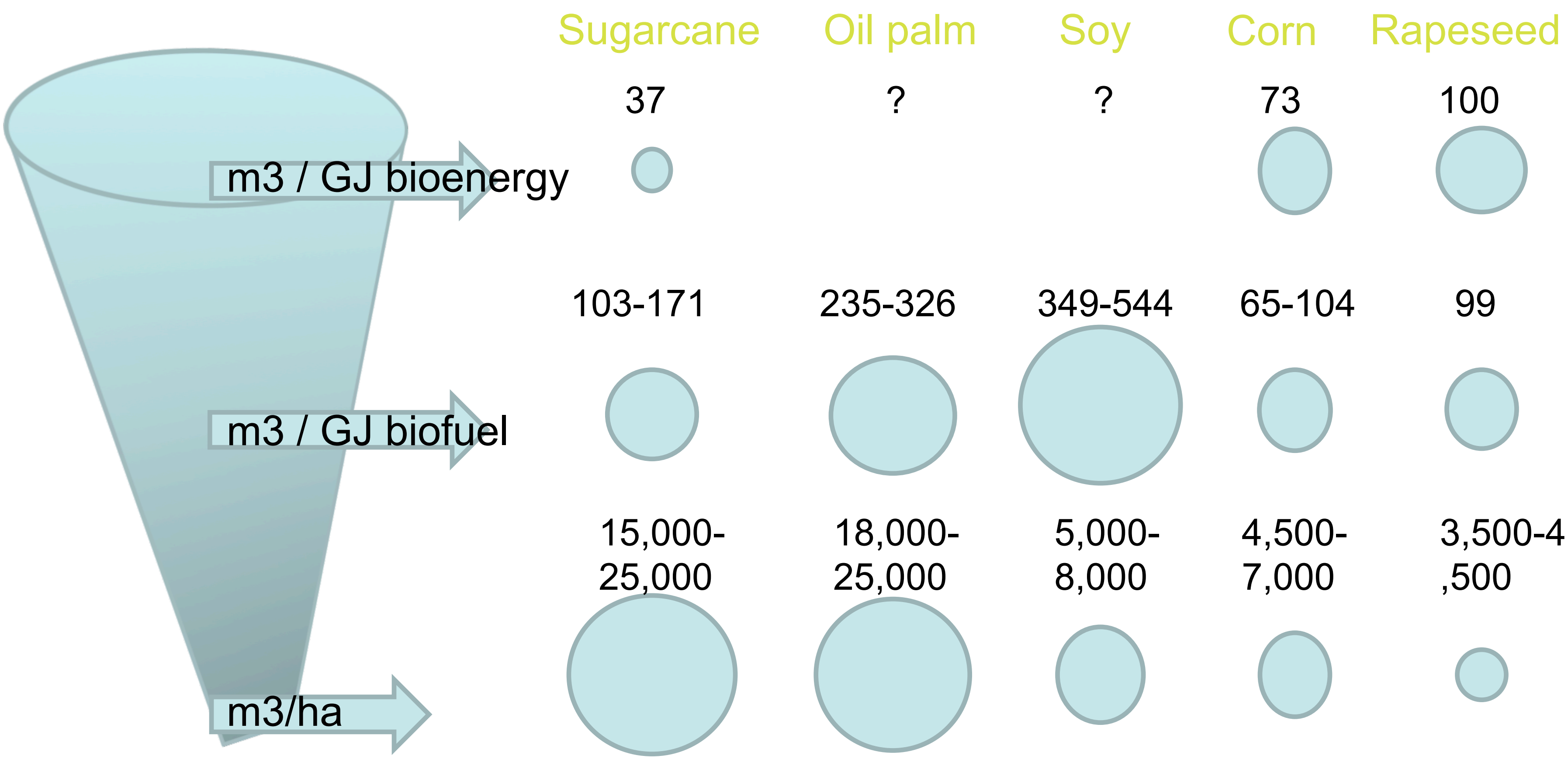
Presentation Overview

- Current approaches - assessment
- Improvements
  - Scale
  - Scope
- Moving towards monitoring

Monitoring **outcomes** is the essential feedback loop for delivering sustainable biofuels



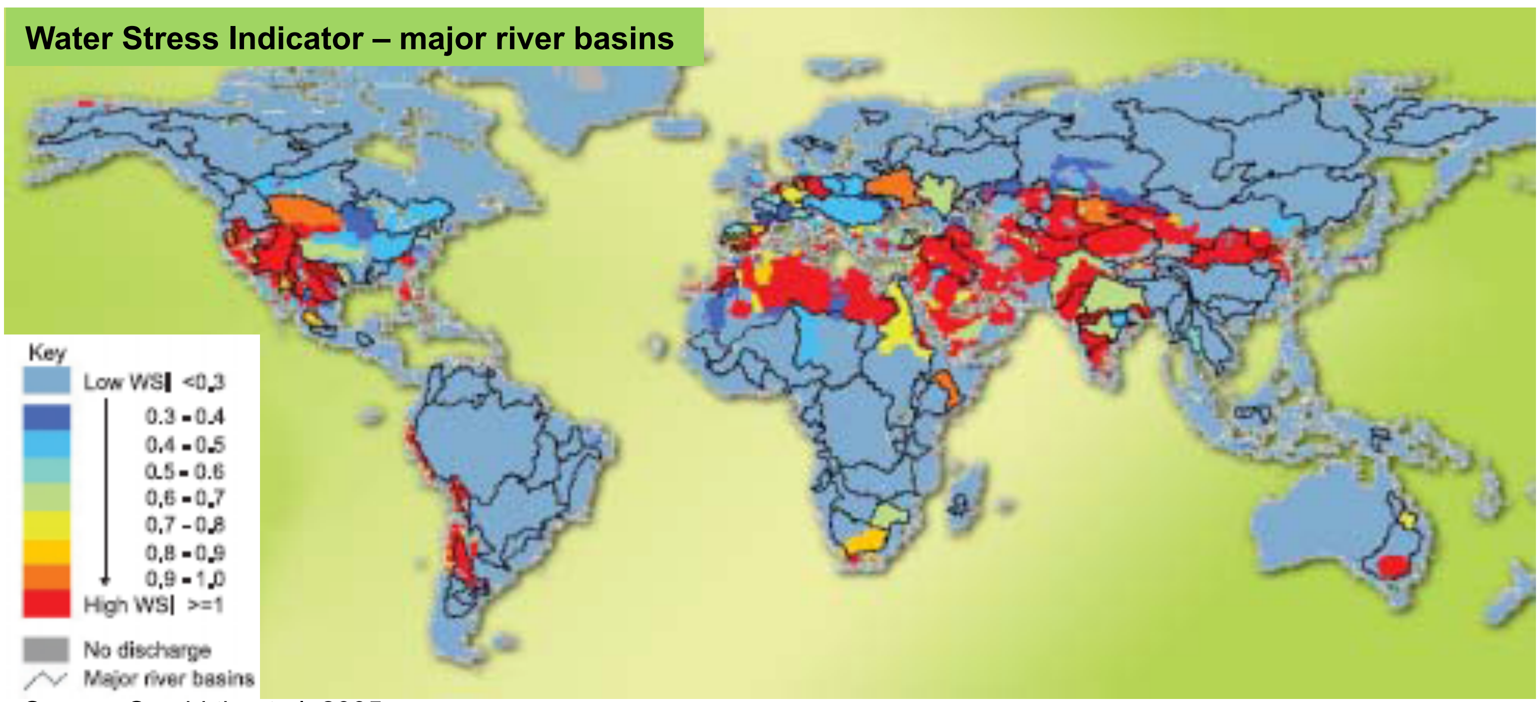
Choice of functional unit is interesting…but misses context



Source: Winrock International, 2009: Based on data from Rajagopal & Zilberman, 2007; Berndes 2002; de Fraiture & Berndes, 2009

River basin assessment and monitoring is critical for delivering biofuels sustainably

- Some requirements of standards include: water management plans, water footprints, reduction of water use by X%
- But what about the appropriate context? – river basin availability



Source: Smahktin et al, 2005

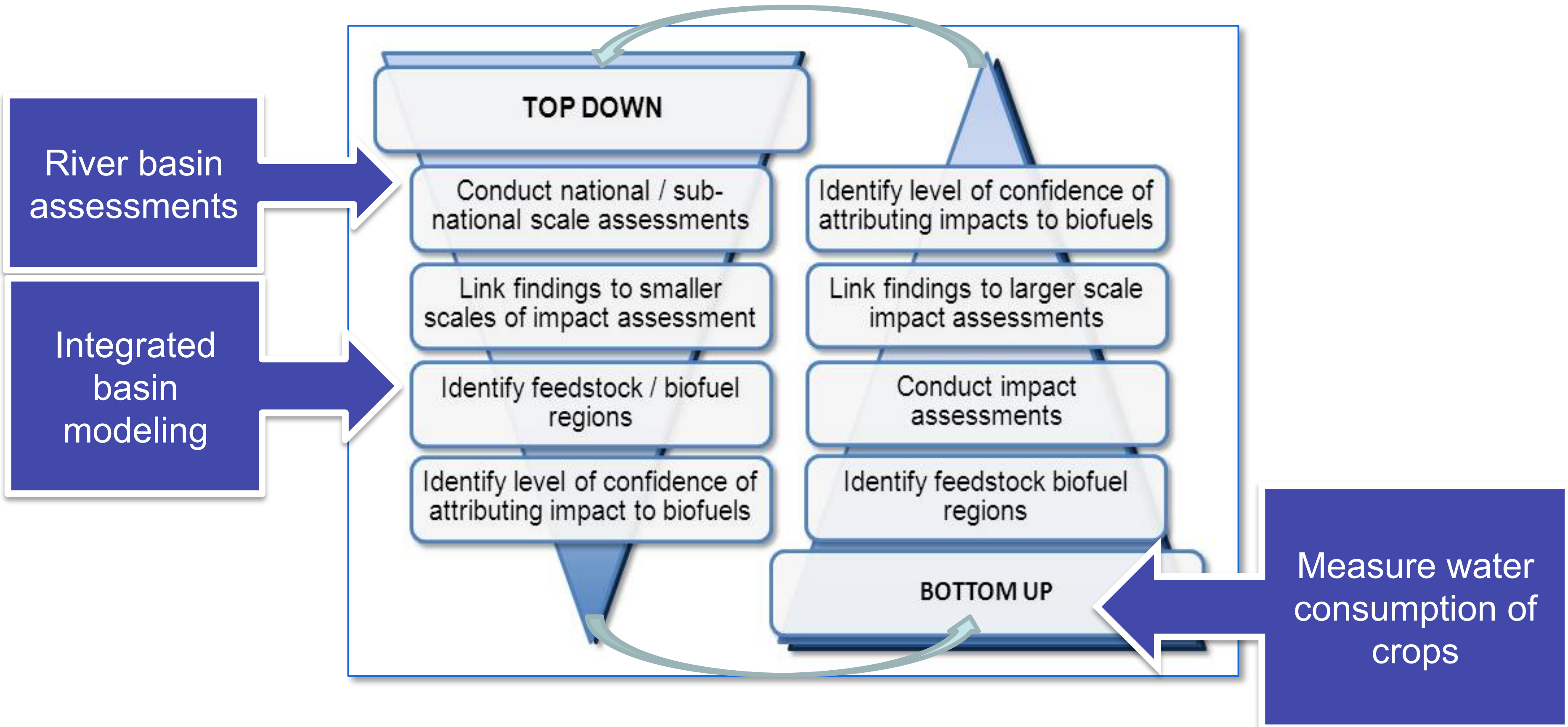
Without this, actions could be irrelevant or counterproductive

- ***Requirement: Improve irrigation / water use efficiency***

  – Water savings from modern irrigation technology are mostly illusionary - they reduce drainage which at the field level means less water needs to be applied to satisfy crop water requirements. But at the basin level of analysis most of the drainage becomes "return flow"; it returns to the rivers, lakes, and aquifers where it is usually captured and reused by downstream users.

- ***Requirement: Increase yield in order to reduce iLUC impact*.**
  – Increasing yield increases water requirements
  – Reduced water availability for downstream uses may lead to changes in land use – iLUC is not avoided

Links across geographic scales are key to monitoring outcomes



We need to monitor consumption… not withdrawal

- "In 2000, about 195,000 million gallons of water each day (Mgal/d) were used to produce electricity, whereas withdrawals for irrigation were an estimated 137,000 million gallons per day (Mgal/d)." (http://ga.water.usgs.gov/edu/totpie95.html)

- Only a small fraction of the diversion for electricity is actually consumed, maybe 5%, the rest returns to the river basin. Irrigation, however, consumes about 60% of its diversions through evapotranspiration. Thus while it sounds as though electricity is a larger water user than irrigation, irrigation actually consumes over eight times more water than (hydro)electricity.

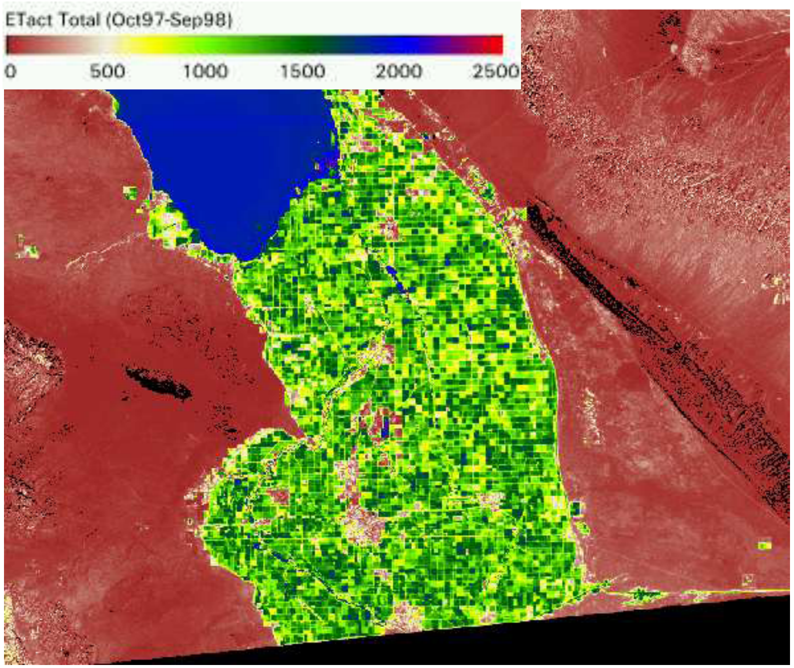
Total water requirements are relevant NOT only irrigation demand

	Country	Feedstock	WSI (cropland only)	WSI (country average)	Net irrigation demand (m^3 per ha)	Net water footprint (% change per ha)
High stress	Ukraine	Rapeseed	0.81	0.80	-65	24%
	USA	Soybeans	0.69	0.78	-231	-16%
Moderate stress	Canada	Rapeseed	0.29	0.06	-10	22%
	Russia	Sunflower seed	0.27	0.06	-86	-12%
	Malaysia	Palm Oil	0.24	0.06	-198	12%
Low stress	Indonesia	Palm Oil	0.19	0.03	-340	75%
	Argentina	Soybeans	0.09	0.36	-32	7%
	Brazil	Sugarcane	0.04	0.03	261	74%
		Soybeans			-8	39%
	Paraguay	Sugarcane	0.03	0.03	1064	114%
	Tanzania	Sugarcane	0.05	0.02	-56	90%
	Guatemala	Sugarcane	0.01	0.01	1014	97%

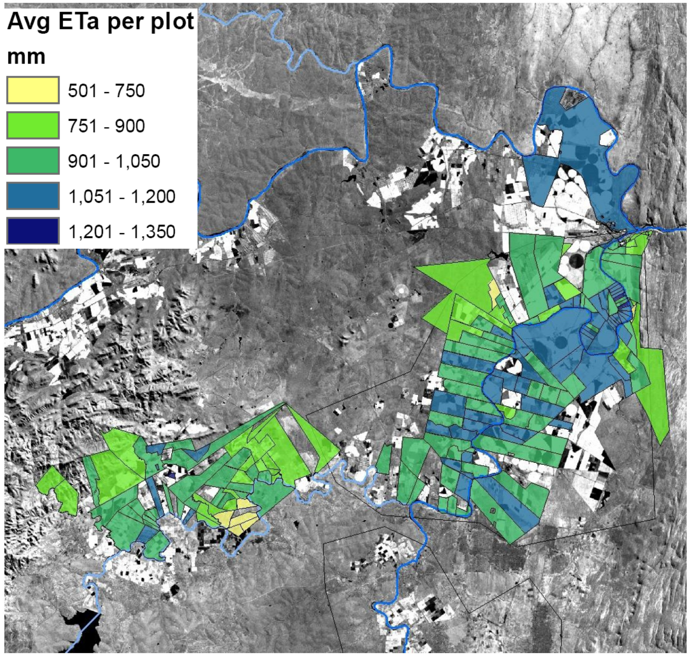
Source: TBA   Average cultivation = Area-weighted average of crops that comprised at least 1% of area under cultivation in 2010 to represent the "average hectare". Yield and water data averaged for 1991-2010 to account for climatic variations.

Winrock International

Remote sensing could be used to assist in monitoring across scale



Annual total ET in Imperial Valley (California, US) in the period Oct 1997 – Sep 1998. The image dimension is approx 75 km x 75 km, pixel size is 30 m (source: Thoreson et al., 2009 cited in eLEAF/Winrock paper).



Average ET actual per plot for commercial farming in Lomati and Komati basins, South Africa (source: Perry, 2007).

Conclusions:

How will we know if we really are delivering biofuels sustainably?

- Choice of functional unit (metrics) influences sustainability conclusions but have to be based in context of river basin status

- We need to focus on monitoring outcomes not just one-off assessments.
  - Assessment and monitoring across temporal and geographic scales is needed – context and baseline data
  - Communication network needed to co-ordinate data across geographic scales (top down and bottom up)

Thank you!

www.winrock.org

Jessica Chalmers

JChalmers@field.winrock.org

+44 (0) 7985 499 061