Master class - Smart Water and Agriculture

Using waterpads
Retention, recharge reuse
Managing salinity

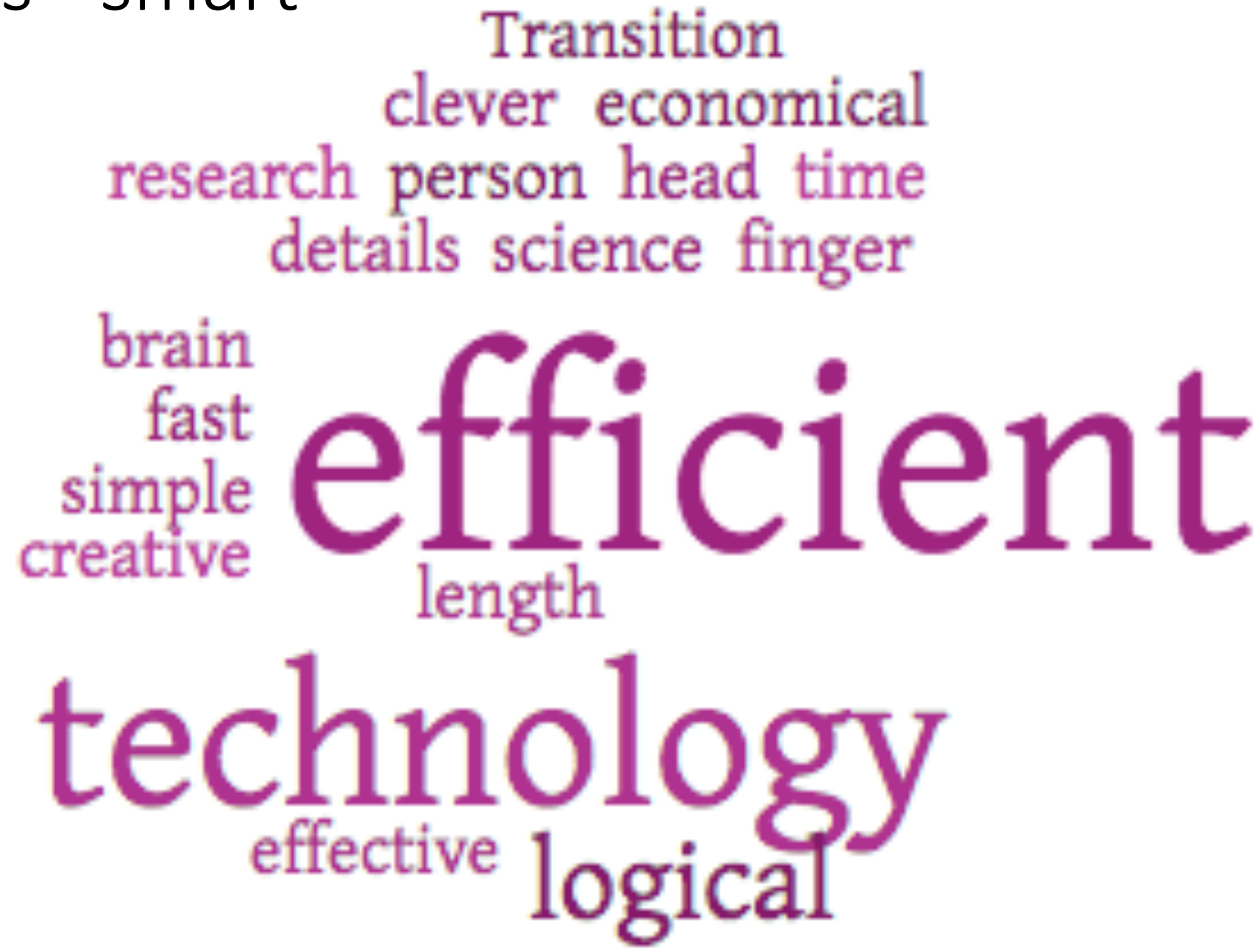
META

Flood-Based Livelihoods Network Foundation

Master class – the outline

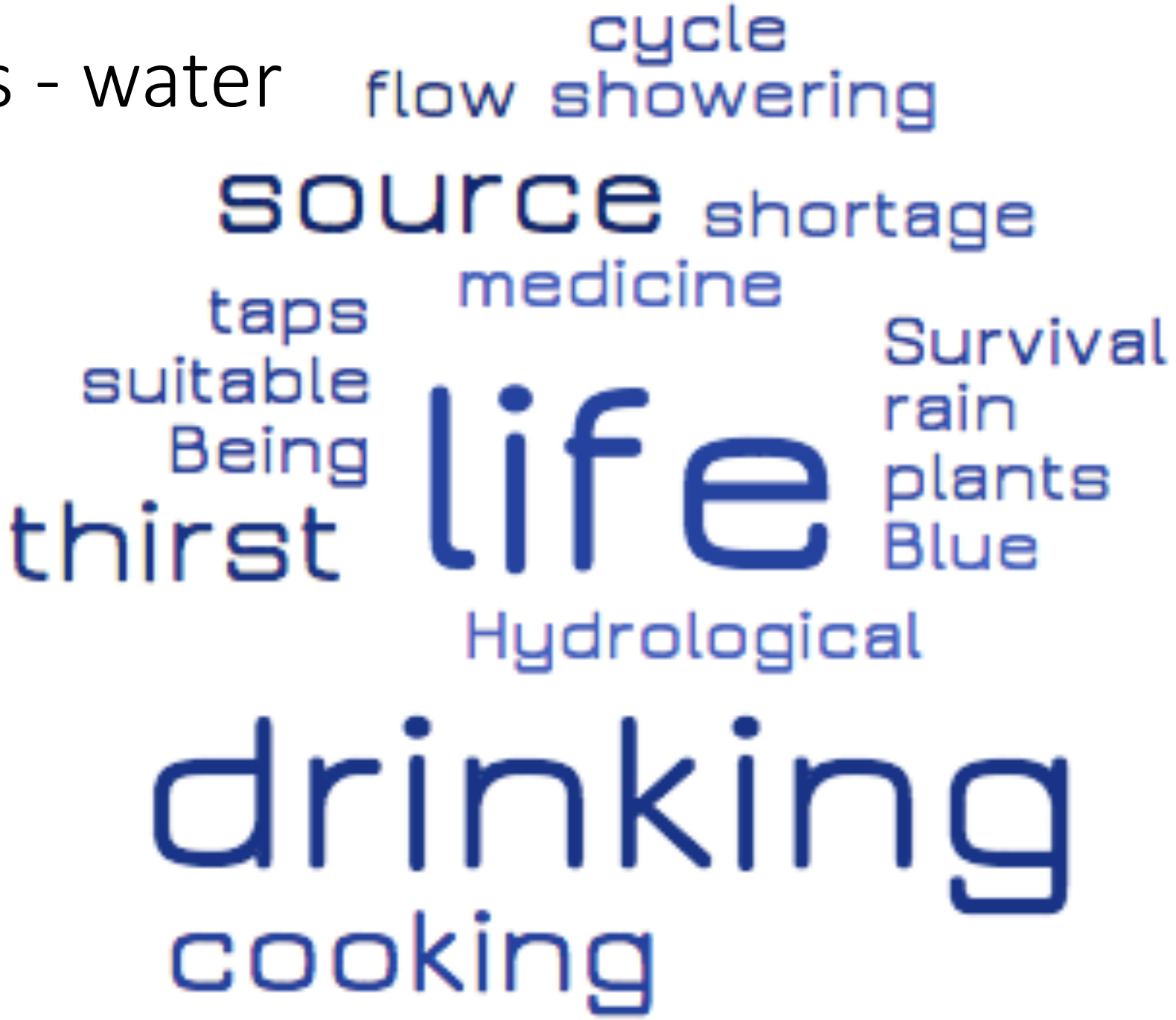
- What is water, agriculture and what is smart / Smart / S.M.A.R.T.
- From innovations to solutions for agriculture
- ‘smart’ solutions
  - Recovering water in Deyang (China)
  - Managing salinity with salt tolerant potatoes
  - Implementing Waterpads

first thoughts - smart



first thoughts - agriculture

first thoughts - water



first thoughts

Smart
water
agriculture

Smart water…le's first hits

What does smart (/Smart/S.M.A.R.T.) mean and how are we using this word?

Oxford dictionary – Smart : Fashionable / Quick-witted intelligence / Capable of independent action

Smart water for agriculture

- **S =** Socially and environmentally viable
- **M =** Measurable, quantifiable (M&E)
- **A =** Affordable, financially and business wise feasible
- **R =** Replicable, upscalable
- **T =** Technically feasible

SMART Water Centres

- **S =** Simple
- **M =** Market based
- **A =** Affordable
- **R =** Repairable
- **T =** Technologies

What is water

'*Classical*' elements of nature Earth, Wind, Fire and Water

H20 - Molecule

Solid (ice), Liquid and Gas

Water evaporates, condenses, falls (gravitational flow)

,but also adheres and can counter gravitation

What is Agriculture

'*Ager*' '*Cultura*' – land cultivation

Also defined as *'the art, the science and the business of producing crops and livestock'*

Requirements are:

1. the elements of nature;
2. the human

, with the brain

Smart

Agriculture

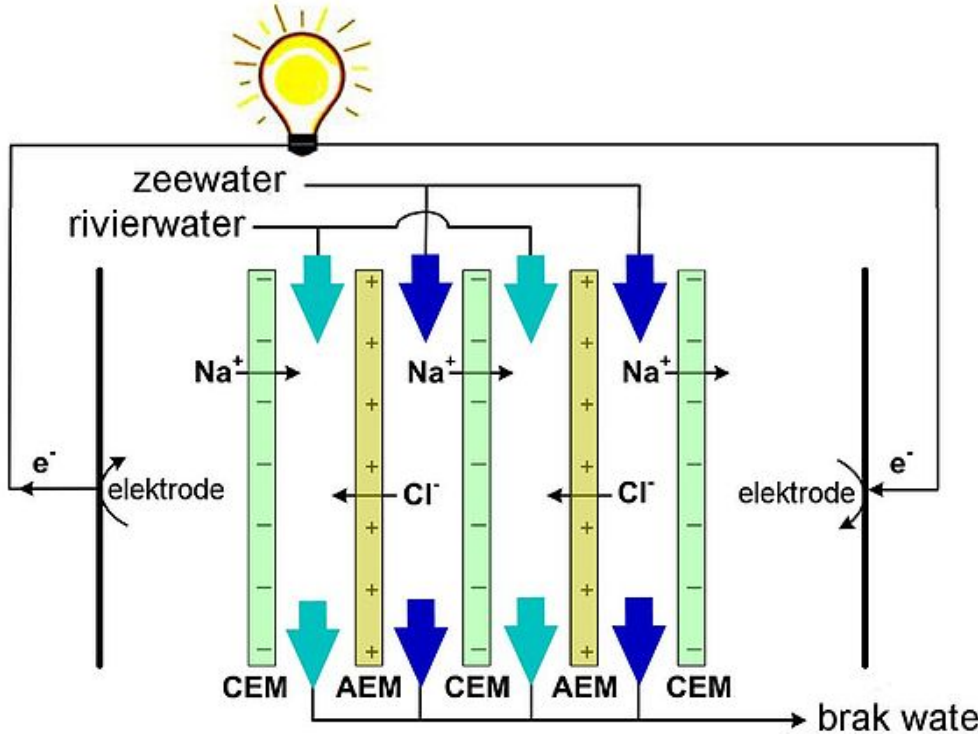
Water

second thoughts

Smart water solutions (examples)

- Energy

Reverse ElectroDialysis (Afsluitdijk, The Netherlands)



- Dew collection

(Namib Desert Beetle)

- Transport (ice skating)

Water and Agriculture

- Natural physical environment
- Humans - with their accumulated knowledge, skills, tools and their intelligence, i.e. the ability to acquire and apply these as means to gather sufficient water and food in a given specific 'context'

Matching Water and Food challenges with Solutions

By being smart - intelligent / capable of independent context specific action …

Solutions

Magoye ripper – combing an innovation and practice (minimal tillage)

Smart is

- analysis, translating and applying
- combining innovations and practices to make them count/workable, i.e. Solve problems / induce development

(combing and scaling of) Solutions

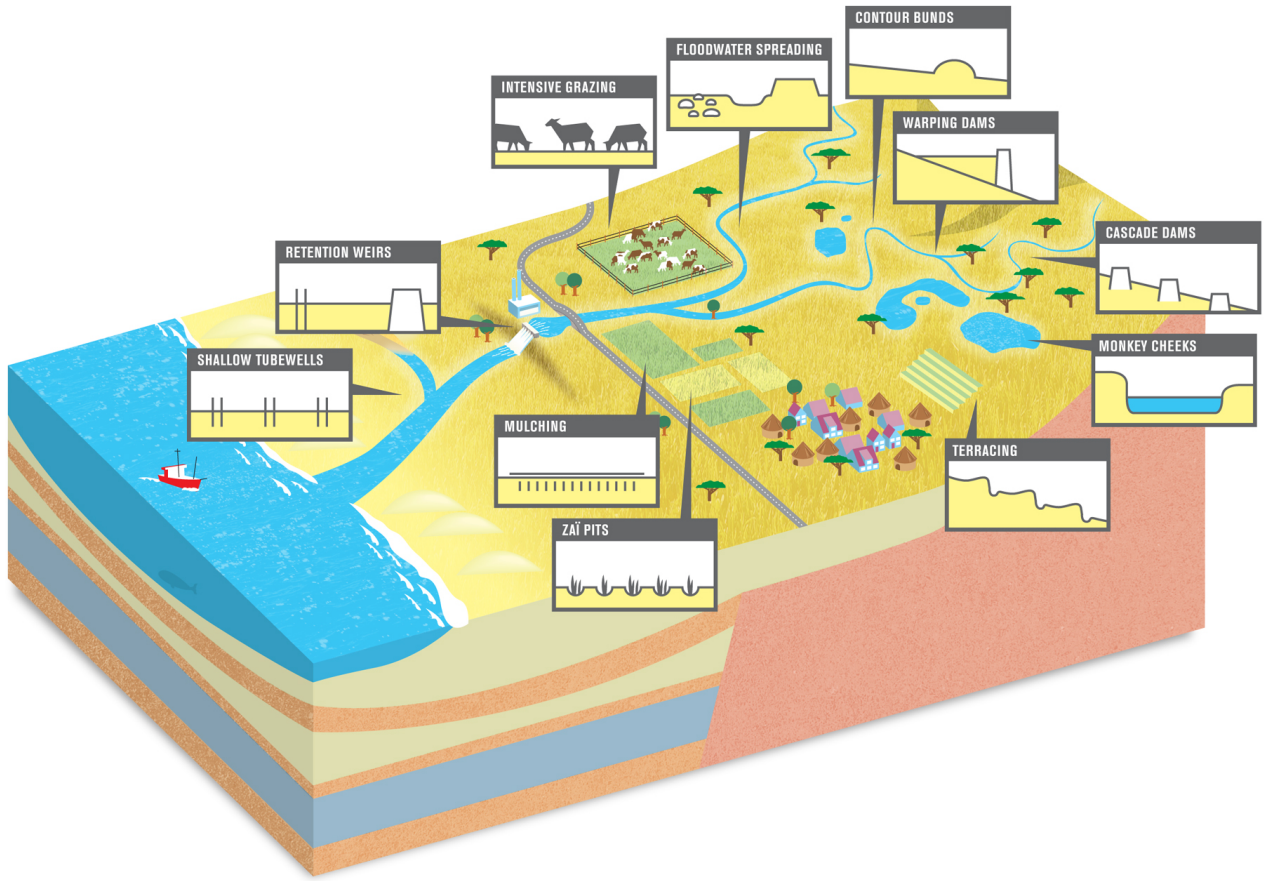


Table 4. Overview of techniques described in this book

		Technique	Geographic Suitability*			Function						New or existing
#	Main category		Upper	Middle	Lower	Soil conservation	Recharge	Retention	Reuse	Micro-climate	Water quality	
1	A	Contour bunds	•	•		•	•	•				Existing
2	A	Grass strips	•			•		•			•	Existing
3	A	Gully plugging	•			•	•	•				Existing
4	A	Bench terraces	•			•		•				Existing
5	A	Stone bunds	•	•		•	•	•				Existing
6	A	Trapezoidal bunds		•	•		•	•				Existing
7	A	Tied ridges	•			•		•				New
8	A	Demi lunes		•		•		•				Existing
9	A	Tal ya trays			•							Existing
10	A	Double dug beds			•			•		•		New
11	A	Composting	•	•	•			•		•		New
12	A	Bio-char	•	•	•			•				New
13	A	Organic mulching	•	•	•			•		•		Existing
14	A	Plastic mulching		•	•			•		•		Existing
15	A	Making use of invertebrates		•	•		•					New
16	A	Planting pits		•	•	•	•	•				Existing
17	B	Percolation ponds and contour trenches	•	•		•	•					New
18	B	Tube recharge	•				•					New
19	B	Subsurface dams	•	•	•		•	•	•			Existing
20	B	Sand dams		•	•		•	•	•			Existing
21	B	Sand dune water infiltration			•		•		•			New
22	C	Harvesting water from roads		•	•		•	•	•			Existing

(combing and scaling of) Solutions

Smart Water and Agriculture – References to solutions

- seeing is believing - www.thewaterchannel.tv / https://www.youtube.com/channel/UCNEgSbZYxVHgmMF-AH0D6Jg

- reading is understanding – www.bebuffered.com / www.wocat.net / www.fao.org/publications/en / www.nwp.nl/_docs/SWS_2006.pdf

- programmes / projects in action – www.smartcentregroup.com / www.facebook.com/smrtwtr /

‘smart’ solutions

- Implementing Waterpads (link with water productivity and buffer management)
- Wetland park integrated with groundwater recharge and water supply in Deyang (link with buffer management/ 3R)
- Managing salinity with salt tolerant potatoes (irrigation and drainage challenges / link with sweet water productivity)

Waterpads – a water buffer solution

Water buffering…

Buffering water in landscapes - Road water harvesting in Amhara (Ethiopia)

Water buffering…

Buffering in soils – Rice husk mulching, Farmer Field School (Tanzania)

Buffering water in landscapes - Road water harvesting in Amhara (Ethiopia)

Water buffering…

Buffering in at root zone – Waterpads in open soil (Turkey)

Buffering in soils – Rice husk mulching, Farmer Field School (Tanzania)

Buffering water in landscapes - Road water harvesting in Amhara (Ethiopia)

Waterpads – a sandwich of hessian, polymers and paper

Components:

A fully biodegradable water and nutrient buffer for plants

Waterpads

Application:

- (drip)irrigated agriculture
- different growing media
- different crops: annual / perennial, ornamental / edible
- reusability

Previous results

- Roses (The Netherlands): 36% yield increase
- Tomatoes (Spain): 51% yield increase; 37% water application reduction
- Citrus saplings (Pakistan): 53 % higher rate of foliage growth; 31% water application reduction

Waterpads in pots

Green pepper, cocopeat in pots

Waterpads in open soil

Tomato in open soil

Waterpads in different substrates

Green pepper, eggplant, cucumber and tomato in cocopeat and perlite slabs

Waterpads in practice

Waterpads
from innovation - to - smart solution

Green pepper		AVG Yield/Slab	
		Total weight	Yield increase/decrease
		grams	% of 100%
Cocopeat %100		1441	
Cocopeat W %100		1682	17%
Cocopeat %75		1433	
Cocopeat W %75		1542	7%
Cocopeat %50		1134	
Cocopeat W % 50		1192	-17%
Perlit %100		729	
Perlit W100		826	13%
Perlit %75		618	
Perlit W %75		811	11%
Perlit %50		545	
Perlit W % 50		522	-28%

Green pepper

Higher Yields

Break even point after 2.5 seasons

Waterpads
from innovation - to - smart solution

Green pepper		Water application		Water savings
		Liters	% of total	Liter/slab
Cocopeat %100		438	100%	
Cocopeat W %100		438	100%	
Cocopeat %75		330	-25%	108
Cocopeat W %75		330	-25%	108
Cocopeat %50		221	-50%	217
Cocopeat W % 50		221	-50%	217
Perlit %100		282	100%	
Perlit W100		282	100%	
Perlit %75		210	-26%	72
Perlit W %75		210	-26%	72
Perlit %50		140	-50%	142
Perlit W % 50		140	-50%	142

Green pepper

Lower water requirements

Waterpads
from innovation - to - smart solution

Green pepper		AVG Yield/Slab	Yield	Water application		Water savings
		Total weight	increase/decrease			
		grams	% of 100%	Liters	% of total	Liter/slab
Cocopeat %100		1441		438	100%	
Cocopeat W %100		1682	17%	438	100%	
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Water productivity

Waterpads – Water productivity

Productivity:

- Water – Plant / Soil – Plant
  - Water can be as productive as its environment allows it to be (nutrients, micro-organisms, soil organic matter, micro-climate ,etc.)

  Waterpads provide buffer for water and nutrients

- Farming practice and rational
  - Saving water
  - Saving land
  - Saving inputs

Roll out of a smart solution

Co-creation of knowledge and expertise

Farmer adaptation

Roll out of a smart solution 2017

Farmer adaptation

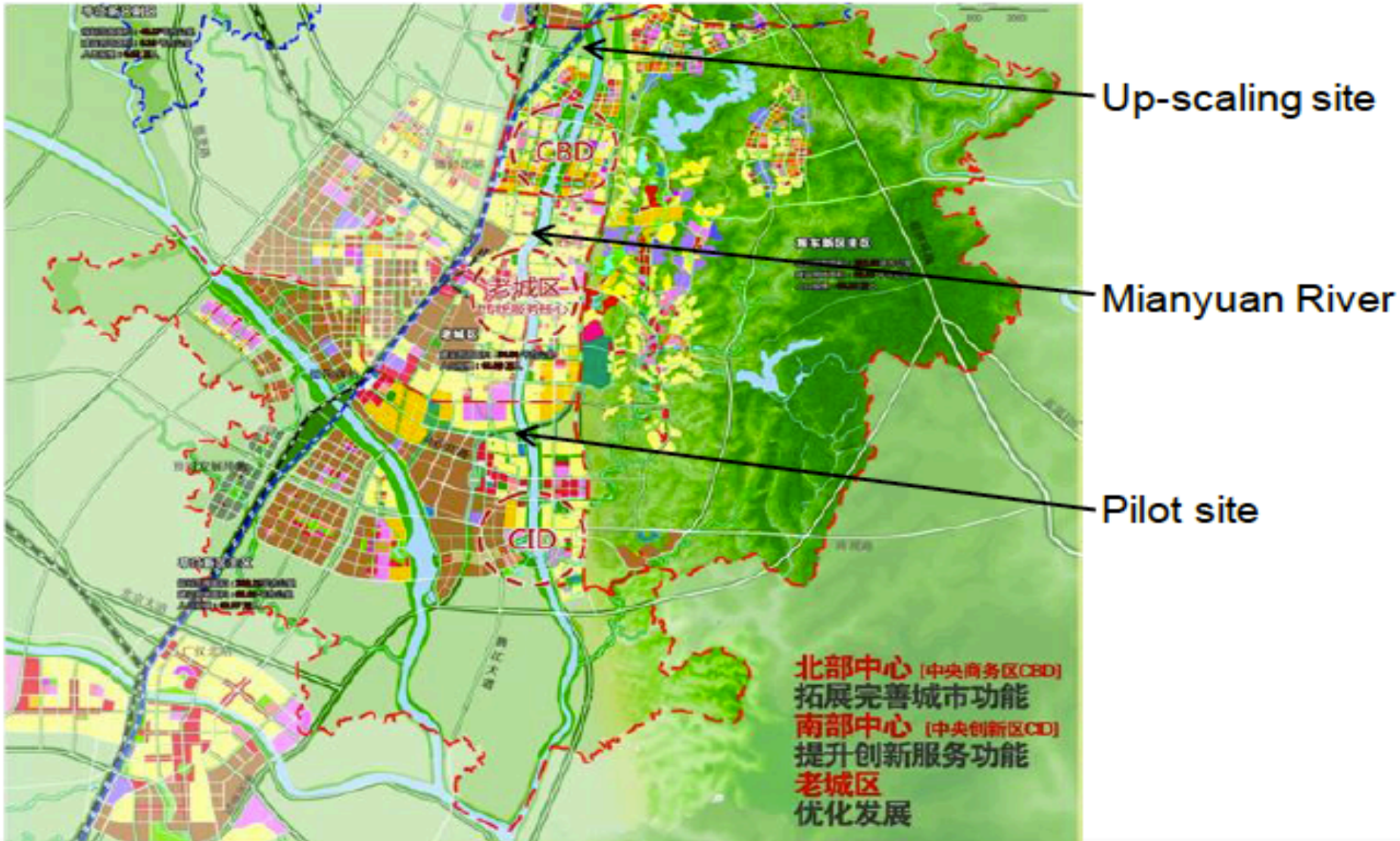
Roll out of a smart solution 2017

Research and development

1. Antep Pistachio Research Institute

2. Gap Agricultural Research Institute, (Olive, Pistachio and Pine tree plantation)

Smart Solution - Wetland park integrated with groundwater recharge and water supply in Deyang City, China



time lapse – 4 years

Smart Solution - Salt tolerant potatoes

Soil salinisation and sodicity a global problem - Billion hectares of affected lands

Salinity

- (natural) Mineral Weathering
- (artificial processes)Irrigation

Introduction of potatoes

- Saline soils, 4 – 12 dS/m
- Alternating sweet (/non-saline) water and brackish water, 0.8 dS/m

- Saving 10,000 m3/ha of sweet water
- Achieving above national average yields:
  - Total average 21ton/ha (5% increase)
  - Average of introduced variety compared with local variety on same plot 55% increase

Salinity

making and tasting non-saline, moderately saline and brine (/seawater)