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The Role of Horizontal Subsurface Drainage in Irrigated Agriculture in the Semi-arid and Arid Regions

Henk Ritzema
Alterra/Chairgroup IWE
Wageningen University and Research Centre
Wageningen
Henk.ritzema@wur.nl



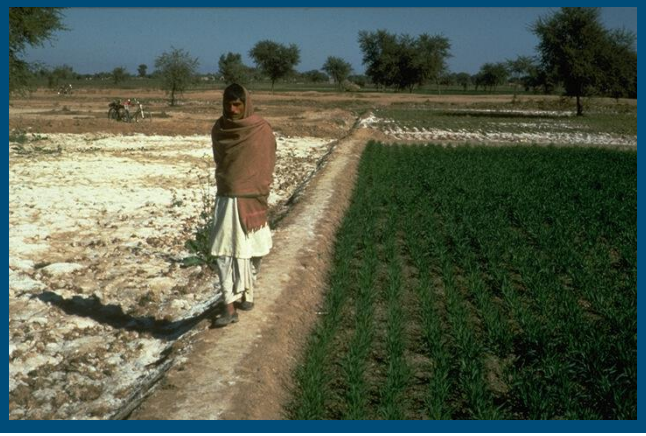


Worldwide: 20% of the cropped land is irrigated ➔ contributing 35-40% of agricultural outputs

Problem: waterlogging and salinity

Indicator	Unit	World	Egypt	India	Pakistan
Irrigated area	(Mha)	272	3.4	57.2	16.7
Drained Area	(Mha)	190	3.0	2.5	7.5
of which subsurface drainage	**(Mha)**		**1.9**	**0.025**	**0.32**
Salt-affected areas	**(Mha)**		**1.0**	**6.7**	**2.4**
of which waterlogged	**(Mha)**		**0.6**	**4.5**	**1.7**

ICID, 2003



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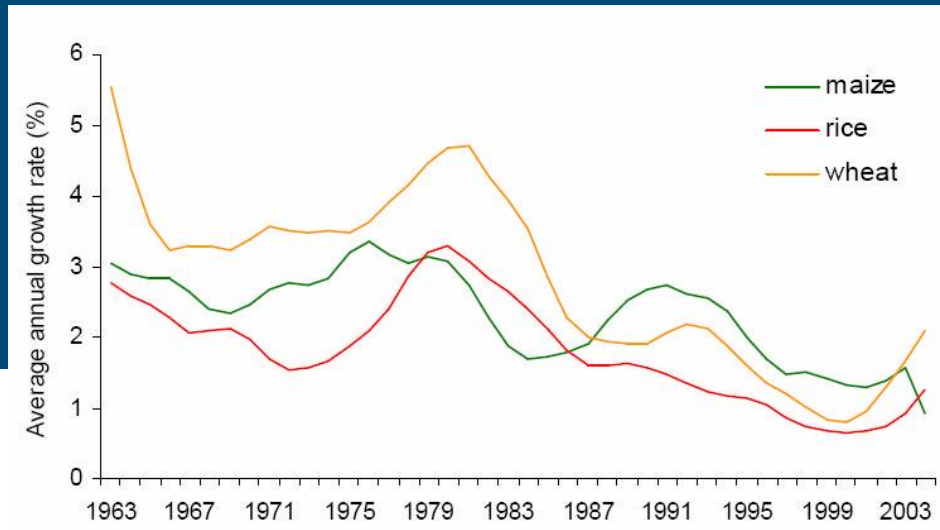
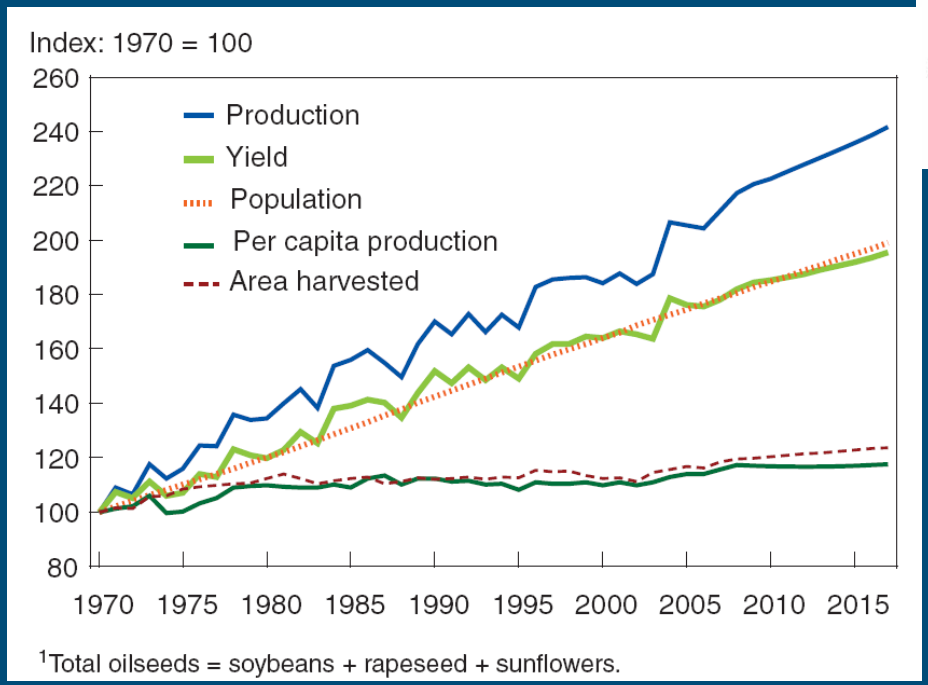
The challenge

Food production has to be doubled in the next 25 years



World Bank, 2008



Trostle, 2008

Majority of this increase has to come from existing agricultural lands

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PhD Study - Research Question & methodology

Research question:

Under which conditions is subsurface drainage a technically feasible, cost-effective and socially acceptable technology to sustain agriculture in irrigated lands?

Methodology:

Comparing subsurface drainage practices in Egypt, India and Pakistan*.

* Based on lessons learned over the last 25 years in a number of research, education and advisory projects in these countries

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Are the subsurface drainage systems technically sound?

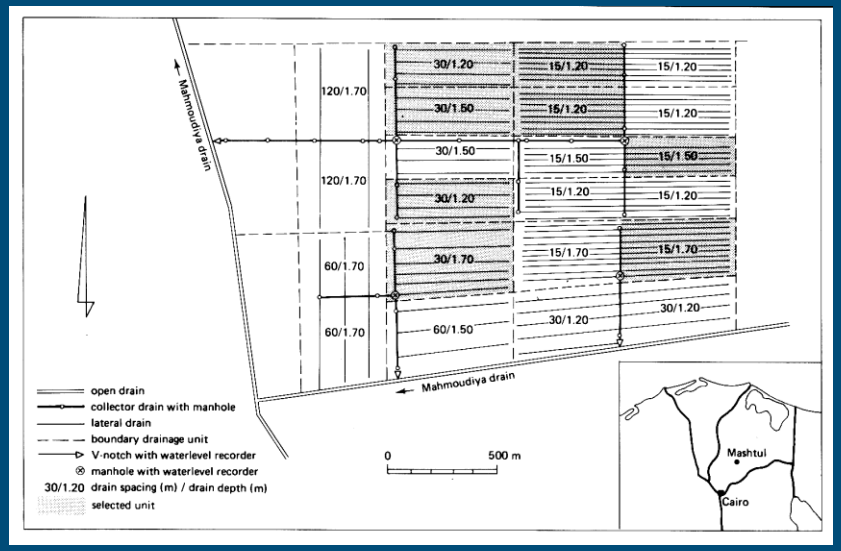
1. Need for ssd can be reduced by:

- Improving or restoring surface drainage
- Identifying areas in need for drainage by looking to the soil & hydrological conditions

2. Need for operational control

(not only for areas with rice in the cropping pattern)

- Savings in irrigation water
- Reduction of drainage effluent



3. Reduction in design criteria:

	discharge	drain depth
	(mm/d)	(m)
Egypt	1.0 ➔ 0.9	1.20 - 1.40
India	2.0 ➔ 1.0 to 1.5	1.75 ➔ 0.5 - 1.5
Pakistan	3.5 ➔ 1.5	2.25 - 2.40 ➔ 1.50 - 2.10

(Ritzema et al, 2007)

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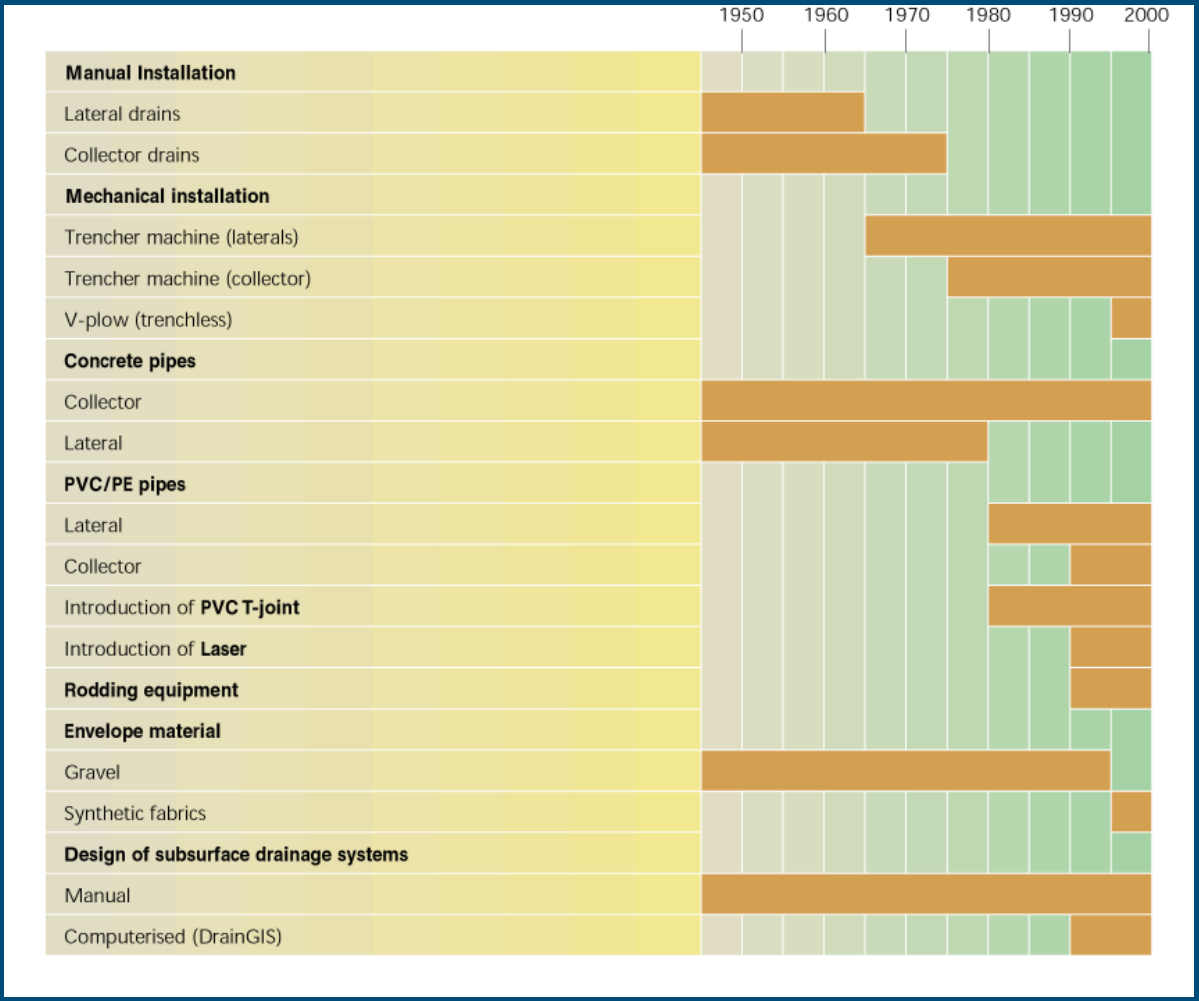
Are the subsurface drainage systems technically sound? (cont).



Nijland, 2000

4. Implementation practices:

From manual to large-scale implementation

➔ improvements in:

- equipment
- materials
- planning
- organisation
- human capacity

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Are the subsurface drainage systems cost-effective?

Installation costs for large-scale installation:

Egypt: € 750/ha
India: € 770 – 815/ha
Pakistan: € 1200/ha

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Nijland et al, 2005

Are the subsurface drainage systems cost-effective? (cont.)

B/C ratio: 1.2 to 3.2

IRR: > 20%

Pay-back period: 3 to 5 years

Increase in the value of the land

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Ritzema et al., 2008

Is subsurface drainage an accepted practice?

Egypt:

- EPADP: planning, design, implementation
- WAU's: operation

India:

- CADA's
- Farmer

Pakistan:

- WAPDA: p
- PID: operation
- Water boards and far

Conclusions:

- Top-down
- Farmers see the benefits
- Farmers are willing to contribute
- Farmers cannot do it on their own
- Farmers do not have the means

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Ritzema et al., 2006

Conclusions

- Is SSD technical feasible? Yes, but …
- IS SSD cost-effective? Yes, but …
- IS SSD socially accepted? Not yet, ….

↓

The Way Forward

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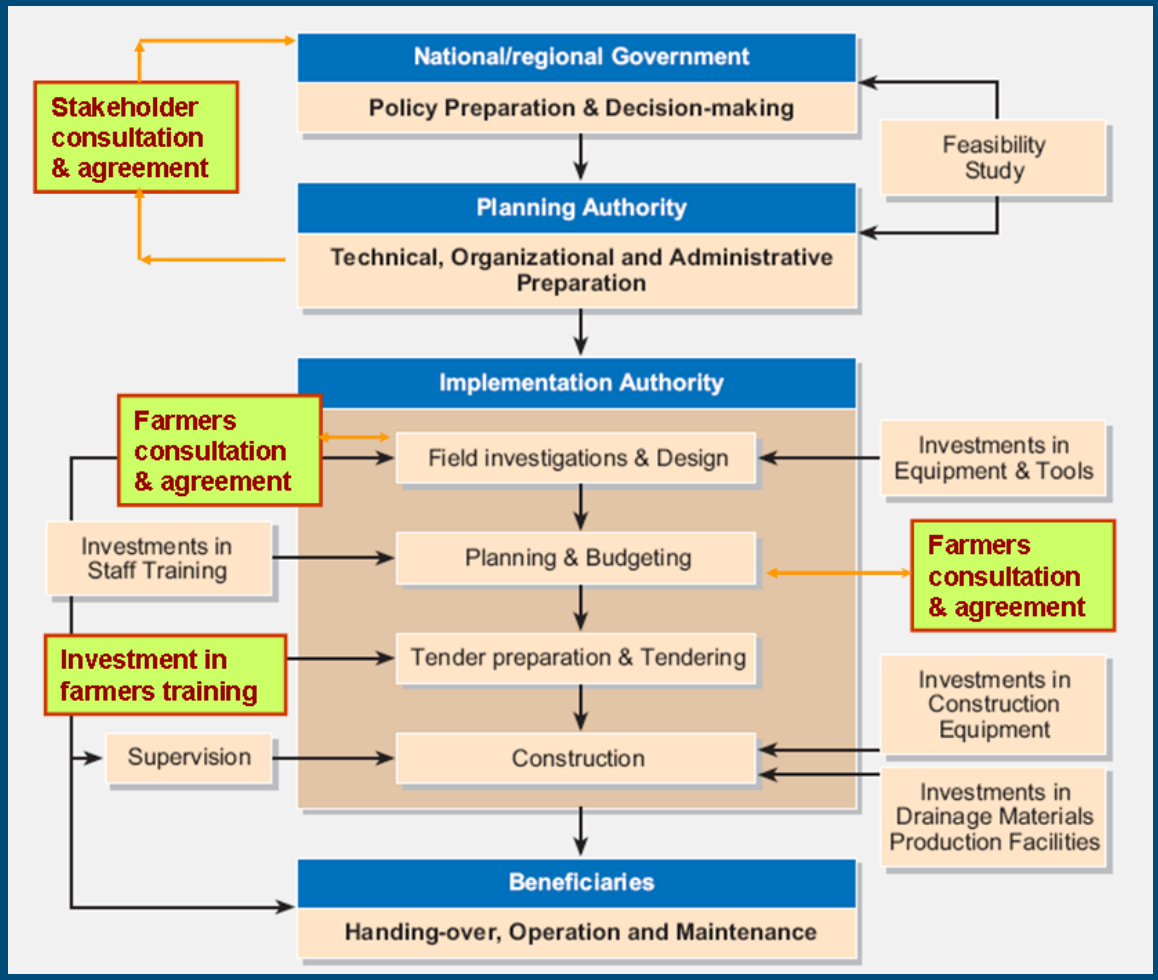
Recommendations – the way forward

- A better balance between top-down and bottom-up
- A shift from standardization to flexibility
- A need for location-specific knowledge
- Capacity development by linking research, education and extension



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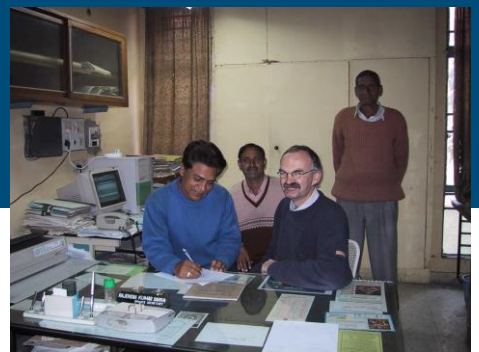
Is there a role of horizontal subsurface drainage in irrigated agriculture in the semi-arid and arid regions?

My answer is

YES

and your answer?

Thank you for listening



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