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Joining forces in water research for agriculture

Collaboration between grower and research organisations as a mechanism to improve water measurement and metering in commercial irrigated agriculture

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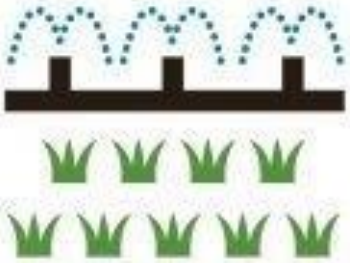
Context

- In drought conditions, the pressure on irrigated agriculture to produce enough food with less water is even higher
- To sustain food security in drought conditions, growers have to apply the best available irrigation techniques, water delivery systems and decision support tools that research and innovative design are offering
- Also true for normal conditions – scarce water resources, a growing population and economic pressures

CROPS

Switching to varieties tolerant to heat, drought or salinity

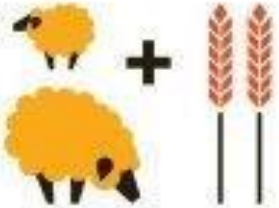


Optimising irrigation

Managing soil nutrients and erosion

LIVESTOCK

Matching animal numbers to changes in pastures



More farms that mix crops and livestocks

Controlling the spread of pests, weeds and diseases

FISHERIES

Switching to more abundant species

Restoring degraded habitats and breeding sites like mangroves

Strengthening infrastructure such as ports and landing sites

Challenge for research organisations

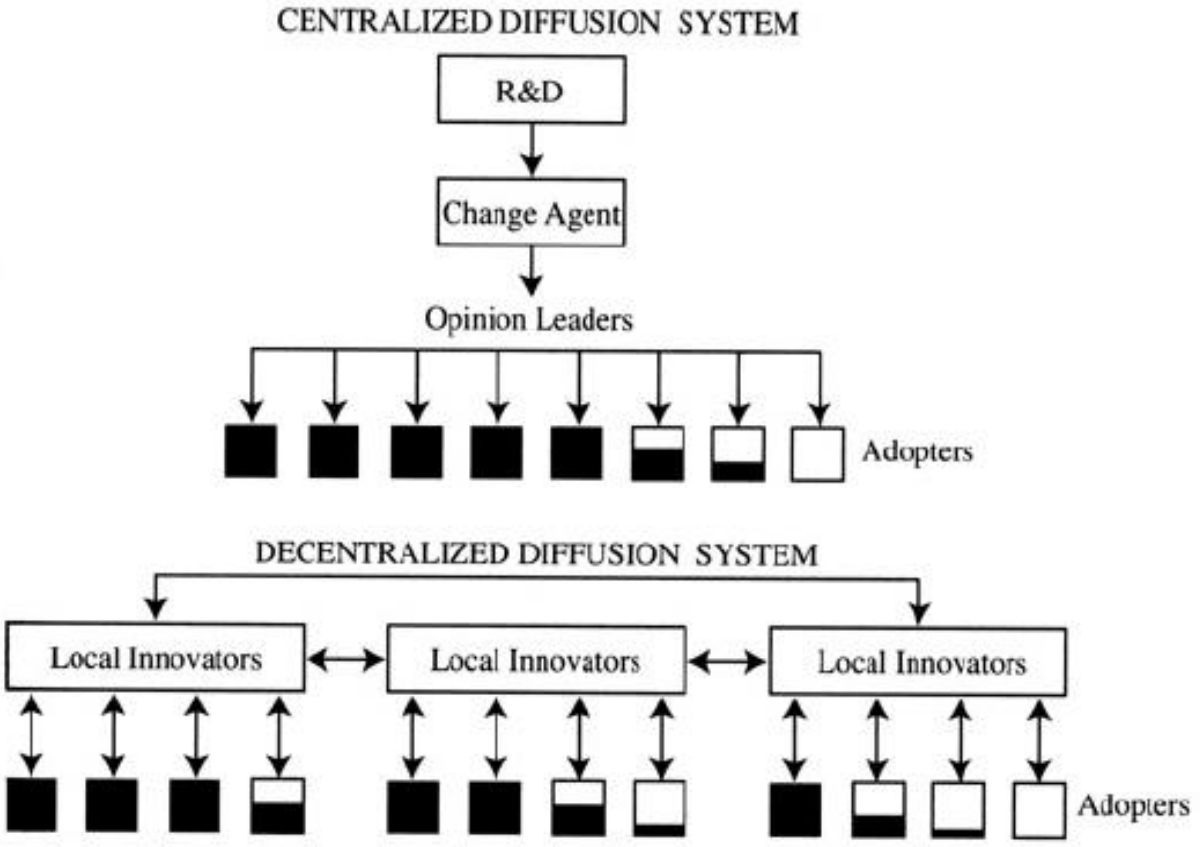
- International and local water research organisations all face the same challenge:

  How do you ensure that your research products are taken up by the target audience?

- The uptake of research as part of the diffusion or adoption of innovation by practitioners, whether individuals or organisations, has been a popular topic in agricultural development studies for many decades

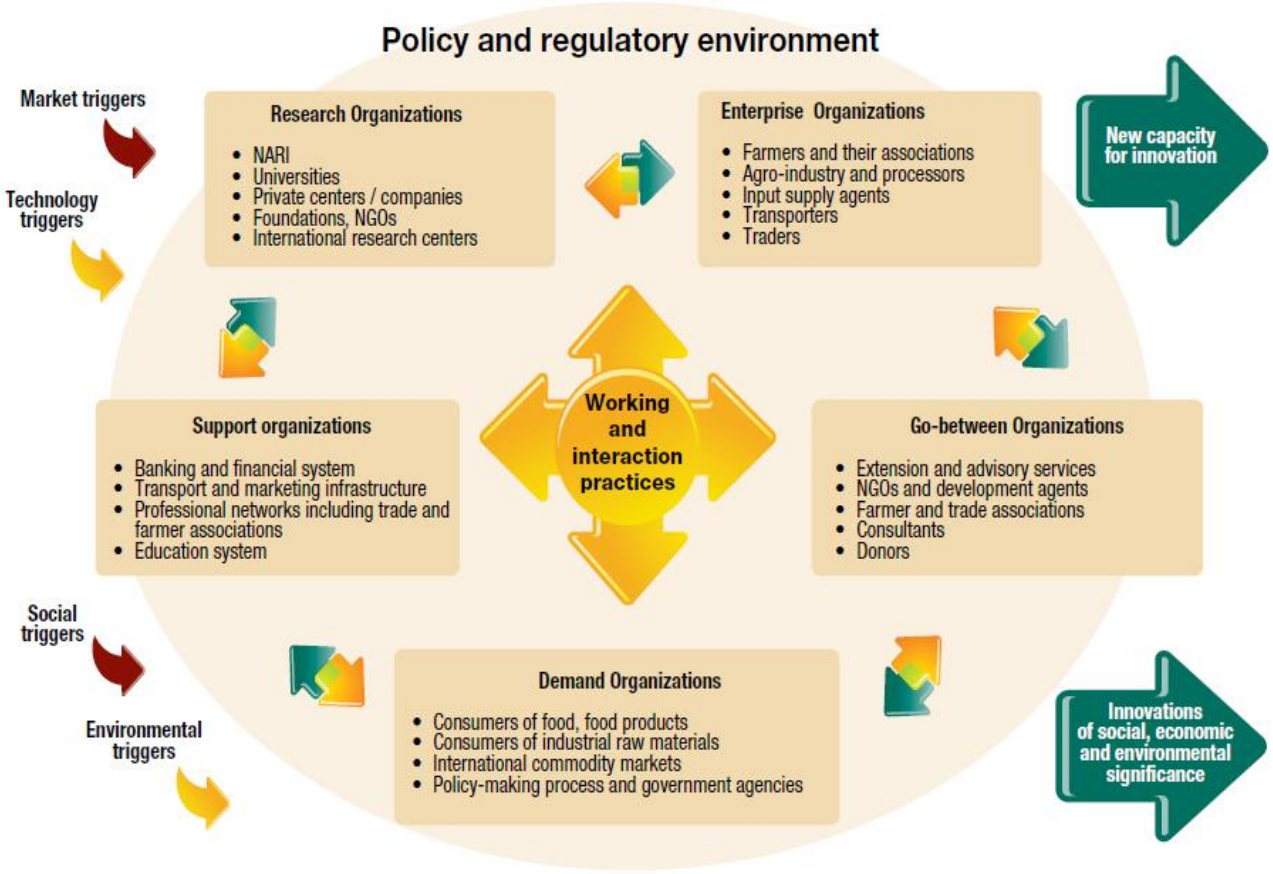
Evolution in the diffusion of agricultural innovation

The classical, linear model of innovation theory:



AIS model

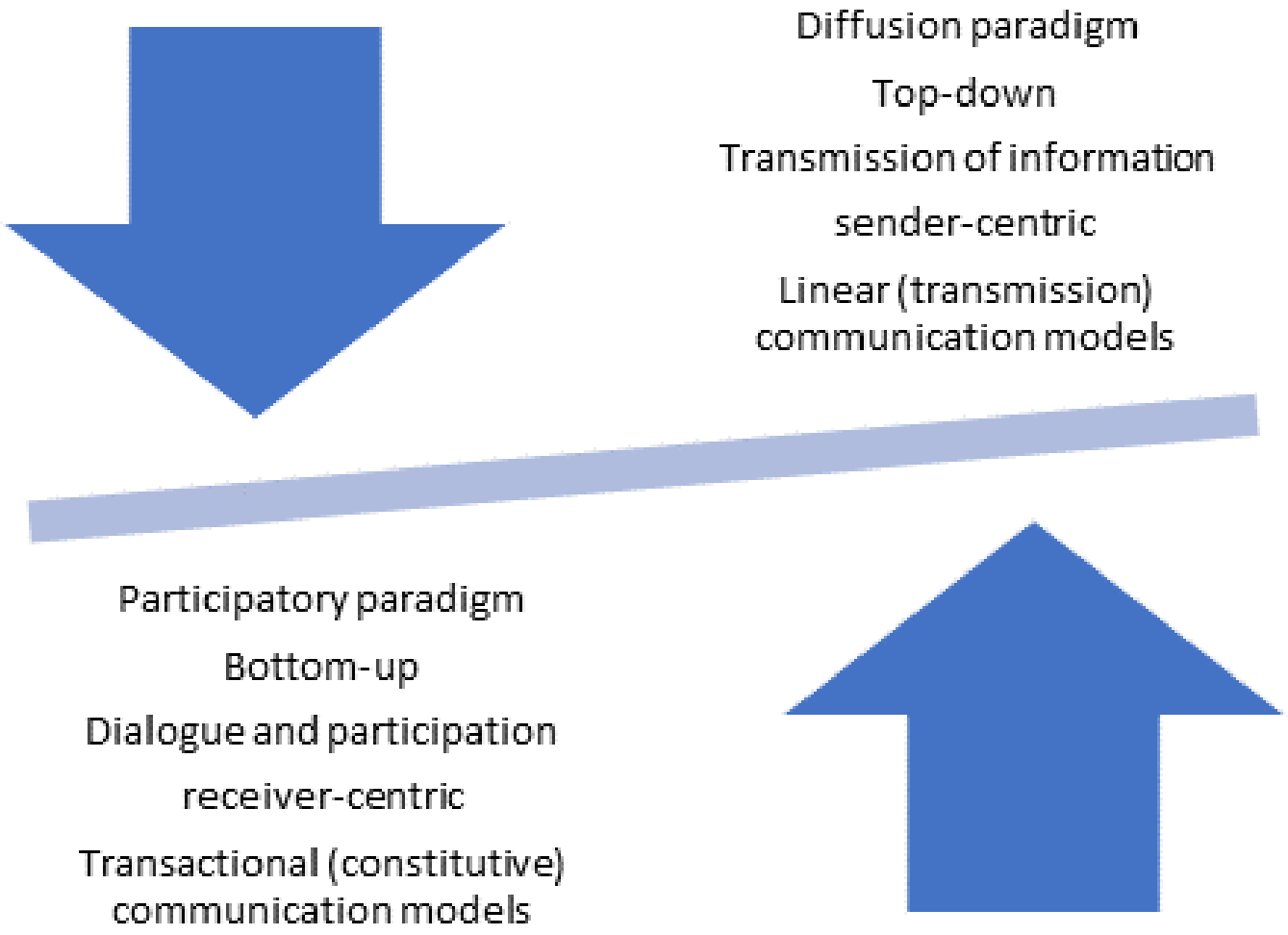
The agricultural innovation systems model describes innovation as a complex interaction between individuals and organisations, which include private industry and collective action organisations



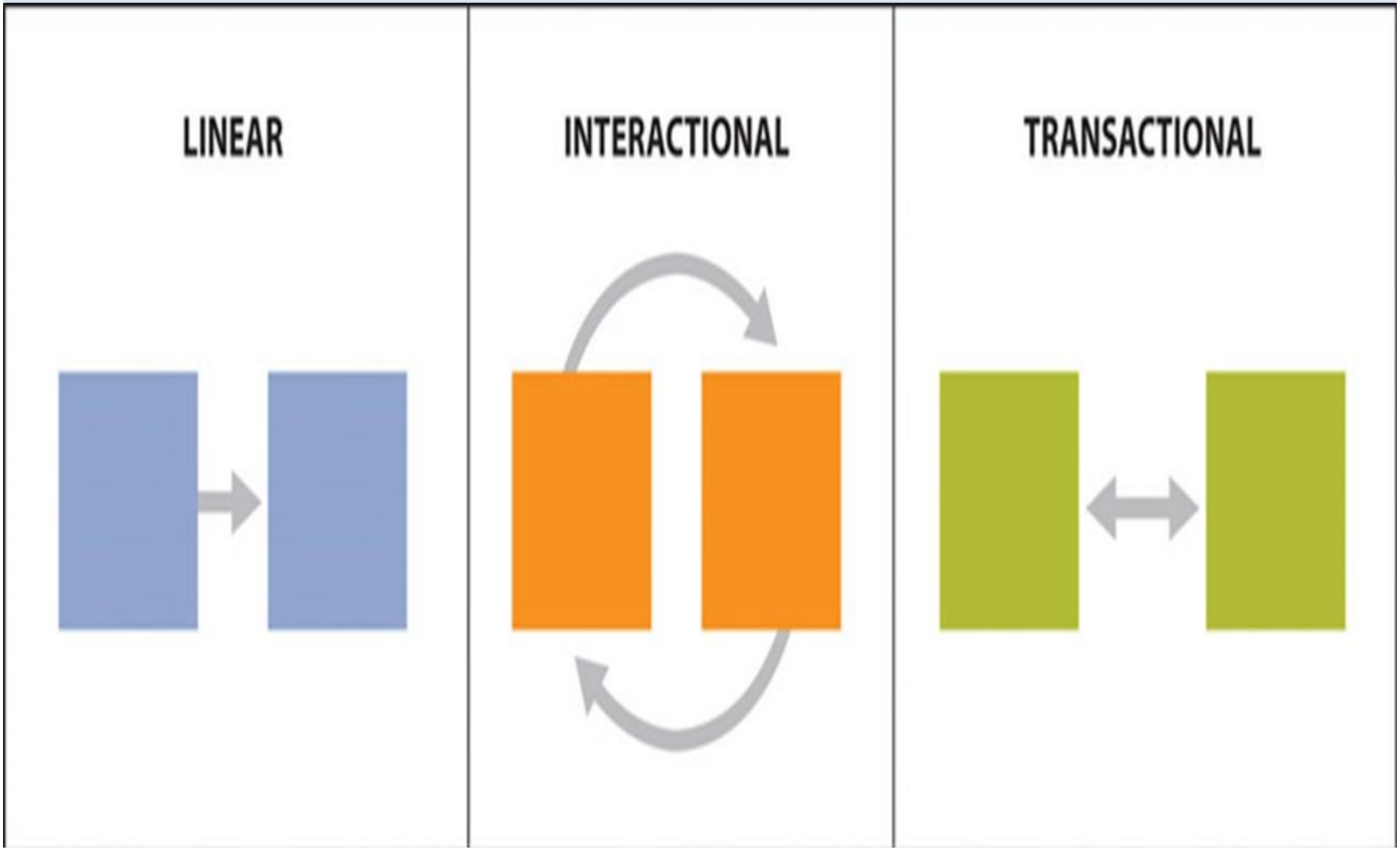
Innovation systems theory

- Innovation systems theory gives recognition to economic and social factors and external triggers
- Also to networks – different interest groups and their interaction with each other
- Realisation that the context of decision-making is very complex with many role players

Development of the participatory paradigm



MODELS OF COMMUNICATION



The impact of the digital age

- Paradigms of the digital age:
  - Users access and interpret content in an interactive process
  - Anyone can publish content
  - Content is organised in a virtual space that is controlled by the user
  - Online media is multimedia – integrating audio, video and text
  - Online media is real-time
  - Over-supply of information

What does this mean for uptake?

- Catch your target audience where they are and when they are there
- Target audience is an active participant in the discourse
- Be prepared to create meaning together with your target audience

Basic principle of all user-centred communication:
The better you understand the target audience (networks and behaviour) the greater the chance is of connecting with the target audience

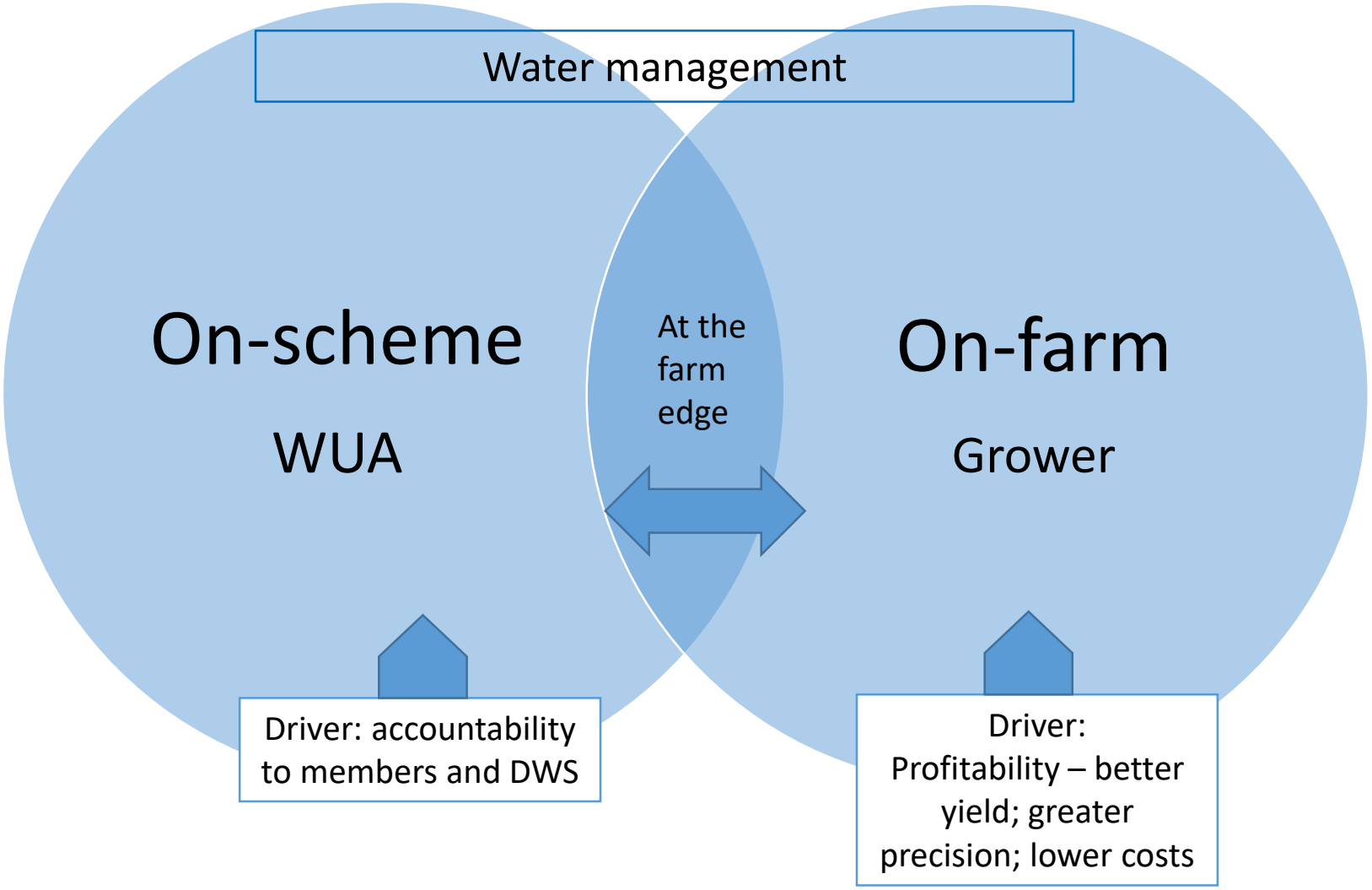
Uptake of research-based knowledge in agriculture

- Local and international studies show that uptake of research-based knowledge in agriculture is disappointing
- Examples:
  - Irrigation scheduling (e.g. Stevens (2007))
  - Water measurement and metering (WRC guidelines and training material)

Our research

- In 2016, the WRC initiated a study to investigate the knowledge needs, information sources and knowledge networks of WUAs and commercial irrigators with the aim of improving uptake of its research and guidelines on water measurement and metering in commercial irrigation
- Face-to-face interviews with the CEOs and Board Chairs of four WUAs along the Orange River, and 36 commercial irrigation growers from the same four irrigation schemes
- Intermediaries who act as knowledge conduits to the WUAs and the irrigators were identified and 21 of them were interviewed telephonically
- The theme of the research was irrigation water measurement and metering

Different logical frameworks



Different methods to measure irrigation volumes

Different methods are used to measure the volume of water that is used for irrigation:

1. Irrigation scheduling (add all volumes) applied through sprinkler/drip package determined from a seasonal water use value multiplied by the area irrigated
2. Sluice gate measurements
3. Calculation: pump hours x volume pumped per hour or electricity used on a water pump x a conversion factor to get volume
4. Meters on pivots, distribution pumps and abstraction pumps

Arguments for water meters at the farm edge

- Management tool
- Plant more hectares or only pay for water used
- Calculate water balance on-farm
- Prove that growers are not exceeding their quota

Factors that inhibit the use of water meters at the farm edge

- Uncertainty about the impact of water use data on the access to water:
  - Will there be sufficient buffers for very hot and dry conditions, or will my water allocation be restricted to actual use in favourable conditions?
  - Will there be any incentive for greater efficiency, or will you be penalised for greater efficiency by receiving less water?
  - Will my water allocation be cut if I use less water?
- Concern that you need more than the licensed amount in hot and dry conditions

  We are allowed 11 000 cubic meters per ha, but in a dry season you need more than that. (WUA2, grower 5)
- The lack of clear and demonstrated value to growers for on-farm management

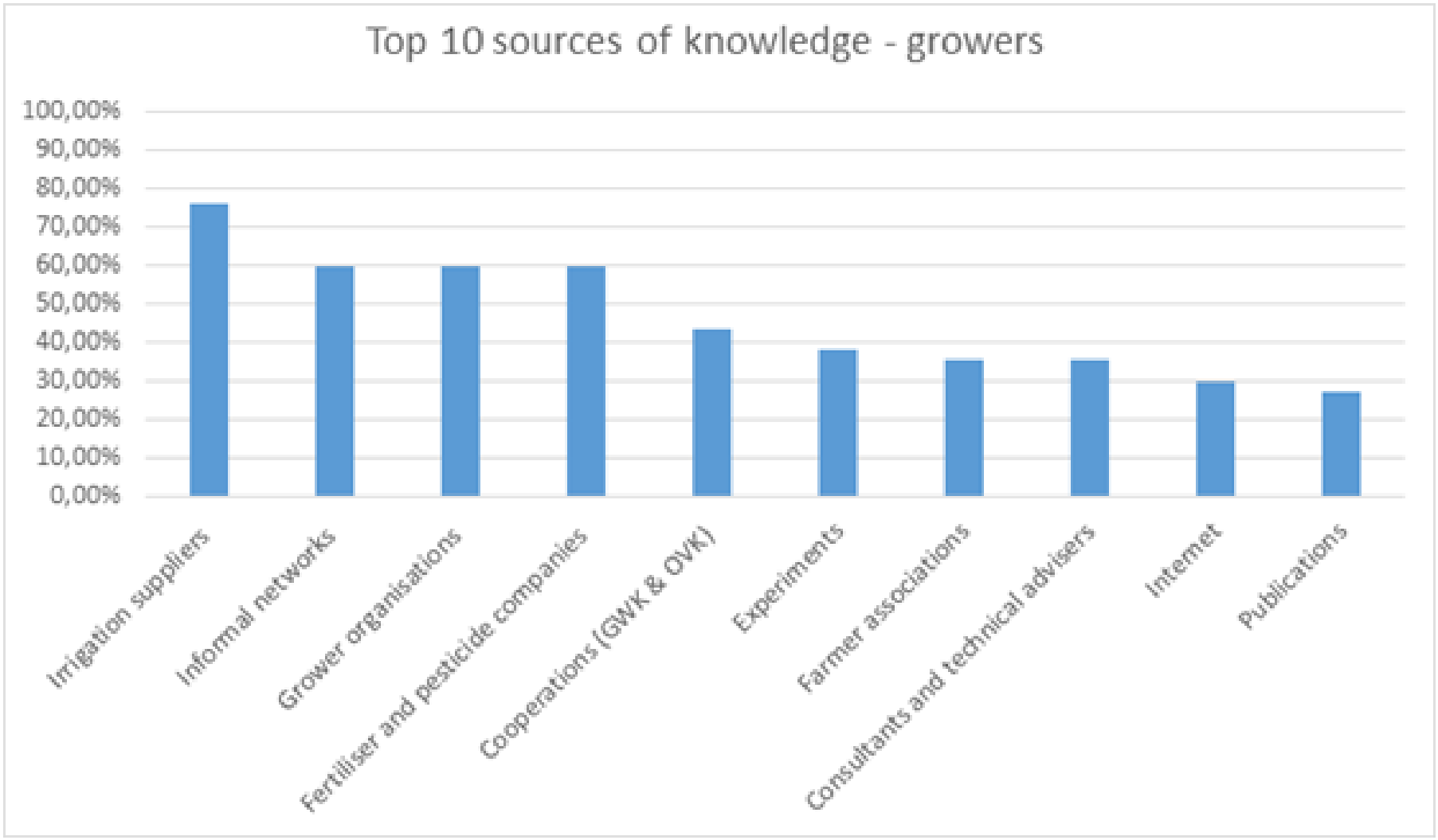
Factors that inhibit the use of water meters at the farm edge

- CEO and Board support and the absence of regulations
- Inconsistency and inefficiency of DWS (as regulator)
- Uncertainty that DWS will prescribe a specific type of meter waiting for guidelines from the Department
- Cost:
  - Growers in WUA3 have less resources to invest in technology and other innovations
  - The cost of maintenance and calibration
- Lack of hands-on and updated information on which meters are the most practical; affordable; and reliable
- Concern about the correctness of readings and the impact if the meters and data are not managed efficiently: maintenance, calibration, data processing
- Lack of early adopters (WUA2)

Knowledge sources – WUA management

- Experiential knowledge – function of internal capacity
- Knowledge networks – informal network of experts
- Own research:
  - Internet – function of individual's interests and preference
- Other WUAs – NB
- Universities – very little contact
- WRC – function of management's involvement in WRC projects
- DWS – regular contact
- DAFF – little to no contact

Knowledge sources - growers



Knowledge sources - growers

Distribution of knowledge sources across WUAs:

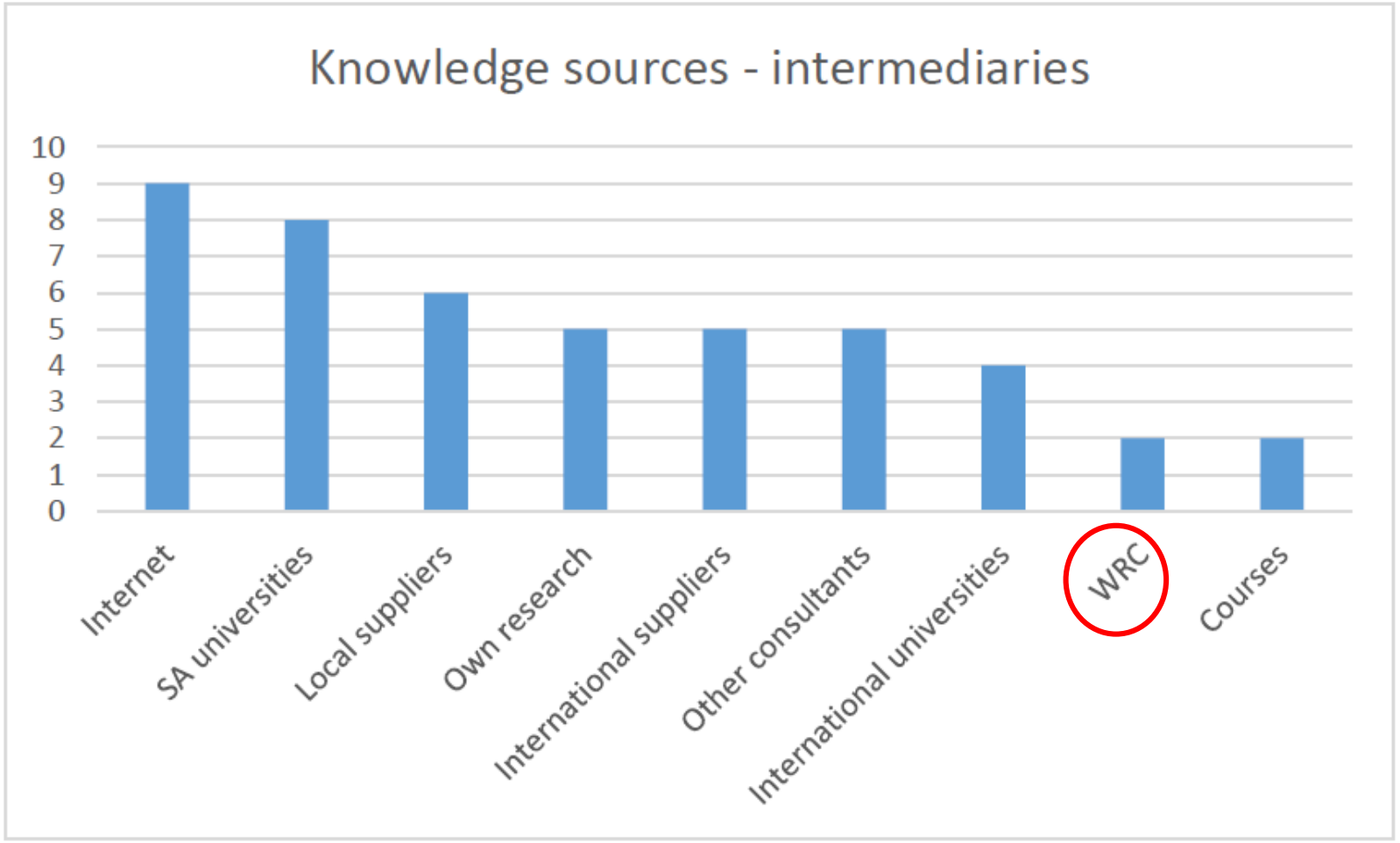
Source	WUA1	WUA2	WUA3	WUA4	Total
Irrigation suppliers	7	5	5	11	28
Informal networks	3	8	4	7	22
Grower organisations	1	0	10	11	22
Fertiliser and pesticide companies	3	5	6	8	22
Co-operations (GWK & OVK)	7	8	1	0	16
Experiments	2	7	1	4	14
Farmer associations	3	4	2	4	13
Consultants and technical advisers	0	4	0	9	13

Knowledge sources - growers

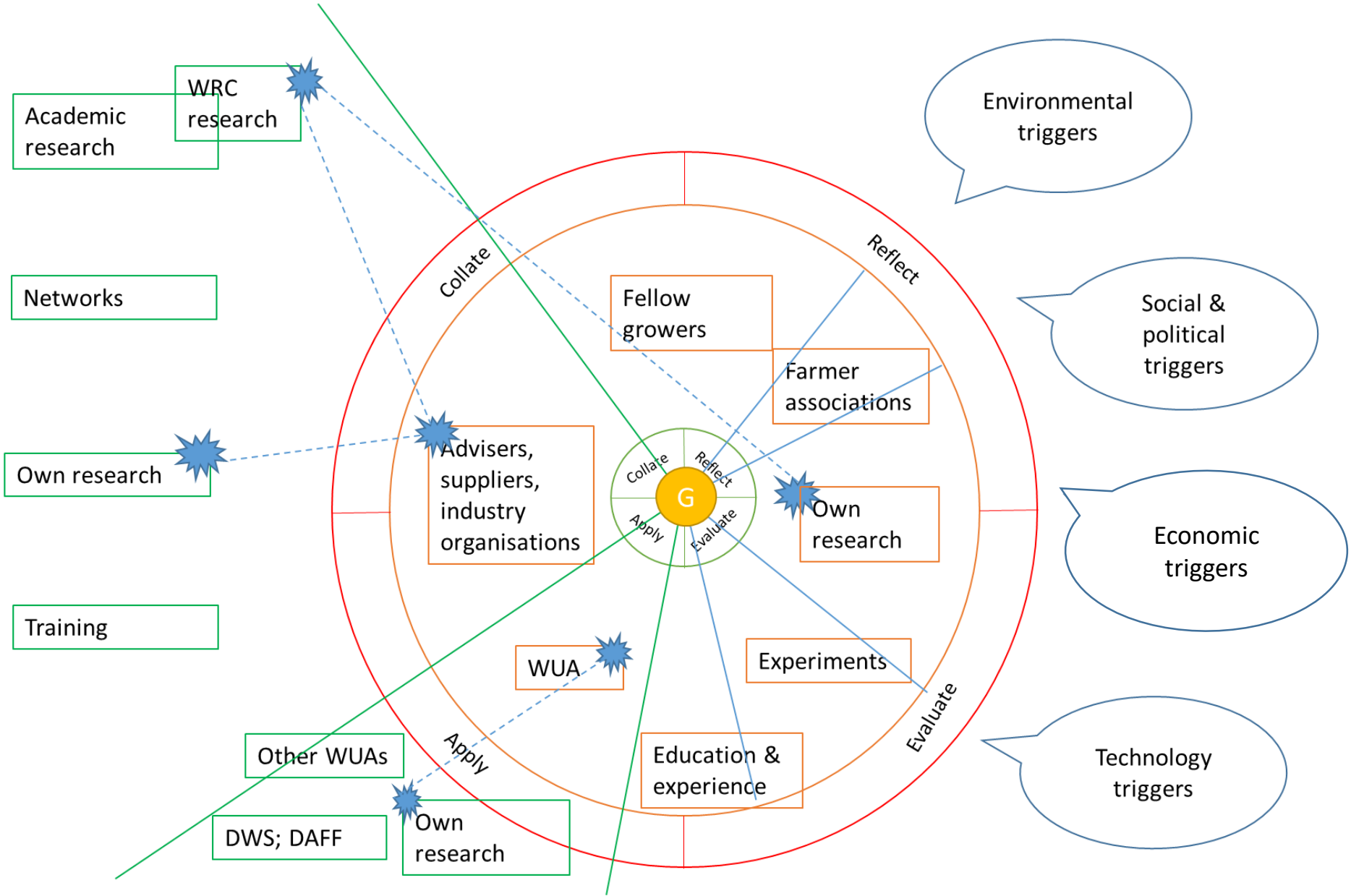
Distribution of knowledge sources across WUAs (continued):

Source	WUA1	WUA2	WUA3	WUA4	Total
Internet	2	4	3	2	11
Publications	0	5	2	3	10
HTB group	5	2	0	0	7
International visits	0	3	0	4	7
Nurseries	2	2	0	3	7
Cultivar developers (IFG, SNFL)	0	0	0	7	7
Study or WhatsApp grower groups	3	0	1	2	6

Knowledge sources - intermediaries



Dynamics of growers' knowledge systems



The power of external triggers

- Policy and regulation
- Economic triggers
- Environmental triggers
- Social triggers
- Technology triggers

Growers' relationship with technology

- All irrigators agree that measuring the volume of water used for irrigation is part of modernisation and better management in irrigation farming
- Goes hand in hand with precision farming, greater efficiency and the use of technology. A recurring slogan was:

  To measure is to know
- Investment in technology is a function of available resources
- Cutting edge vs bleeding edge (*Wie gaan eerste skoolgeld betaal?)*

What does user-friendliness mean for commercial irrigators?

- Content – business driven and one-stop solutions
- Access at the tip of my finger – on my cell phone

Growers' attitude toward research and research-based knowledge

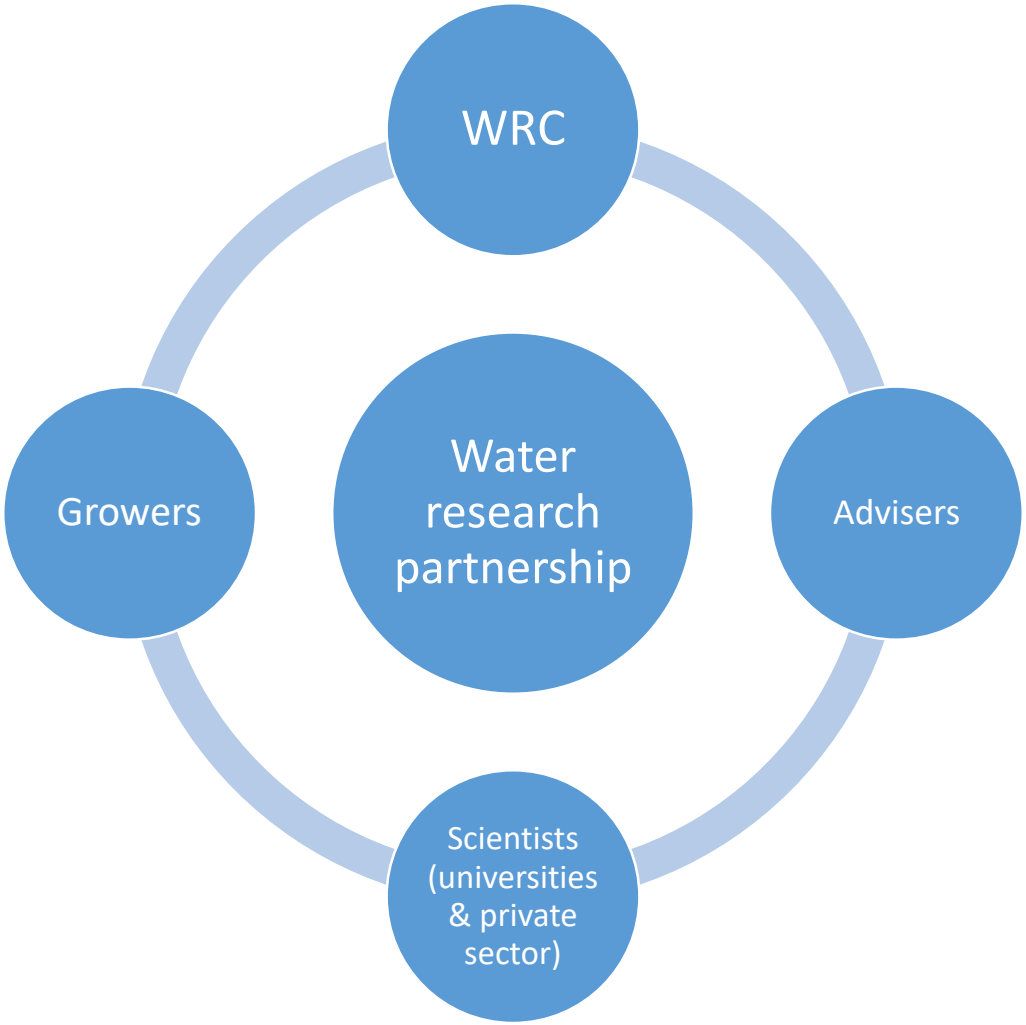
- They fund water research – WRC and growers' associations
- They participate in water research – leader growers
- Relationship with research is business driven

What does all this mean?

Bridging the gap between the end user and the research organisation

- Leverage networks
- Involve the end user as a research partner

Strategic partnerships



Examples of success stories

- GWK, SAPPA and the WRC
- CRI and the WRC

Strategic partnerships are powerful mechanisms to coordinate water research in agriculture in South Africa.

Coordinated research is needed to address sustainable agriculture water use in the face of climate change and the increasing demand on our water resources.

Knowledge needs with reference to water measurement and metering

- Integrating and applying data generated by water meters at the farm edge into water management on-farm
  - On-farm value = business value
- Mitigating the risk of inaccurate metering