Association of Irrigation Acceleration Platform

WATER PIP
KNOWLEDGE & ACTION NETWORK

IHE DELFT

Watering the Margins: *Remote Sensing & GIS Working with Vulnerable and Marginalized Smallholders in Kenya*

Webinar on:

Working with Smallholders and Women Farmers

Organized by the WATERPIP KAN Project

Presentation by:

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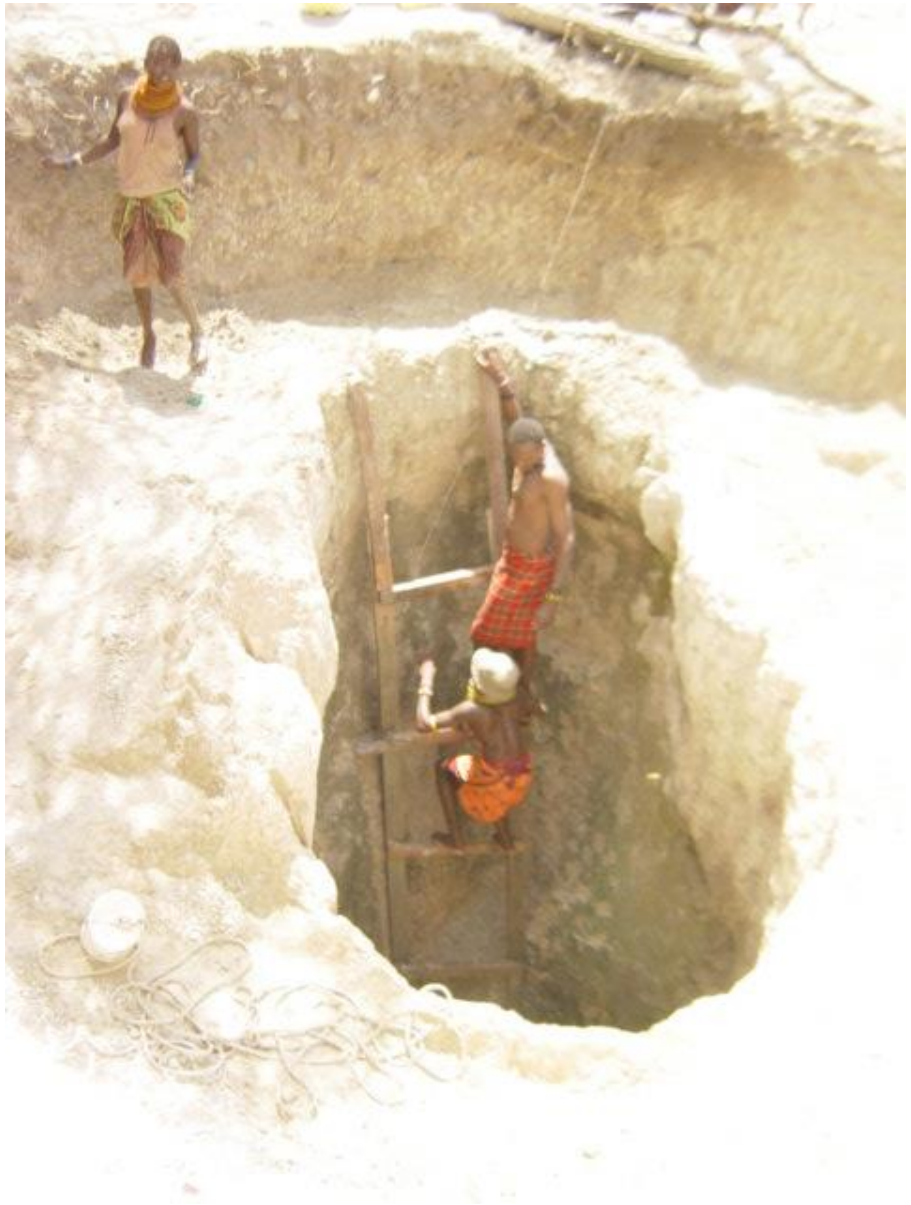
What is Marginality?

Marginality is an involuntary state of a person, community or group, with regard to social, political, economic, ecological, and biophysical systems, that restrains freedom of choice, limits the development of capacities and results in poverty *(Gatzweiler et al., 2011).*

Who are Vulnerable and Marginalized Groups (VMGs)?

VMGs are distinct social and cultural groups having the following traits in varying degrees:

- **Self-identification** as a distinct indigenous social/ cultural group and recognition of this identity by others;
- Collective attachment to distinct **geographical ancestral territories** or areas and to the natural resources in these areas;
- **Customary cultural**, economic, social, or political institutions that are distinct from those of the mainstream society
- A **distinct language/ dialect**, often different from official languages of the country/ region.



Marginalized Communities in the Kenyan Context

In Kenya, the Constitution (GoK, 2010), describes a **marginalized community** as one that: "*because of its relatively small population or for any other reason, has been unable to fully participate in the integrated social and economic life of Kenya as a whole*".

Characteristics:

- They have small populations as ethic groups
- Retained most of their traditional culture
- Live in arid and semi arid zones,
- Are mostly pastoralists or hunter gatherers,
- Crop farmers in dry zones
- Fishers in isolated areas e.g. Lake Turkana or Tana Delta
- Others are poor urban dwellers in informal settlements

My Experiences with Remote Sensing & GIS working with Marginalized Communities in Kenya

1995: I attended a 6-week course in Remote Sensing at Stockholm University, Sweden

1996: During my PHD, took special courses at Cranfield University, UK in Remote Sensing & GIS (actually we were taught ERDAS-IMAGINE & SPANS, a Canadian software

1997: Self-taught on ESRI's ArcInfo, ArcEdit, ArcMap – *Dos based*, and later ArcGIS

1996-1999: Used RS & GIS to assess / modelling with USLE erosion hazard in the Upper Ewaso Ng'iro Basin in Kenya –

1999-2000: I mapped all Irrigation schemes in Kenya (42 Districts)

2003: I mapped all water points in Isiolo District -

2018-2019: Used ***drones mounted with IR sensors*** to map small-scale farms in Meru

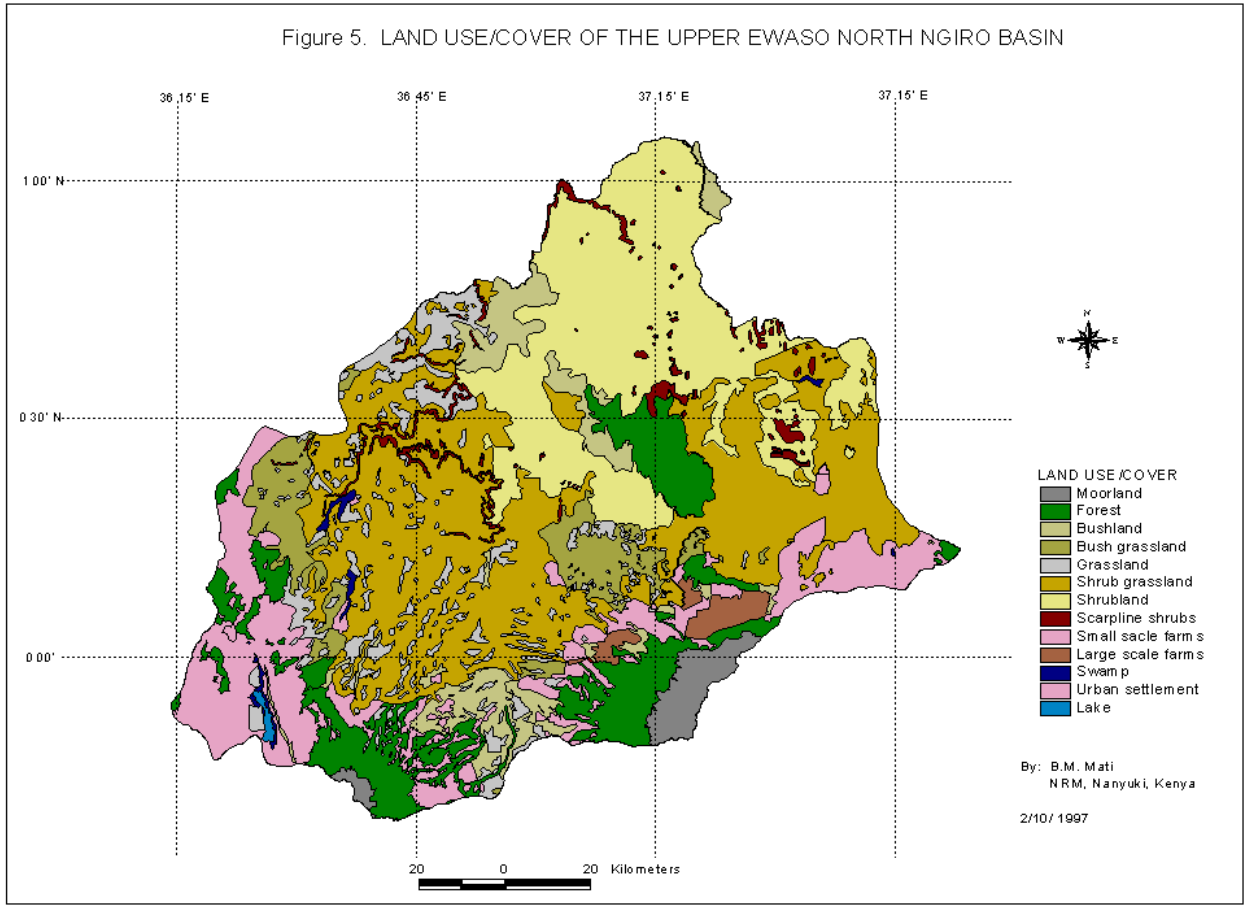
2022: WAPOR tool to determine water productivity and yields of diverse **crops in Keny**a

2024: Currently implementing the WaterPIP-KAN project, aiming to ***"Take Remote Sensing Data to the Margins".***

Here's a synopsis of my challenges & successes

Modelling Soil Erosion with Remote Sensing & GIS in Upper Ewaso Ng'iro Basin

- During my PhD research, used RS & GIS to assess through modelling with USLE erosion hazard in the Upper Ewaso Ng'iro Basin in Kenya
- I used Landsat MSS and ArcInfo/ArcEdit (all in DOS!!)
- G***round-truthed the data (supervised classification)***
- I worked with marginalized communities in Laikipia, Isiolo & Samburu



Main Challenges

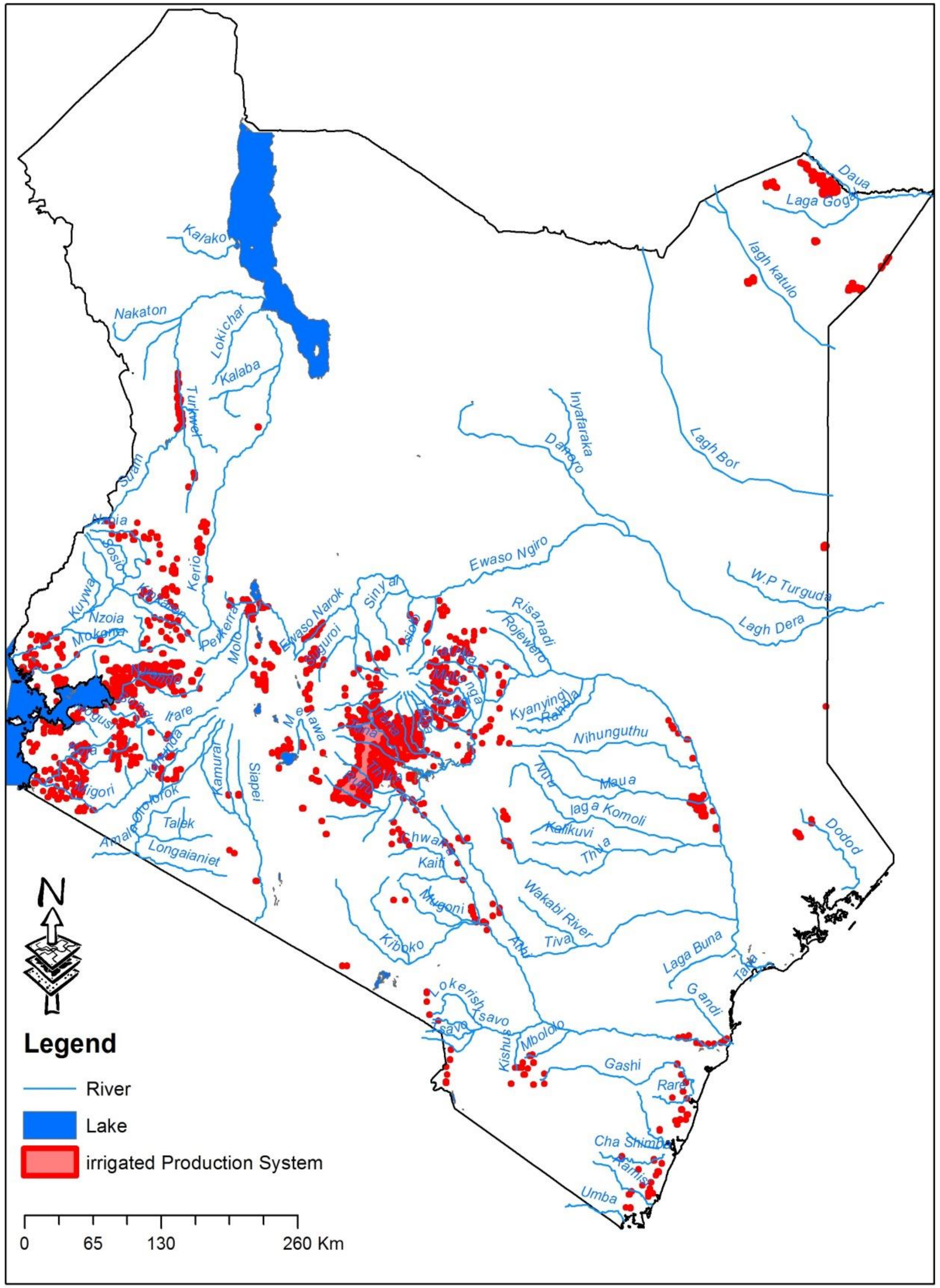
- The Remote Sensing & GIS technology then was very archaic, using DOS scripts even to calculate areas etc.
- Did not find it easy to share findings since VMGs were never invited to our workshops (this being research)

Mapping Distribution of irrigated areas in Kenya

- 1999-2000: I mapped all Irrigation schemes in Kenya (42 Districts)
- This utilized map reading of analog maps by respective District Irrigation Engineers.
- Then I picked the data as excel formats.
- Then I converted the analog data into digital Points (Northings, Eastings)
- Then I created this map
- *–This is still the only map available*

Main Challenges

- It was not possible to ground truth the data.
- There were few marginalized areas irrigated at the time

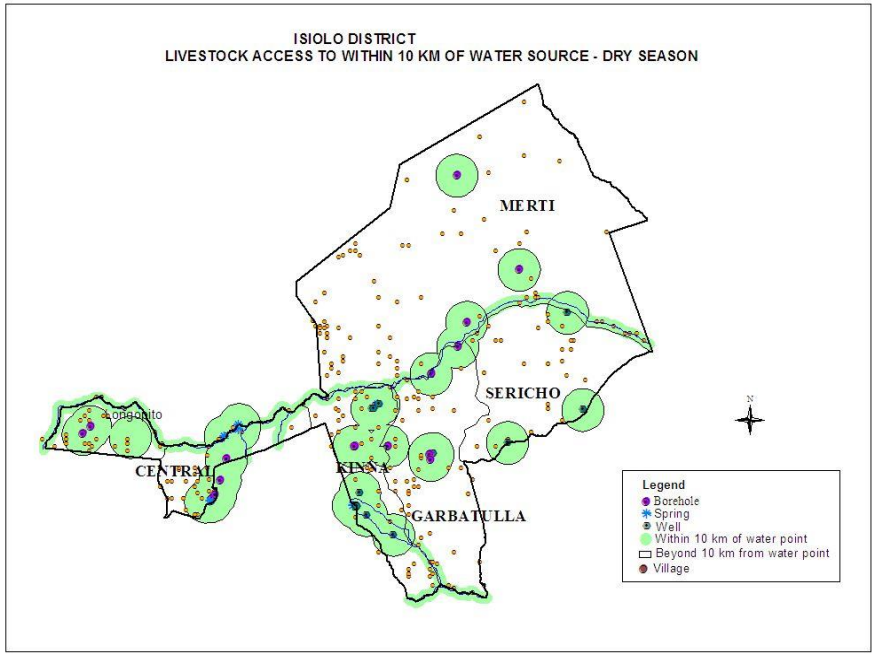


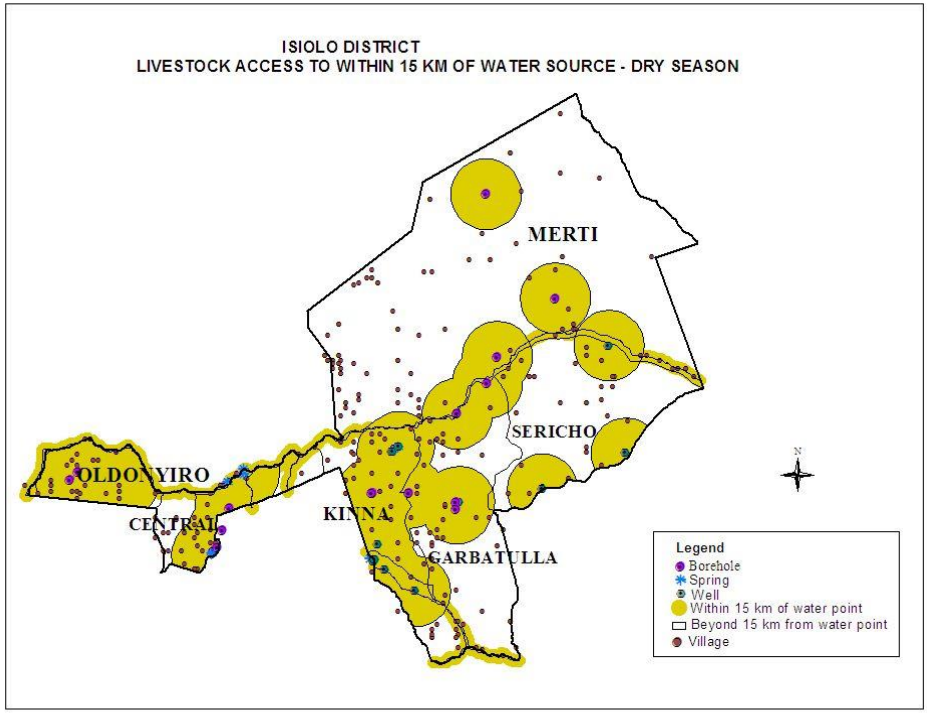
Mapping of all water points in Isiolo District, Kenya

- Used hand-held GPS to collect point data for wells, pans etc (there was no tap water in rural areas of Isiolo then)
- Utilized ArcGIS to create point data
- Applied buffering to show distance to water points
- ***Ground-truthed the data***
- Also trained Governement staff on GIS)
- ***I worked with marginalized communities in Isiolo***

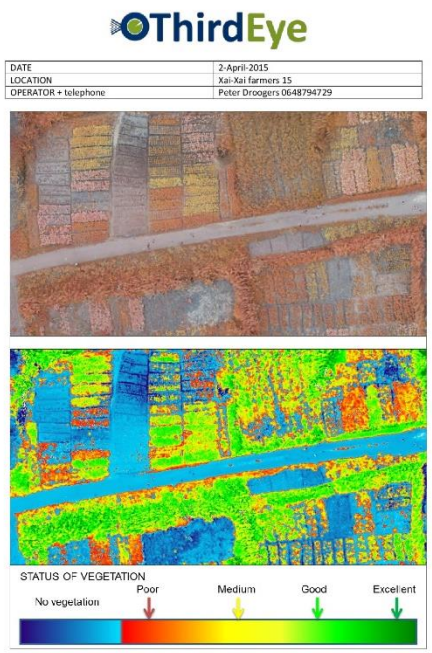
Main Challenges

- The water points were in very remote areas
- Found many were not functional.
- Data was for policy makers back in Nairobi





Lessons from the “Third Eye” project – using drones to Capture Rs data and selling the data to farmers



Use of Drones mounted with IR Sensors to support farmer DSS in Meru County

- This was a research project dubbed: “The Third Eye”
- We used drones mounted with IR camera to map small-scale farms
- The Images were downscaled for farmer use and taken back to them#
- The IR images could track affected crops 2 weeks before the human eye
- Farmers bought the RS data @EUR1.50/acre
- ***I worked with both men and women farmers***

Main Challenges

- The original intention was to provide data for Water Productivity, but farmers wanted pest & disease surveillance
- When project funding ended, the youth group found it hard to operate alone as a business

AIAP project with IHE-Delft: Simulation of WAPOR Model in Kenya

We used FAO's WAPOR tool to determine water productivity and yields of diverse crops at eight sites in Kenya; viz:

Mwea Irrigation Scheme (Rice)

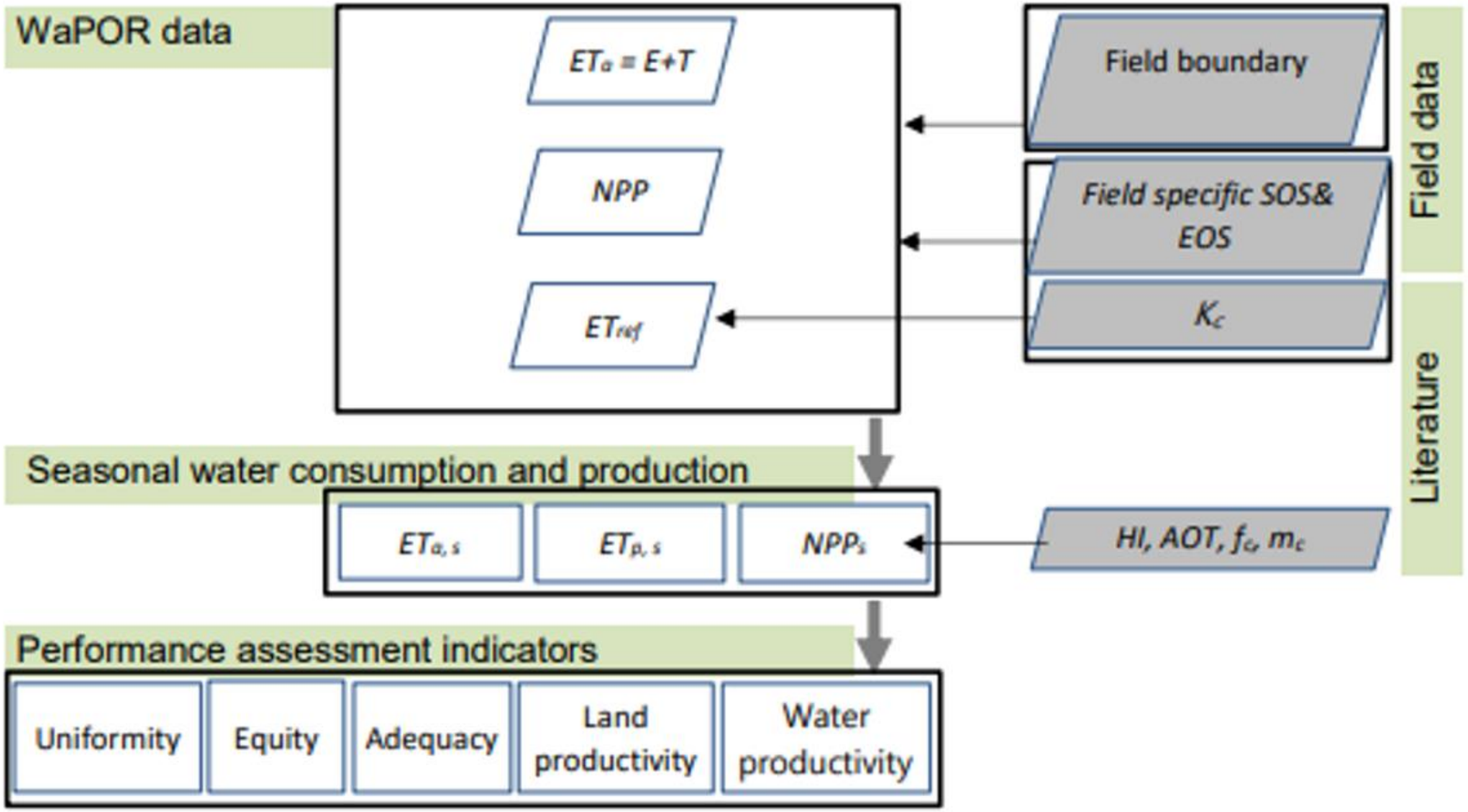
1) Kwale County, Ramisi/KISCOL area (Sugar)
2) Ahero Irrigation Scheme (Rice)
3) West Kano Irrigation Scheme (Rice)
4) Perkerra Irrigation Scheme (Seed maize)

6) Kibirichia area of Meru County (potatoes/peas/cabbage)

7) Kibwezi area, Makueni County (Sisal plantation)
8) Kabaa Irrigation scheme in Machakos County (French beans)

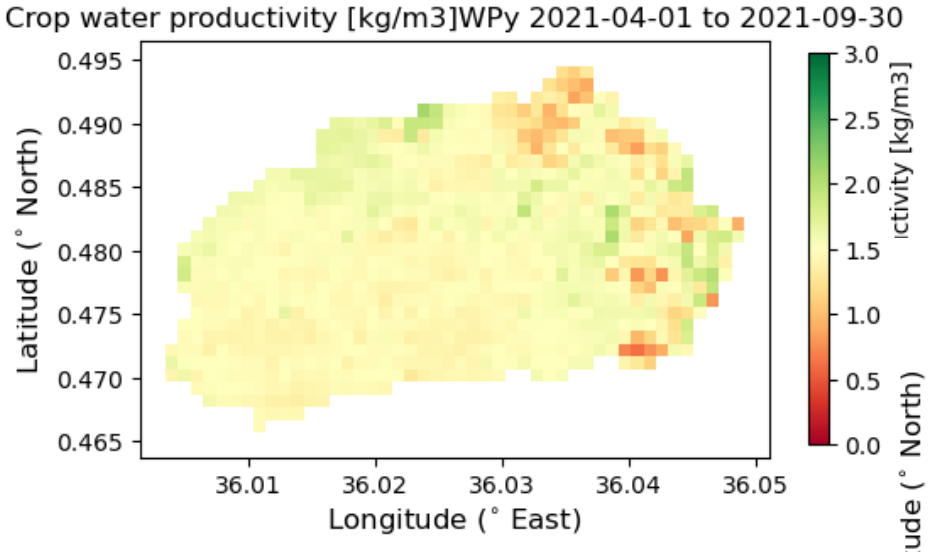
Here's a brief of some of the findings

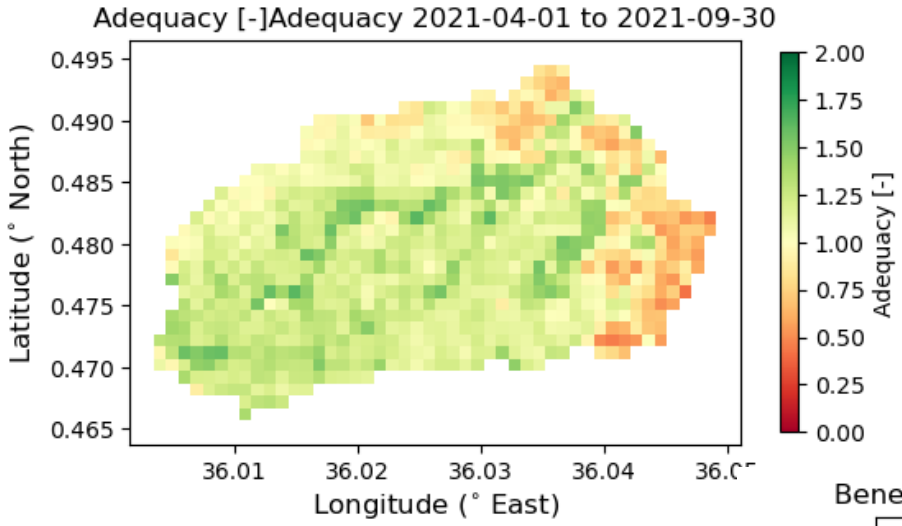
Schematic representation of WaPOR based Irrigation performance assessment framework

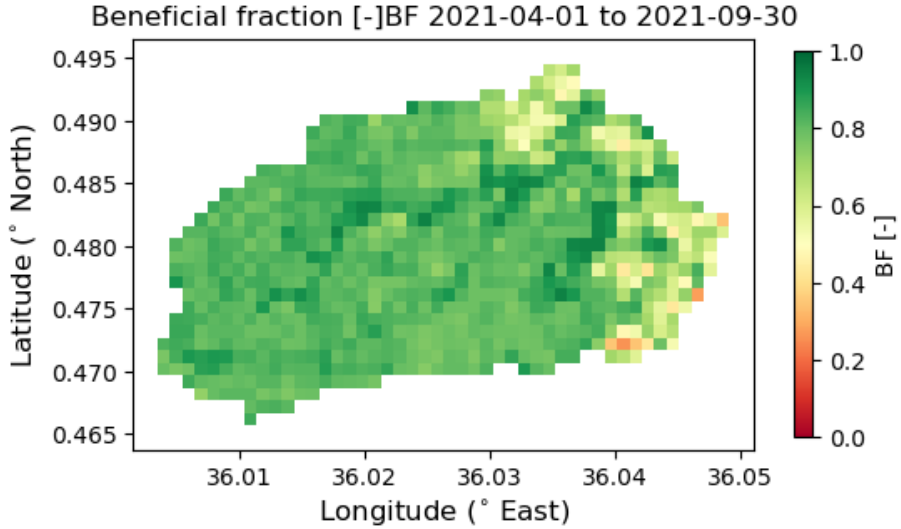


Perkerra Irrigation Scheme, Baringo County (Maize)

Perkerra Irrigation Scheme, Baringo County (Maize) – *WaPOR Products*

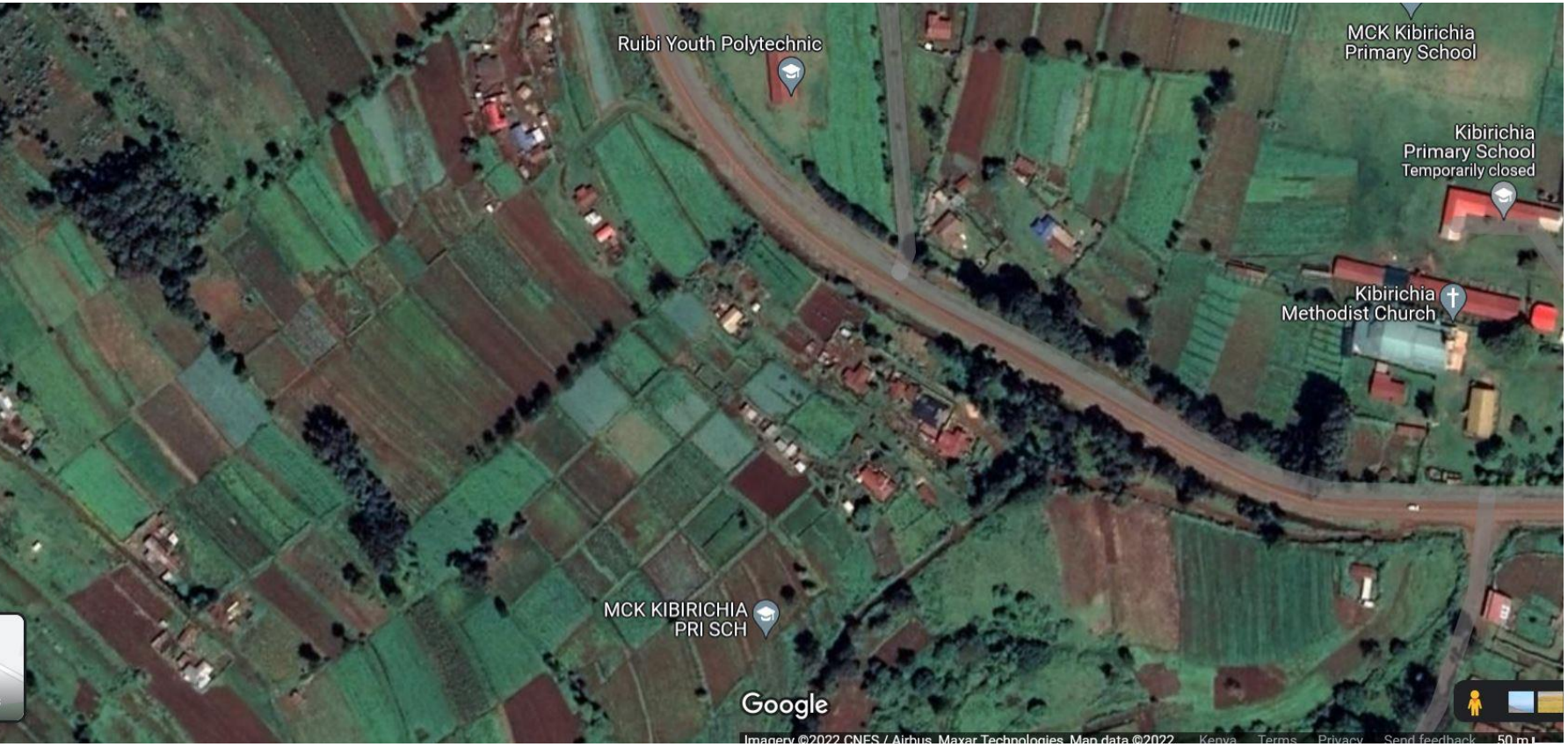






[AIAPpresentation]

Kibiricha, Meru County (potatoes, peas)



[AIAP presentation]

Kibwezi sub-county, Makueni County (Sisal plantation)

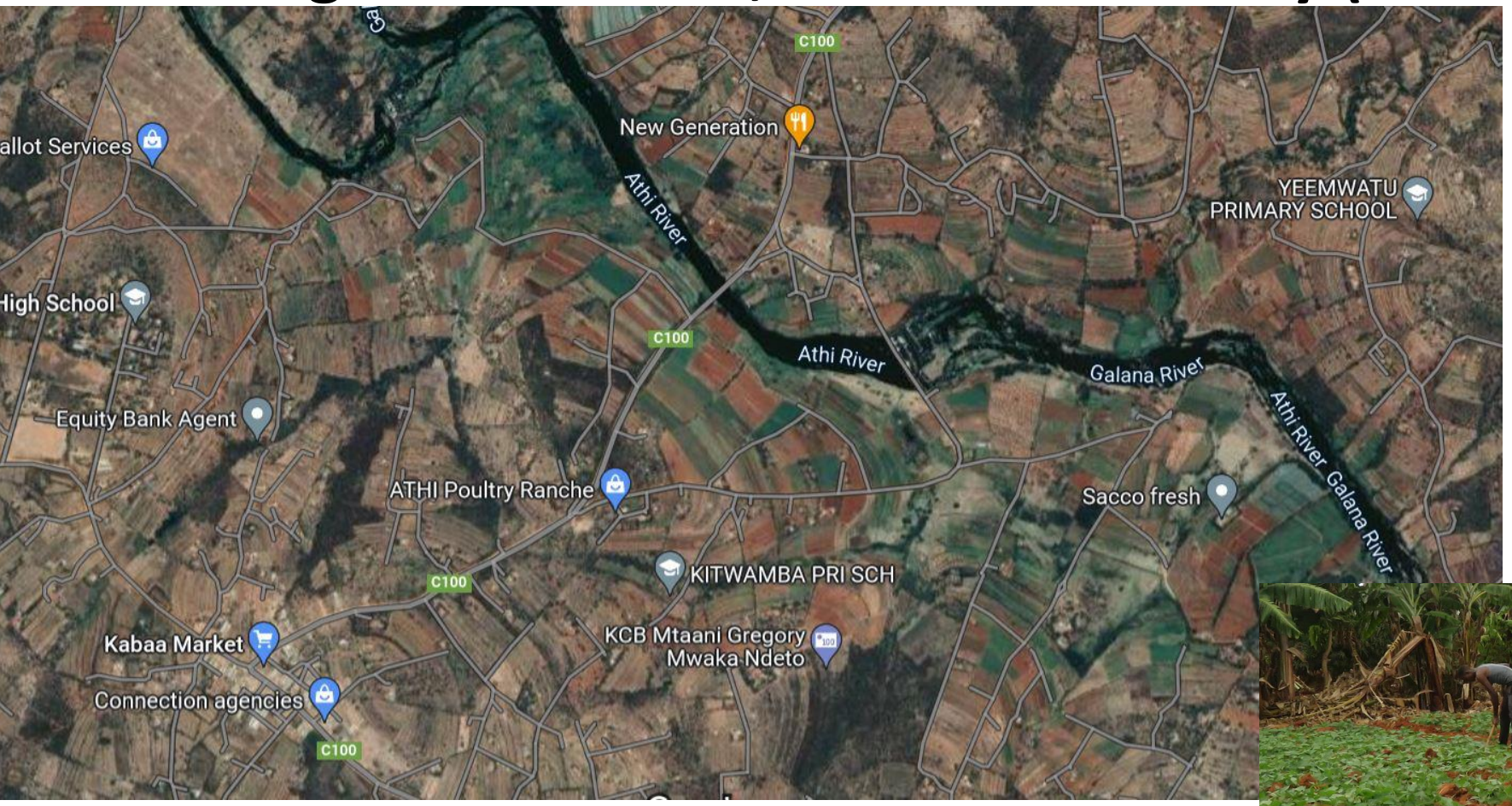
Why this site

Sisal is a hardy fibre crop which survives the worst drought and does well on poor soils – but not grown much

- Opportunity is in use of WAPOR data to determine sisal WP as an alternative rainfed cash crop with Climate smart & environmental benefits (instead of plastics)

[AIAP presentation]

Kabaa Irrigation Scheme, Machakos County (French beans)



Irrigated French beans

[AIAP presentation]

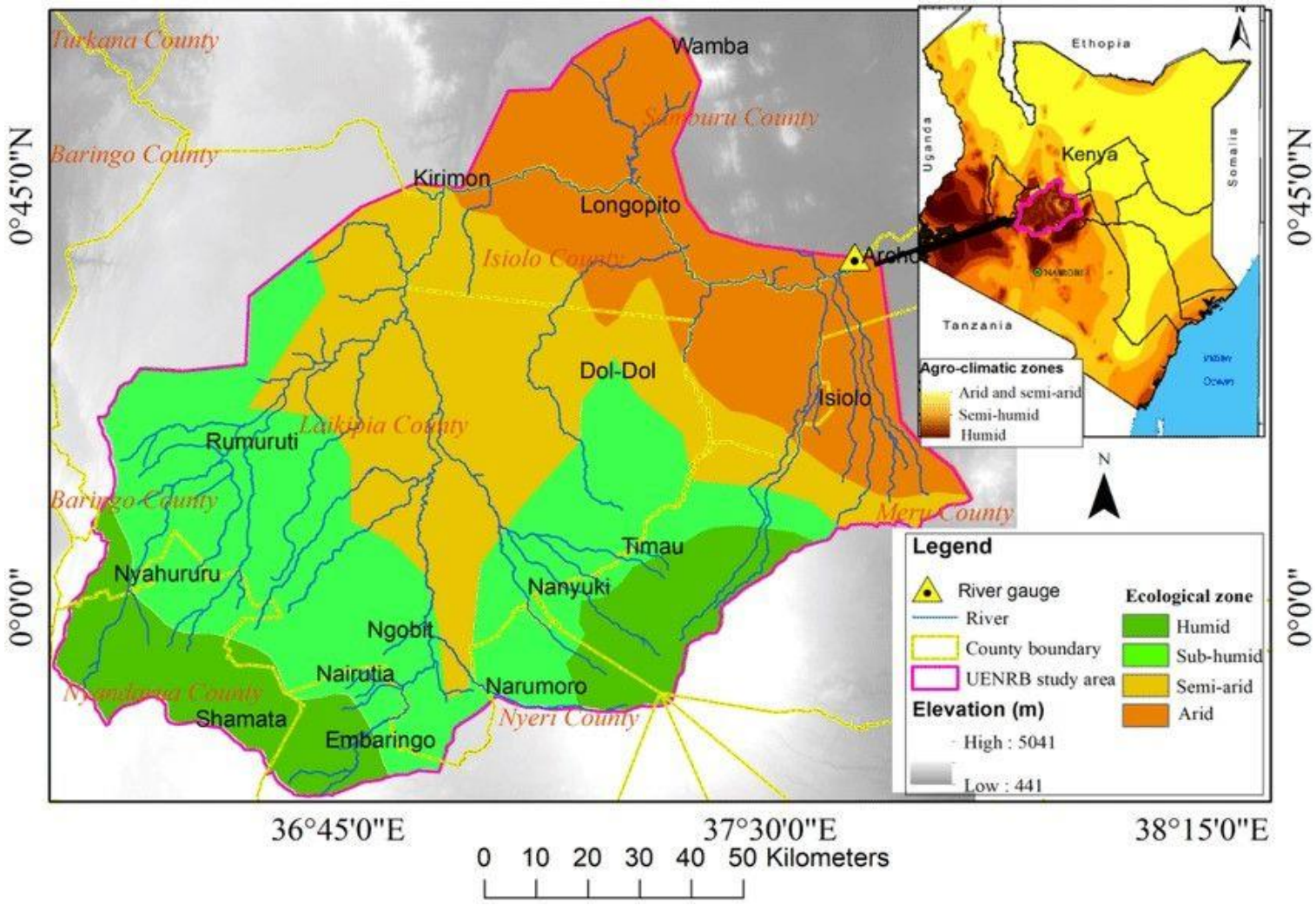
Challenges Faced with WAPOR Data application

1) Low Resolution of WAPOR data (100 m Resolution) – *Selected areas of large scale irrigation*
2) Mixed crop types and planting dates increasing noise in data
3) Translation of WP into yield- difficult for fruits e.g. citrus, banana
4) Could WAPOR data be useful for rainfed crops/
5) Would National Irrigation Authority or farmers really buy WAPOR data?
6) Identification of “customers” for WAPOR data
   - Private sector is too advanced and unlikely to be interested.
   - Public sector institutions hold possibility as they do not assess WP in most irrigated areas in Kenya.

Currently, AIAP is working with 18 partners in the WaterPIP-KAN Project

Example: Identifying Marginalized Groups For WaterPIP-KAN Project Engagement

- Developed criteria for broad site selection (that has VMGs)
- Desk studies of suitable areas (i*dentified the Upper Ewaso Ng'iro Basin)*
- Field visits to the candidate sites
- Interviews with local communities
- A scoring system to prioritize Community/ sites
- Selected 5 candidate sites



The Upper Ewaso Ng'iro basin

Criteria for Identifying Candidate sites in Upper Ewaso Ng'iro Basin

- The project will be targeting small-scale farmers – as per Kenyan definition;
- Sites have VMGs i.e. marginalized groups /farmers, as per national definition;
- Agricultural enterprises that are mappable with satellite data (spatial extent);
- Water scarcity or management challenges are faced
- Relatively large numbers of farms (or farmers) will be impacted by project;
- Gender and youth inclusivity are accommodated;
- Policy, political and institutional support;
- Other activities in the area

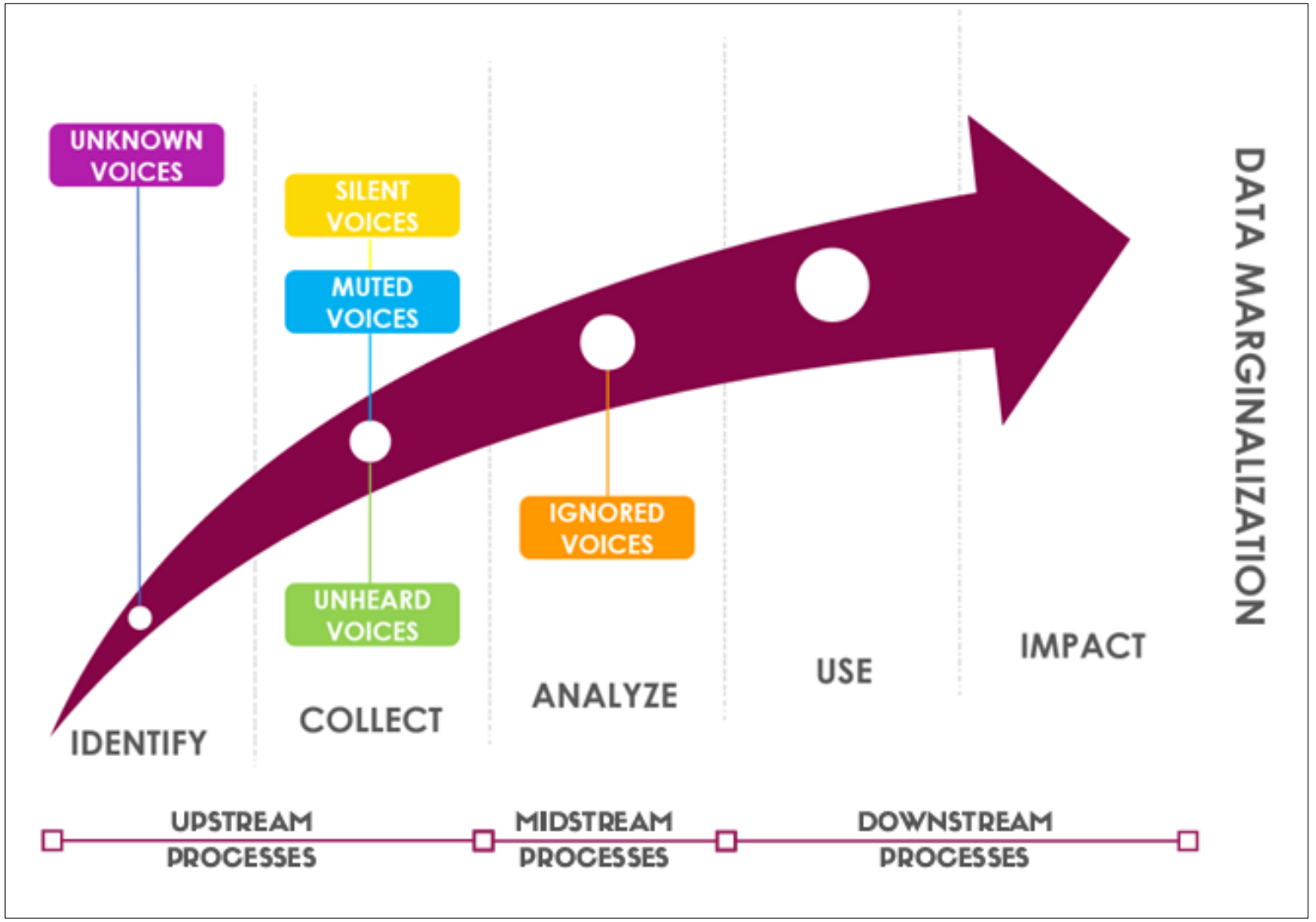
Accommodating Marginalized Groups Data Collection for Research
(Typical VMG Voices)

- **Unknown voices:** Being invisible in the mainstream societies, hence are unknown to the data collecting actors.
- **Silent voices:** Due to restricted agency, these groups lack the capacity for vocalizing. Results in inability for direct participation without specialized interventions.
- **Muted voices:** Due to socially constructed systems of classification that devalue and discredit them in particular contexts. Results in exclusion from data collection and subjected to discriminatory practices during the data use phase.
- **Unheard voices:** Being excluded from the sampling due constrained resources and limitations of sampling procedure, data collection, and data infrastructures.
- **Ignored voices:** Being marginalized and excluded during data analysis either through aggregate bias and ecological fallacy, or new data approaches, such as Big Data analytics.

Challenges Faced by Farmers in Candidate sub-watersheds *(VMGs & non-VMGs)*

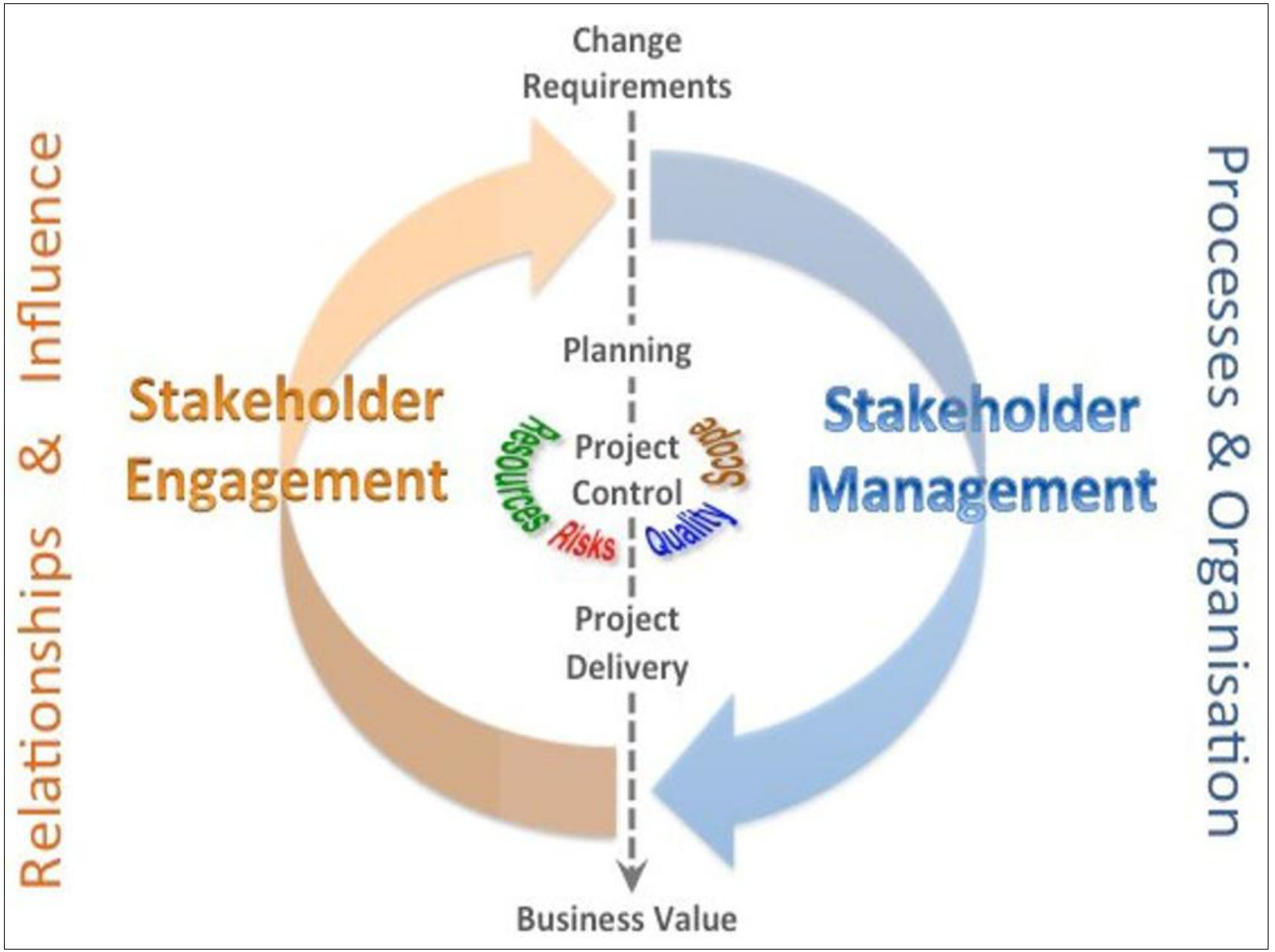
- Water scarcity - especially during the dry spells when water rationing is done.
- Inadequate water storage and few water harvesting facilities –
- Cost of constructing farm ponds/water pans is too high
- Archaic farming technologies- Most farmers use the hand hoe.
- Marketing challenges - due to middlemen who offer low prices for the vegetables.
- Knowledge disconnect especially as regards water productivity
- Most farmers own mobile phones, but most are not smart phones.

Addressing Marginalization in Research: Visualizing the Life Cycle of Data

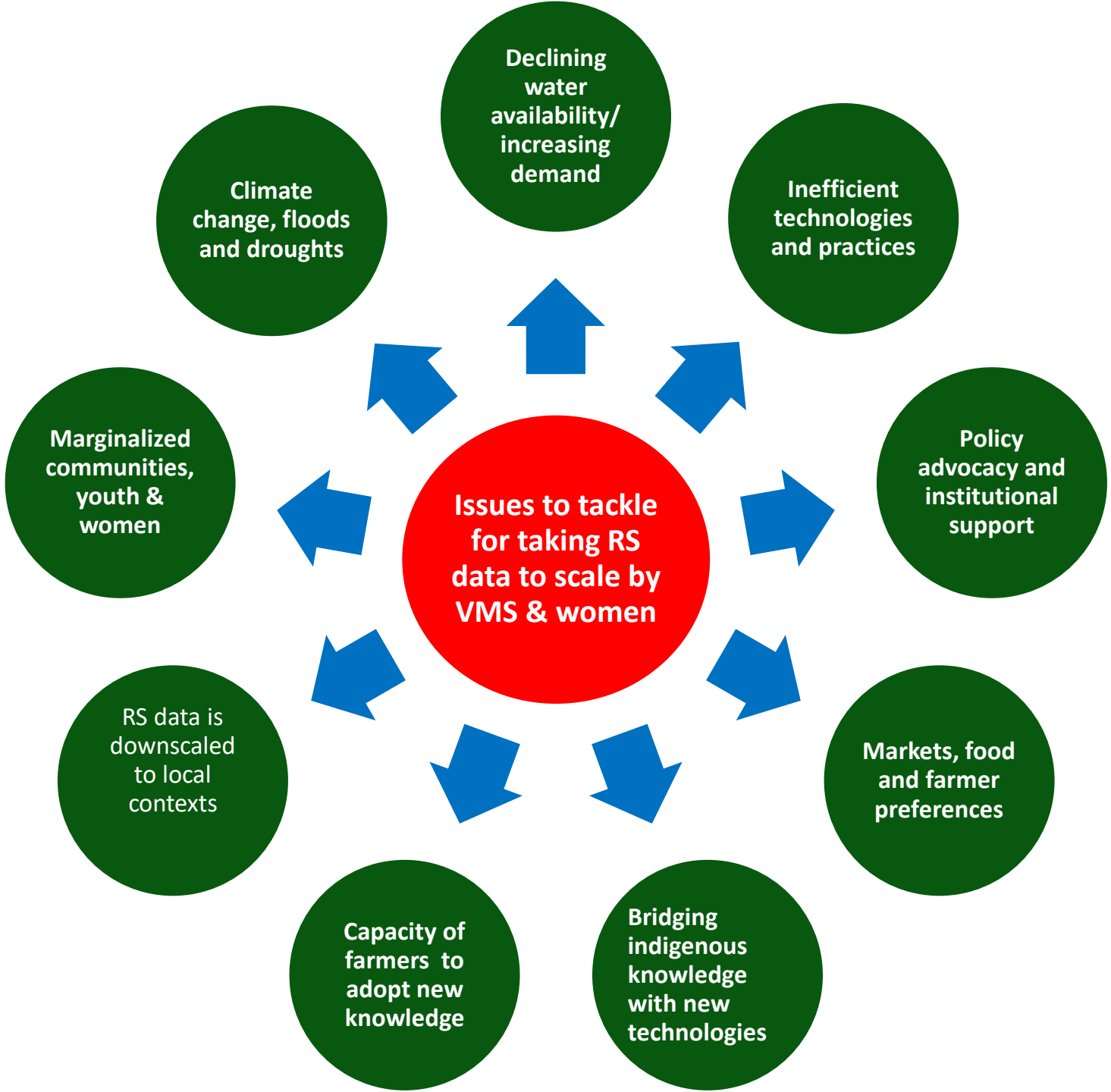


Source: https://i.unu.edu/media/cs.unu.edu/page/4453/UNU-MACAU_Data_Marginalization_Flyer.pdf

Stakeholder Engagement Cycle



Source: https://www.apm.org.uk/resources/find-a-resource/stakeholder-engagement/


Declining water availability/ increasing demand
Inefficient technologies and practices
Policy advocacy and institutional support
Markets, food and farmer preferences
Bridging indigenous knowledge with new technologies
Capacity of farmers to adopt new knowledge
RS data is downscaled to local contexts
Marginalized communities, youth & women
Climate change, floods and droughts
Issues to tackle for taking RS data to scale by VMS & women

Lessons Learnt: Engaging VMGs & Women Farmers for R&D

- **Respect for human rights** - the project should uphold human rights, dignity, aspirations, identity, culture and natural resource-based livelihoods of affected VMGs;
- **Participatory**– Local communities including VMGs and non-VMGs are engaged in the full project cycle
- **Gender and youth inclusivity** – Ensure representation of both men and women, including youth.
- **Community opinions matter**- Listen and hold open discussions. Show respect for their views
- **Addressing adverse impacts of the project** - Avoid negative impacts by project or at least minimize, mitigate, and/or compensate for such impacts.
- **Promotion of culturally appropriate and sustainable benefits** – How project promoters behave, dress, talk etc. matters
- **Using simple and appropriate tools** – or simplification of the complicated e.g. downscale Remote sensing data into formats usable by local poor communities;
- **Improve community's buy-in to the project** –Meaningful consultations and fostering positive change
- **Timely (preferably short) –** Keeping time, don't waste farmers; time, encourage efficient use of time.

Thank you

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