Managing Agricultural Water and Land Degradation

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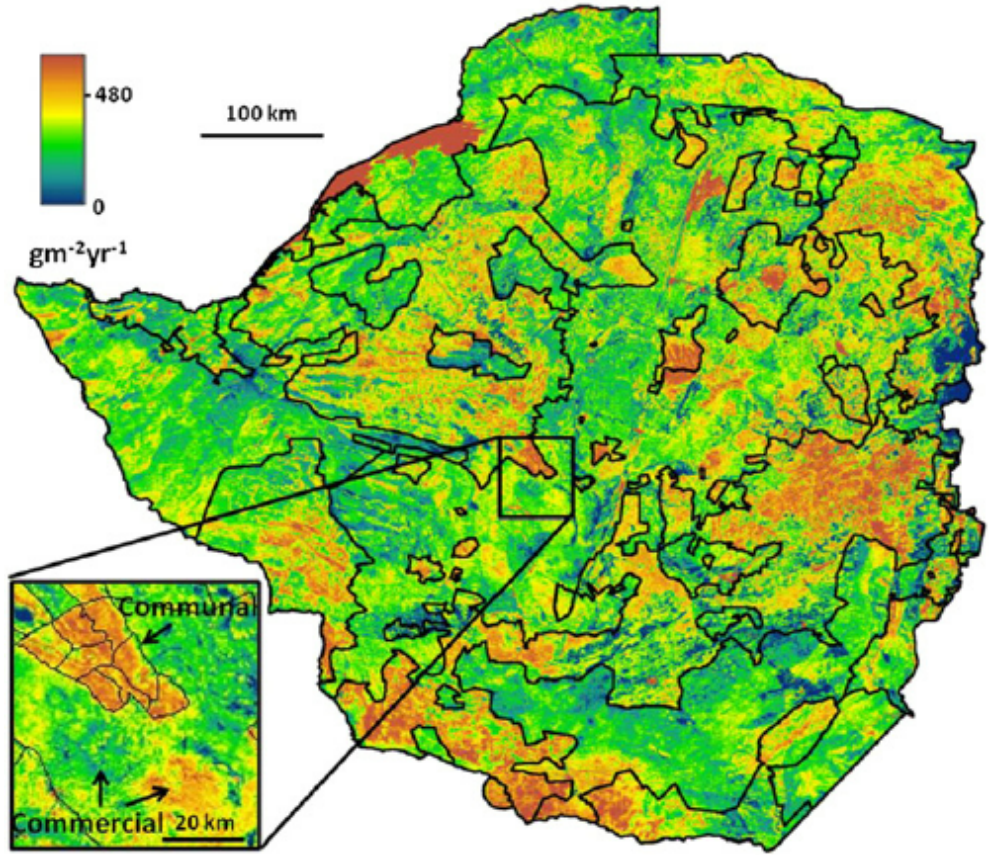
Agricultural water: *The Farmer's Panacea*

- Water scarcity is one of the most limiting factors for food security in Zimbabwe and many African countries.

- Yet water collected is not used efficiently.
- With climate change and unpredictable rainfall events, judicious water use is required.

Land degradation and Soil Erosion is widespread in Zimbabwe

Average soil erosion rates:
Communal areas = 50 t/ha/year
Commercial areas = 5 t/ha/year



Nuclear techniques can be used to address soil water and land degradation issues

TC projects addressing agricultural water and land degradation

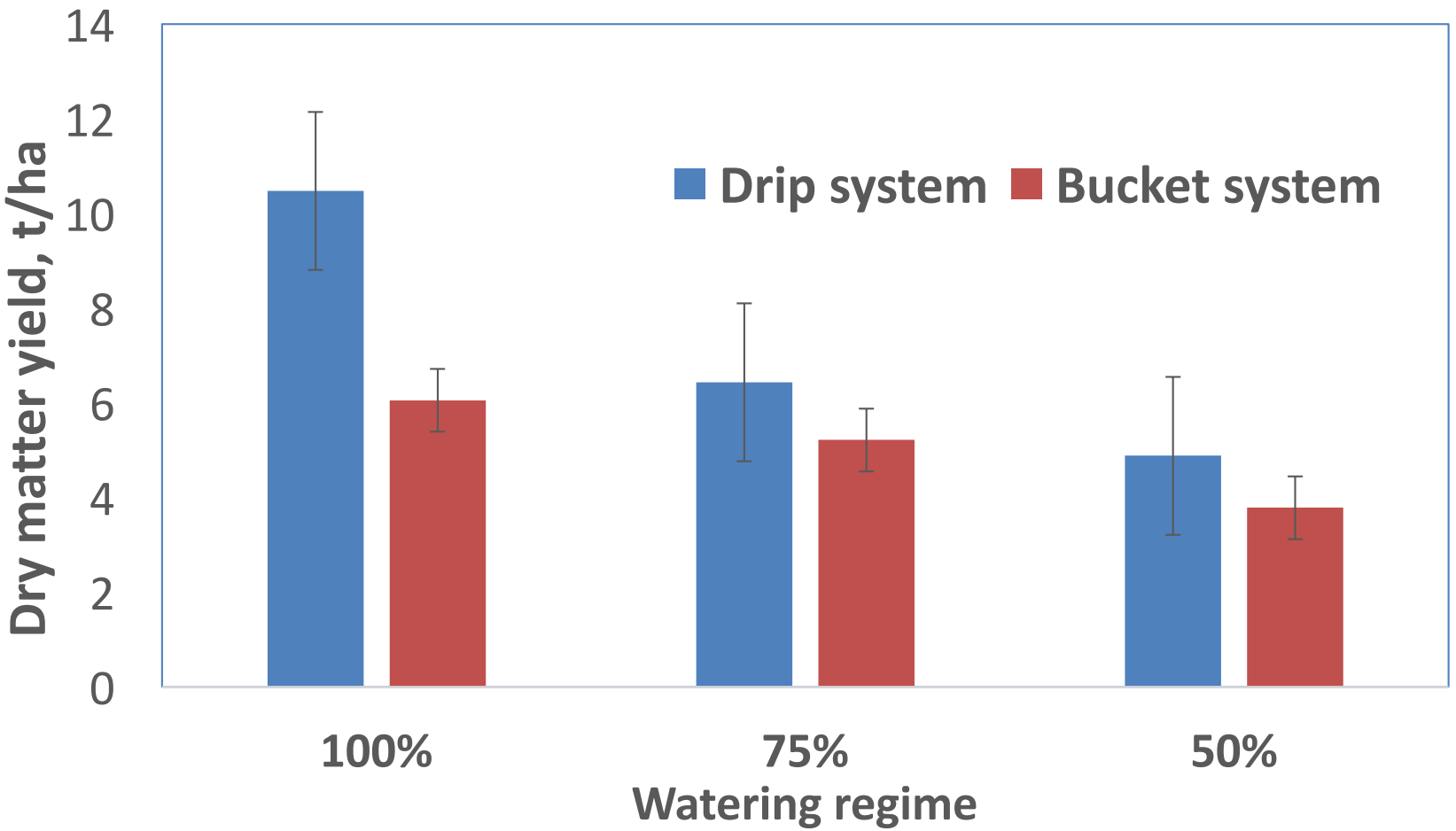
- RAF5079: “Enhancing Crop Nutrition and Soil and Water Management and Technology Transfer in Irrigated Systems for Increased Food Production and Income Generation (AFRA).”
- RAF5075: “Enhancing Regional Capacities for Assessing Soil Erosion and the Efficiency of Agricultural Soil Conservation Strategies through Fallout Radionuclides (AFRA).”
- ZIM5021: “Assessing and Promoting Sustainable Agricultural Production in Communal and Newly Resettled Farms.”

Introducing small-scale drip irrigation system and improved water management to Zimbabwean communities

- Isotopic and nuclear techniques are used to improve irrigation management and maximize fertilizer application

Soil moisture neutron probe

Yield of cabbage under different watering regimes, measured using nuclear technique (neutron probe)



Soil conservation research in Zimbabwe

Climate change and variability further aggravate land degradation, soil loss, and sedimentation, affecting soil and water resources & pollution.

Effective land management strategies are essential for sustaining soil and water resources.

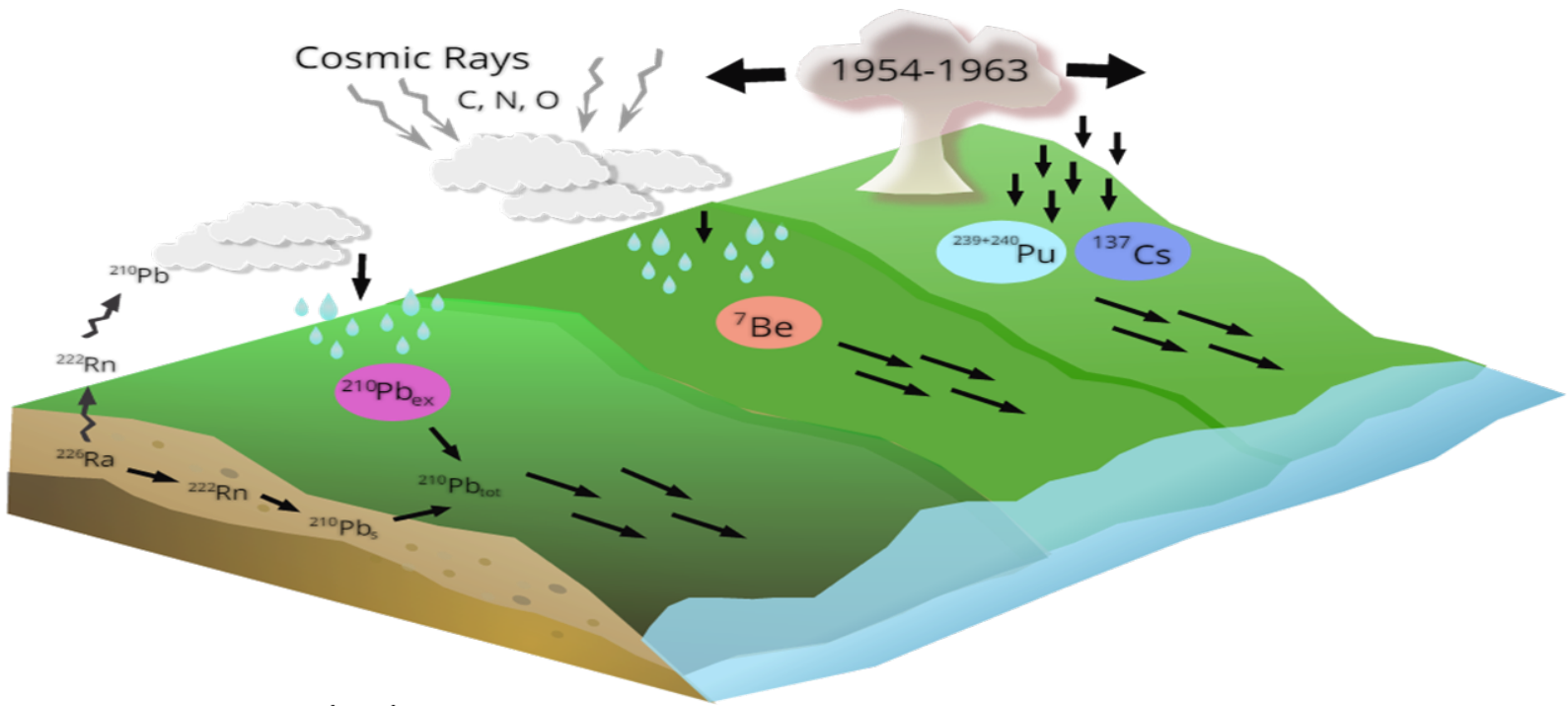
Nuclear and isotopic techniques (fallout radionuclides e.g. caesium-137) allowed easy assessment of the effectiveness of soil conservation and impact of farming practices on soil erosion control.

Direct seeding equipment

Maize with crop residues cover

Principle of fallout radionuclides (FRNs) methods

- FRNs (e.g. Caesium-137) get to soil from atmosphere.
- They can be used as tracers for soil redistribution as they strongly bind to fine soil particles and their movement indicates soil erosion.



Adapted from: Mabit et al (2018). Promoting the use of isotopic techniques to combat soil erosion: an overview of the key role played by the SWMCN Subprogramme of the Joint FAO/IAEA Division over the last 20 years. Land Degradation & Development. https://doi.org/10.1002/ldr.3016

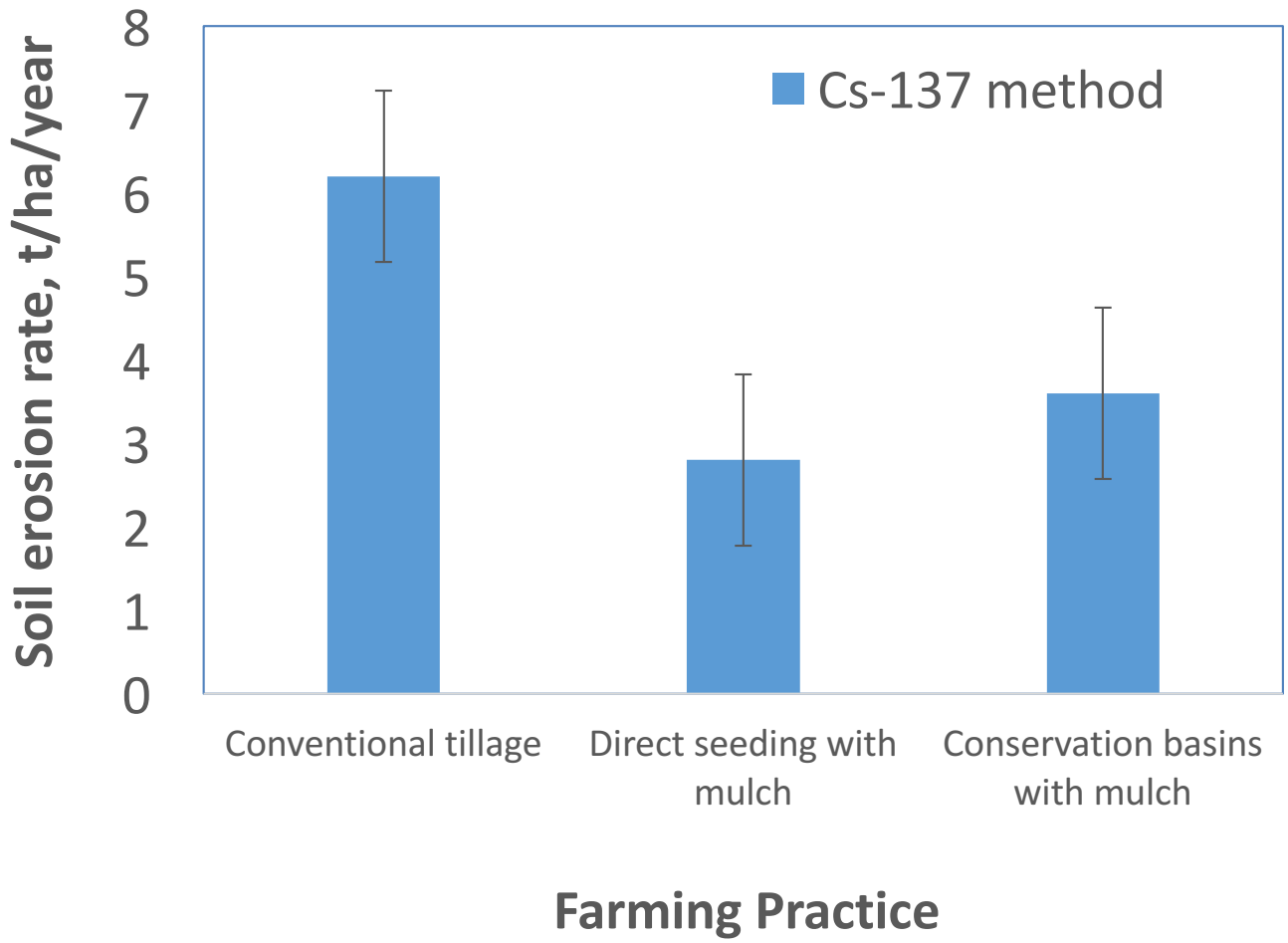
Cs-137 was used for assessing the efficiency of soil conservation measures in Zimbabwe

Makoholi experimental site with soil conservation experiment

Soil sampling for Cs-137 measurements

Gamma Spectroscopy System for Cs-137 measurements

Efficiency of soil conservation land management estimated by caesium-137 method



Conclusions

Nuclear and isotopic techniques are useful for obtaining essential information for:

- managing agricultural water and fertilizers
- evaluating soil conservation strategies

Nuclear and isotopic techniques have supported developing countries in adopting climate-smart agriculture.

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THANK YOU