The contribution of Indigenous Knowledge Systems to primary production in Agriculture

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Three types of agriculture worldwide (introduction)

- **Industrial agriculture**: characterised by highly capitalised infrastructure and machinery, large-scale farming units, reliance on high volumes of external inputs, such as synthetic fertilisers and pesticides, and heavily dependent on government subsidies. Mostly found in developed countries. This type of agriculture is also practiced in South Africa, characterised as commercial farming, with large-scale agriculture.

- **Green revolution agriculture**: areas have well irrigation infrastructure or receive reliable and sufficient rainfall. Farming lands are both large and small in scale and involve a simple farming system that includes the planting of a single type of crop on large fields. This type of agriculture is found in developing countries, such as in Latin America, North Africa and Asia.

- **Resource-poor agriculture**: characterised by fragile or poor soils and areas that are almost exclusively rain-fed. Agriculture is characterised by complex farming systems involving mixed cropping systems. Found mostly in resource-poor areas, where farming is very risky due to diverse agroecological environment and socioeconomic circumstances of the farmers. Farmers usually employ complex and diverse farming systems based on indigenous knowledge (IK) as a strategy to produce crops for household consumption and income generation.

(Hart and Vorster, 2006; 2007)

IKS in agriculture

- IK generally is knowledge that communities in a specific geographical area have developed over time to survive and forms the basis for local level decision-making in diverse areas of human endeavor, including agriculture.
- IKS is generated by communities through a systematic process of observing local conditions, experimentation, re-adapting to new conditions to provide solutions to modified environmental, and socioeconomic and technological situations.
- African farmers (i.e., smallholder farmers) rely on IKS and experiences gained over the years to adapt to environmental conditions and seasonal changes without external inputs, capital and modern scientific knowledge support to boost agricultural production systems.
- IKS affords African farmers the ability to sustain agriculture through knowledge, skills, practices, innovation and technologies to produce crops and livestock on a long-term basis, while having minimal effects on the environment.
- Interfacing IKS and scientific knowledge systems prerequisite to drive growth for industrialisation through technology and innovation.

(Leys, 1996; Hart and Mouton, 2005; Tella, 2007; Nwonwu, 2011; Briggs and Moyo, 2011; Maroyi, 2012)

Areas of agriculture where IKS is relevant for primary production

Areas of agriculture

Labour: hired, family-based, community-based

Land: choice, acquisition and size of land, ownership, land use planning, land clearing and preparation

Capital: sales of cash crops, community-based banks/stokvels, personal savings, in-kind

Managerial skills: farmers' seed savings, nutrient cycling and soil fertility maintenance, livestock management, soil and water conservation, crop production and management, indigenous food resources, land management, cropping systems, indigenous irrigation practices, indigenous food storage and processing

(Materechera, 2021)

Case study 1: Soil quality and nutrient management in Malawi

- Soil quality and fertility are critical in crop production to achieve food security

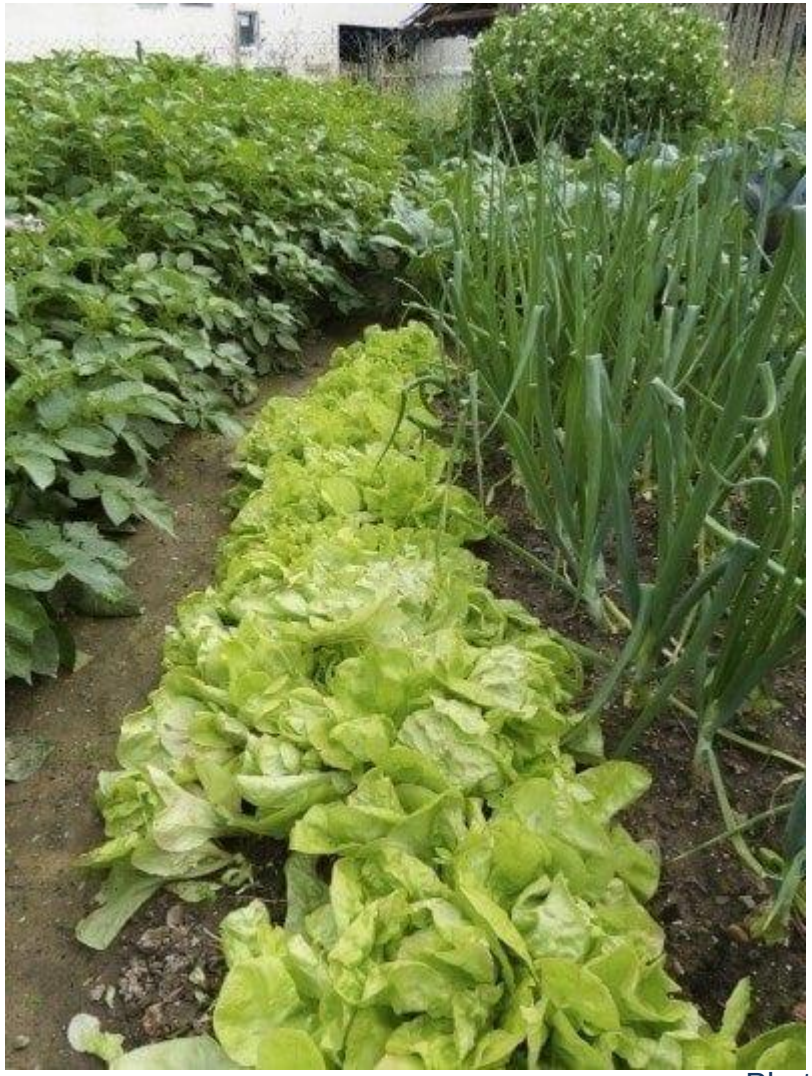
- Farmers' techniques in determining soil quality and fertility
  - Soil quality: rubbing the soil against the fingers to determine soil quality and texture
  - Soil fertility: visuals to determine the colour of the soil (dark-coloured and black clayed (contain organic matter) soils are perceived to be highly fertile or rich in nutrients; light-coloured soils signify lower fertility and this calls for the use of chemical fertilisers to improve crop yields)

- Some of the techniques (e.g., visuals used to determine and manage soil quality and fertility) are comparable to modern scientific knowledges

Soil properties	Minimum		Maximum		Mode		Mean		Median	
	Ant hill	Flat	Ant hill	Flat	Ant hill	Flat	Ant hill	Flat	Ant hill	Flat
pH	5.500	4.300	7.400	6.100	6.600	4.900	6.373	5.180	6.400	5.300
Nitrogen %	0.115	0.070	0.285	0.185	0.115	0.070	0.218	0.120	0.218	0.110
Phosphorus (ppm)	2.123	2.622	10.740	11.928	3.144	2.622	4.169	5.509	3.523	3.901
Clay%	40	30	83	47	67	40	68	40	70	40
Sand %	7	23	27	50	10	40	15	39	13	40
Silt%	**10**	**7**	**23**	**27**	**20**	**20**	**17**	**20**	**17**	20

(Moyo, 2010; Briggs and Moyo, 2017)

Case study 2: Crop production systems in South Africa



- Mixed or multiple cropping: growing of two or more crops simultaneously on the same plot

- Benefits:
  - Slows the spread of host-specific diseases and pests
  - Helps to safeguard against crop failures
  - Productivity per unit area is higher than in mono-cropping systems with the same level of management – the farmers incorporate a variety of crops with different growth habit in the same field
  - Supplies a minimum level of food for households by intercropping crops that mature at different times
  - Addresses the land shortage, spreads risk and suppresses some weeds

(Hart and Vorster, 2007; Rankoana, 2017)

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Photo credit: Bonnie Grant

Concluding remarks

- Through research, case studies and experiences, IK is being used by smallholder farmers for agricultural production across the African continent, as highlighted through Malawi and South Africa as examples.

- IKS contributes to sustainable agriculture through indigenous ways of knowing and practices in areas such as land use planning, soil water conservation and fertility management, crop and livestock husbandry, pest, weed and disease control, which are principles and indicators of primary production in agriculture for food security and socioeconomic development.

- Therefore, there is a need to interface IKS and other knowledge systems, such as modern scientific knowledge and technologies, e.g., biotechnology on soil nutrient determinations and crop production; and information technologies, such as the use of drones to generate, store and disseminate information (i.e., images) that smallholder farmers can use to plan land use and determine soil quality and fertility using smartphones with appropriate applications to deepen sustainability agriculture and primary production.

THANK YOU