

# African Agriculture through Innovation from planting to harvesting: A case study of Cassava



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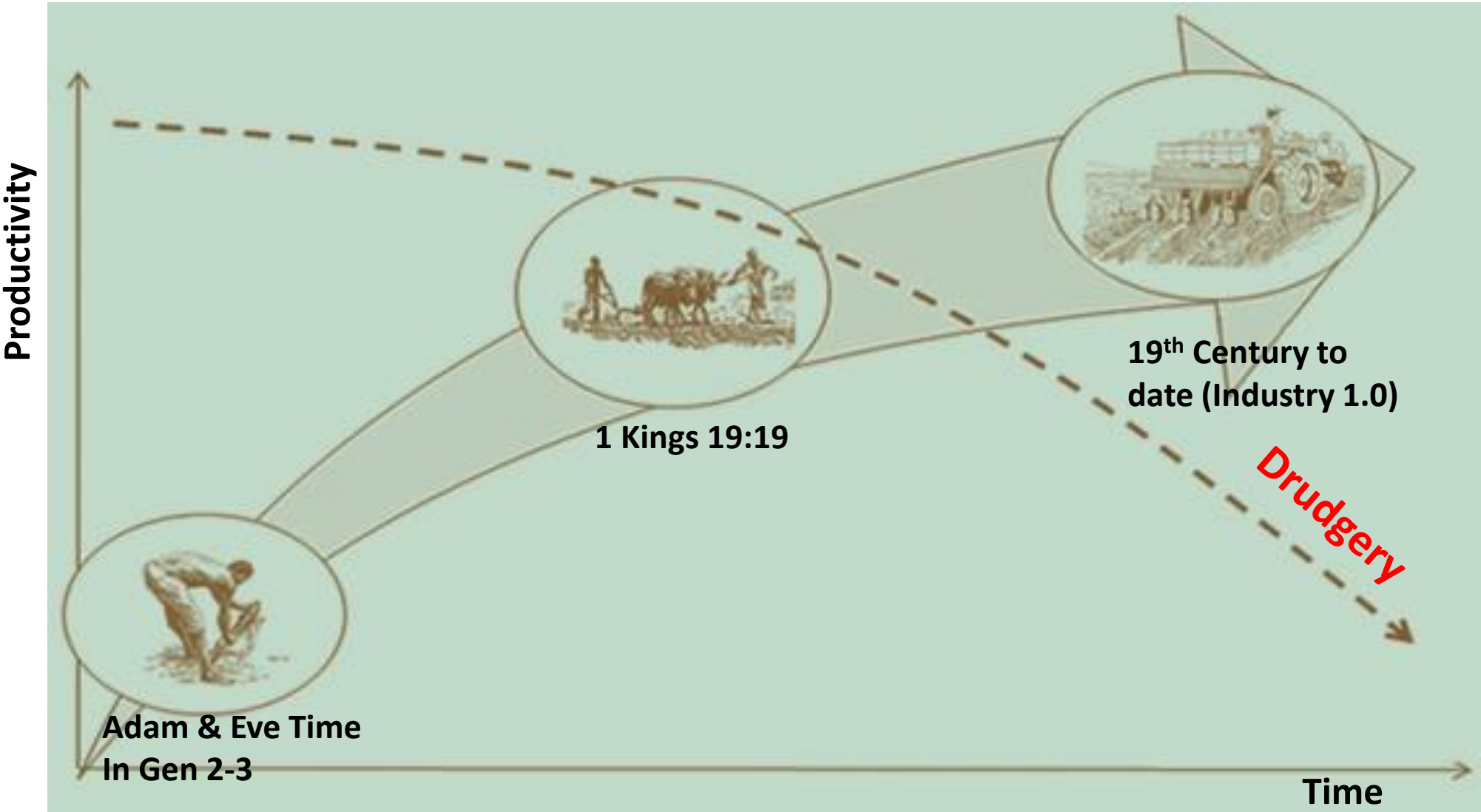
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# Outline

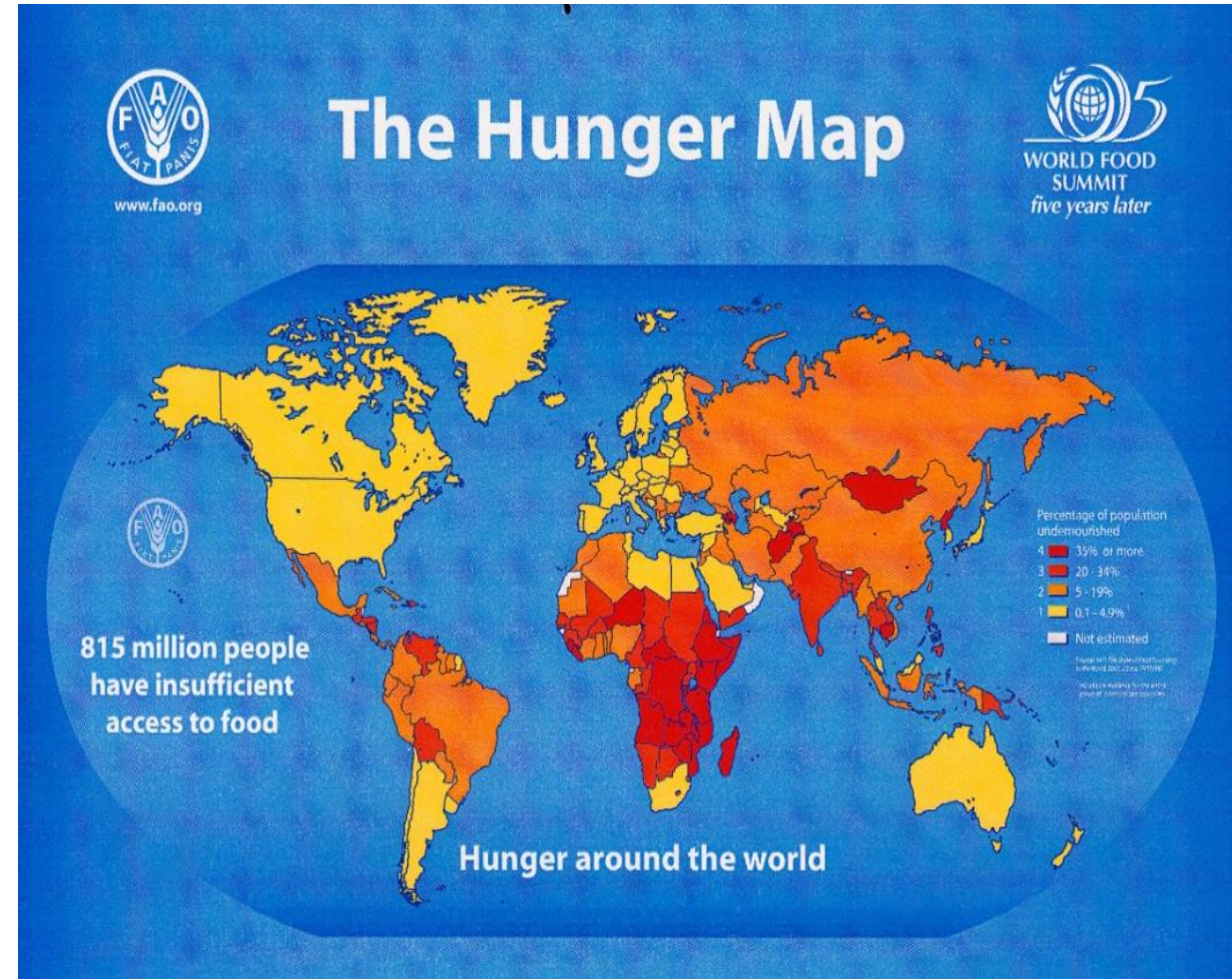
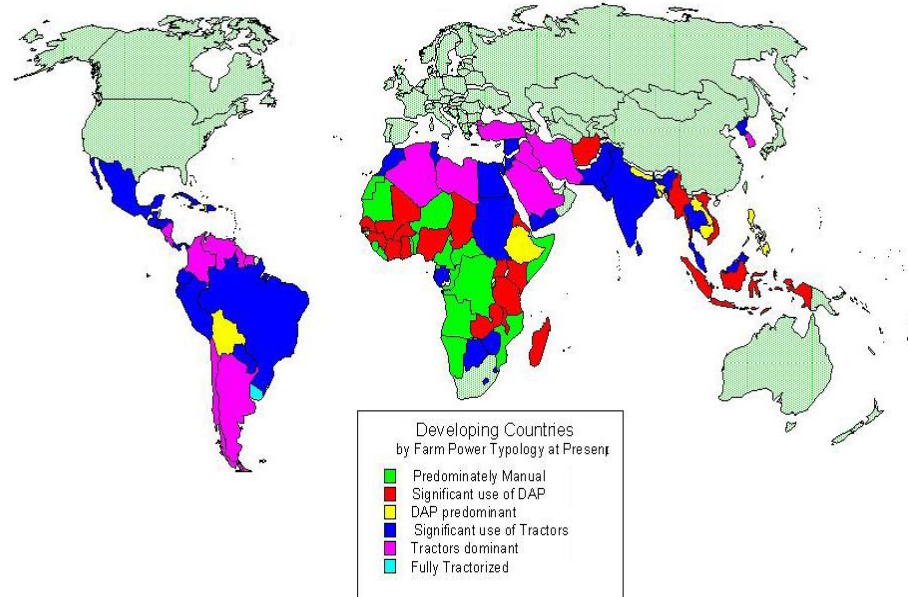
- **Challenges to mechanised cassava production in Ghana and Africa**
  - ❖ Low farm power & drudgery in agriculture
  - ❖ Aging agricultural labour force
  - ❖ Slow progress in agriculture mechanisation
  - ❖ Low level of mechanised cassava production
- **Innovations developed to address some challenges by Bobobee *et al.***
  - ❖ The TEK Mechanical cassava harvester and others
  - ❖ Durable digging blade
  - ❖ Double-row disc ridger

# Global Agricultural Mechanization Progress



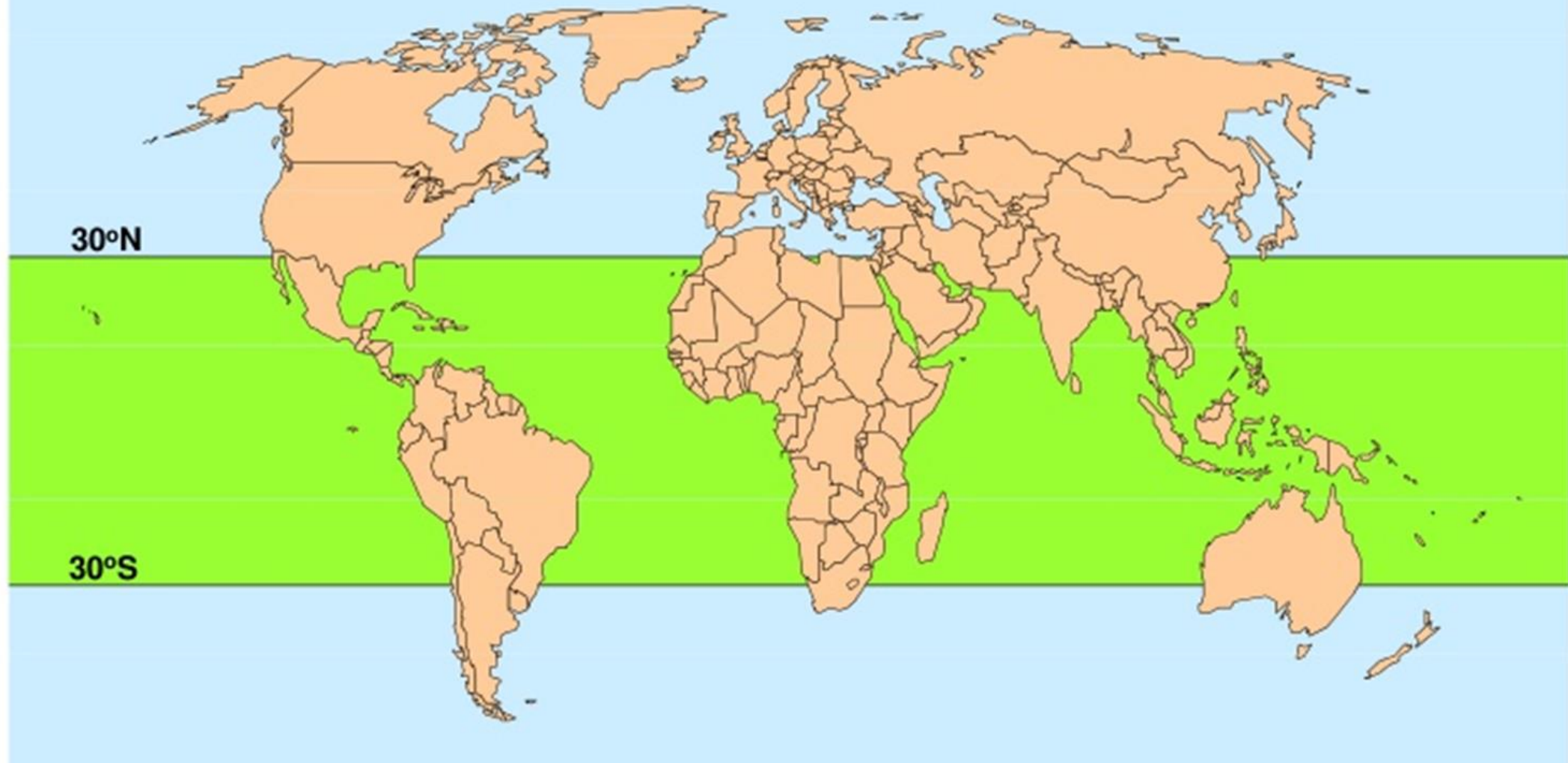
# Global Farm Power Typology and Hunger Map

## Farm power typology – Developing Countries (L Clarke)

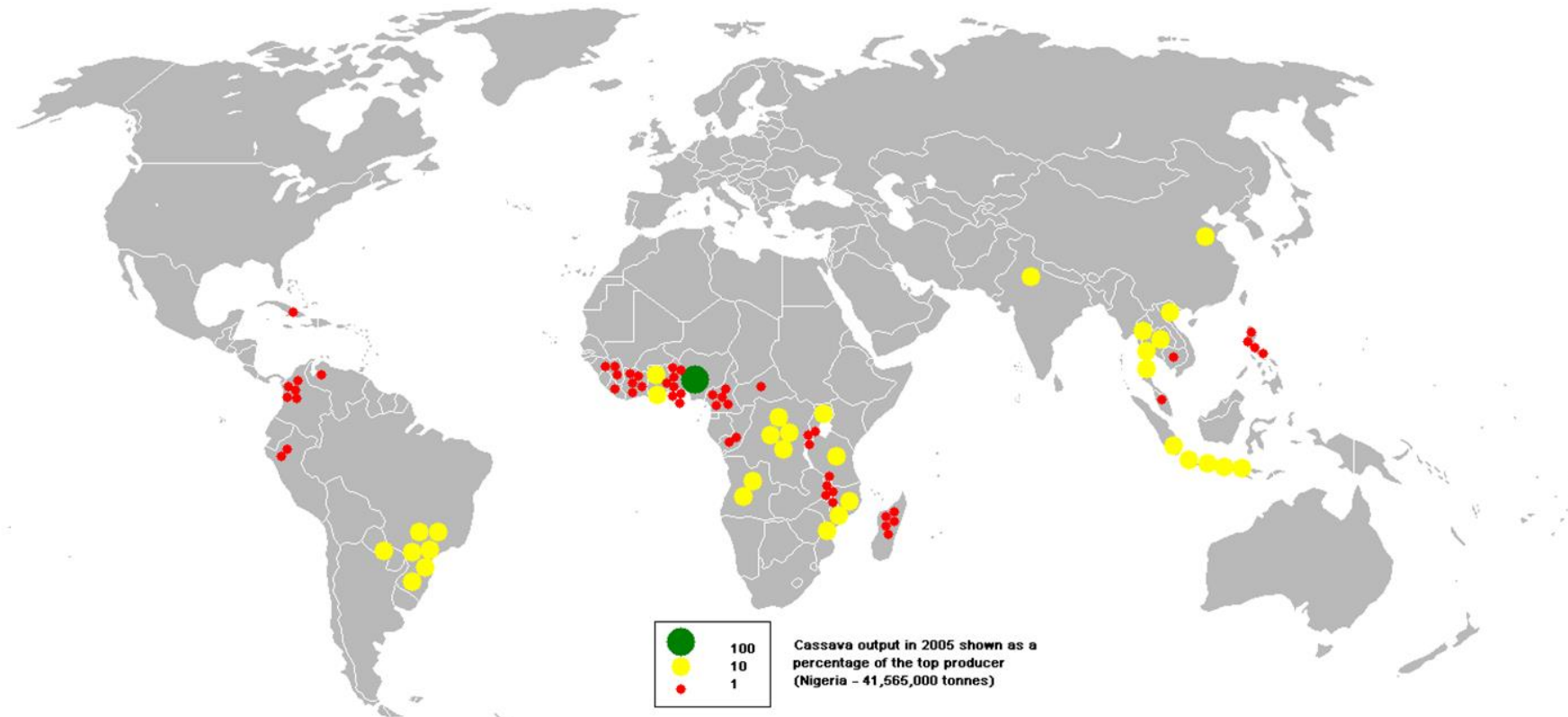


# Cassava distribution

Grows between 30°N and 30°S latitude mostly in areas marginal for most others crops

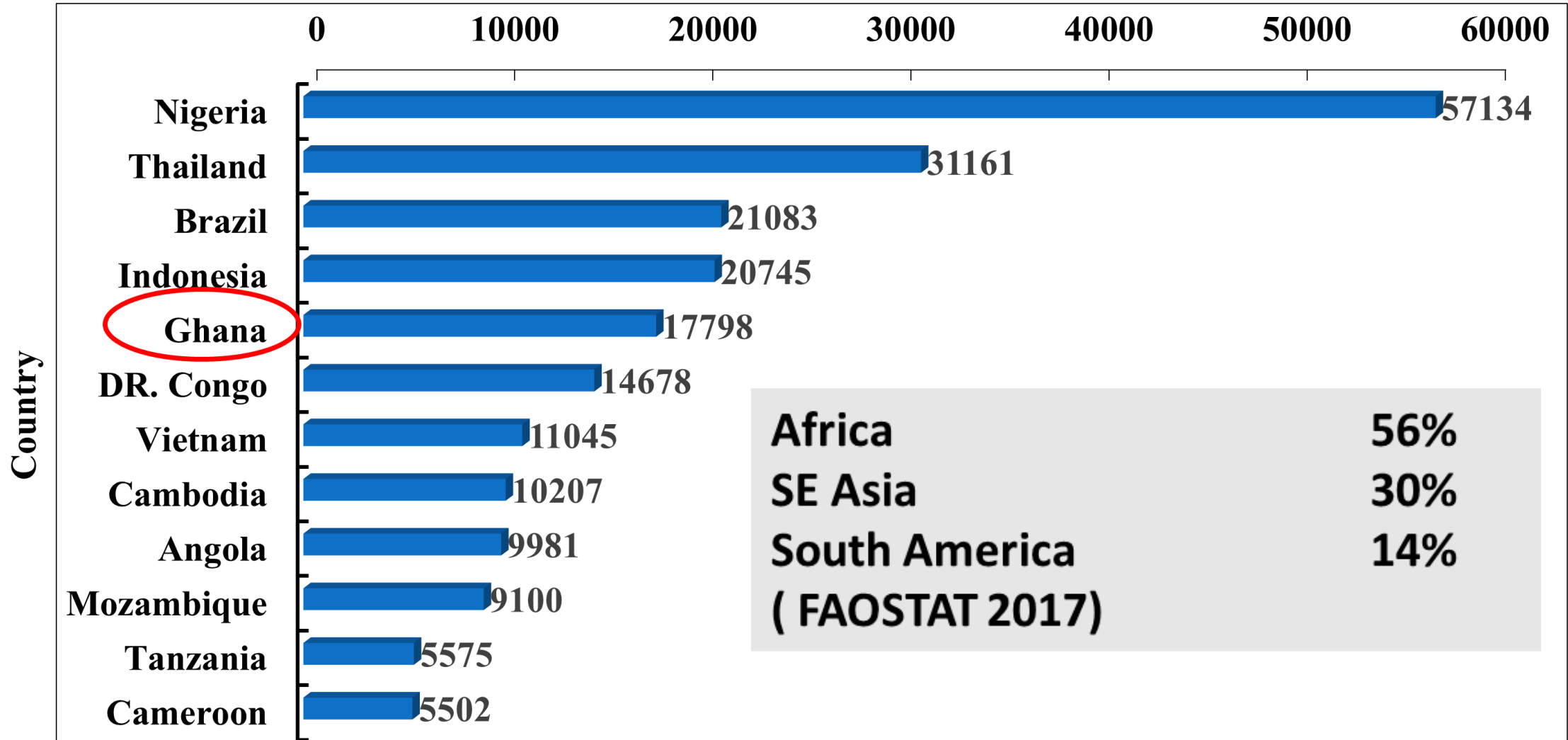


# Global Distribution of Cassava



<b>Africa</b>	<b>56%</b>
<b>SE Asia</b>	<b>30%</b>
<b>South America</b>	<b>14%</b>
<b>( FAOSTAT 2017)</b>	

## Production quantity ('000 Mt)



# The challenge to mechanised & commercial cassava production

- Small-scale producers dominate agriculture in Ghana and SSA
- Cassava is planted randomly/haphazardly/disorderly
- Apart from ploughing, there is little mechanisation by cassava growers
- Agricultural labour is aging in Ghana & Africa
- Agriculture is a way of life not treated as a business
- The youth are not interested to use manual tools in agriculture
- Manual cassava harvesting is a painful activity full of drudgery,
- Until recently, there are no commercial mechanical cassava harvesters developed in Africa.



# Cassava production by task and days per ha in the Congo, Côte d'Ivoire, Ghana, Nigeria, Tanzania and Uganda *(Source : Nweke et al 2001)*

Task	Country					
	DR Congo	Cote D'Ivoire	Ghana	Nigeria	Tanzania	Uganda
Land preparation (manual)	66	53	44	49	54	45
Seedbed preparation	21	29	31	41	27	31
Planting	39	22	28	32	27	28
Weeding	27	28	34	38	28	32
<b>Harvesting</b>	<b>48</b>	<b>44</b>	<b>53</b>	<b>62</b>	<b>46</b>	<b>52</b>
<b>Total days</b>	<b>201</b>	<b>173</b>	<b>191</b>	<b>222</b>	<b>182</b>	<b>187</b>

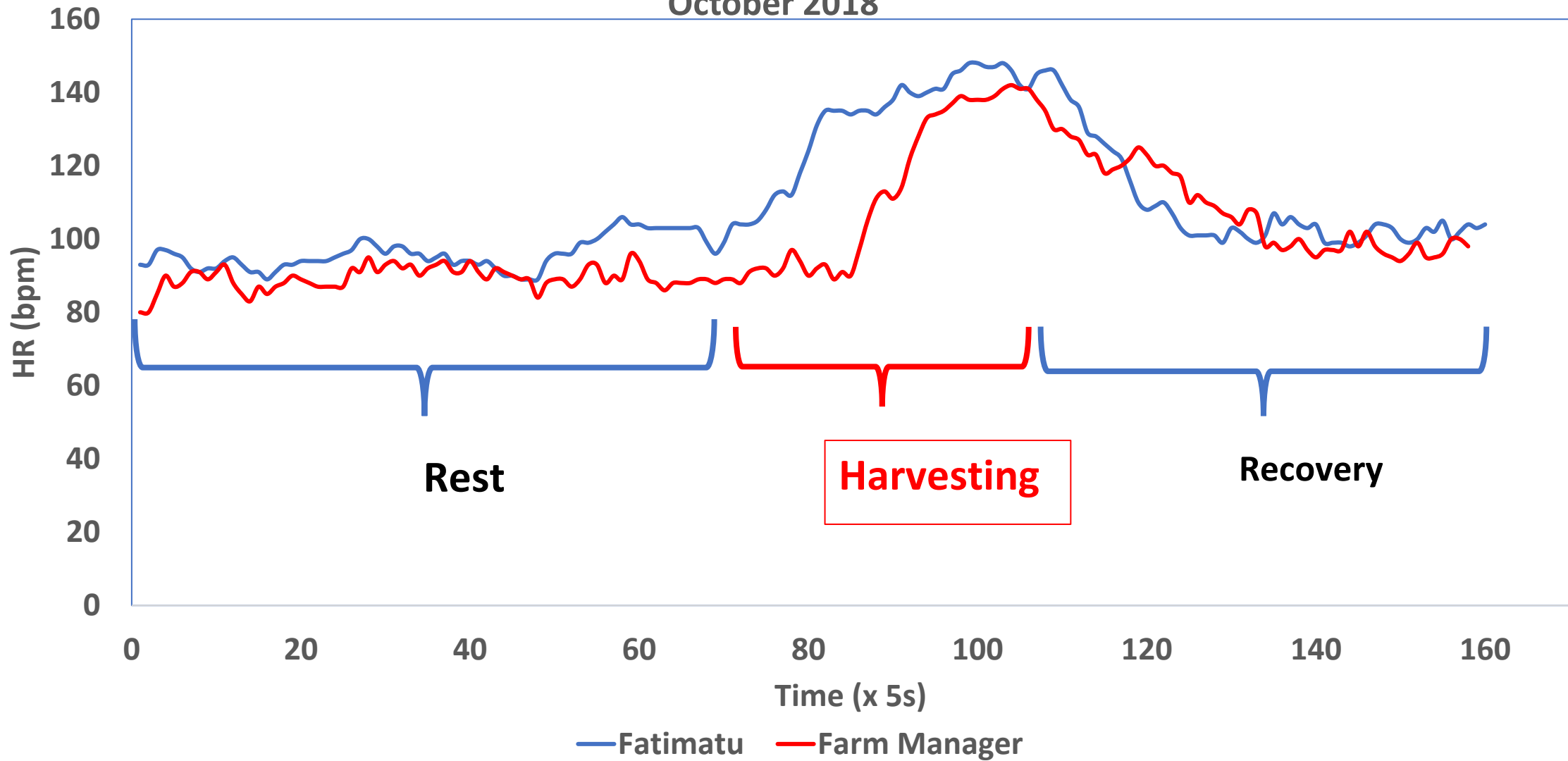
# Painful manual harvesting methods



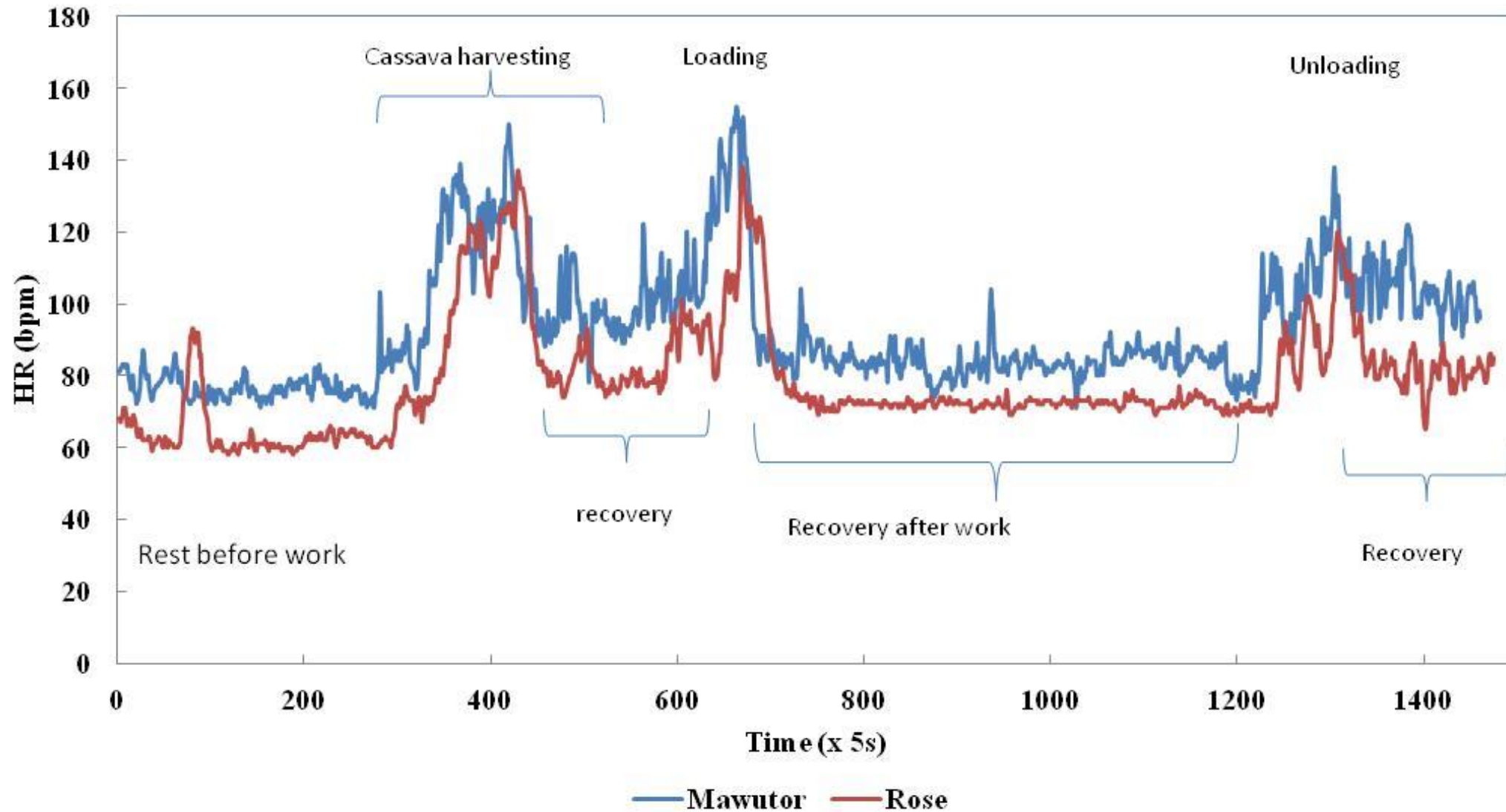
# Manual Cassava harvesting in NIJILUCAS Farm, Nigeria, 2018



# Heart rate profiles of manual cassava harvester on Niji Lucas farm, Nigeria, October 2018



# HR profiles of two women for manual harvesting 10 Nkabom Cassava plants together on 01 July 11



# KNUST Solution

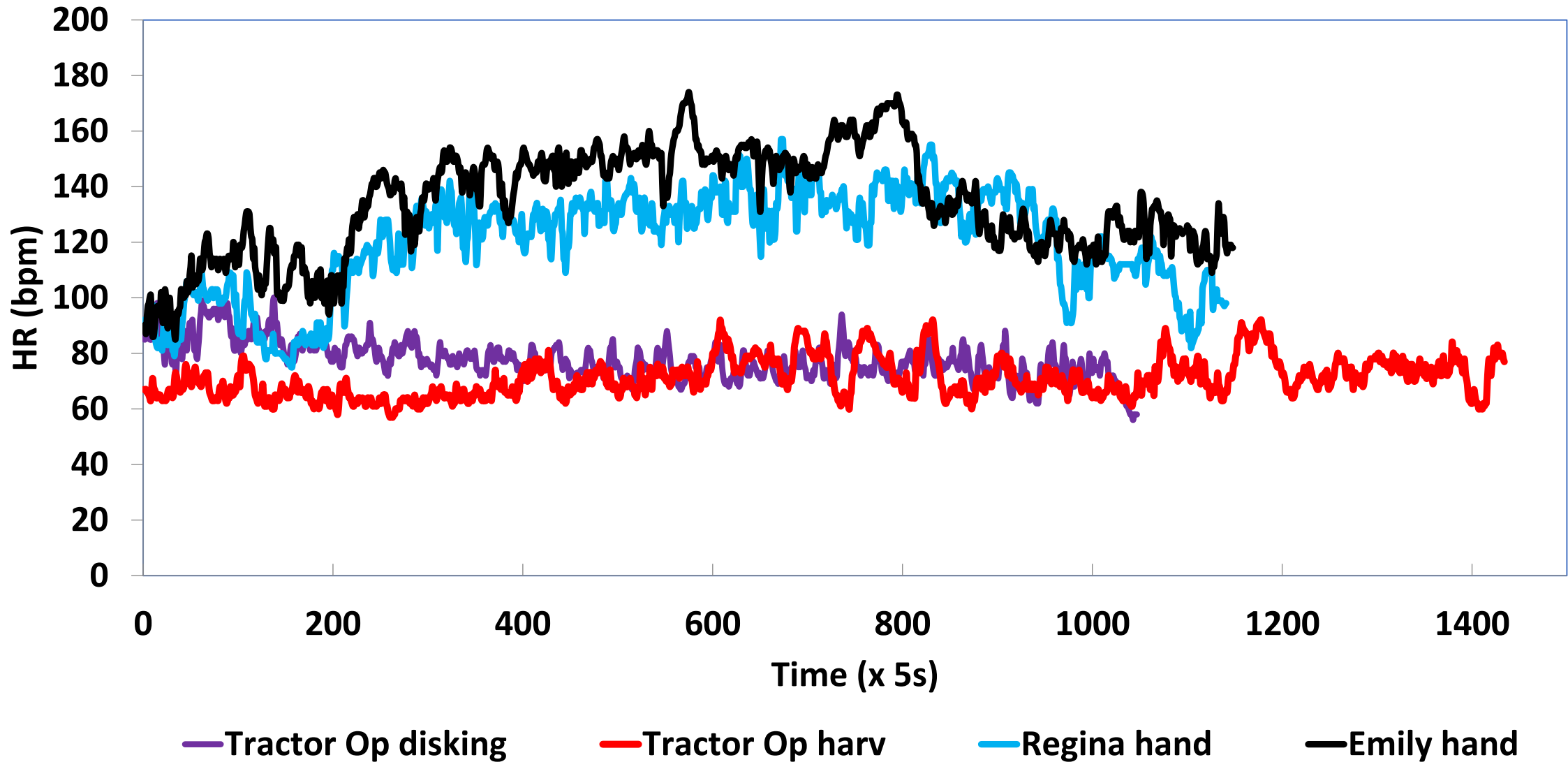


- An efficient TEK mechanical cassava harvester invented and patented at KNUST (*OAPI patent 17219*).
- Harvester takes 1 sec/plant to dig out compared with 5 - 10 mins/plant manually.
- 50 prototypes manufactured and 30 deployed in Ghana, South Africa, Nigeria & Jamaica.
- Capacity exists to manufacture to satisfy continental demands.

# Mechanical Harvesting Demo Video Clips

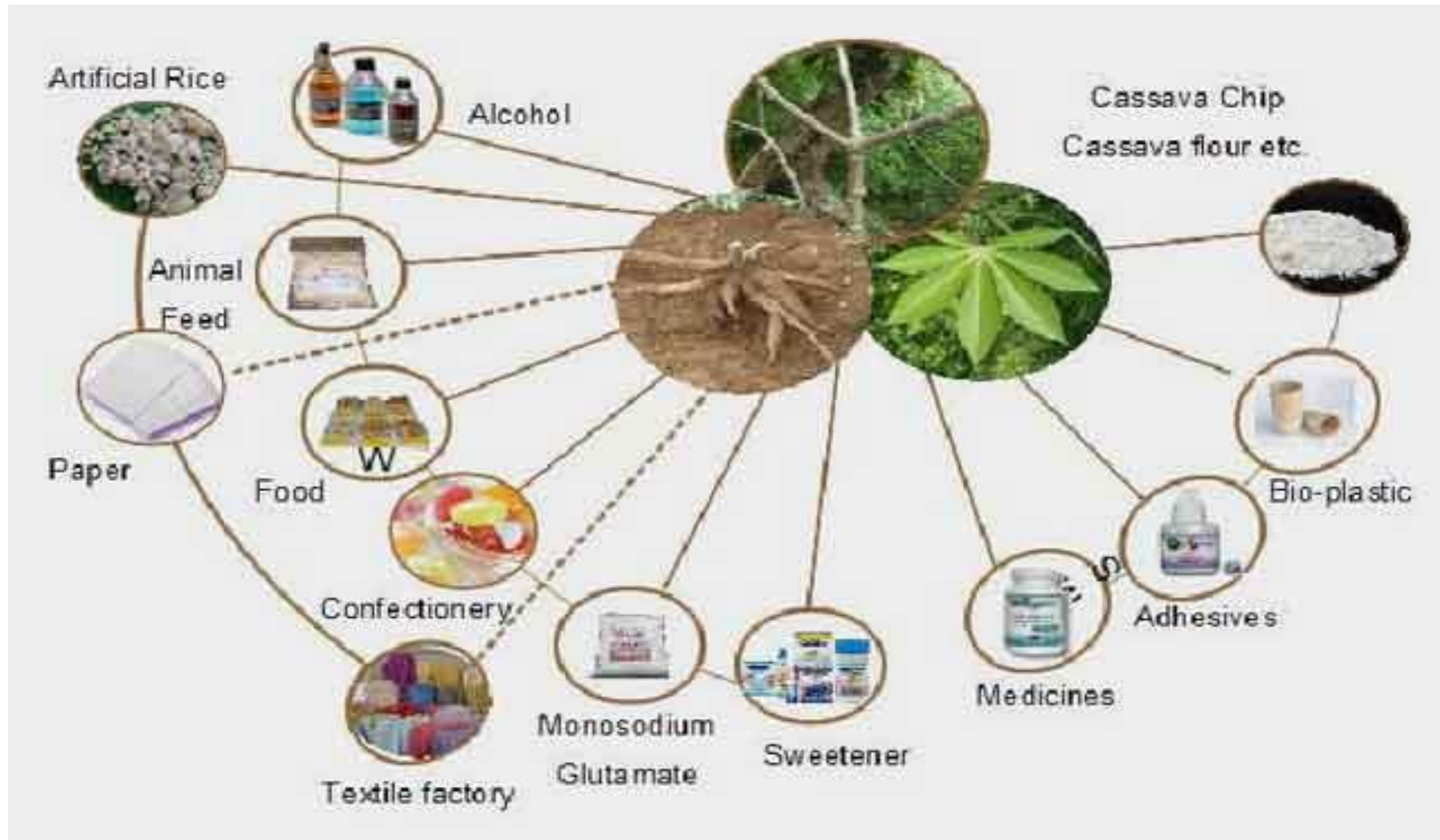


# Drudgery evaluation of manual and mechanical cassava harvesting in RSA, 2015





# Some Industrial Cassava Products



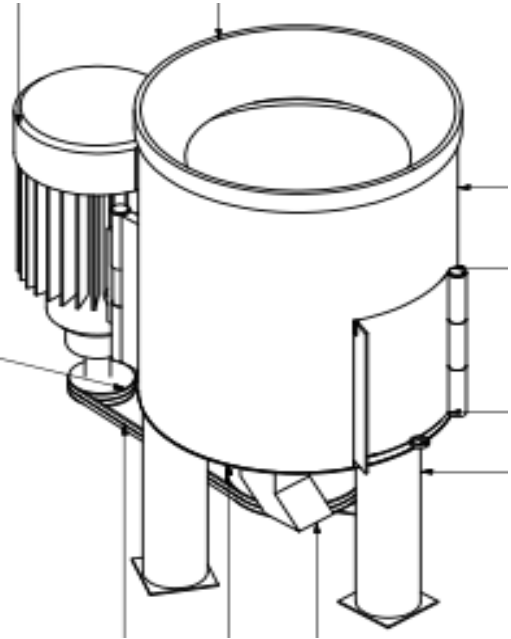
**After mechanical harvesting, the field is ploughed, conserving fuel, time and money**



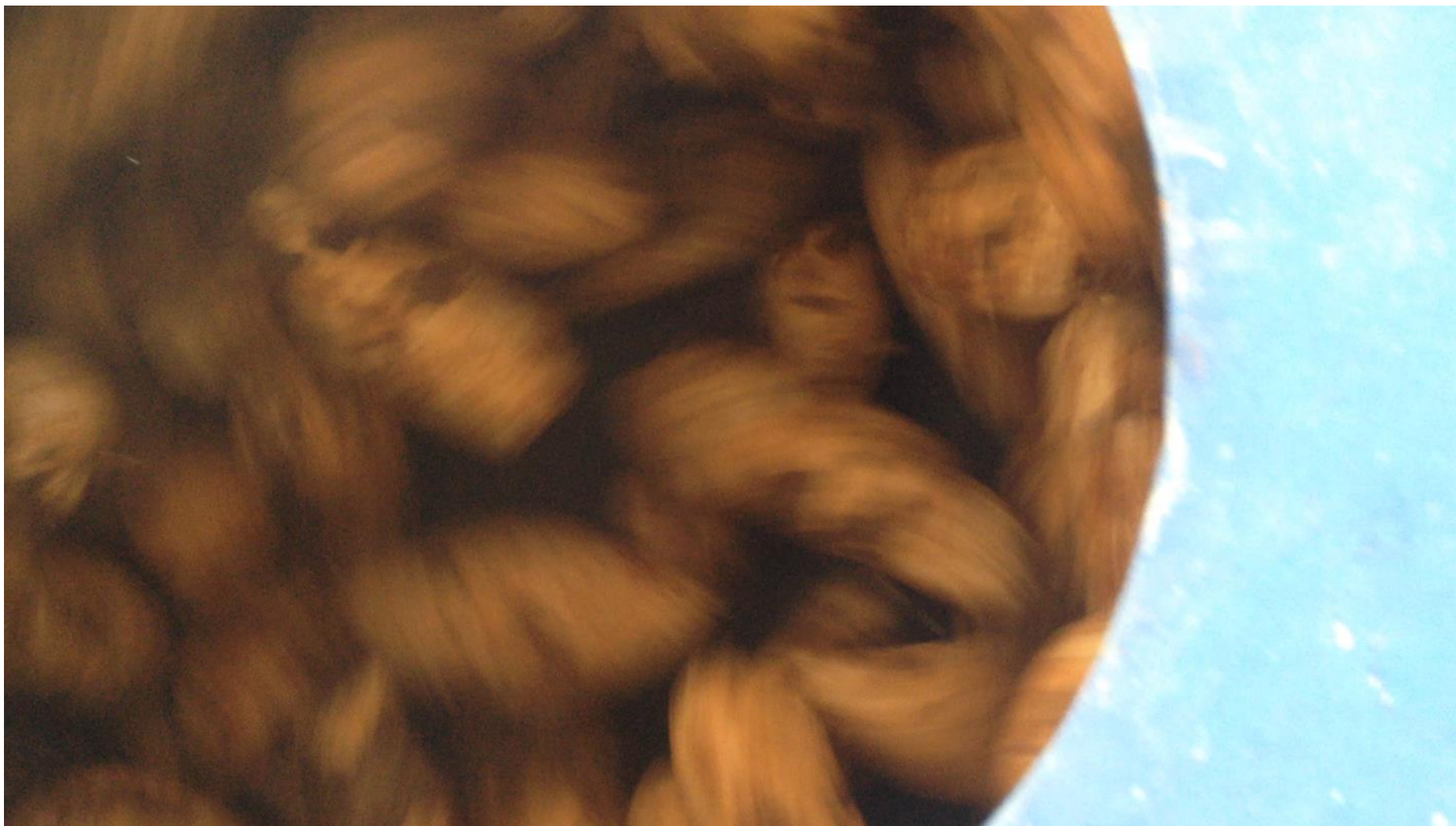
# DURABLE BLADES – THE ONLY SPARE PART



# Tedious Manual Cassava Peeling



# Motorised Cassava Peeler Video



# The future is planting on ridges



**Ridges must accommodate trackwidth of the tractor**

# RIDGING & CA BENEFITS OF RIDGING FOR CASSAVA (SDG 13)



**KNUST Cassava farm  
planted on ridges to  
facilitate mechanical  
operations**





# Drone view of KNUST Cassava Farm planted to 22 elite varieties



# Commercial Cassava Farm on Ridges in Ghana



**Recommended inter-row  
and intra-row spacings  
of mechanised cassava  
production**



# KNUST PROTOTYPE RIDGER



# KNUST Ridger Field Testing



2021/04/27

# Inspecting mechanically harvested cassava at UNIVEN, RSA in 2014



# Demonstrating Mechanised Cassava Harvesting in UNIVEN, South Africa, 2014



# Demonstrating mechanical cassava harvesting and root damage assessment at University of Venda, RSA, 2014





# Displaying mechanically harvested cassava at University of Venda, Limpopo, RSA, 2014.



# Mechanical cassava harvest demonstration in Nelspruit, South Africa, June 2015



# Displaying mechanically harvested cassava



# Cassava Harvesting Demonstration in Nigeria, October 2018



# VISIT BY FAO DELEGATIONS TO KNUST CASSAVA FARM 2017



## Ghana Vice President and Minister of Agric at my Exhibition stand at 33rd National Farmers' Day in Dec. 2017



## Ghana Minister of Agric Hon Kofi Humado (MP) commissioned harvesters in 2013



# Conclusion

- **First and reliable commercial mechanical cassava harvester developed at KNUST for Ghana and Africa**
- **Africa must develop cassava from food security crop to industrial & export crop.**
- **Well developed cassava value chain represents a multi- \$billion market.**
- **The TEK Mechanical Cassava Harvester will unlock the huge potential of the crop on the continent**
- **Research team needs support to train farmers and tractor operators to adopt the modern cassava production methodology to reduce drudgery in sub-Saharan Africa.**
- **Cassava farmers and tractor operators should be supported by donors, development partners and policy makers to adopt the new methodology of growing cassava.**

# Concluding Remarks

Africa has the land (9 m ha) and the people (1.2 bn) and must adopt agricultural mechanisation technologies to attract the youth and turn agriculture into a multi \$trillion industry on the continent.



**THE TRUE  
SIZE OF  
AFRICA**





# THANK YOU!

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