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The changing importance of livestock for food and nutritional security in sub-Saharan Africa

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Outline

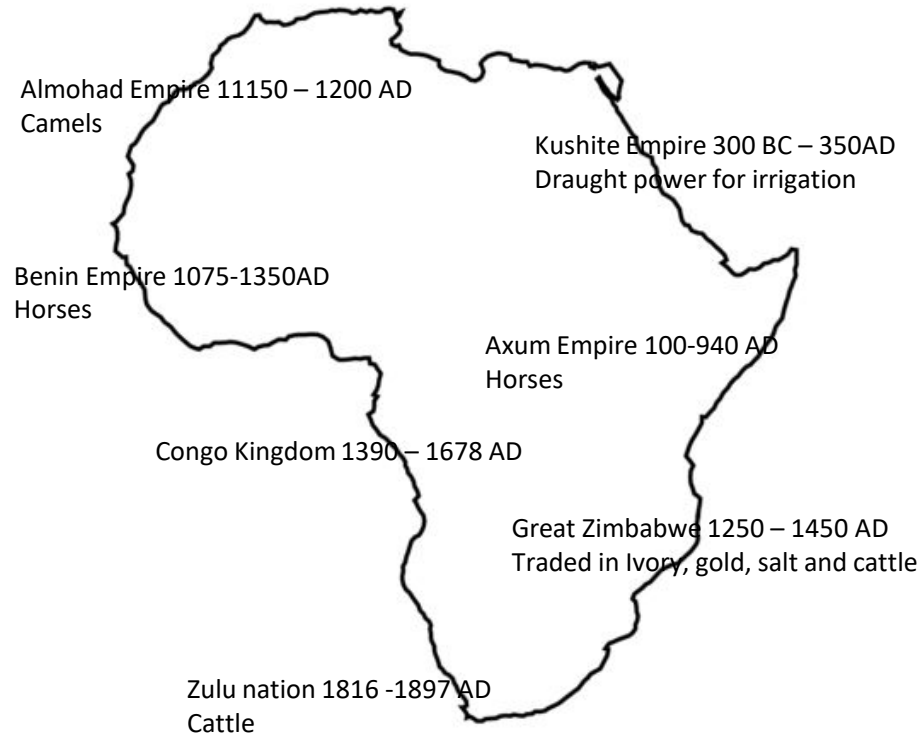
- Livestock in the historic perspective of Africa
- Current role of livestock in Sub-Saharan Africa
- The future perspective



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Historic perspective

Animal production in the old African civilisations



The oldest archaeological evidence of domestic cattle dates back to between 6000 and 5000 BC in western Egypt



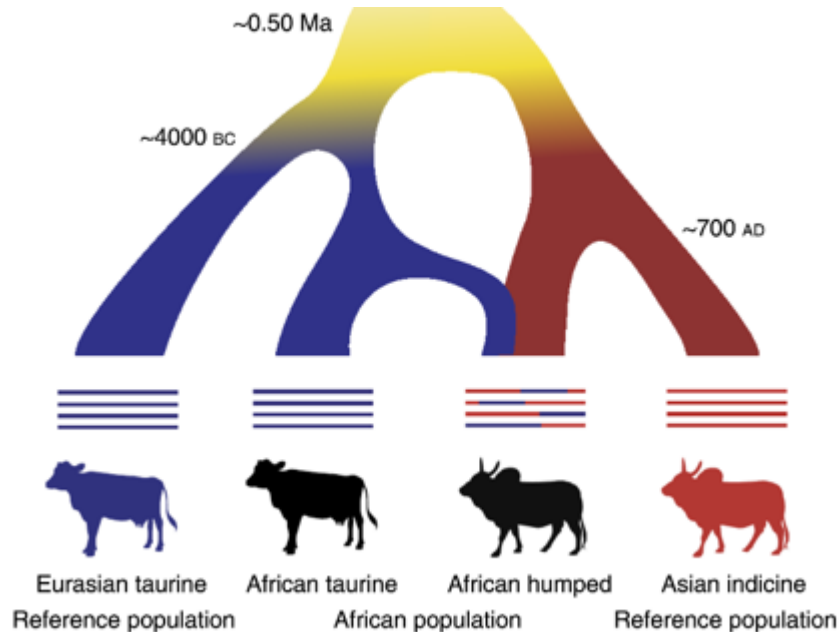
Animal Husbandry Practices

- “Despite the environmental complexity of the African continent, cattle were domesticated across all African agro-ecologies”.
- - Numbers
 - Traits of interest: Fertility, Adaptation, Longevity, Draught power, Stamina, Resilience, Temper
 - Subsistence food
 - Trait of interest: Yield-consistency
 - Production system
 - Extensive

Source : Kim et al., 2020



Breeding practices



- Natural selection
- Free mating system
- A combination of past taurine and recent indicine admixture-derived genetic resources is at the root of the present success of African pastoralism

Source : Kim et al., 2020



Low level of commercialisation

- Although livestock have been part of the culture in SSA for a long time, commercialisation of livestock products is relatively a 20th century phenomenon
- Recorded literature indicates milk was a free commodity representing good hospitality and community sharing
- With expectation of a few countries, main products were:
 - Liquid milk
 - Sour milk
 - Butter

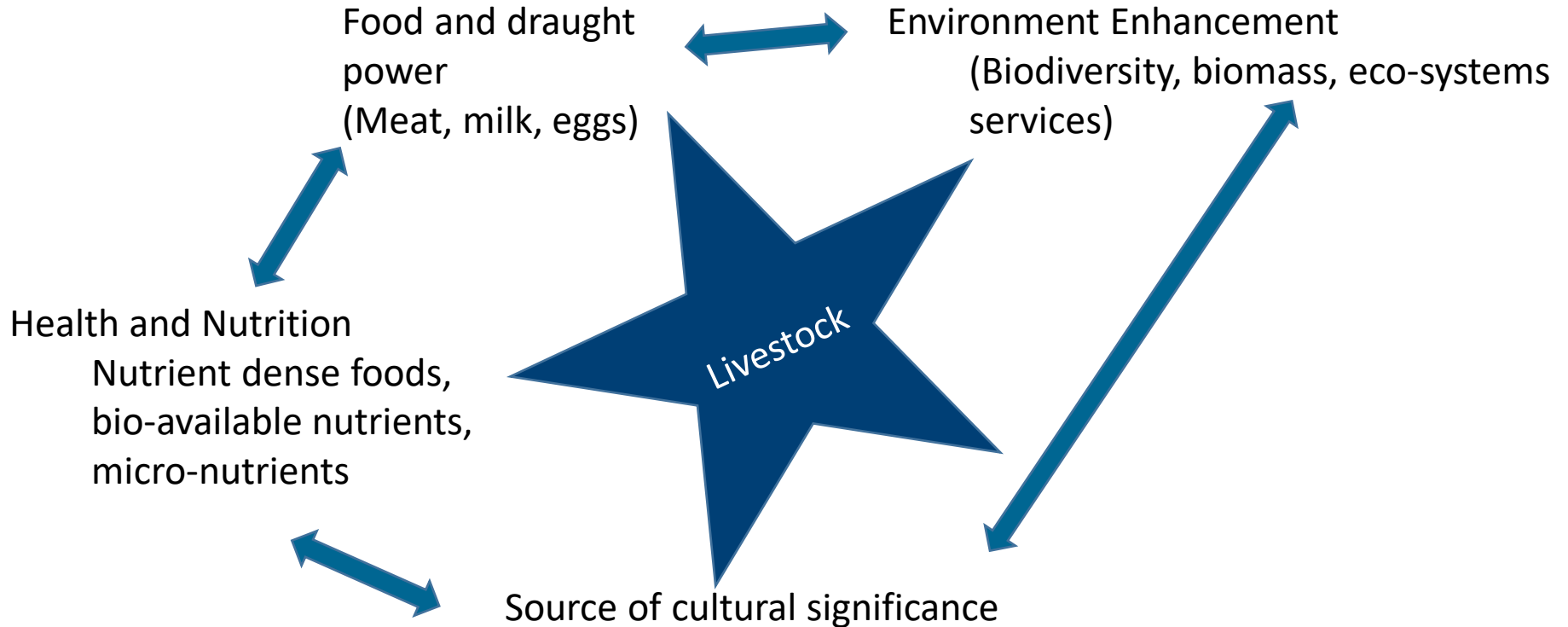


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Did livestock contribute to food and nutritional security?

- To rural household and individuals
- Very short value chains
- Nutrients taken out of the system found their way back into the system

Did Livestock contribute to food and nutritional security?



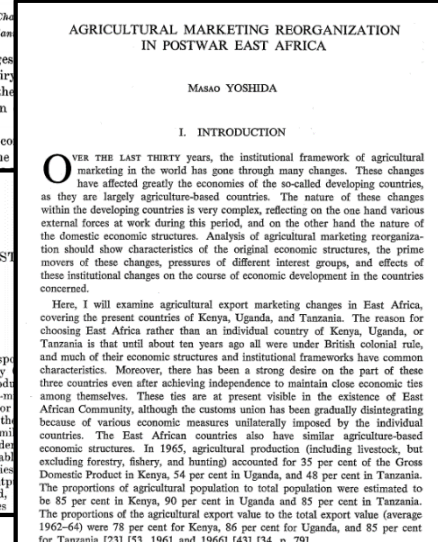
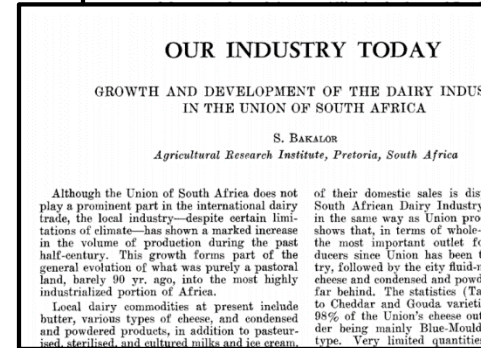
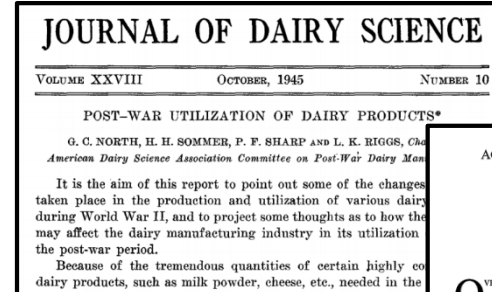


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Current status

Recent history of commercial livestock in SSA

- Pre-second world war
 - A subsistence issue and not market oriented
- Post-second world war
 - Similar developments as rest of western world
 - Powdered milk
 - Dairy products
 - Liquid milk
 - With a few exception, most agricultural development focused on crops



Post 1945 dairy breeding strategies characterised by:

- Importation of exotic breeds because of their high yields
- Crossbreeding of indigenous breeds exotic breeds ending up in “upgrading programmes” e.g. Malawi dairy improvement programme
- Low utilization of indigenous breeds
- No-within population selection

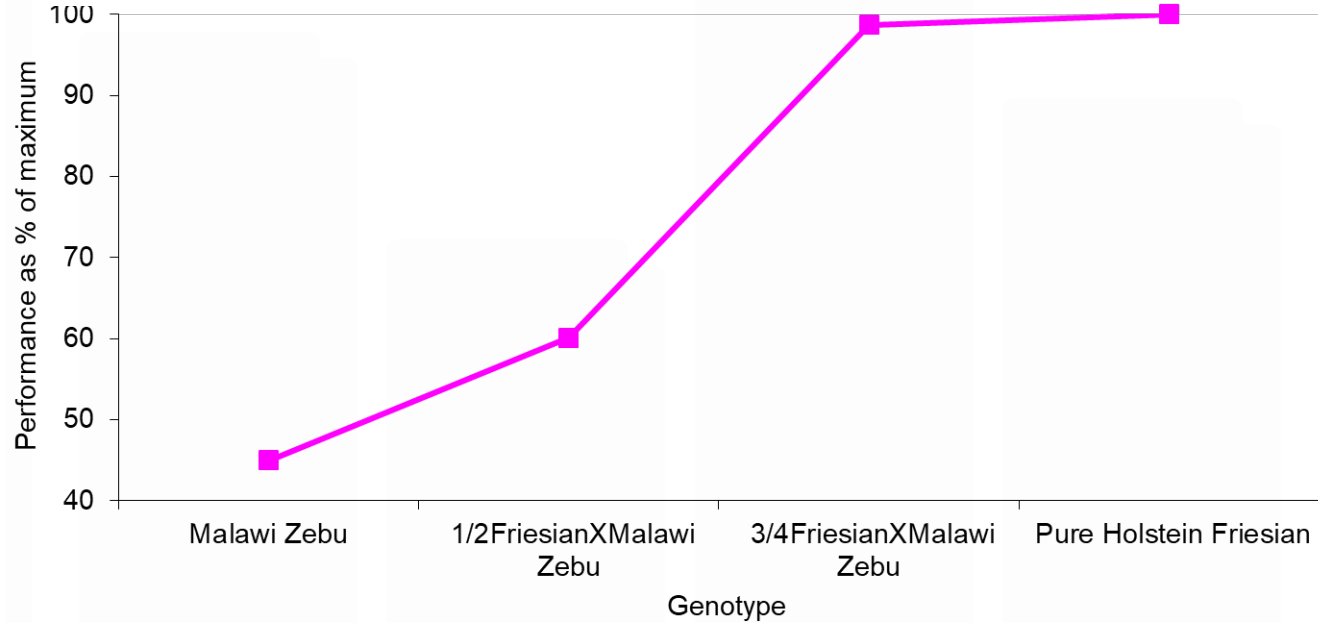


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A case of crossbreeding

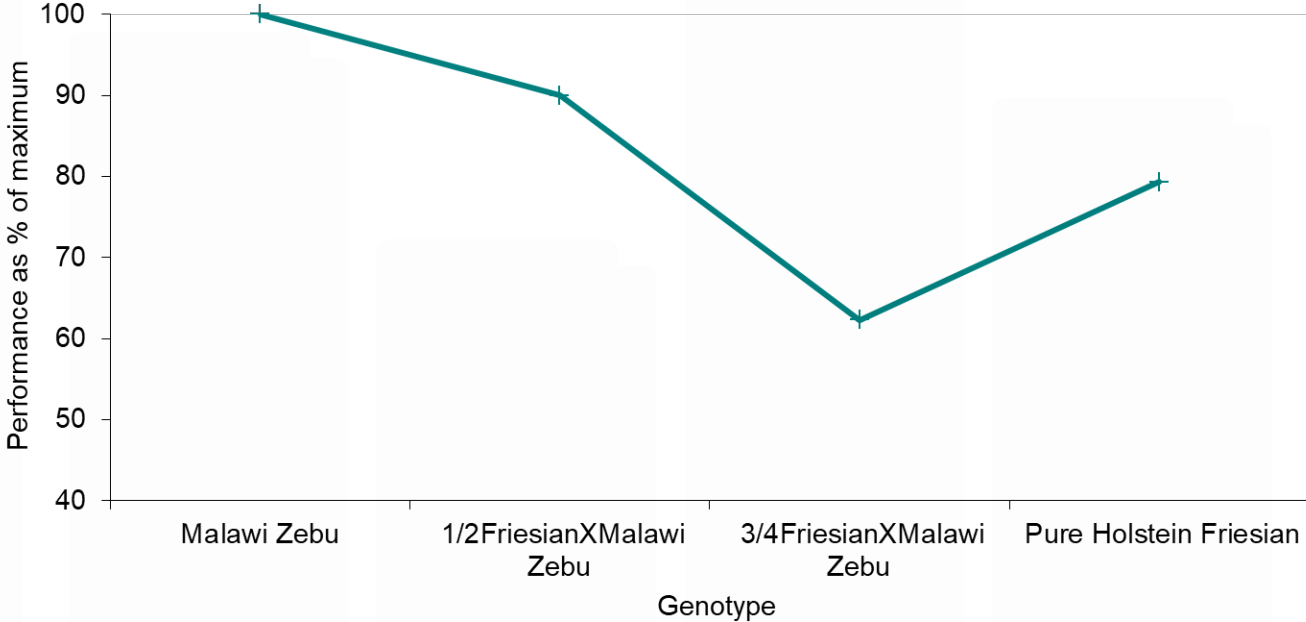
Chagunda et al, 2013

Effect of upgrading: Milk yield



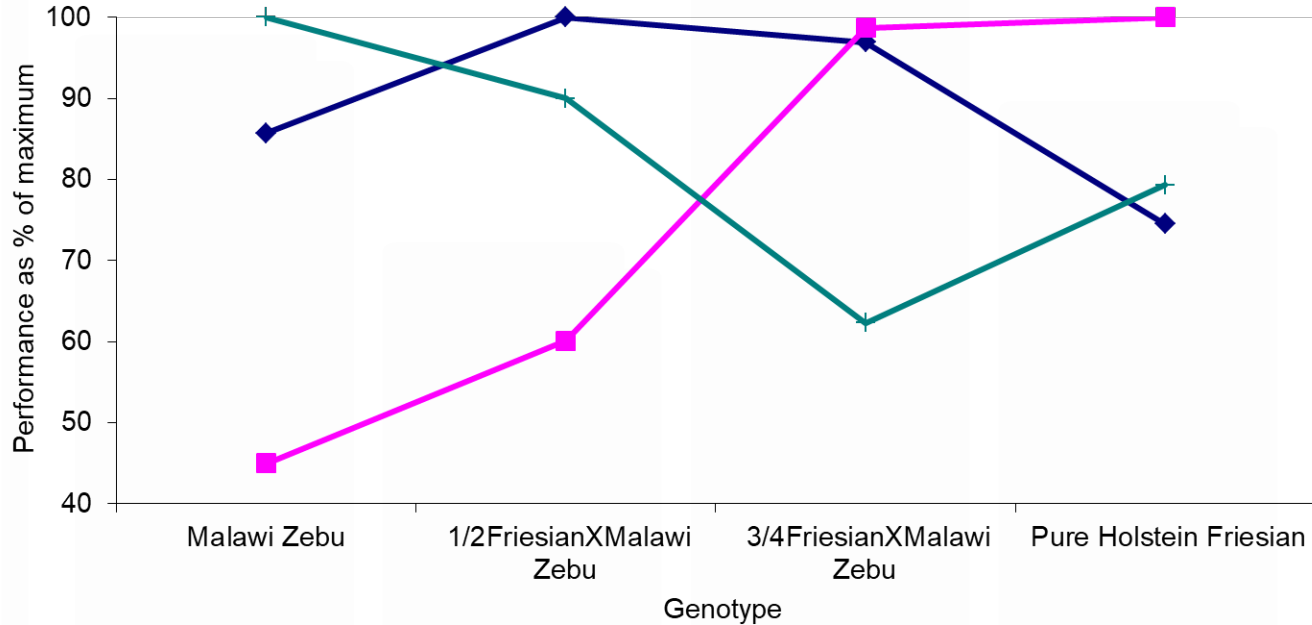
—■— Average test day milk yield

Effect of upgrading: Calf Survival



— Calf survival rate

Effect of upgrading: Performance index

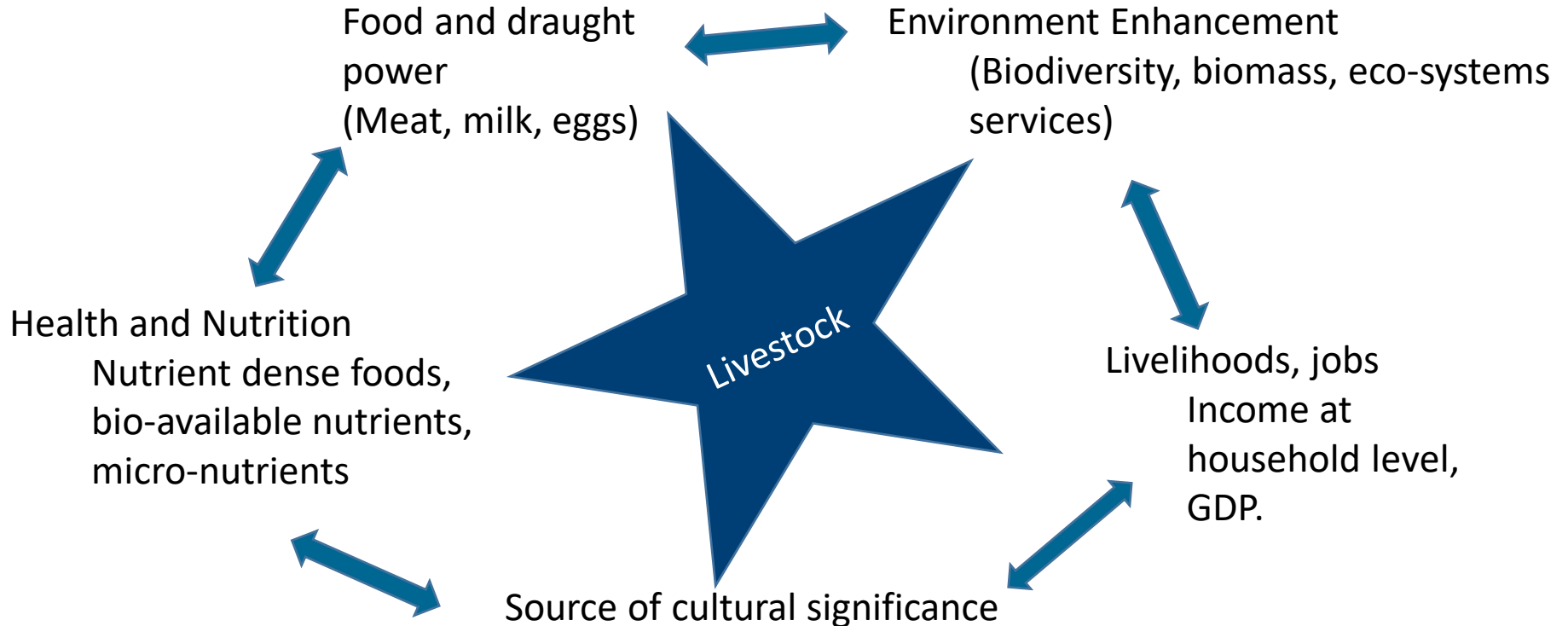


◆ Productivity index

■ Average test day milk yield

— Calf survival rate

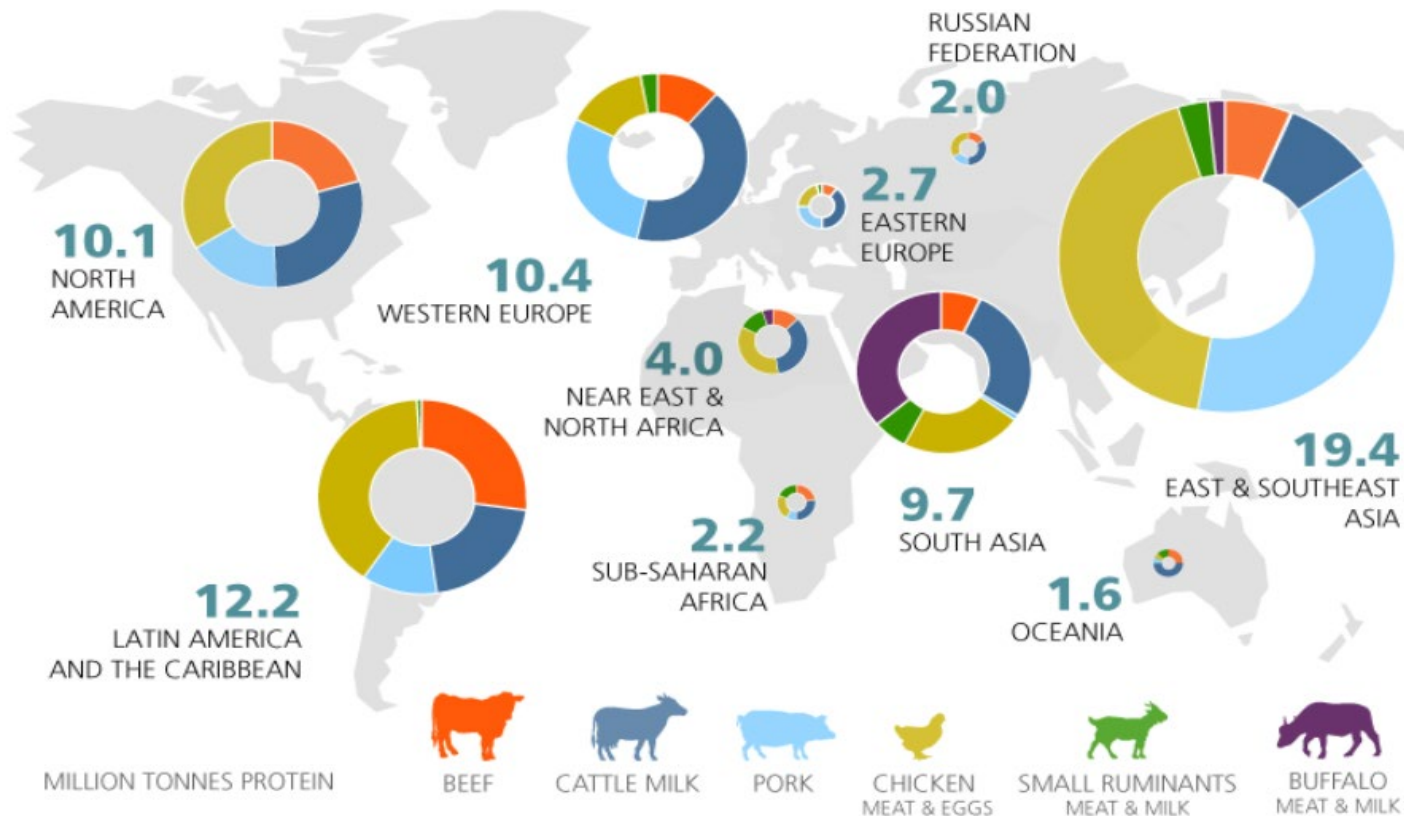
Has livestock contributed to food and nutritional security?



However...

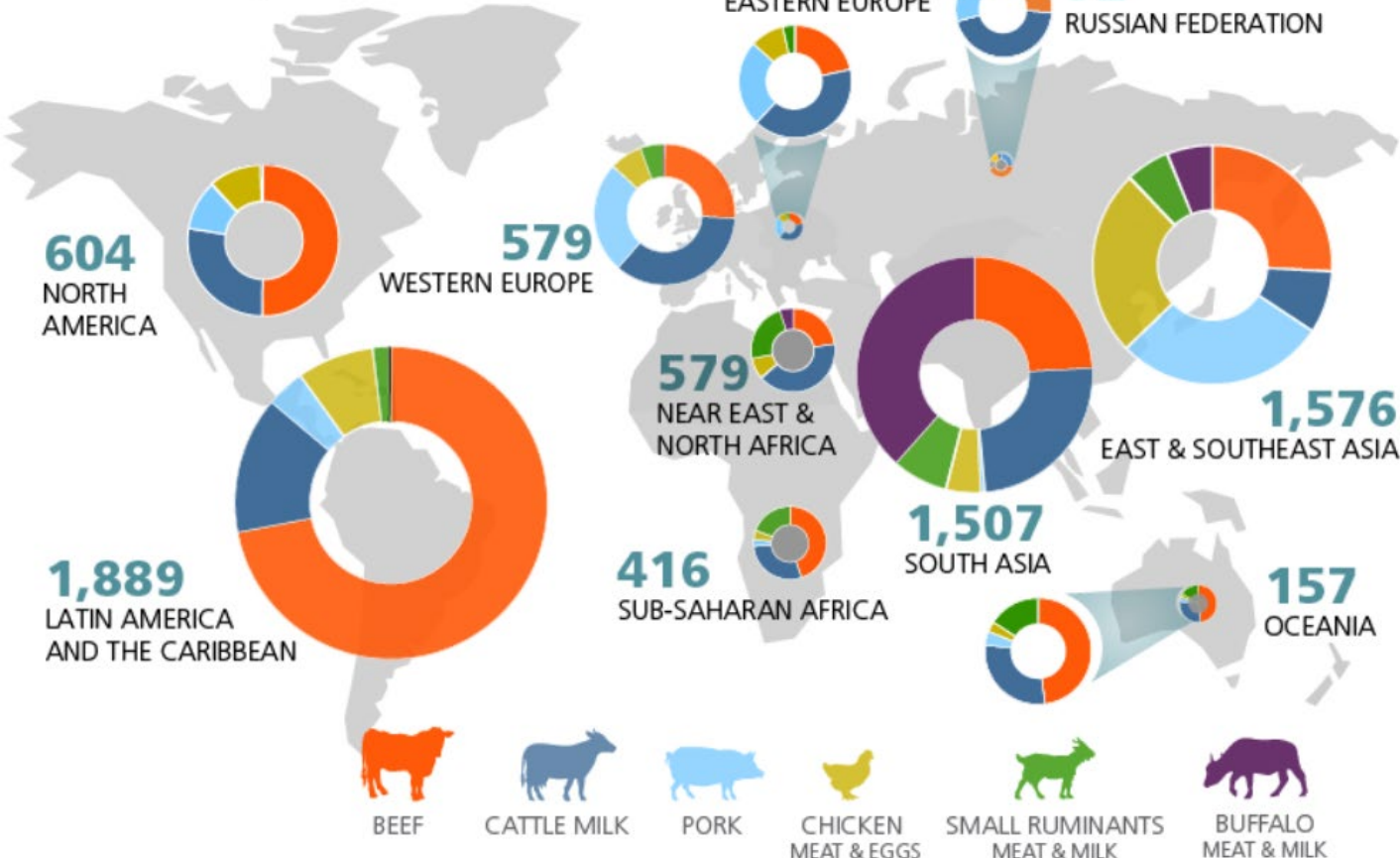
- This contribution to food and nutritional security has been lower than expected
- Has had limited contribution to sustainable development goals
- Has had lower efficiency (Higher GHG per unit of product)

Regional production. Regional total production and their profile by commodity



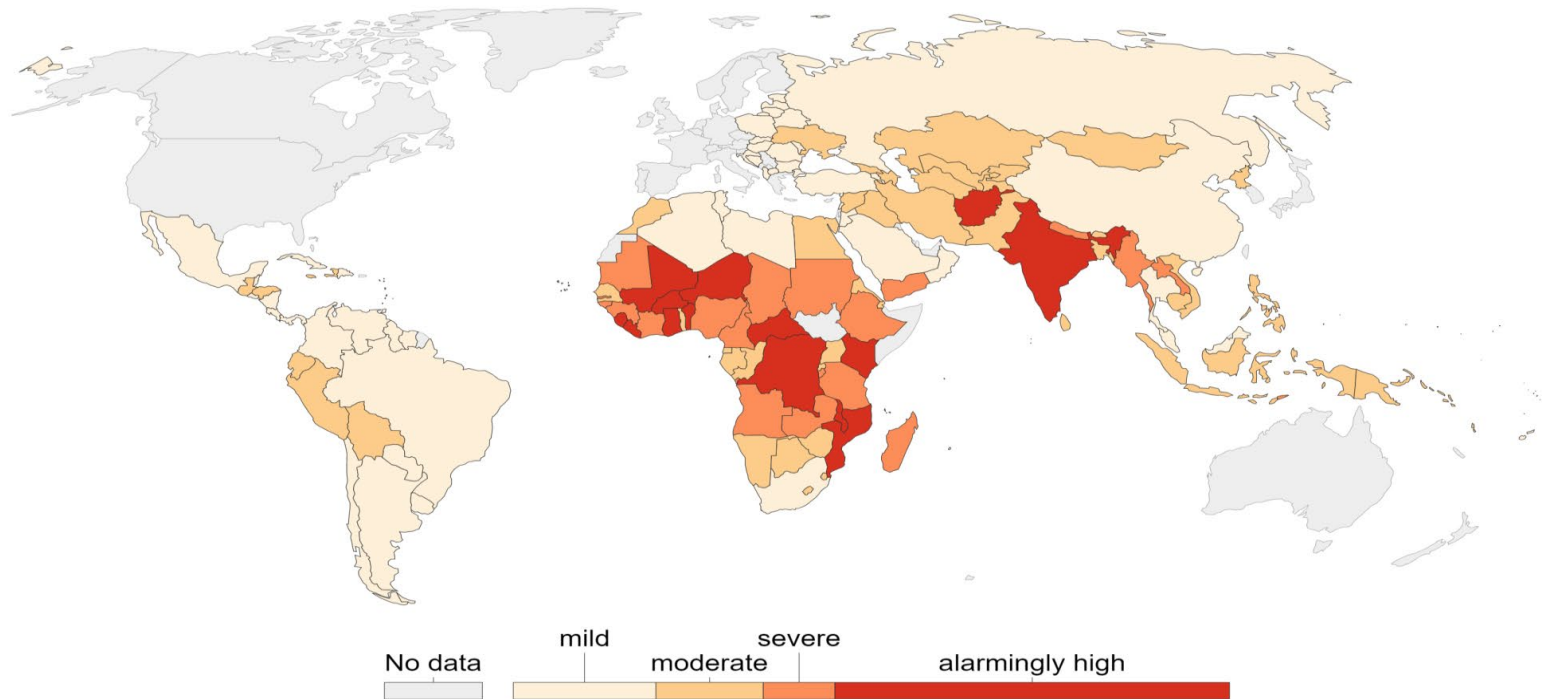
Source: <http://www.fao.org/gleam/results/en/>

Regional emissions. Regional total emissions and their profile by commodity



Global Hidden Hunger Index in pre-school children

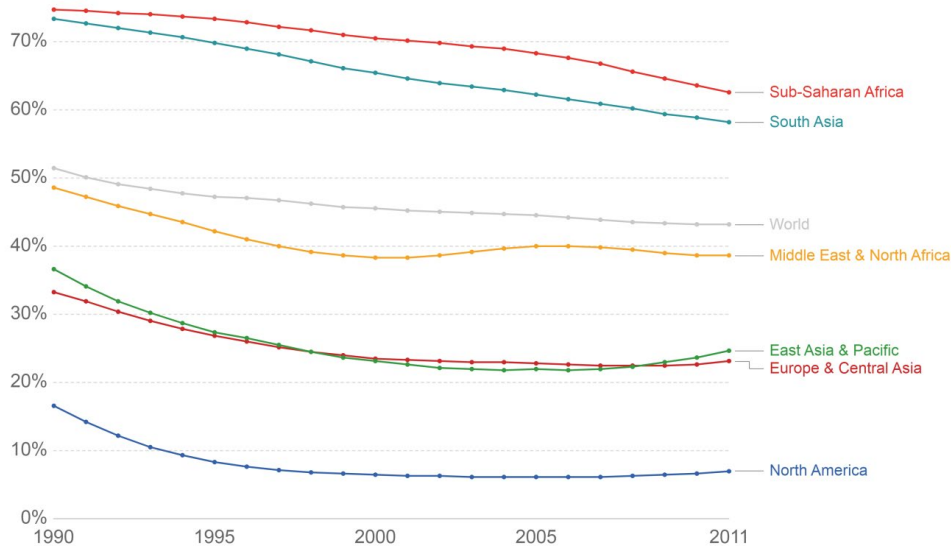
Global Hidden Hunger Index scores in pre-school (aged under-5) children (GHI-PD) over the period 1999-2009. Hidden Hunger Index (HHI-PD) for preschool-age children is calculated as the average of three deficiency prevalence estimates: preschool children affected by stunting, anemia due to iron deficiency, and vitamin-A deficiency. The HHI-PD score ranged between the best and worst possible scores of 0 and 100, respectively. Applying arbitrary cut-offs, HHI-PD scores between 0 and 19.9 were considered mild, 20-34.9 as moderate, 35-44.9 as severe, and 45-100 as alarmingly high.





Prevalence of anemia in children

Prevalence of anemia in children, measured as the share of children under the age of five with hemoglobin levels less than 110 grams per liter at sea level.



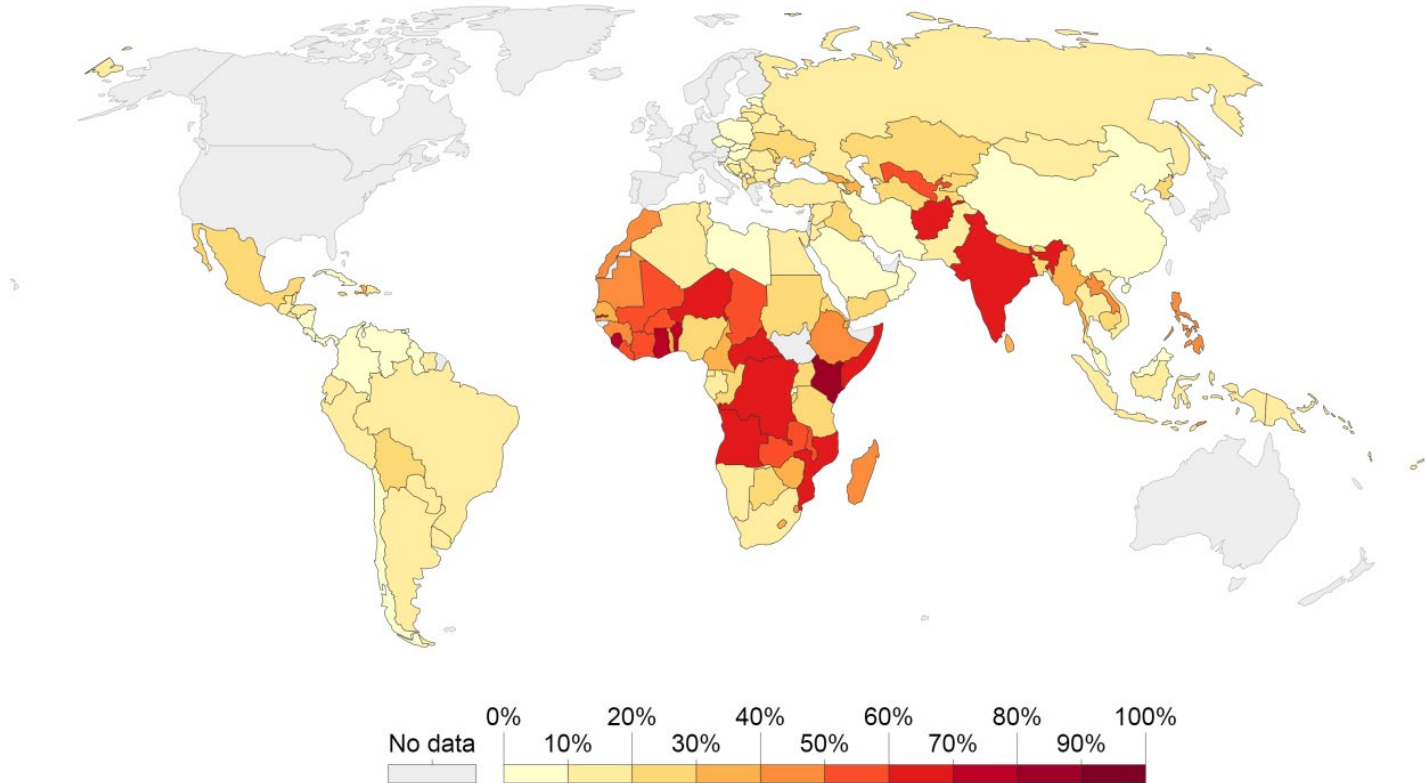
Source: World Bank – WDI

OurWorldInData.org/micronutrient-deficiency/ • CC BY-SA

Iron and Vitamin B₁₂ Deficiency

Prevalence of vitamin-A deficiency in children

Prevalence of vitamin-A deficiency in pre-school children (aged under-5), measured as the percentage of children with serum retinol levels $<0.7\mu\text{mol/l}$ (a key indicator of vitamin-A deficiency) during the period 1995-2005. Note that all countries with a 2005 gross domestic product (GDP) $\geq\text{US\$ }15,000$ were assumed to be free from vitamin-A deficiency of a public health significance and were therefore excluded.



And yet, good livestock production can help

Nutrient	Deficiencies	Animal source
Vitamin A	Impairs immunity and haematopoiesis	Dairy, Liver, Egg yolk, Fish liver oil
Iron	Anaemia	Meats , Fish
Zinc	Immunity	Meats, Fish
Calcium	Many severe consequences	Dairy, Fish
Riboflavin	Many severe consequences	Dairy, Organ Meats, Eggs
Vitamin B12	Many severe consequences	Animal Food Sources only (Algae)



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A look into the future



Trends of milk and meat consumption in developing and developed countries

		Per capita consumption		Total consumption	
		Meat (kg)	Milk (kg)	Meat (Mt)	Milk (Mt)
Developing	1980	14	34	47	114
	1990	18	38	73	152
	2002	28	44	137	222
	2015	32	55	184	323
	2030	38	67	252	452
	2050	44	78	326	585
Developed	1980	73	195	86	228
	1990	80	200	100	251
	2002	78	202	102	265
	2015	83	203	112	273
	2030	89	209	121	284
	2050	94	216	126	295





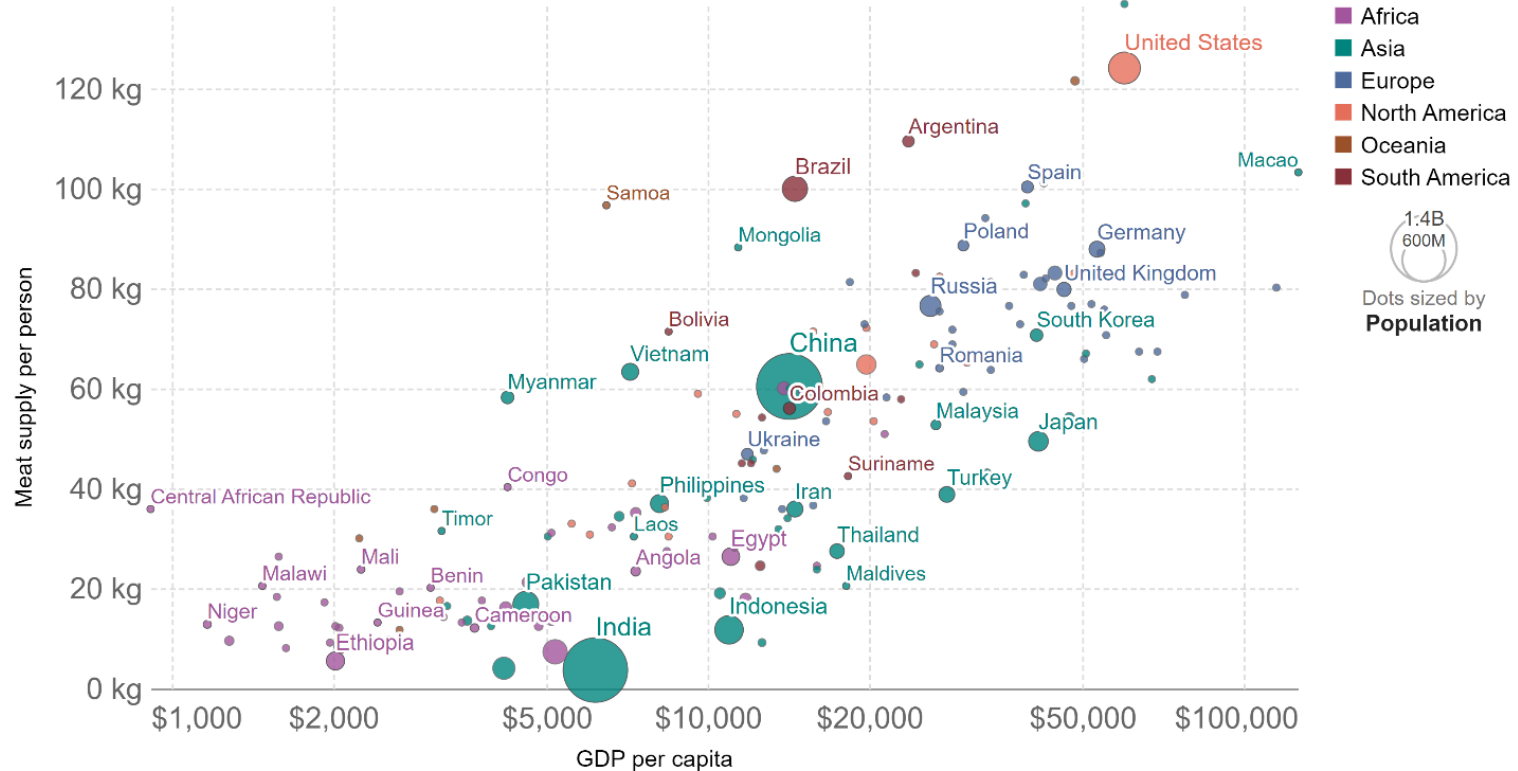
Why is this the case?

- Increased consumption of livestock products as level of income increases
- Diet change as indicator of social status
- Increased access



Meat consumption vs. GDP per capita, 2017

Average meat consumption per capita, measured in kilograms per year versus gross domestic product (GDP) per capita measured in constant international-\$. International-\$ corrects for price differences across countries. Figures do not include fish or seafood.





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Why should we worry?

- Metabolic disease in Humans
- Zoonotic diseases
- Environmental degradation
- Poor environmental health

Would livestock make a meaningful contribution to Food and Nutritional security in Sub-Saharan Africa?

- Yes, if the local inefficiencies are dealt with
 - Commercialisation of livestock products
 - Production system-change
 - Appropriate breeding practices
- There is huge potential to provide food and nutritional security
- Without compromising the environment



Main References

- Chagunda, M.G., Mwangwela, A., Mumba, C., Dos Anjos, F., Kawonga, B.S., Hopkins, R. and Chiwona-Kartun, L., 2016. Assessing and managing intensification in smallholder dairy systems for food and nutrition security in Sub-Saharan Africa. *Regional environmental change*, 16(8), pp.2257-2267.
- Kim, K., Kwon, T., Dessie, T., Yoo, D., Mwai, O.A., Jang, J., Sung, S., Lee, S., Salim, B., Jung, J. and Jeong, H., 2020. The mosaic genome of indigenous African cattle as a unique genetic resource for African pastoralism. *Nature Genetics*, 52(10), pp.1099-1110.
- Revesai, T., Chagunda, M.G.G., Banda, J.W. and Kamwanja, L.A., 2002, October. Effects of upgrading on some production and reproductive traits in smallholder dairy cattle in Malawi. In *Proceeding of the second national scientific conference, department of agricultural research and technical services, ministry of agriculture and irrigation, Lilongwe, Malawi* (pp. 28-30).
- <https://ourworldindata.org/>

Thank you for your attention.

