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Family poultry, egg production and gender: systems, challenges and options for sustainable contributions to household nutrition security

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Aligning the Food System for Improved Nutrition in Animal Source Foods
University of California, Davis, CA USA - May 14-15, 2019

Acknowledgements

UCDAVIS
DEPARTMENT of ANIMAL SCIENCE

Program in International
and Community Nutrition

UCDAVIS
World Food Center

Australian Government
Australian Centre for
International Agricultural Research

Australian Government
Department of Agriculture

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CHATHAM
HOUSE
The Royal Institute of
International Affairs

ILRI
International Livestock Research Institute
Better lives through livestock

My dual passions, commitment to family farming and a possible conflict of interest

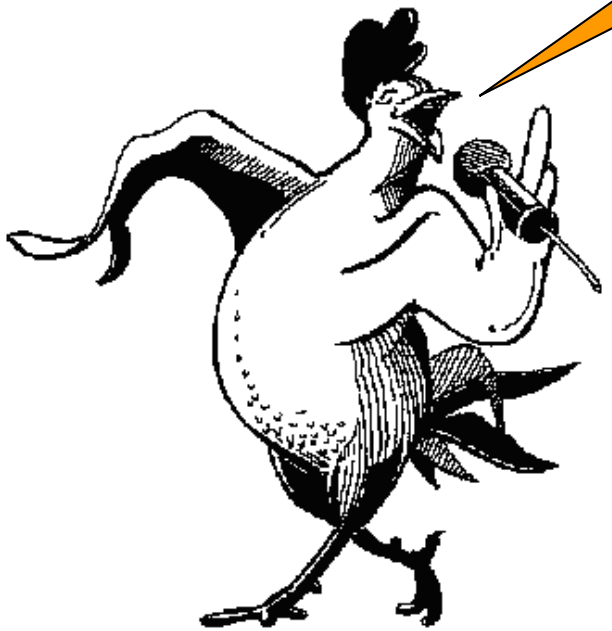
Village chickens and their owners

Merino sheep and Australian farmers

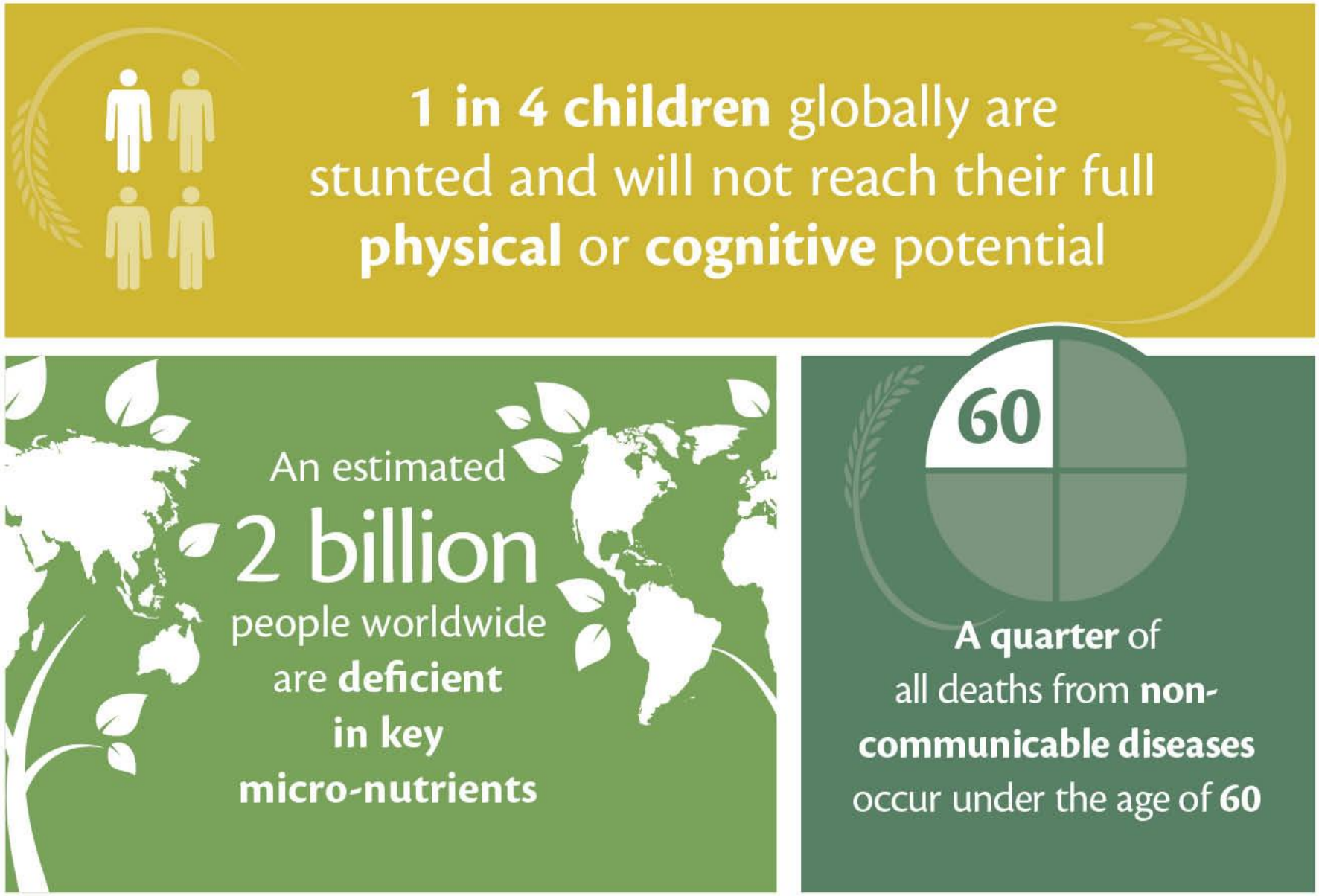
Outline

1. **Introduction**
   - the world we live in
   - poultry production systems
   - multiple roles
2. **Sustainable poultry husbandry**
   - disease prevention & control
   - food safety and sanitation
   - nutrition security
3. **Family poultry & maternal & child nutrition**
   - nutrition security
   - sanitation
4. **Conclusions**

1. Introduction



The world we live in …

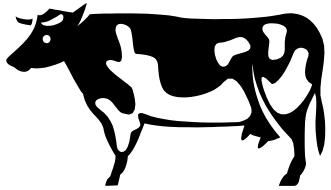


The agriculture, human nutrition and health nexus

- More **food** ≠ better nutrition
- More **crops** ≠ less stunting
- **Stunting** - long-term cumulative impacts
  - **Children** – health, physical and cognitive development capacity
  - **Adults** - productivity losses
- **11% of gross national product** in Africa and Asia lost annually due to malnutrition

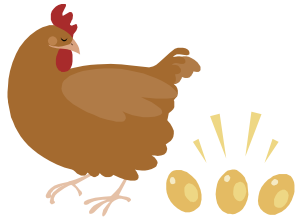
Households and livestock ownership

In mixed farming systems in Eastern and Southern Africa:



- 10 – 20% own
  [Men's business]

- 30 – 40% own
  [Men's business]



- most own village
  [Women's business]

Family poultry: three production systems under one umbrella

Family poultry is defined as **small-scale** poultry keeping by households using family labour and, wherever possible, locally available feed resources.

Family poultry employs one of four different production systems and may involve chickens, muscovy, pigeons, mallard ducks, Guinea fowl, quail, turkeys or geese. (FAO 2014)

Increasing inputs and risks

Credit: Kyeema/Alders

Evolution of avian viruses

Evolution of new avian viruses and variants of existing virulent viruses facilitated by characteristics of current intensive poultry production systems including:

Host genetic homogeneity (with few host adaptive bottlenecks)

High density rearing (allowing close animal-to-animal contact and favouring transmission of virulent over low pathogenic strains)

Intensive vaccination programs (which provide selective immune pressures and may be executed improperly in resource-poor settings)

Contributions to human wellbeing ...

- Poverty alleviation (SDG#1)
- Food and nutrition security (SDG#2)
- Human health (SDG#3)
- Education (SDG#4)
- Empowerment of women (SDG#5)
- Wildlife conservation (SDG#15)

Village poultry: small birds, big contribution

- **Still command premium price** in most urban markets
- **Lack of essential inputs** in rural areas to support intensive poultry production

→ not in direct competition with commercial poultry

Village poultry production is efficient …

- **Low-input** in terms of labour & capital
- **Scavenge for feed** → major saving & decrease competition for human-edible food
- **Smart & agile** → escape predators
- **Go broody** → replacement stock
- **Healthcare** → frequently traditional
- **Very high benefit-cost ratio**

Vital role in rural families …

Village poultry provide:

- **petty cash**
- **high quality protein & micronutrients**
- **pest control** (including both plant & animal pests)
- **manure** for vegetable gardens
- **social credit** – ceremonies & rituals
- **assets** for women & children


2. Sustainable poultry husbandry & management

Improving village chicken production

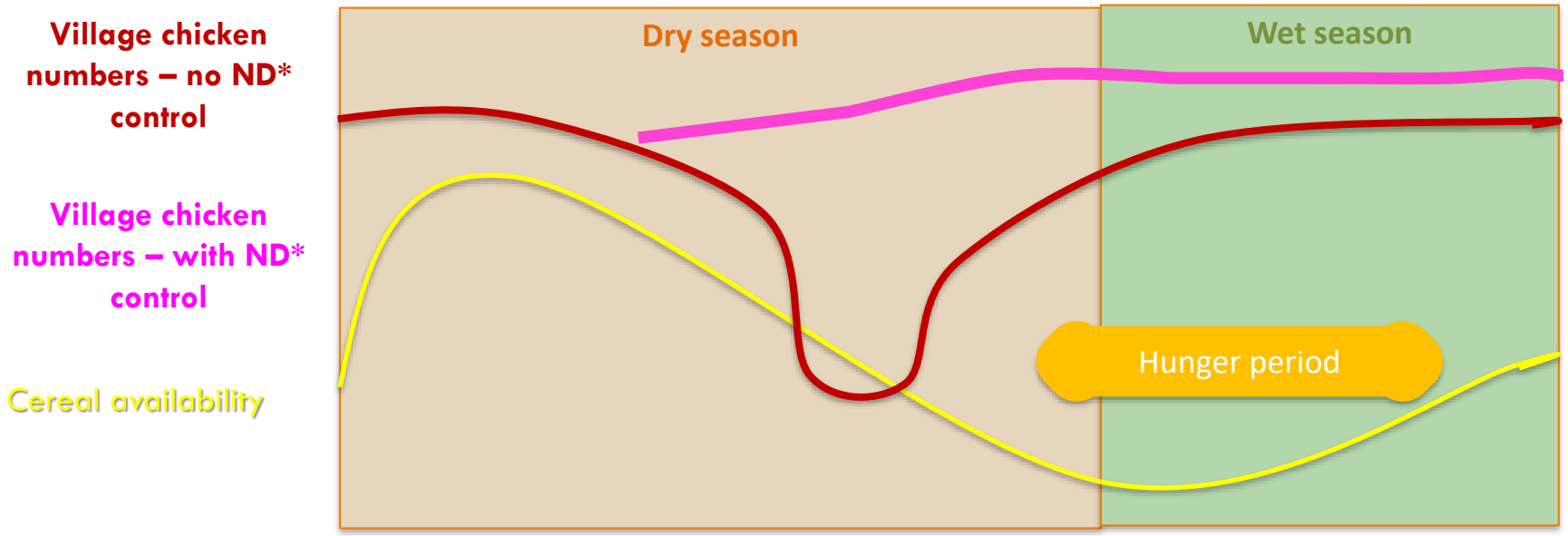
- Interventions must be **cost efficient**
- Basic inputs include:
  - **management**
    - disease control
    - supplementary feeding
    - shelter
  - **marketing**
  - **group formation**
- Should **complement other farm activities**

Improving animal health management

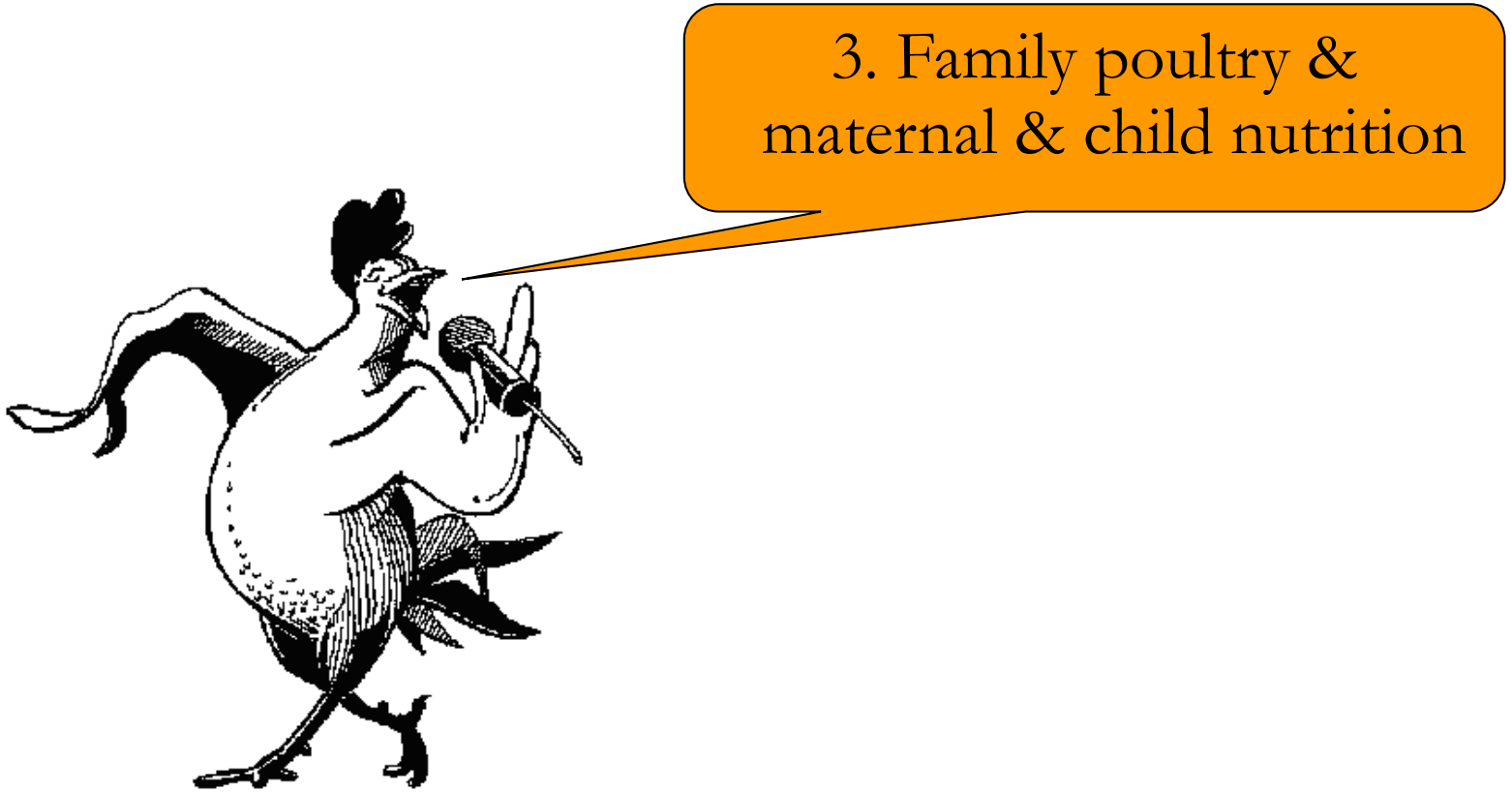
Reducing the risk of unplanned reductions in herd and flock sizes allows farmers to plan how best to manage their animals

Effective disease control of endemic diseases to promote rapid detection of emerging and zoonotic diseases

Providing nutritious food across the seasons in agriculturally resource-limiting situations



* ND = Newcastle disease

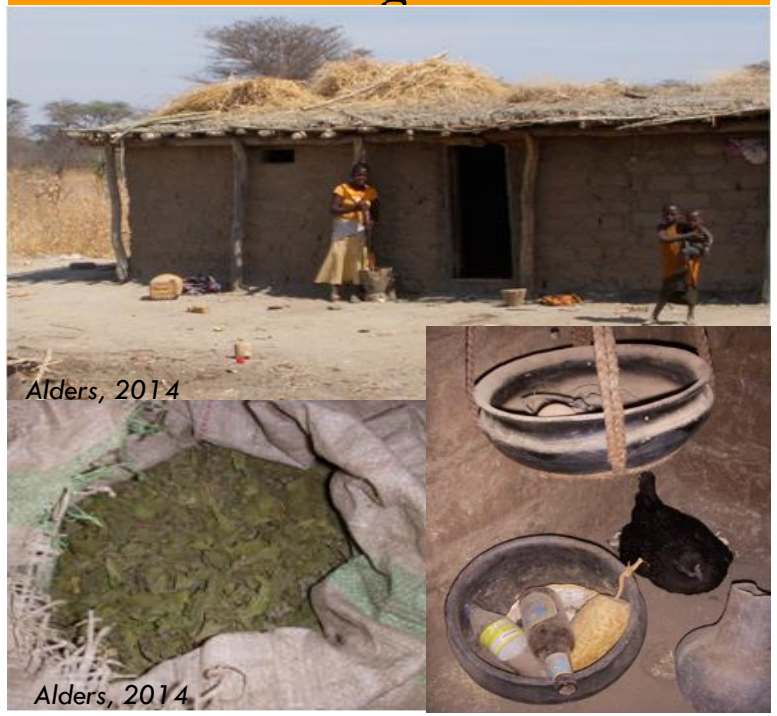

3. Family poultry &
maternal & child nutrition

Challenges for women in resource-limiting settings

Nutritional information for breastfeeding women

Tanzanian Food and Nutrition Centre, 2014

Environment where breastfeeding women live



Alders, 2014

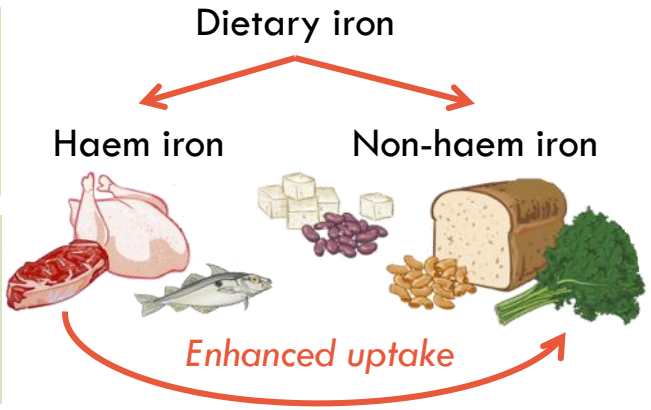
Alders, 2014

Maternal and Child Nutrition Journal Egg Supplement:
https://onlinelibrary.wiley.com/toc/17408709/2018/14/s3

Credit: Robyn Alder

Nutritional contributions of animal-source foods

Protein of high biological value	• Essential amino acid profile is well matched to body's requirements • Contrast to cereals, typically largest contribution to protein intake (eg. maize – limiting in lysine and tryptophan)
Variety of micronutrients in bioavailable forms	• Efficient for addressing multiple micronutrient deficiencies • Haem iron, pre-formed vitamin A
Enhanced uptake of less bioavailable micronutrients	• Non-haem iron (plant-source foods) • Significant given inhibitory effect of oxalates and phytates in diet
High nutrient density	• Benefits for young children and those with reduced dietary intake • Small amounts can significantly increase nutritional adequacy of diets based on staple crops



Credit: Julia de Bruyn 2016

Micronutrient content

Recommended Nutrient Intake (RNI) for Vitamin A for a breastfeeding mother:
950 µg/d

Chicken liver, fried
9g

Spinach, cooked
148 g

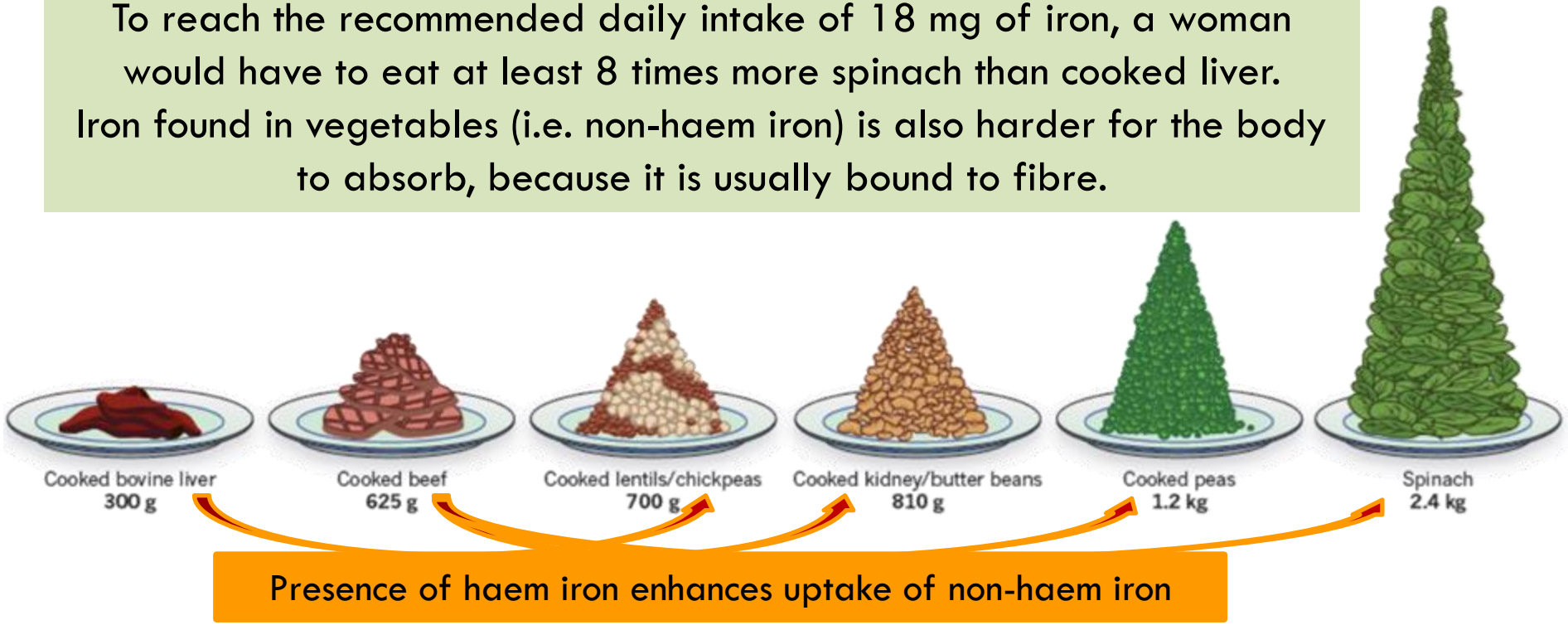
Orange sweet potato, cooked
220 g

Fresh papaya
704 g

Credit: Julia de Bruyn 2016

Nutritional contributions of animal-source foods

To reach the recommended daily intake of 18 mg of iron, a woman would have to eat at least 8 times more spinach than cooked liver. Iron found in vegetables (i.e. non-haem iron) is also harder for the body to absorb, because it is usually bound to fibre.



Gupta, 2016. Nature.

Statistics: Timor-Leste

According to the Timor-Leste Food and Nutrition Survey (2013), Children under five years of age:

Stunted	Low height-for-age	50.2%
Wasted	Low weight-for-height	11.0%
Underweight	Low weight-for-age	37.7%
Undernutrition accountable for deaths		25.5%

http://www.operationworld.org/files/ow/maps/lgmap/timo-MMAP-md.png

Poor young child dietary diversity in Timor-Leste

LOW DIETARY DIVERSITY

73% of children aged 6-23 months consume an inadequately diverse diet [1].

ANIMAL SOURCE FOOD (ASF) CONSUMPTION

Of children 6-23 months of age:
- 25% consume dairy
- 24% meat or fish
- 23% eggs

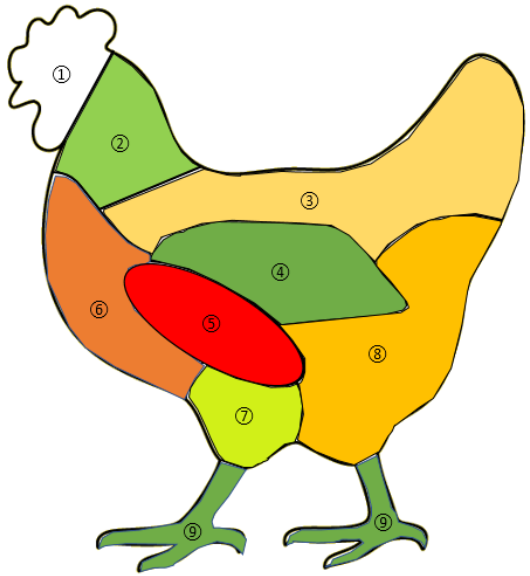
Of children 24-59 months:
- 31% eat meat or fish
- 25% eat eggs
- 11% eat dairy[1].

1. SEAMEO RECFON. 2015. Timor-Leste food and nutrition security 2013. Final Report. Southeast Asian Ministers of Education Organization Regional Centre of Food and Nutrition, UNICEF Jakarta, Indonesia

Credit: Wong et al. 2017

Nutrient distribution in chicken carcases (i)

① = Head
② = Neck
③ = Back
④ = Wing
⑤ = Giblets
⑥ = Breast
⑦ = Drumstick
⑧ = Thigh
⑨ = Feet

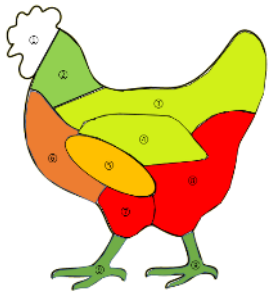


Distribution of **iron** amongst a whole chicken carcass

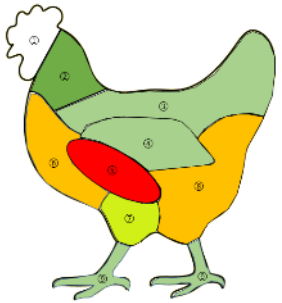
Distribution of nutrients across a chicken carcass								
	Fe (mg)	Zn (mg)	Vitamin B12 (ug)	Vitamin A (IU)	Folate (ug)	Thiamine (mg)	Protein (g)	Energy (kj)
Back	10.7	11.5	2.9	5.0	2.5	9.2	9.3	18.5
Breast	20.1	17.4	9.4	4.0	4.0	27.1	33.1	23.9
Drumstick	9.1	19.2	7.0	1.0	1.4	17.0	13.6	10.6
Thigh	12.7	19.4	11.8	2.6	2.1	21.6	18.1	21.1
Wing	5.0	10.5	2.7	0.6	2.8	10.2	11.7	11.9
Neck	6.0	4.7	0.8	1.2	0.6	2.3	2.6	4.8
Giblet	31.7	14.4	62.9	84.7	69.6	7.5	5.7	3.4
Feet	4.8	2.9	2.5	0.9	16.8	5.0	6.0	5.8

Chan, et al. 2017. What's in a Chicken? Comparing the nutrient value, potential to meet nutrient requirements and health-cost effectiveness of whole and frozen chickens. BVSc Honours Dissertation, University of Sydney.

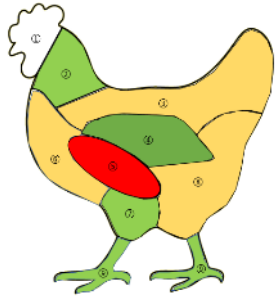
Nutrient distribution in chicken carcases (ii)



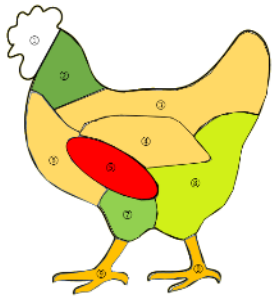
Zinc



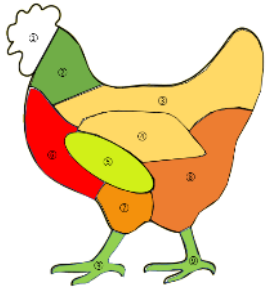
Vitamin B12



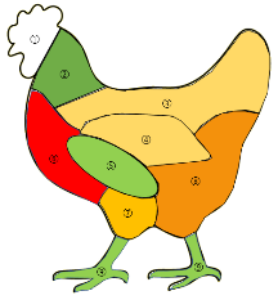
Vitamin A



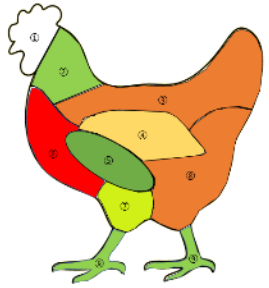
Folate



Thiamine



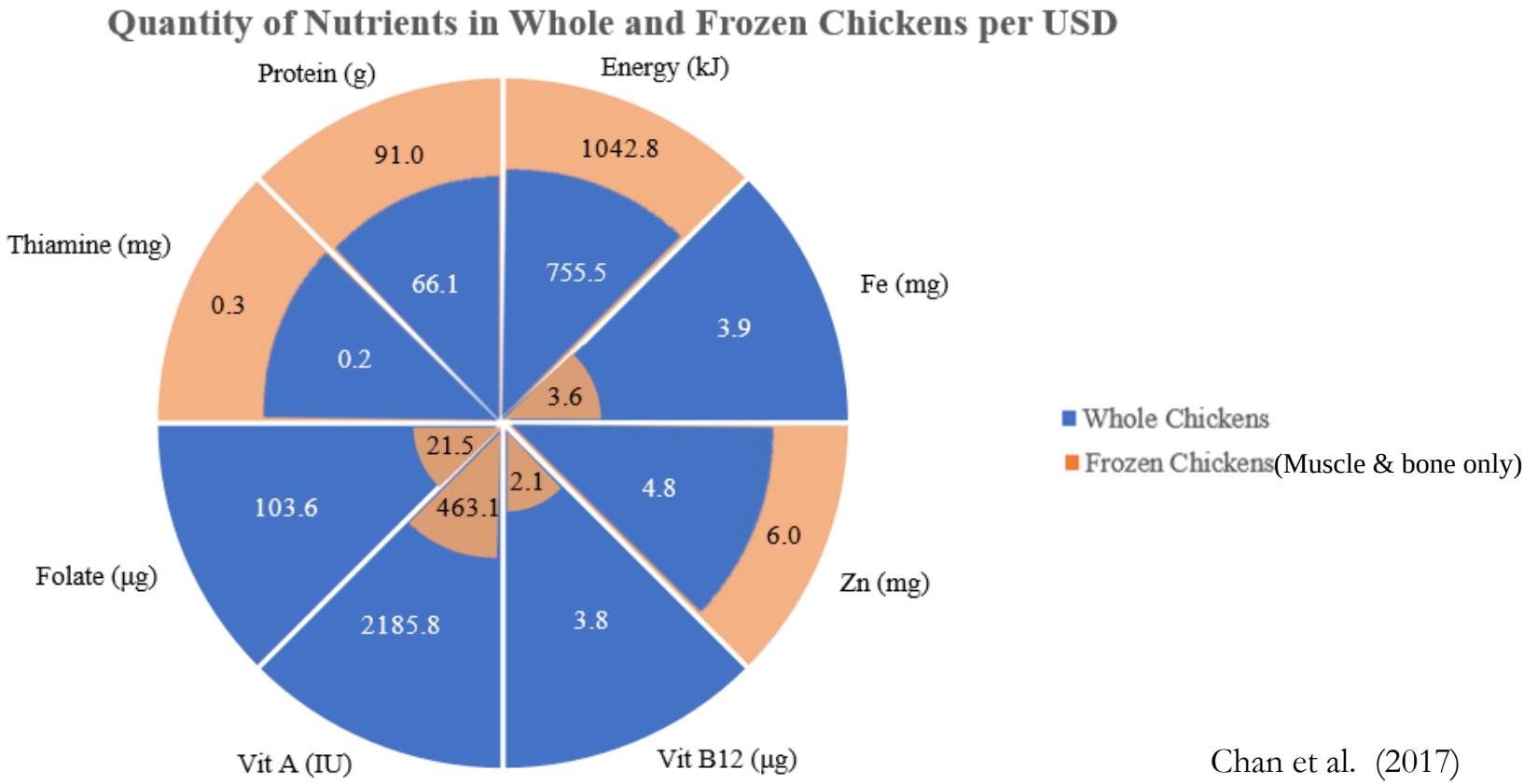
Protein



Energy

Chan et al. (2017)

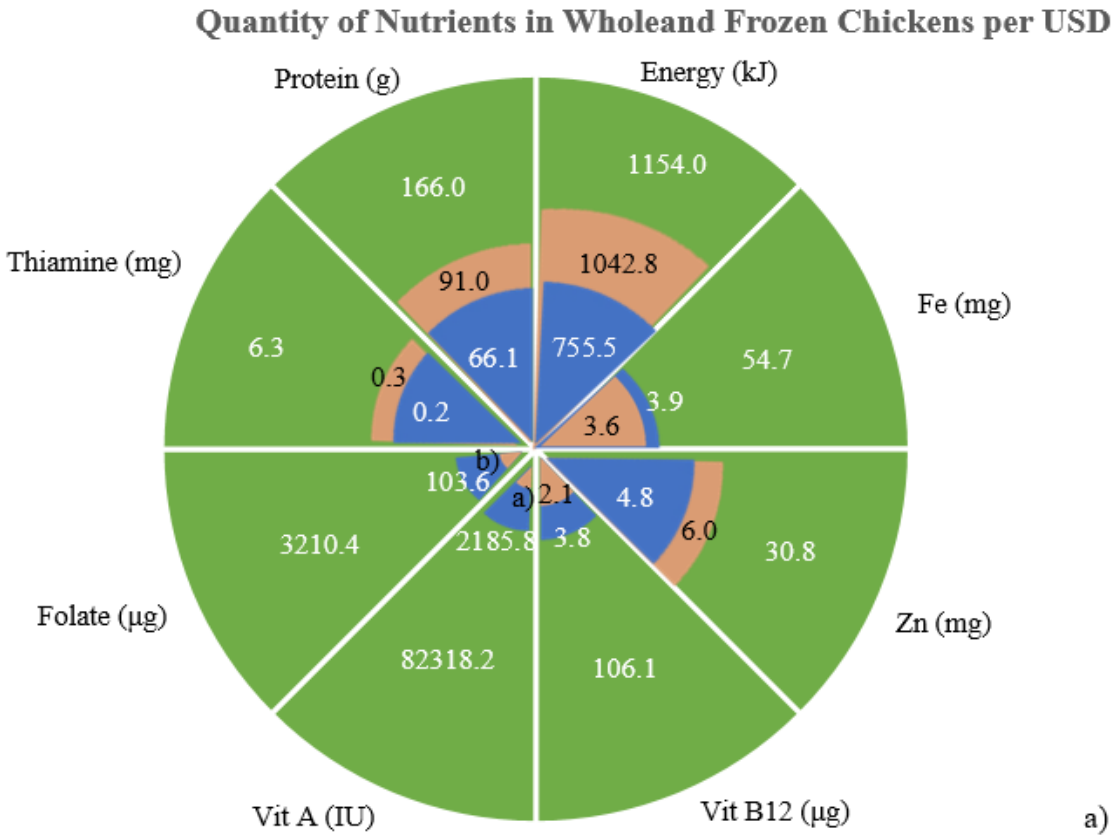
Comparing the cost of nutrients in different types of chicken products (i)



Chan et al. (2017)

Frozen chicken carcasses imported to supplement insufficient local production

Comparing the cost of nutrients in different types of chicken products (ii)



Nutrient deficiencies rarely appear alone

a) 463.1; b) 12.2

Chan et al. (2017)

Effective, gender-sensitive communication

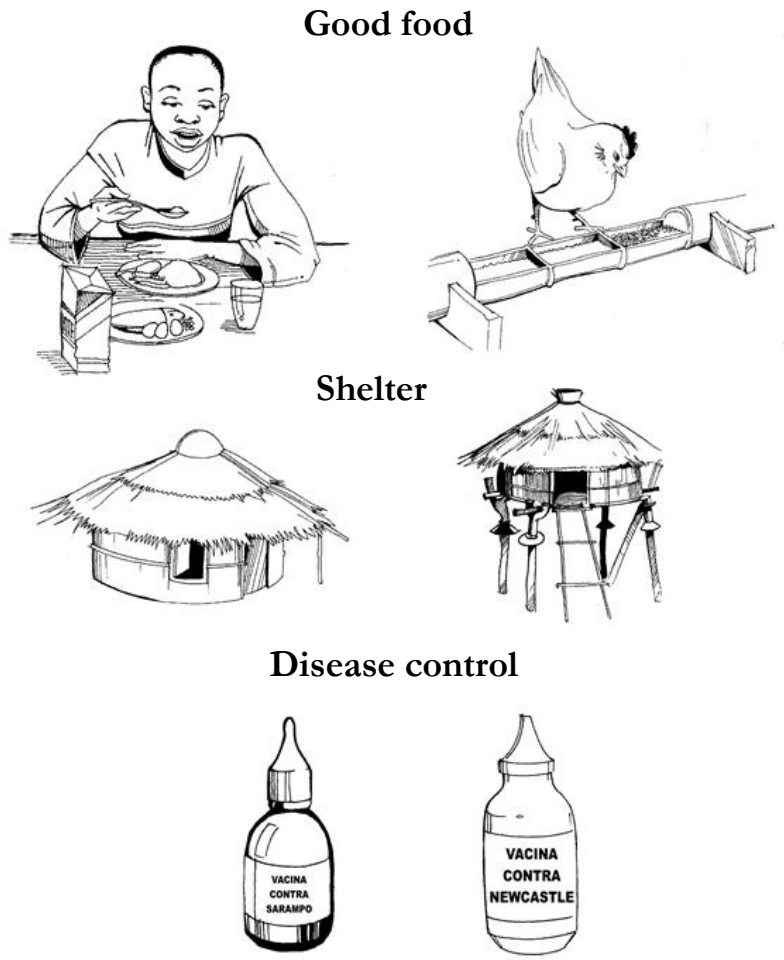
A One Health approach to animal health and human and animal nutrition

Good food

- Links between maternal stunting and offspring outcomes
- Importance of preconception nutrition
- Increased requirements associated with pregnancy and lactation

Good health care

- Phenomenon of "eating down" during pregnancy



EAT EGGS

FOR HEALTH, STRENGTH AND GROWTH

Pregnant women • Breastfeeding mothers • Young children

TVLA

Australian Government
Australian Centre for International Agricultural Research

THE UNIVERSITY OF SYDNEY

Ground eggshell as calcium supplement

Bartter et a. 2018

Promoting nutritious, healthy food by decreasing chicken deaths due to Newcastle disease

Rose: "Now, I am using eggs for the family if there are a lot and if they are only a few I give to the child. My daughter can take up to two eggs per week.

I have 2 adult chickens and 8 small chicks. They are vaccinated [against Newcastle disease]"

(Bagnol 2017)

Rose (on the left; Central Tanzania) is 31 years old and her daughter is 26 months old

http://sydney.edu.au/vetscience/research/Nkuku4U/

Key findings in Manyoni District, Central Tanzania:

- **Semi-arid area** with drought conditions during implementation
- **Chicken ownership significantly associated with more frequent consumption** of animal-source food by women and chicken meat by young children
- **No statistical association between diarrhoeal incidence in children and chicken ownership**
- **Consumption of chickens and eggs low** over all; chickens sold to meet household needs
- **Water and sanitation issues** require further attention

(de Bruyn et al. 2018; Rukambile et al. 2019)

Sustainable inclusion of animal-source food in human diets

Nutrient profile of staple grains declined as broiler productivity increased

The modern broiler carcass – **more energy coming from fat** than protein with **reduction in *omega*-3 fatty acids** (Wang et al. 2009)

"Select poultry **trimmed of visible fat** and **without the skin**" (Heart Foundation 2015)

"**No nutritional case for feeding human-edible crops to animals**, which reduces calorie and protein supplies. If society continues on a 'business-as-usual' dietary trajectory, a 119% increase in edible crops grown will be required by 2050" (Berners-Lee et al. 2018)

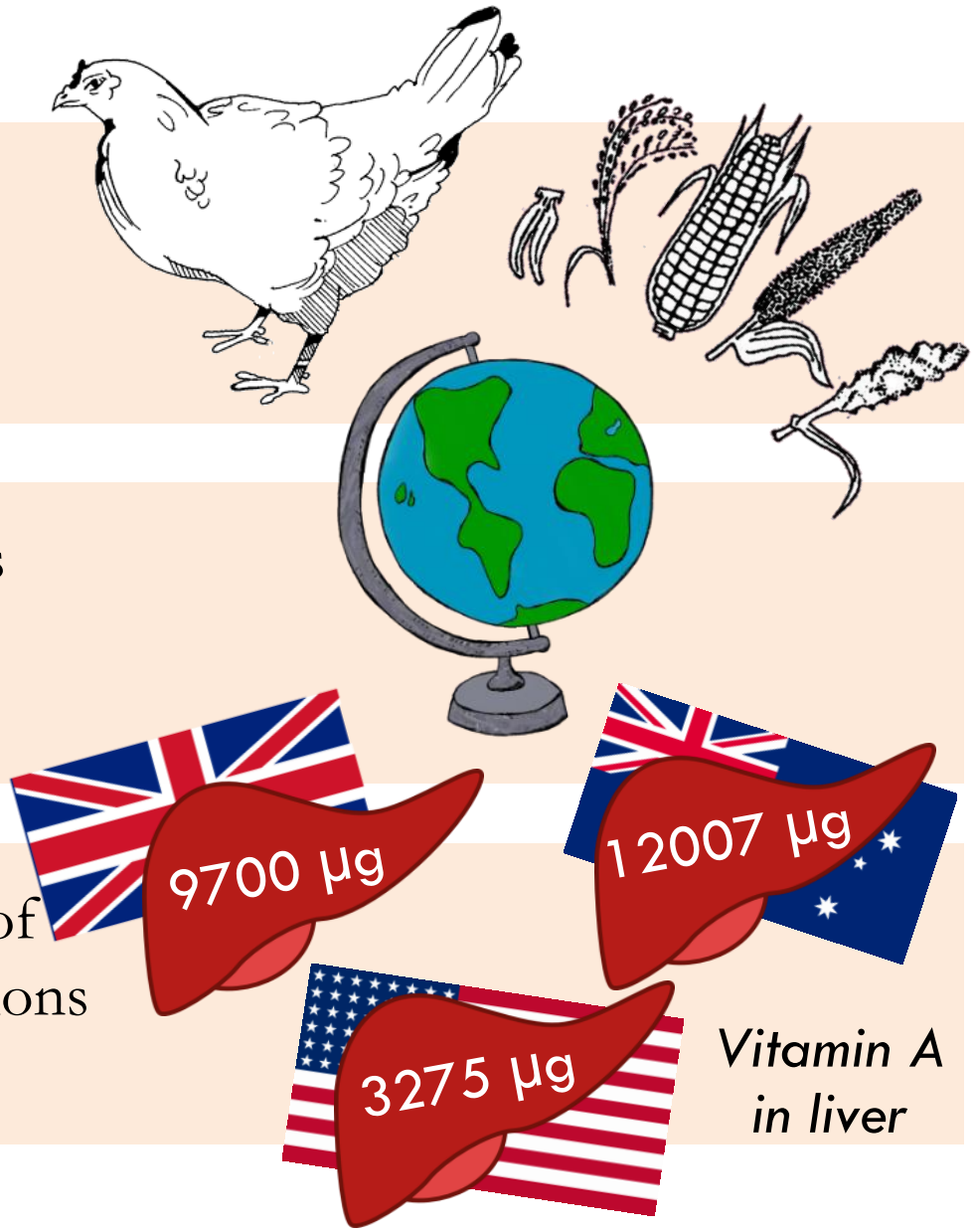
Nutrient density of village chicken eggs superior to commercial eggs in Malawi (Werner et al. 2019)

Food composition tables

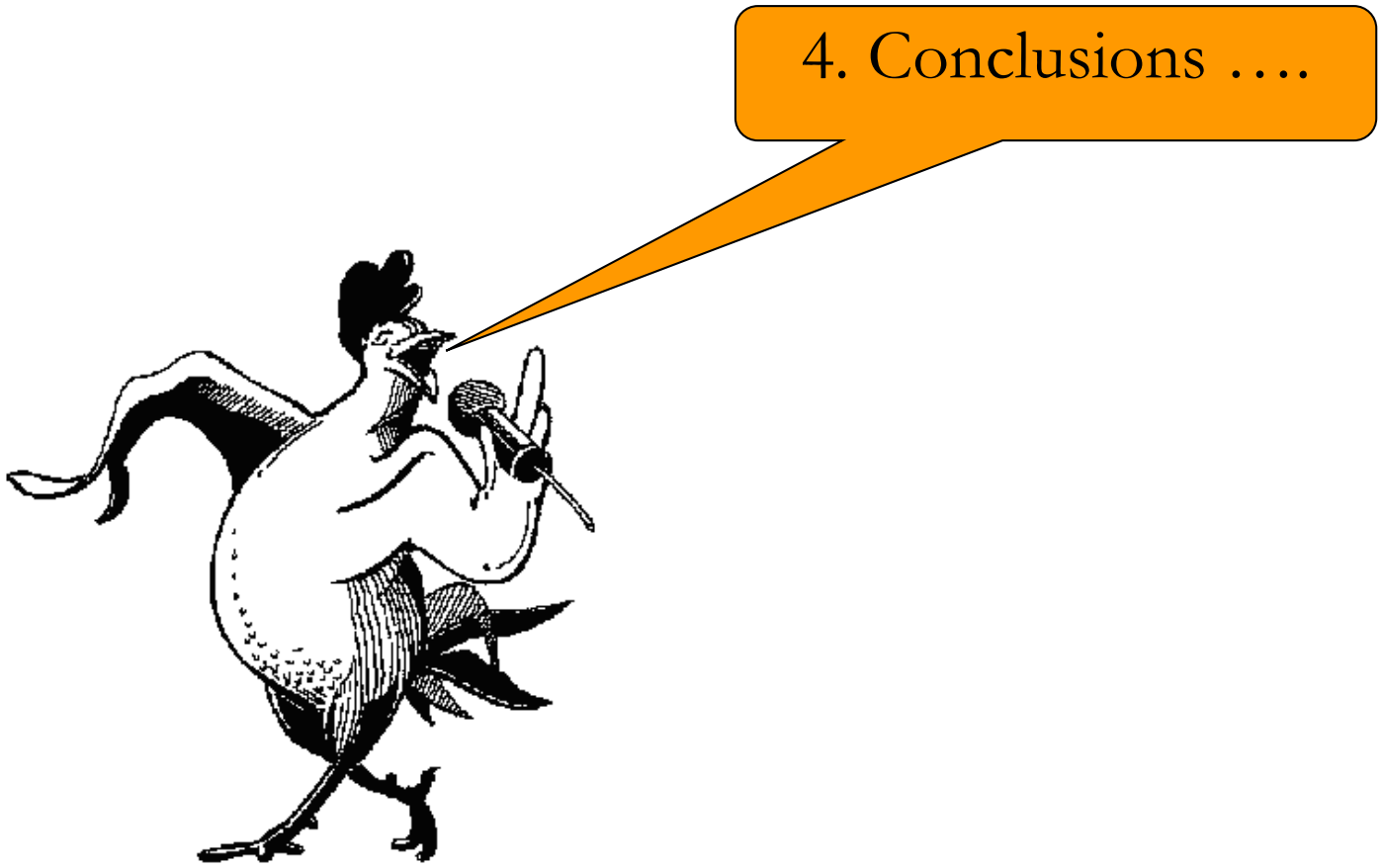
Food composition tables in sub-Saharan Africa don't always reflect the **range of foods** which might be consumed by food-insecure populations.

Most data presented in national or regional databases is derived from **sources outside the country or region**, often from analyses conducted decades previously.

There is **significant variation** in the nutrient content of equivalent food items in databases from developed nations (including nutrients of public health significance).



de Bruyn et al. 2016


4. Conclusions ….

Key messages

- **Family poultry have been raised for thousands of years** and continue to be raised in expanding numbers under a range of production systems across many different agroecological zones
- **Achieving sustainable production** of chickens and eggs that meets both environmental health, 'one welfare' and conservation standards is a complex endeavour
- **Family poultry production** requires attention to husbandry practices, disease prevention and control in line with national and international animal health regulations, and food safety
- **Interdisciplinary research and development** is required to facilitate long-term environmental and economic sustainability of family poultry production enterprises that are a good fit with local circumstances and contribute to household nutrition


Credit: Robyn Alders

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Thank you

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Questions?

Comments?

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https://www.kyeemafoundation.org

Credit: Robyn Alders

Local solutions for vulnerable communities