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

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Acknowledgements
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 …

1 in 4 children globally are stunted and will not reach their full physical or cognitive potential.

An estimated 2 billion people worldwide are deficient in key micro-nutrients.

A quarter of all deaths from non-communicable diseases occur under the age of 60.
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
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

Credit: FAO/Brum
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.

Credit: Robyn Alders
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

Environment where breastfeeding women live

Alders, 2014

Tanzanian Food and Nutrition Centre, 2014
Eggceptional value!

Eggs contain high quality protein, micronutrients and energy.

Sterile inside
Easy to store
Easy & quick to cook

Nutritious in small quantities

Maternal and Child Nutrition Journal Egg Supplement:
## Nutritional contributions of animal-source foods

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

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
- Fresh papaya 704 g
- Orange sweet potato, cooked 220 g
- Spinach, cooked 148 g
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.
Statistics: Timor-Leste

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

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunted</td>
<td>Low height-for-age</td>
<td>50.2%</td>
</tr>
<tr>
<td>Wasted</td>
<td>Low weight-for-height</td>
<td>11.0%</td>
</tr>
<tr>
<td>Underweight</td>
<td>Low weight-for-age</td>
<td>37.7%</td>
</tr>
<tr>
<td>Undernutrition accountable for deaths</td>
<td></td>
<td>25.5%</td>
</tr>
</tbody>
</table>

Poor young child dietary diversity in Timor-Leste

73% of children aged 6-23 months consume an inadequately diverse diet.\(^1\)

**LOW DIETARY DIVERSITY**

**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\(^1\)

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Credit: Wong et al. 2017
Nutrient distribution in chicken carcases (i)

Distribution of iron amongst a whole chicken carcass

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

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
Ground eggshell as calcium supplement

ADD EGGSHELL TO YOUR FOOD
FOR STRONG BONES, HEALTHY BODIES AND GROWTH

- Boil whole egg for 10 minutes or more
- Peel, dry
- Crush
- Add, boil for 20 minutes

Bartter et al. 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)

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)

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


Barners-Lee, M, et al. 2018. Current global food production is sufficient to meet human nutritional needs in 2050 provided there is radical societal adaptation. Elem Sci Anth, 6: 52. DOI: https://doi.org/10.1525/elementa.310


Thank you

Questions?
Comments?

Local solutions for vulnerable communities

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Credit: Robyn Alders