

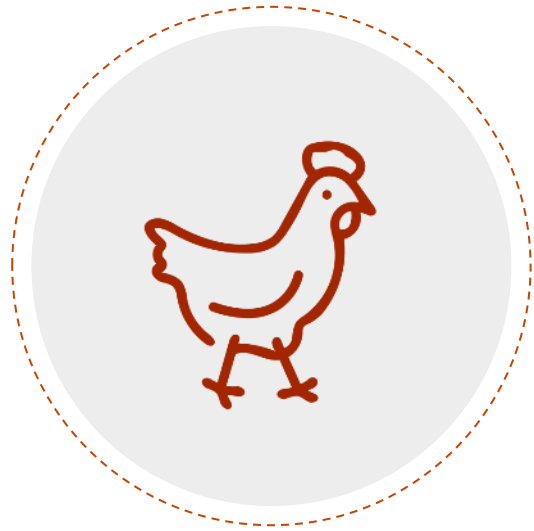
Promoting 'One Welfare' through Silvopasture Systems

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One Welfare approach

A holistic approach to animal welfare, human well-being, and environmental sustainability that recognizes the interconnectedness of these domains



Happy and healthy birds

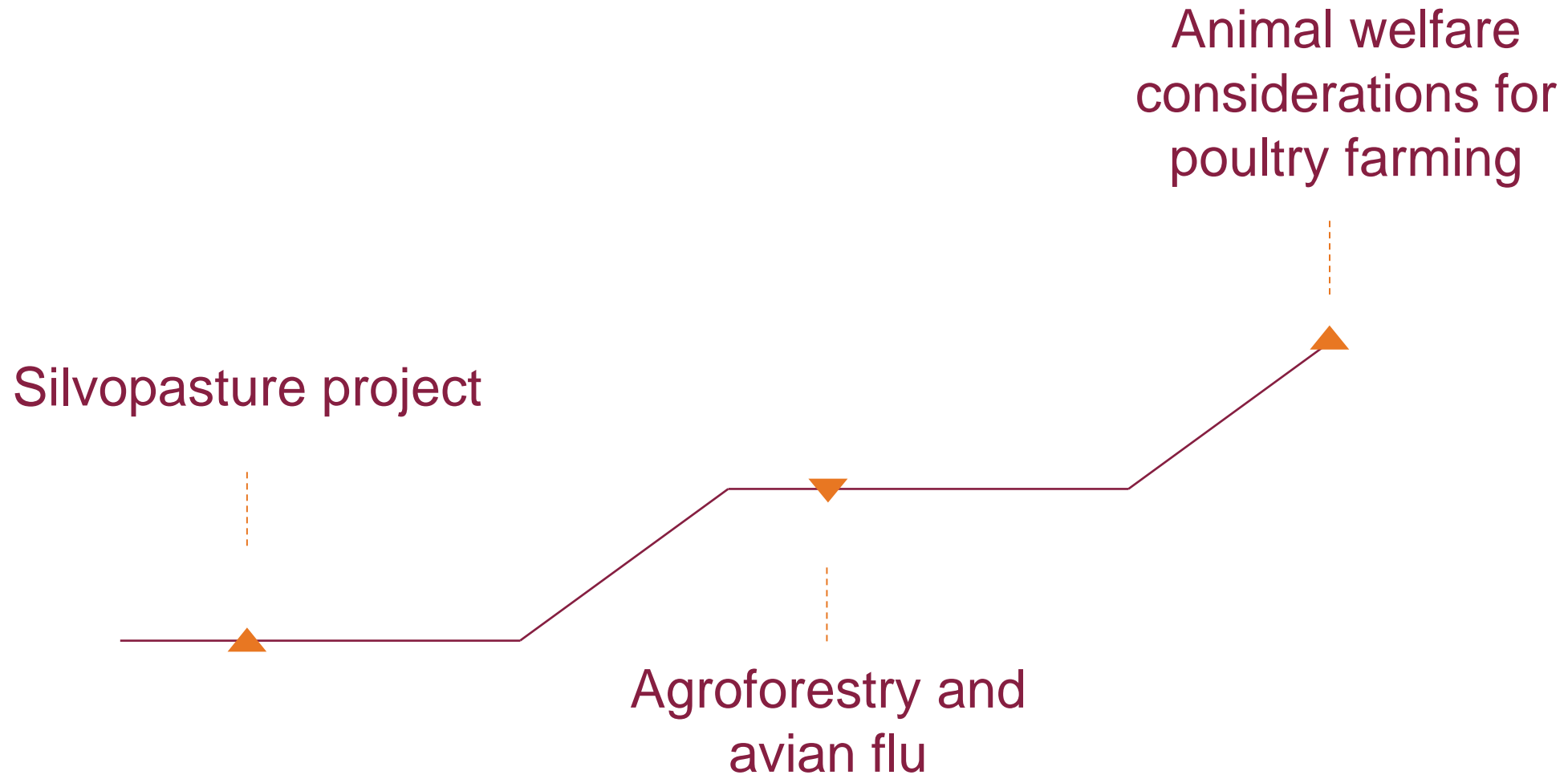


Happy people and 'healthy' income



Sustainable production and healthy environment

Contents





Silvopasture for poultry

Project overview



LS20-332

1. Experiment (2 replicates)
2. Field trial at large-scale broiler producer
3. Field trial at 3 small-scale broiler producers
4. Interviews and farm visits → educational materials
5. Field days

Project team



Leonie Jacobs

Assistant Prof Animal Welfare & Behavior



Adam Downing

Extension Agent Ag and Forestry



John Fike

Assoc Prof and Forage Extension Specialist



Bidur Paneru

Graduate student



Gabriel Pent

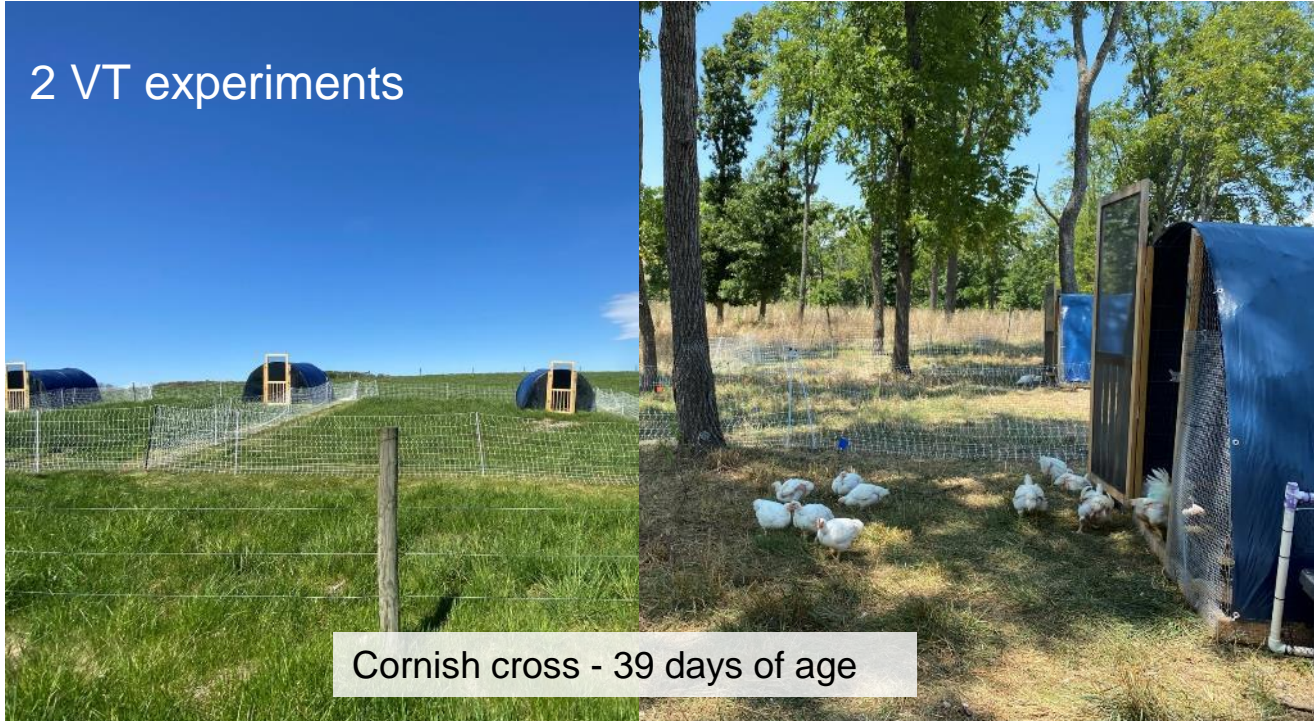
Assistant Prof, Ruminant livestock system specialist, AREC superintendent



John Munsell

Prof and Forest Management Extension Specialist

2 VT experiments



Cornish cross - 39 days of age

Data collection

1 large-scale producer



Cornish cross - 28 days of age

No scientific comparison can be made between flocks at the large-scale farm or between the small-scale producers

Mixed breed - 72 days of age



Freedom rangers - 63-67 days of age

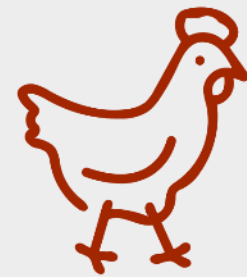


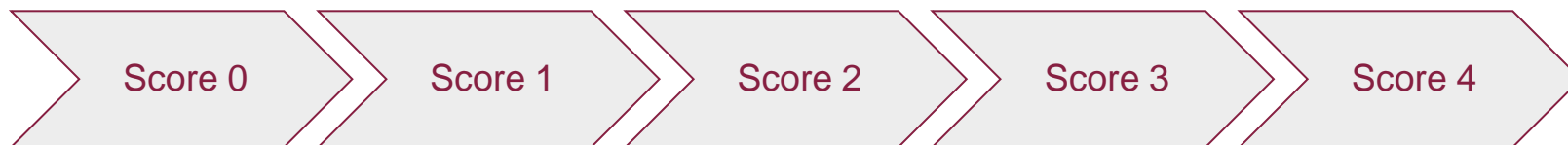
3 small-scale producers

Royal grays - 68 days of age



Silvopastures and leg health





Footpad dermatitis

Lesions due to prolonged contact with moisture/chemicals in the bedding

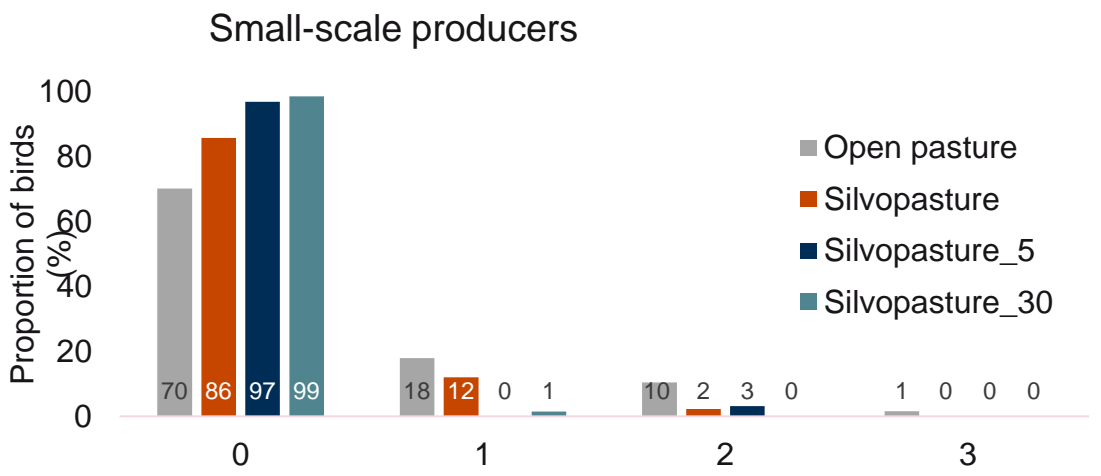
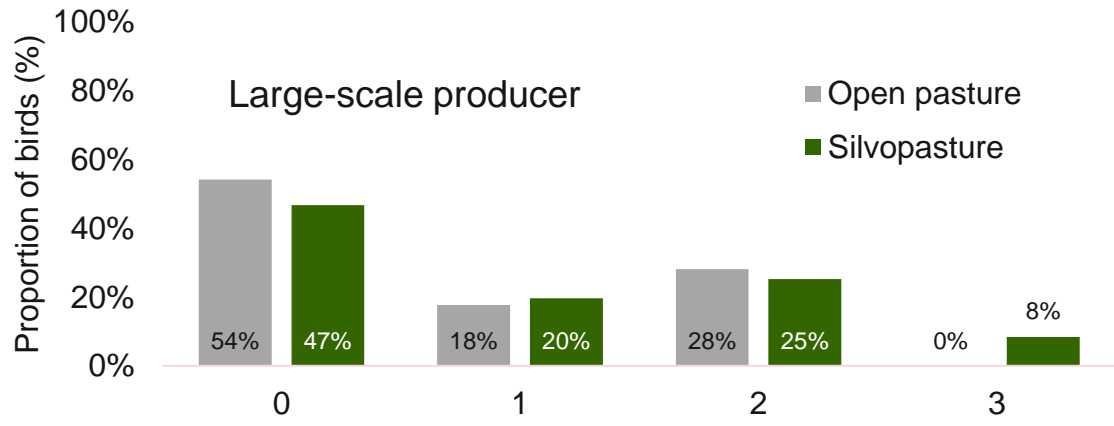
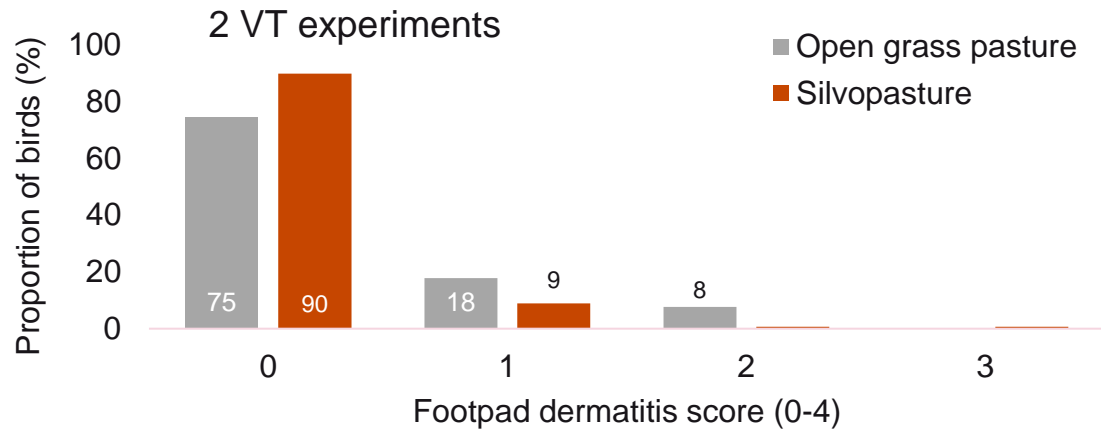
Pain & gateway for bacterial infection

Multifactorial causation that may result in pain & inability to access feed/water

Lameness

0-2 scoring system

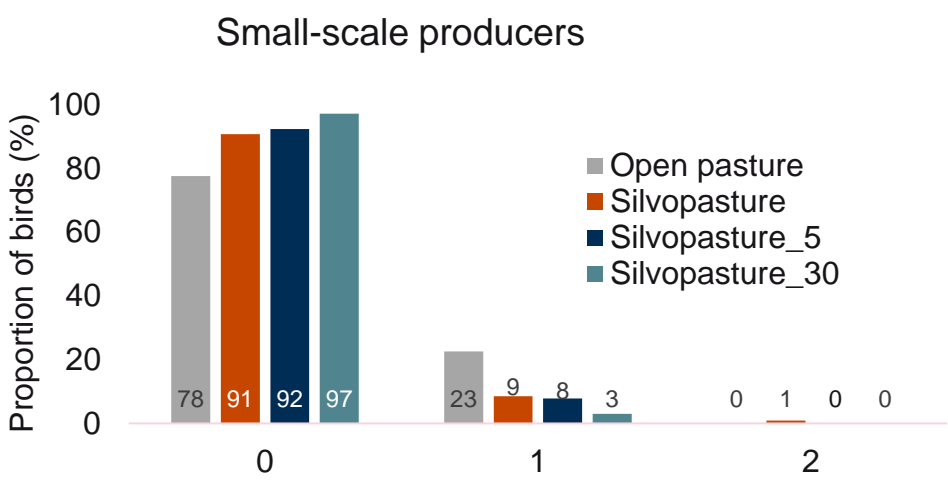
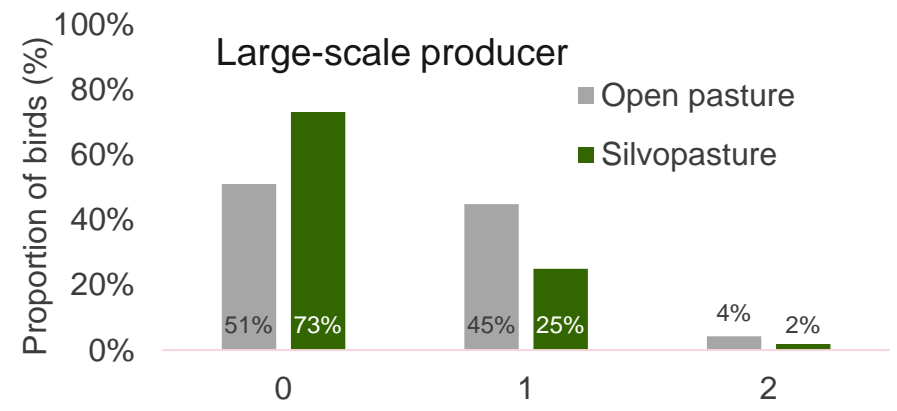
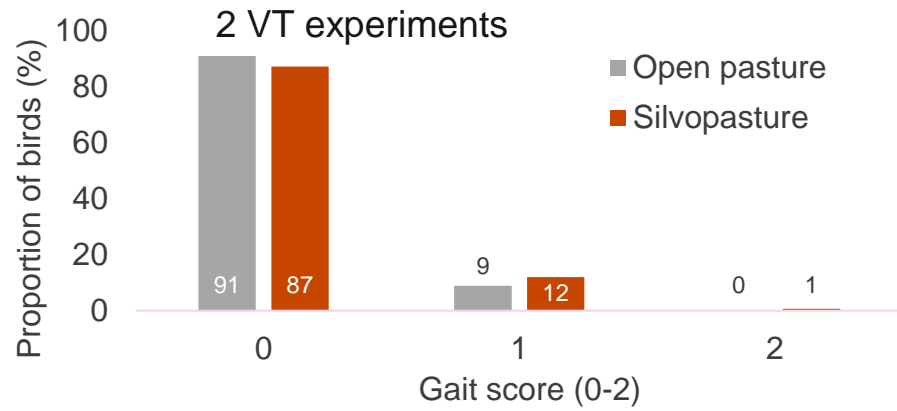
Higher score = **more severe lesions**



Footpad dermatitis

Healthier footpads when birds had access to silvopasture compared to open grass pasture (VT exp & small-scale producers)

Higher score = more severe lameness

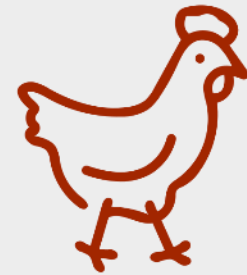


Lameness

Gait was excellent in most birds

Improved gait on large-scale & small-scale farms

Silvopastures and fear



Fear (tonic immobility)

Innate 'play dead' response to a predator

Prolonged immobility reflects greater level of fear



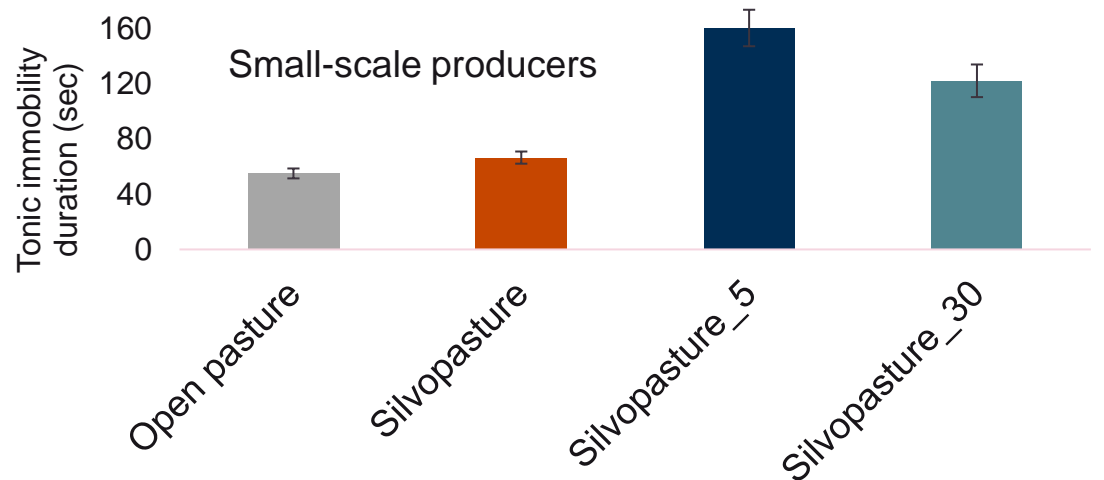
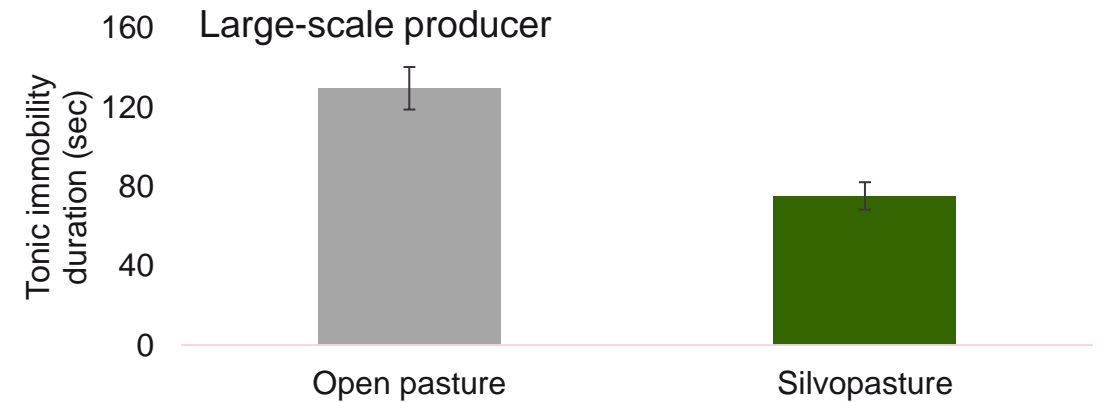
Longer tonic immobility duration = **more fearful**

Fear (tonic immobility)

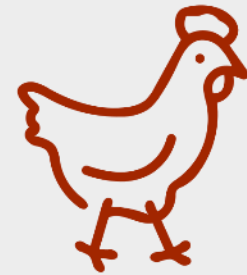
Birds in open pasture were more fearful (VT & large-scale)

Birds in open pasture were similarly or less fearful (small-scale)

Other factors may be more impactful



Silvopastures and behavior



Range use in VT experiment

Birds had access to the range between 8 AM - 5 PM

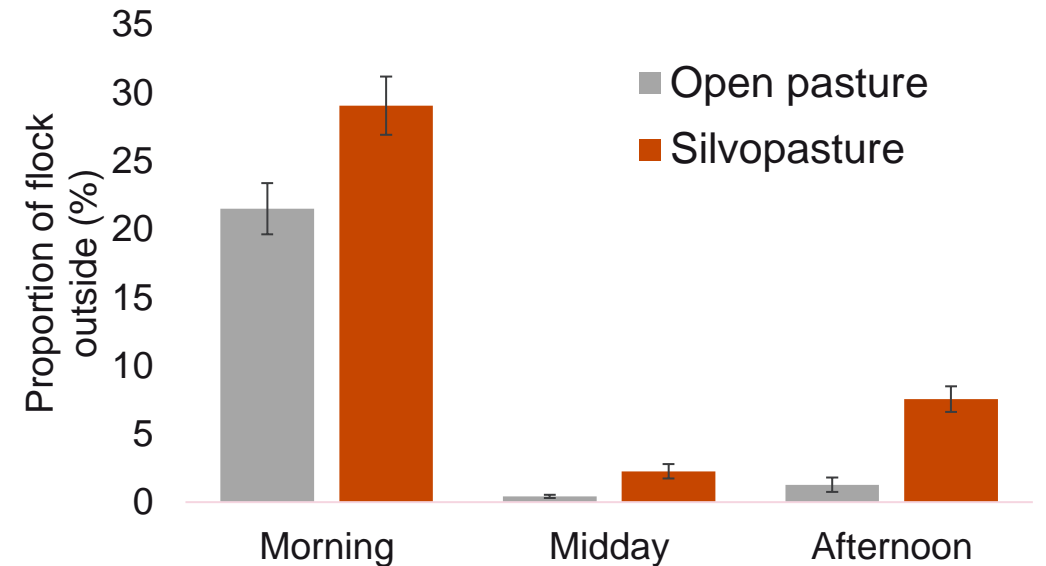
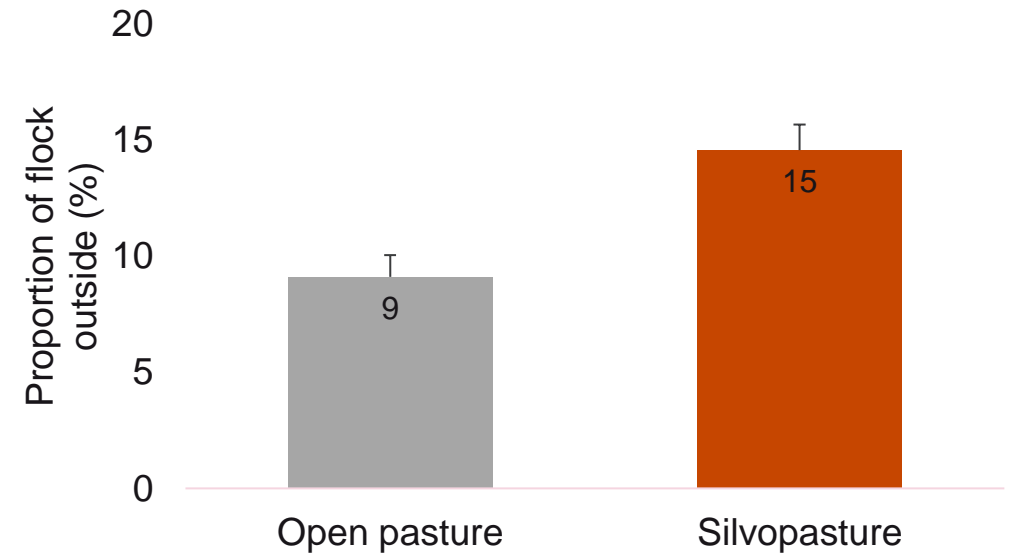
Range use (% of the flock outside) observed on days 29-30, 34-35, 40-41 of age



Range use in VT experiment

More birds used the silvopasture range

- Morning: Most birds outside, more on silvopasture
- Midday: Few birds on the range
- Afternoon: More birds on range in silvopasture





Morning range
use at a tree-
range broiler
chicken farm
(MN)

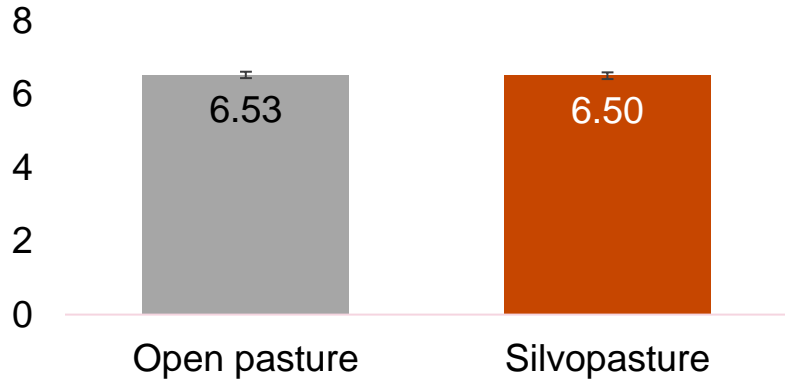


Production

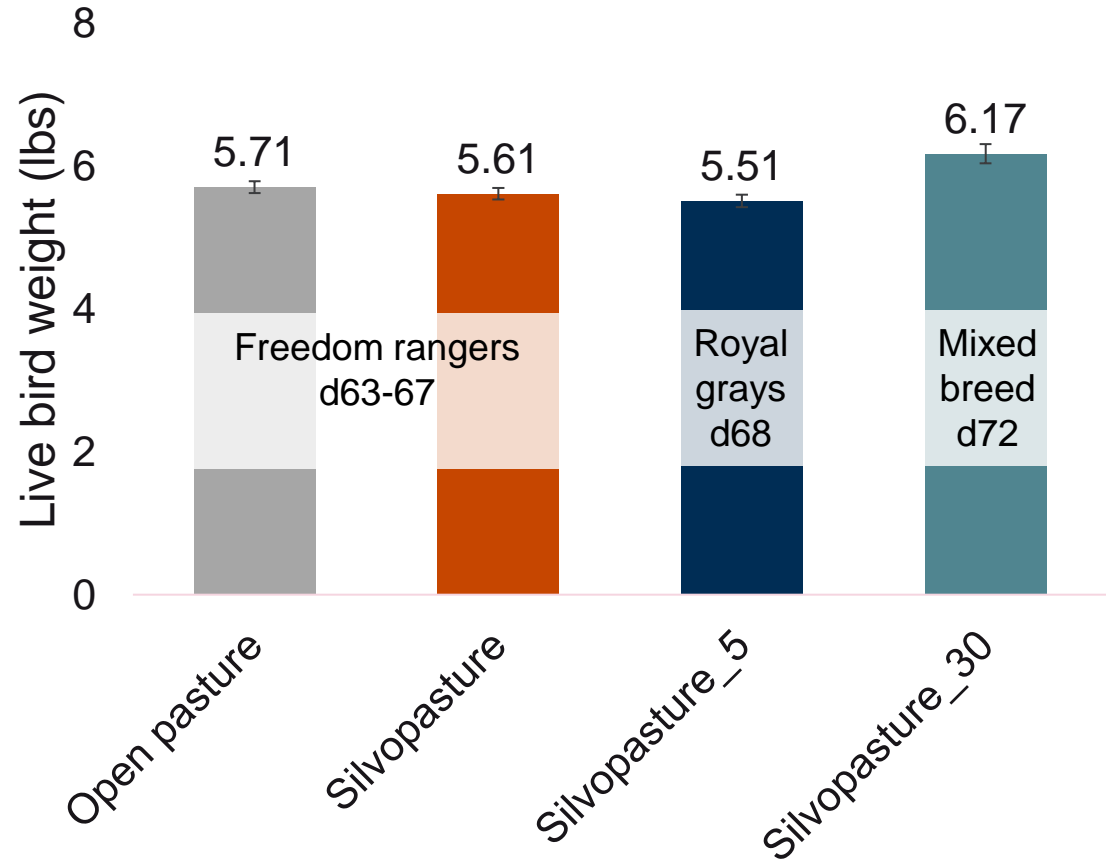
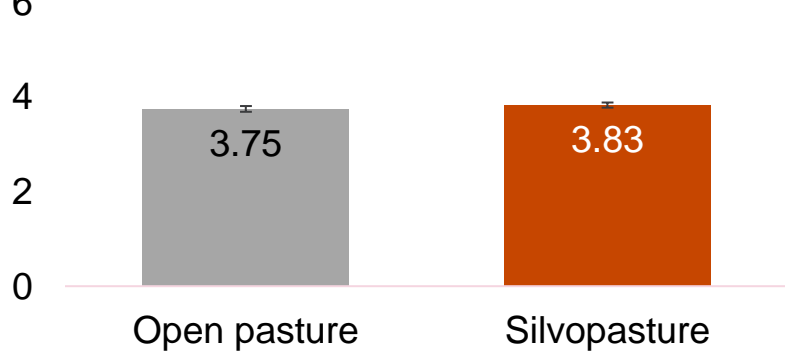


Production outcomes (VT exp & small-scale farms)

Bird live weight d41 (lbs)



Carcass parts yield (lbs)





Environmental impacts

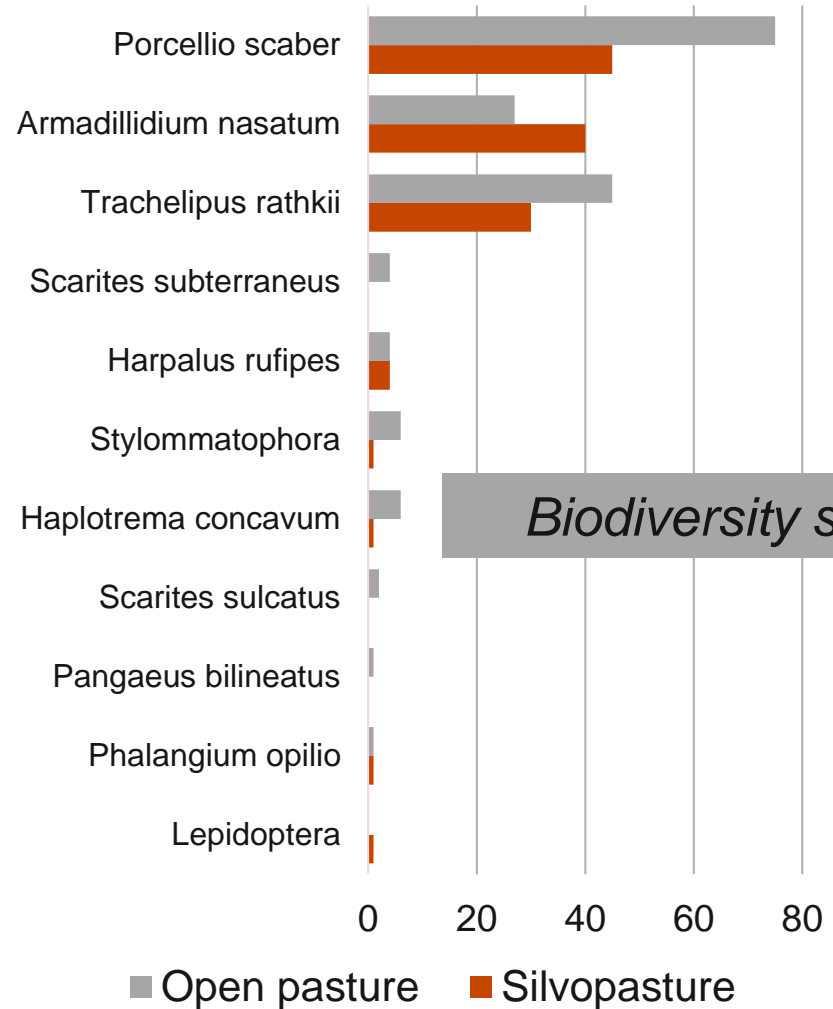


Insect biodiversity: relative species abundance & richness

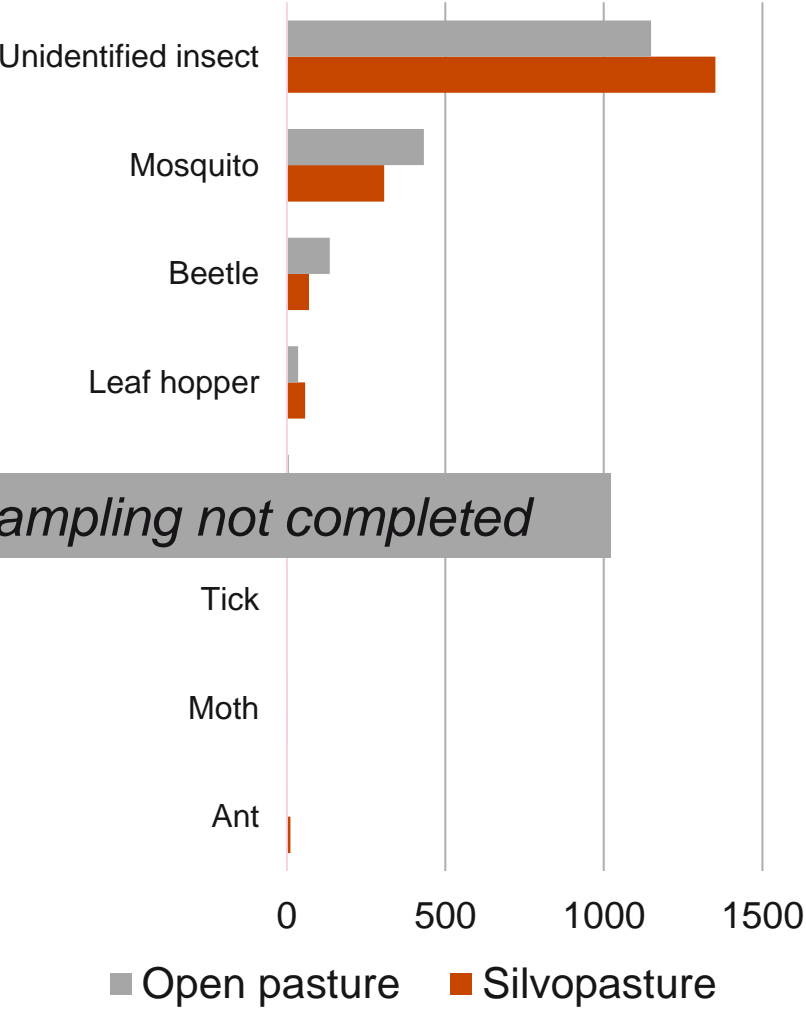
Open pasture:
Greater relative species
abundance (more equal
distribution across
species)

Greater species
richness (more different
species)

Insect species n (pitfall)



Insect species n (sticky traps)



Biodiversity sampling not completed

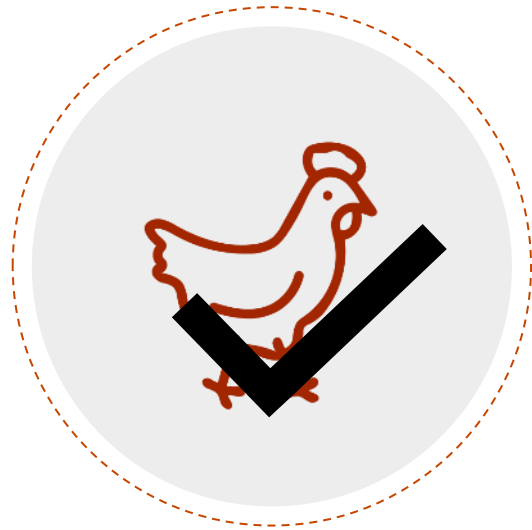
■ Open pasture ■ Silvopasture

■ Open pasture ■ Silvopasture

Soil quality parameters (VT experiment)

	Spring 2021		Summer 2021		Treatment effect	Time point effect
	Post-experiment 1		Post-experiment 2			
	Open pasture	Silvopasture	Open pasture	Silvopasture		
Beta Glucosidase (ppm pNP g ⁻¹ soil h ⁻¹)	172	126	156	113	OP > SP	No difference
Total PLFA	22,289	19,403	18,639	20,179	No difference	No difference
Total nitrogen (H ₂ O Total N in mg/kg)	47	45	65	63	No difference	Post1 < Post2
Organic nitrogen (H ₂ O Organic N)	20	14	17	25	No difference	No difference
Nitrate (H ₂ O NO ₃ -N)	25	29	46	36	No difference	No difference
Ammonium (H ₂ O NH ₄ -N)	2	1	2	2	No difference	<i>post1>post2</i>
Total Carbon (H ₂ O Total Organic C)	206	178	190	169	OP > SP	<i>post1>post2</i>
Acid Phosphomonoesterase	412	304	401	283	OP > SP	No difference
Alkaline Phosphomonoesterase	275	157	248	142	OP > SP	<i>post1>post2</i>

Silvopastures & One Welfare approach



Happy and healthy birds

Generally show improved outcomes



Happy people and 'healthy' income

No disadvantages to productivity, other aspects not –yet- investigated

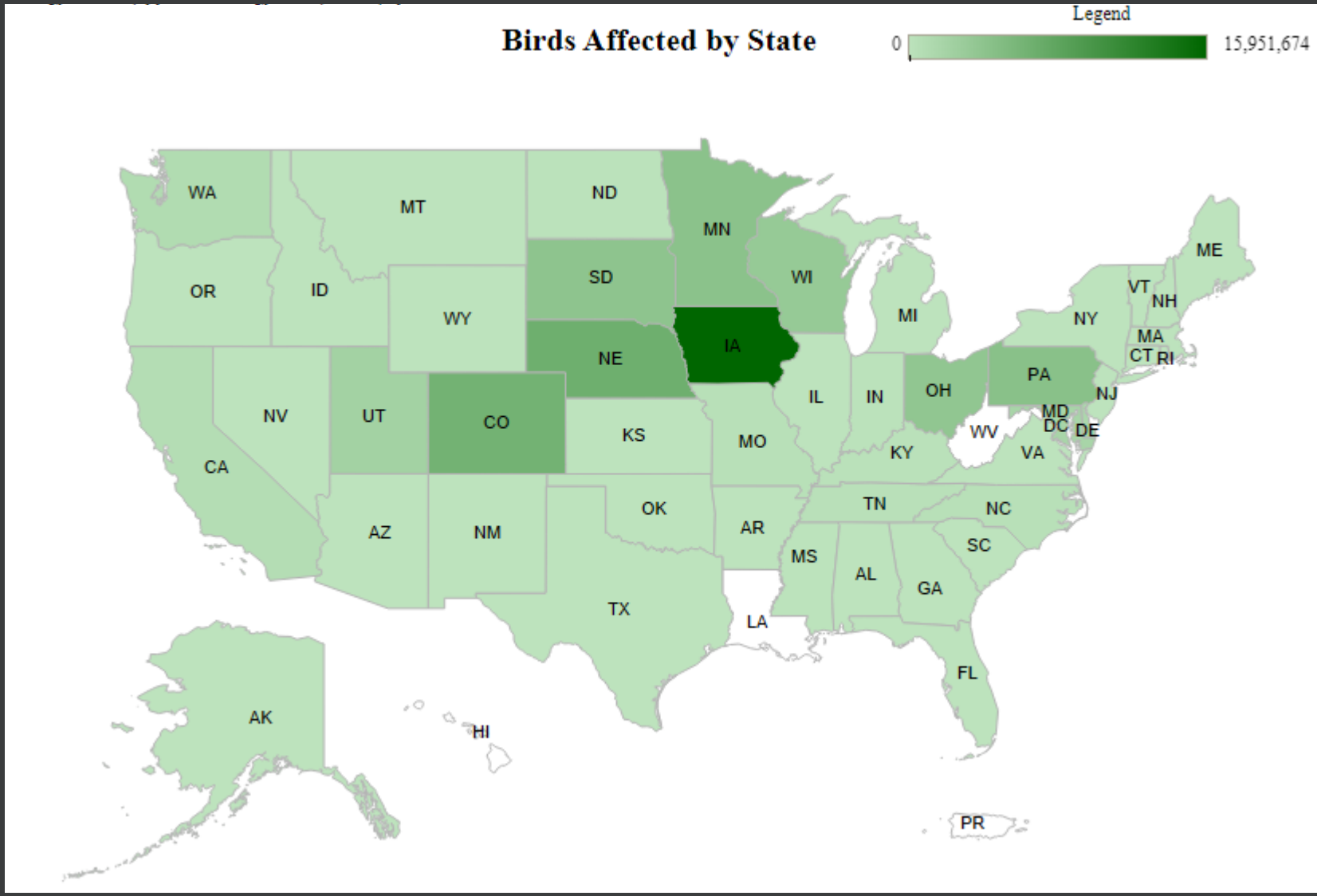


Sustainable production and healthy environment

Needs further investigation



Agroforestry and Avian Flu



Highly-pathogenic avian influenza

322 commercial flocks
 482 backyard flocks
 58.6 MLN birds

MN: last reported detection in December

HPAI signs to look out for

- Birds may have a fever 24h prior to other symptoms
- Swelling of head, eyelids, comb, wattles, and hocks
- Purple discoloration of wattles, combs, and legs
- Nasal discharge, coughing, sneezing
- Lack of coordination
- Less active than typical
- Diarrhea
- Drop in egg production or egg quality
- High mortality >75%



Highly pathogenic avian influenza is a notifiable disease which means that by law, HPAI has to be reported to appropriate government authorities. Animal health professionals are required to report HPAI to their state animal health official and the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS)

Modes of transmission

- Migratory water birds most probable transmitters of virus | high-risk species
 - Water & wading birds (geese, ducks, swans, gulls, lapwings)
- Birds of prey & scavengers | low-risk species
 - Hawks, buzzards, crows, raven, vultures
- Unclear if 'pest species' play a role (rats/pigeons)
- Tree cover?

Verhagen et al. 2015; van der Goot et al. 2015; EFSA, 2006; Bestman et al, 2018

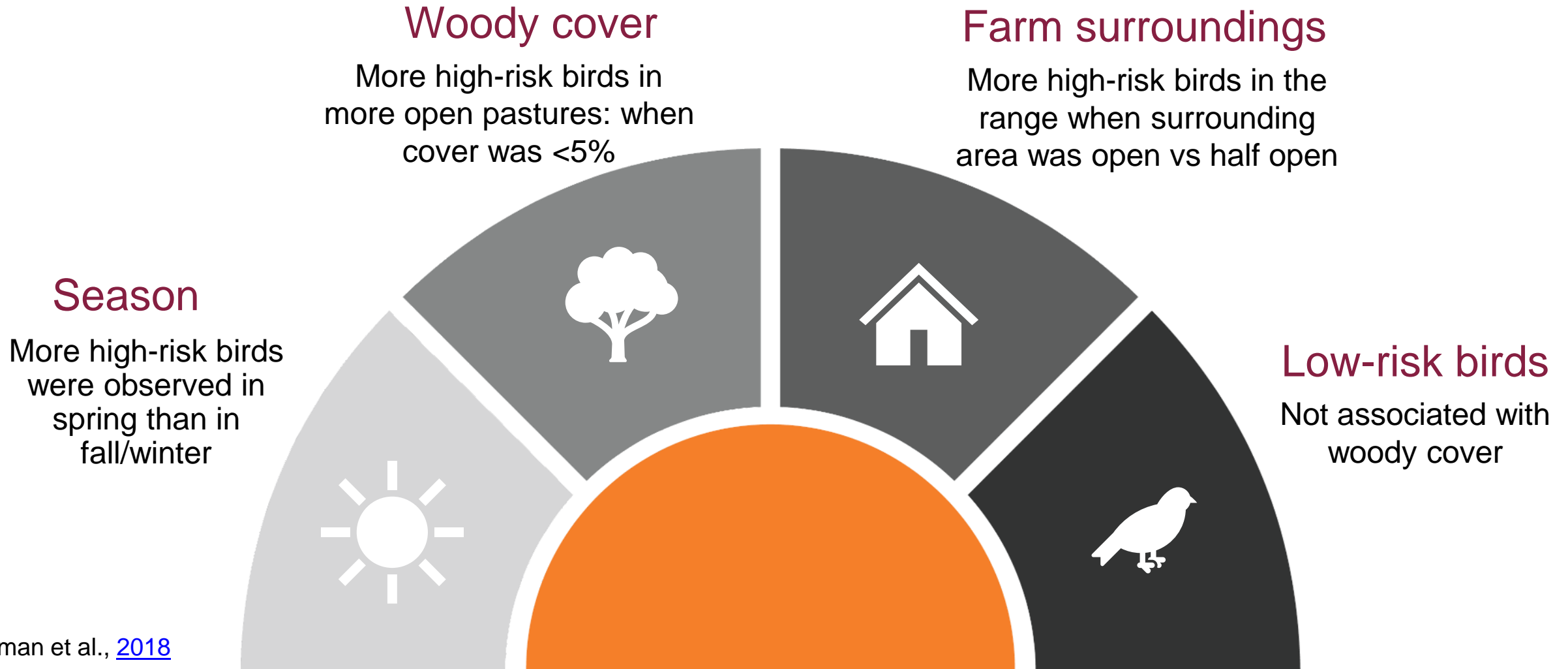




Pilot study by Bestman and colleagues

- 11 layer farms with 0-90% woody cover
- Live observations of wild birds
 - In pasture (on ground or in vegetation)
 - In surroundings (flying or near pasture)
- High risk/low risk species

Results by Bestman and colleagues



Implications



- Waterfowl most common species (ducks/geese)
 - Prefer areas with short grass and no bushes (prey species)
 - Travel in large groups so need open space
- Woody vegetation seems to reduce the presence of high-risk species that can transmit AI
- Pilot study: not an ideal design and thus needs to be replicated

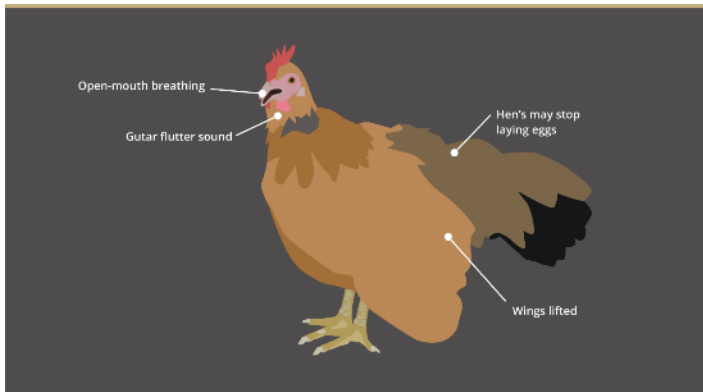
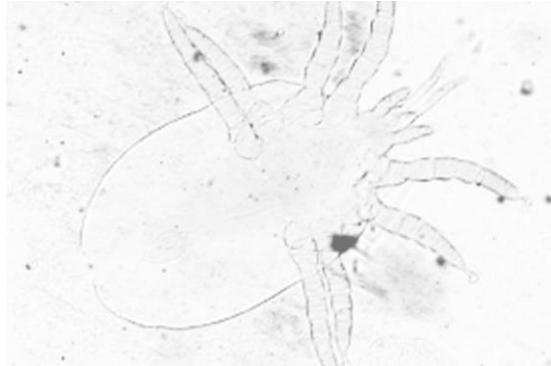
Animal welfare considerations





Behavioral needs

- Perching
- Dustbathing
- Foraging
- Social interactions

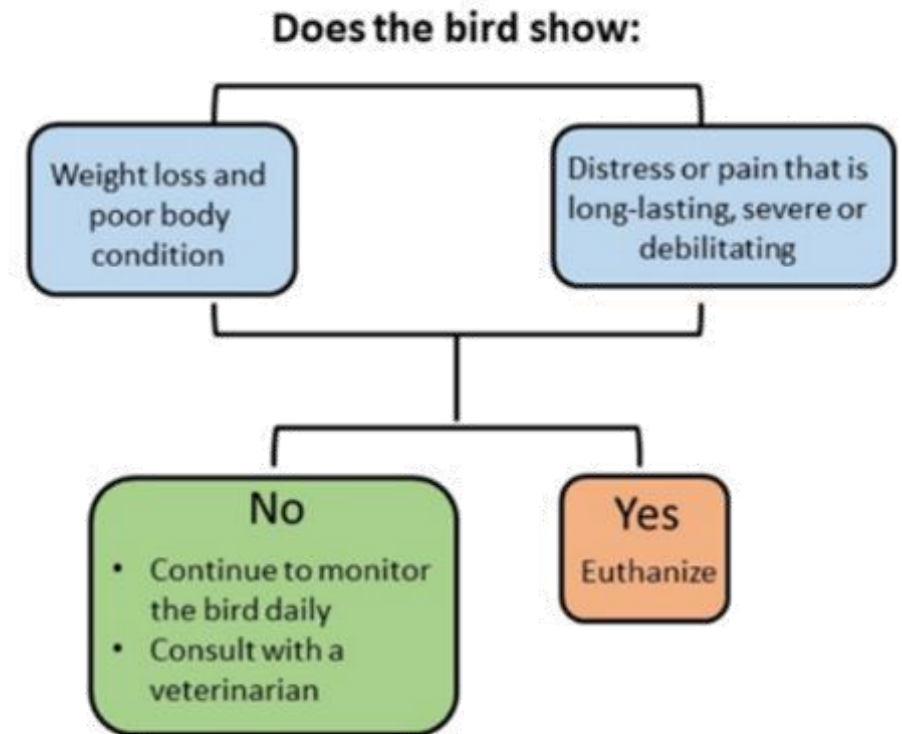
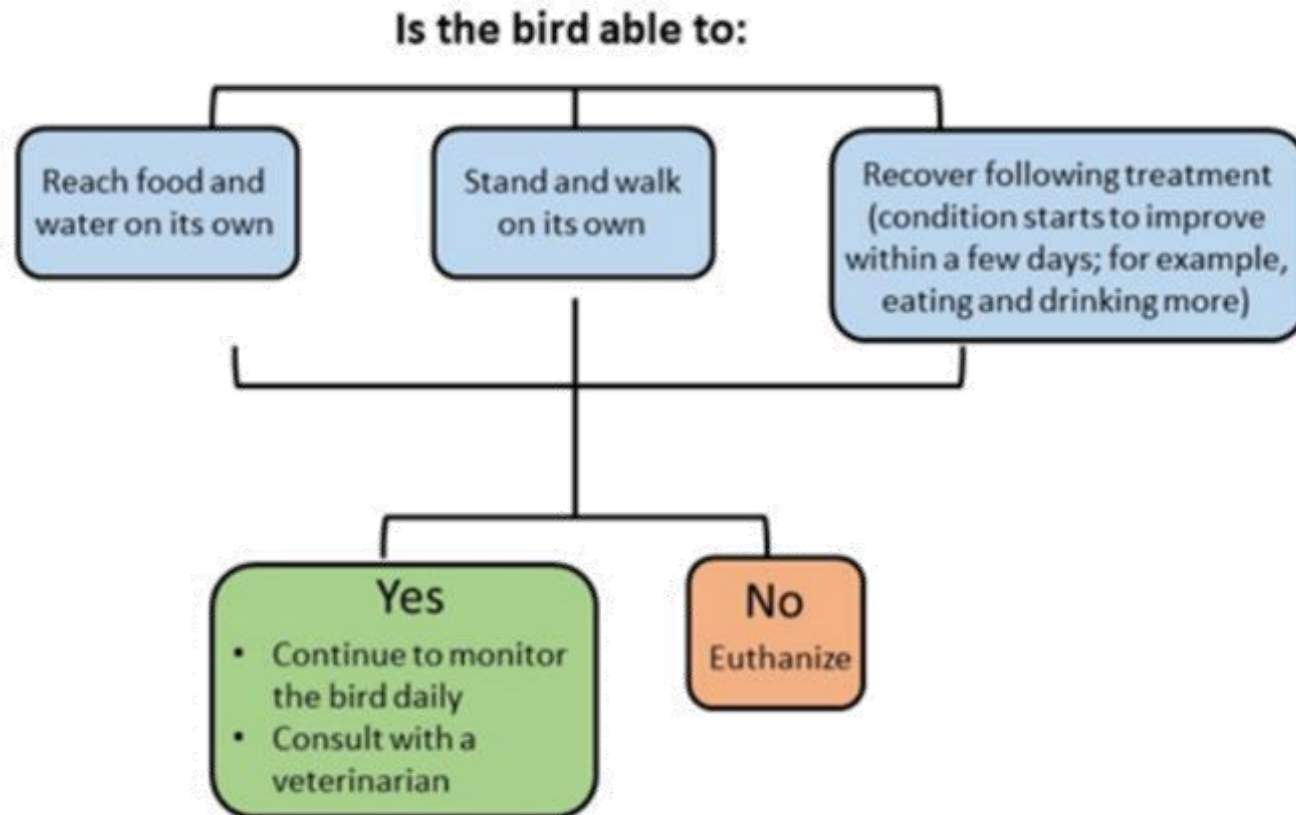


Health risks

- Disease
- Footpad dermatitis
- Lameness
- Fear
- (Ecto)parasites
- Thermal distress

Decision-making: treat or euthanize an animal?

Euthanasia = humane killing for the animal's own benefit - to end current or future suffering



Considerations for euthanasia



- Gentle handling and restraint
- Quick and painless loss of sensibility
- Persistent loss of sensibility
- Confirm brain death
 - No vocalizations or blinking
 - No rhythmic breathing
 - No tension in neck muscles
 - No movement of third eyelid upon touch

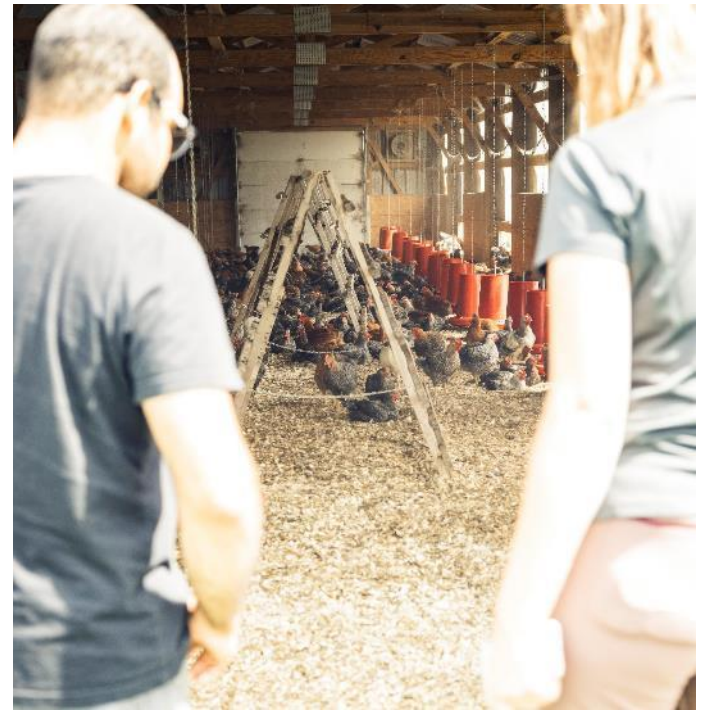
Useful resources

Humane Slaughter Association – [Handling chickens](#)

Jacque Jacob, U. of Kentucky – [End-of life situations](#)

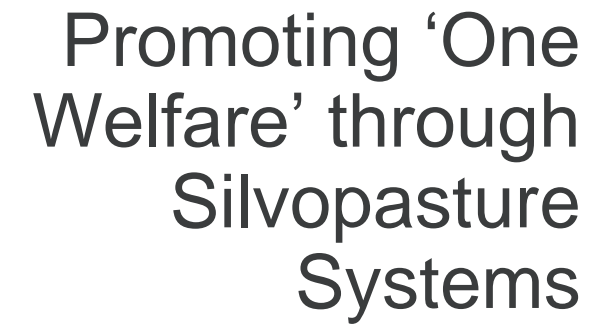
Poultry Extension Collaborative – [On-farm euthanasia methods](#)





Take home message

Silvopastures for broilers can benefit the 'One Welfare' approach although not all relevant aspects were assessed in the current project

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