INRA Pasture Network – March 8 2017 Seminar – Montpellier

The Notion of "Grazing Resource" Revisited Considering Habits and Skills of Herds and Farmers

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Is there a need to discuss further the notion of “Grazing Resource”?


Is there a need to discuss further the notion of "Grazing Resource"?
Maybe here!

Farmers, ranchers, and researchers know herbivores are highly selective.

Plant Species

Plant Parts

Season

Time of Day/Meal

Sheep eat sagebrush in the morning and fourwing saltbrush in the afternoon

Sheep eat clover in the morning and grass in the afternoon

On pasture, the diversity of edible plants can become food “resources” only if the farmer or herder, through his experience and skills, motivates his animals to select and eat it. Otherwise, plants remain… plants.

Hubert, 1994. *Cahiers d’Agricultures*

We can do chemical analyses for primary and secondary compounds, but that tells us nothing.

A plant becomes a “food resource” only if an animal is motivated to eat it, and many factors are involved.

Many factors influence an animal's motivation to eat a plant on diversified pasture

Learning *in utero* and early in life

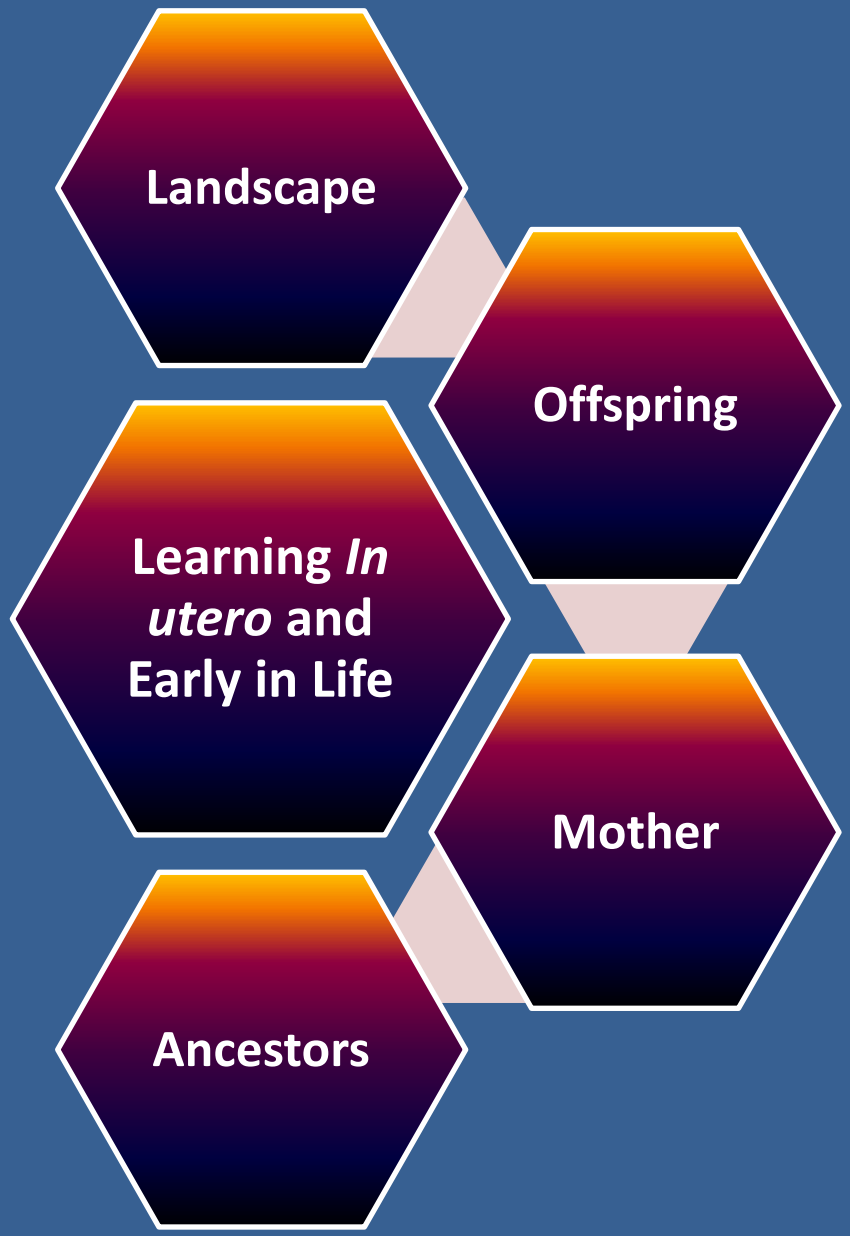
Learning to mix plants in the diet

Learning complimentary sequences

Managing grazing: from set stocking to management-intensive grazing to close herding

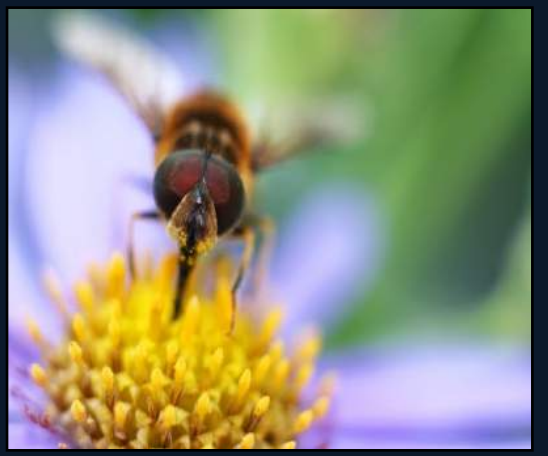
Learning *In utero* and Early in Life

What does it mean for creatures to be locally evolving with landscapes?

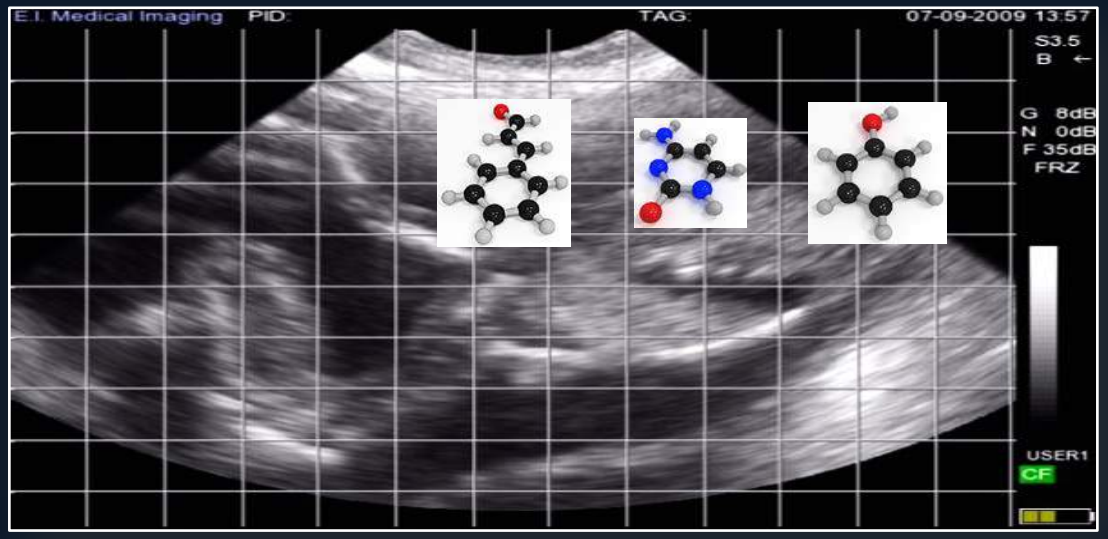


Natal experiences affect food and habitat preferences in a broad range of animal taxa including insects, fish, birds, and mammals

(Davis and Stamps, 2004)



A Mother's Lifelong Influence on Diet and Habitat Selection



In utero
Mother's Milk

Mother as a Behavioral Model

Preference for forages high in secondary compounds is not due solely to differences in breeds, as illustrated in cross-fostering studies with two breeds of goats.

(Glasser *et al.*, 2009)

Offspring from one breed (Damascus) were reared from birth by females from the other breed (Mamber) and vice-versa.


Damascus eat high-tannin browse


Mamber don't eat high-tannin browse

The preferences of the kids for high-tannin browse strongly reflected the preferences of their foster mothers.

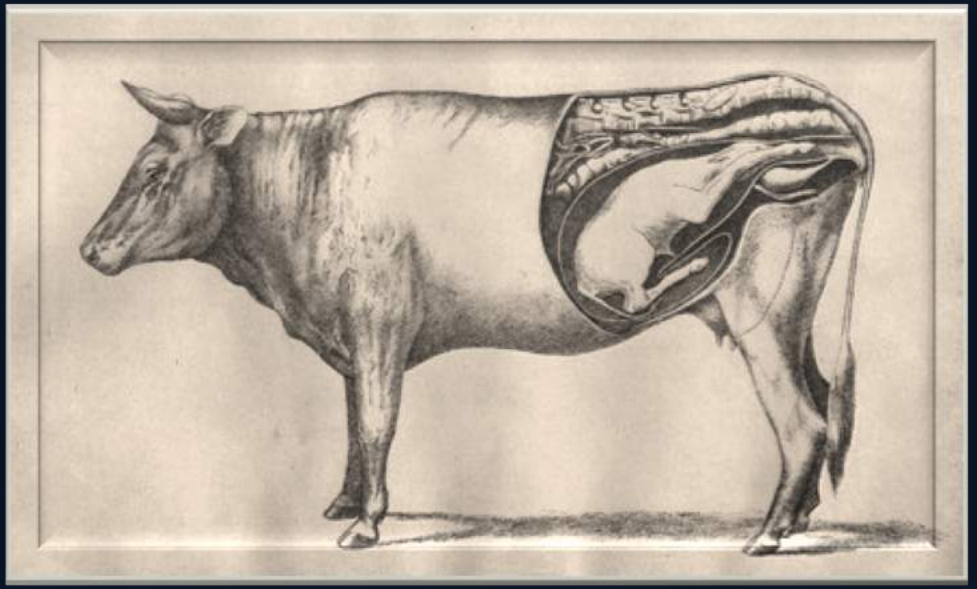
Lambs exposed to saltbush *in utero* grow faster and handle a salt load better than lambs from mothers on grass pasture…

(Chadwick *et al*., 2009)

…they excrete salt more rapidly, drink less water and maintain higher intake when eating saltbush.

Calves exposed to straw *in utero* eat more straw, digest straw better, and grow faster than calves not exposed to straw.

(Wiedmeier *et al*., 2012)



Cows fed straw as calves 5 years before…

✓ higher body weight/condition

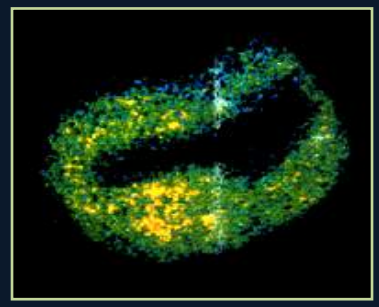
✓produced more milk

✓shorter post-partum intervals

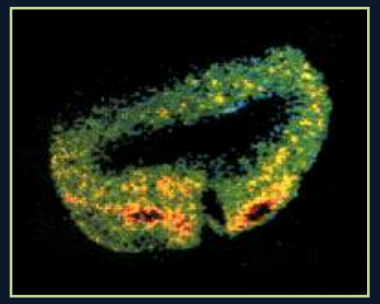
…when fed straw as the bulk of the diet during pregnancies from 5 to 8 years of age.

(Wiedmeier *et al*., 2002)

Environments influence gene expression, which influences form, function and behavior.



Enhanced neural responses



Enhanced rumen volume and papilla

Enhanced kidney function

Food neophobia has long been neglected in studies of grazing management, as well as technical advice to livestock farmers.

When relocated on rangeland, animals that know only cultivated meadows don't know what or what not to eat. They can be out of control for weeks, or even for the entire grazing season.

(Despret and Meuret, 2016)

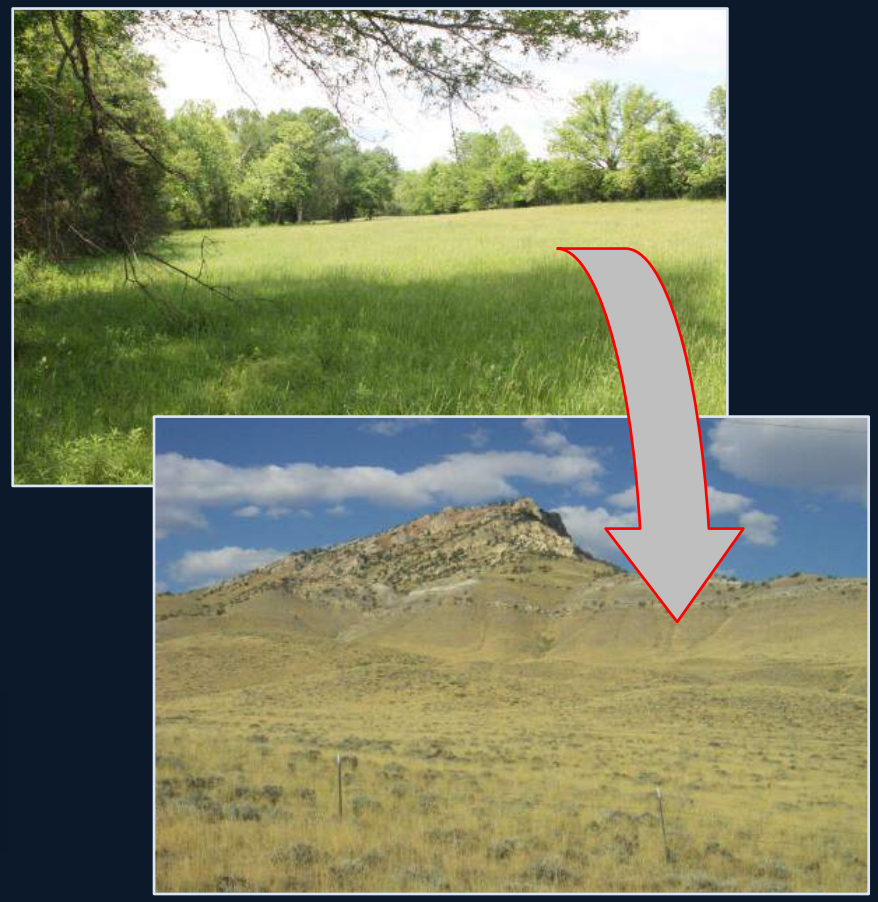
Experienced farmers and herders are aware of animals' habits and culture.

They don't relocate them from one environment to another without considering this.

Jim Howell (farmer), 2005.

Cows Have Culture Too: Understanding Livestock/Landscape Interactions.

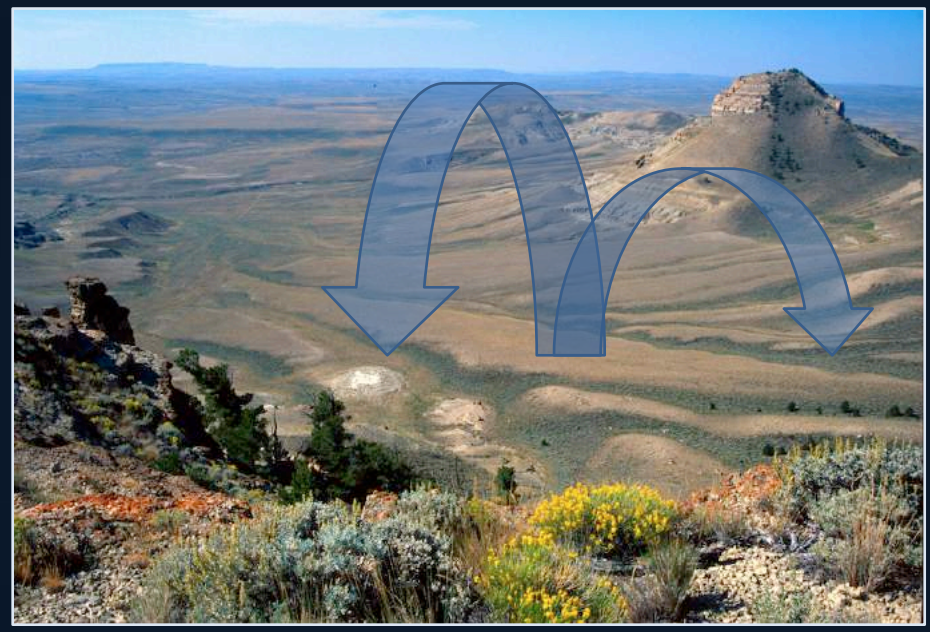
"What would you do if you were unwillingly plucked off of your pretty farm in the green hills of Missouri, transported to a new ranch in the badlands of Wyoming, given a brand new set of friends, all new food, different weather, a novel landscape, and salty water? You most likely would protest and perform below your potential, at least initially."



Jim Howell (farmer), 2005.

Cows Have Culture Too: Understanding Livestock/Landscape Interactions.

"…What if you had been on that same Wyoming ranch your whole life, and had been in charge of the winter country in the Red Desert all that time. You know every square foot of that place, where all the best grass patches are, the good places to take shelter in blizzards, how far you can ride out and still get back before dark, etc. You are intimate with the land."



What price do we pay when we ignore transgenerational linkages to social and biophysical environments?

Learning the Value of Plant Mixtures for Herbivores

Explanations for why animals eat a variety of foods.

- Primary Compounds
- Satiety Hypothesis
- Flavor-Feedback
- Secondary Compounds

Landscapes with diverse arrays of plants are nutrition centers and pharmacies with vast arrays of primary and secondary compounds.

Nothing is more important for health through nutrition.

Livestock producers find that morbidity and mortality of stockers decrease…

…when cattle forage on diverse mixtures of forages as opposed to monoculture pastures.

Cattle learn to "clean their plates"

Ray's cows learned to…

"mix the best with the rest"

rather than

Ray Bannister

Boom-Bust Grazing

"eat the best and leave the rest"

Learning to Create Complimentary Plant Mixing at the Meal Scale

Biochemically diverse diets enable sequences that compliment one another, enhancing nutrition and health

(Seefeldt, 2005; Mote *et al.*, 2008)

bitterbrush (tannins) ⇨ sagebrush (terpenes)

An appetizer of bitterbrush helps the sagebrush go down.

Biochemically diverse diets enable sequences that compliment one another, enhancing nutrition and health

(Lyman *et al*. 2011, 2012)

Trefoil (tannins) → Endophyte-infected Tall Fescue (alkaloids)

An appetizer of trefoil (sainfoin) helps the fescue go down.

Managing Grazing…
from Conventional Set-stock
to Management-intensive Grazing
to Close Herding

Conventional continuous grazing/set-stock management paradigms and rules

Optimal stocking rate calculated from plant biomasses and nutritive values

Using fences as “Livestock-sitters”

Animals not expected to be imaginative or selective

Management-Intensive Grazing paradigms and rules (1/2)

(Gerrish, 2004)

Emphasis on managing local grazing pressure

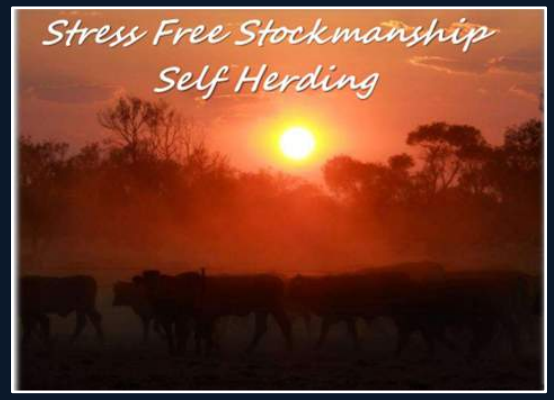
Fencing and movement are critical facets of intensifying management

Emphasis on soil and plants responses

Management-Intensive Grazing paradigms and rules (2/2)

(Gerrish, 2004)

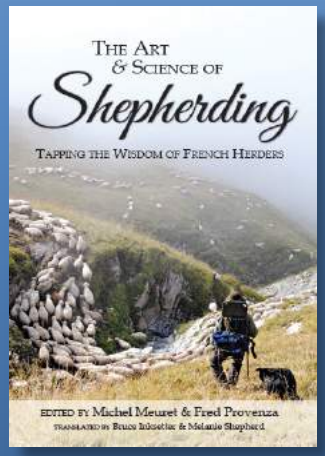
Some people now move livestock several times a day



Growing emphasis on stress-free stockmanship

Enhances plant mixing at day scale and performance of livestock

Close herding paradigms and rules (1/2)



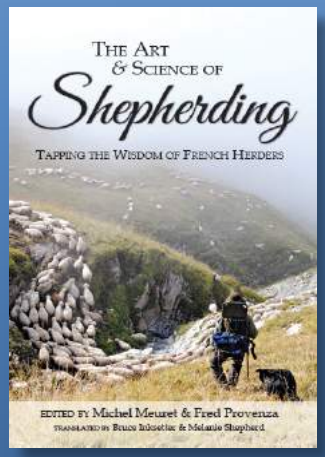
(Meuret and Provenza, 2014, 2015)

Acting as a guide who relies on positive reinforcement and a relationship based on mutual trust

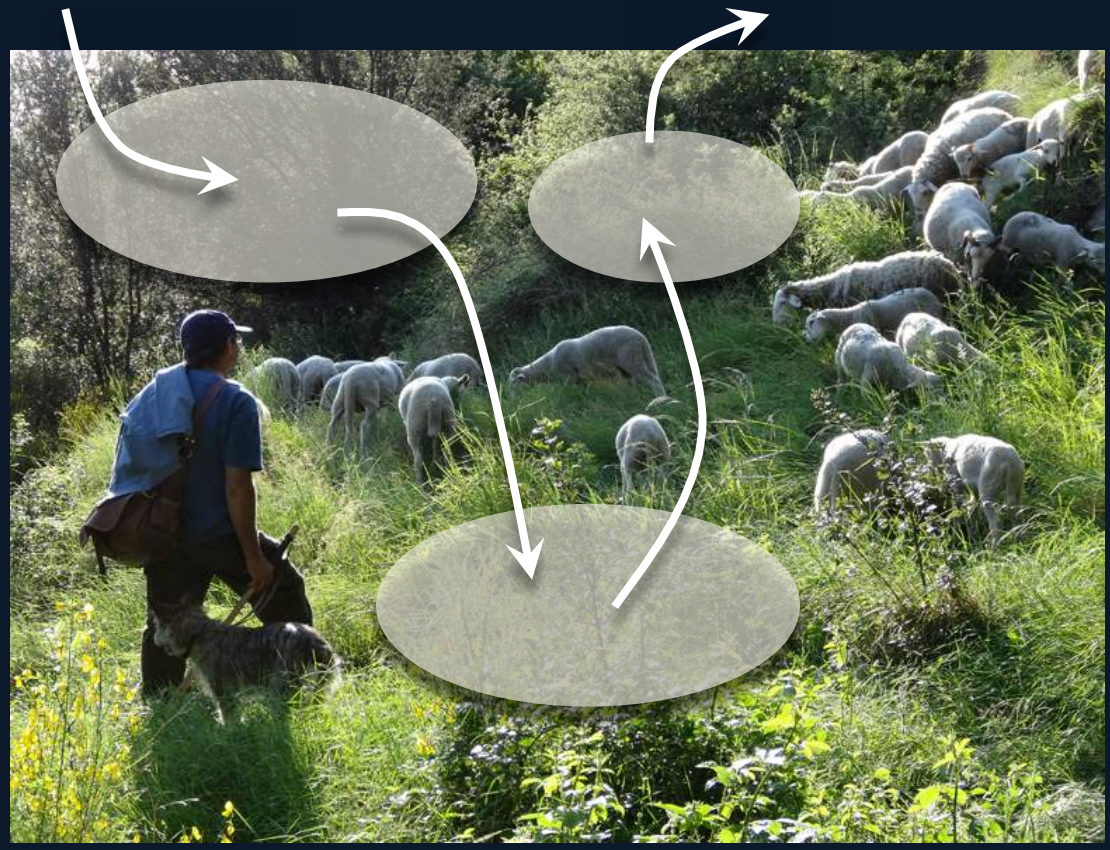
Designing grazing circuits to create synergies among grazing patches by meal sequencing

Avoiding grazing weariness that occurs when diversity is too narrow and overly predictable

Close herding paradigms and rules (2/2)



(Meuret and Provenza, 2014, 2015)

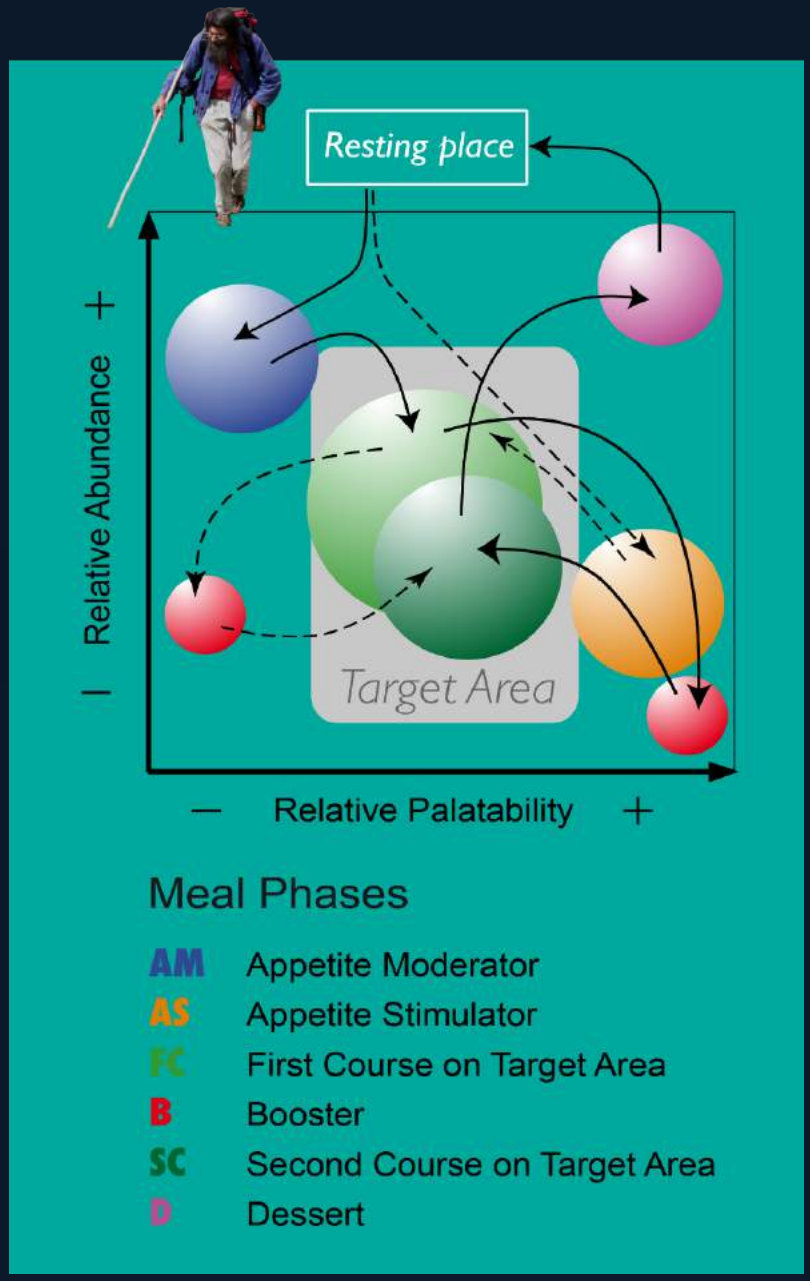


A given section of land is considered by a herder to be of good feeding value if the grazing patches to include within the circuit are effectively laid out relative to one other.

Grazing Circuits

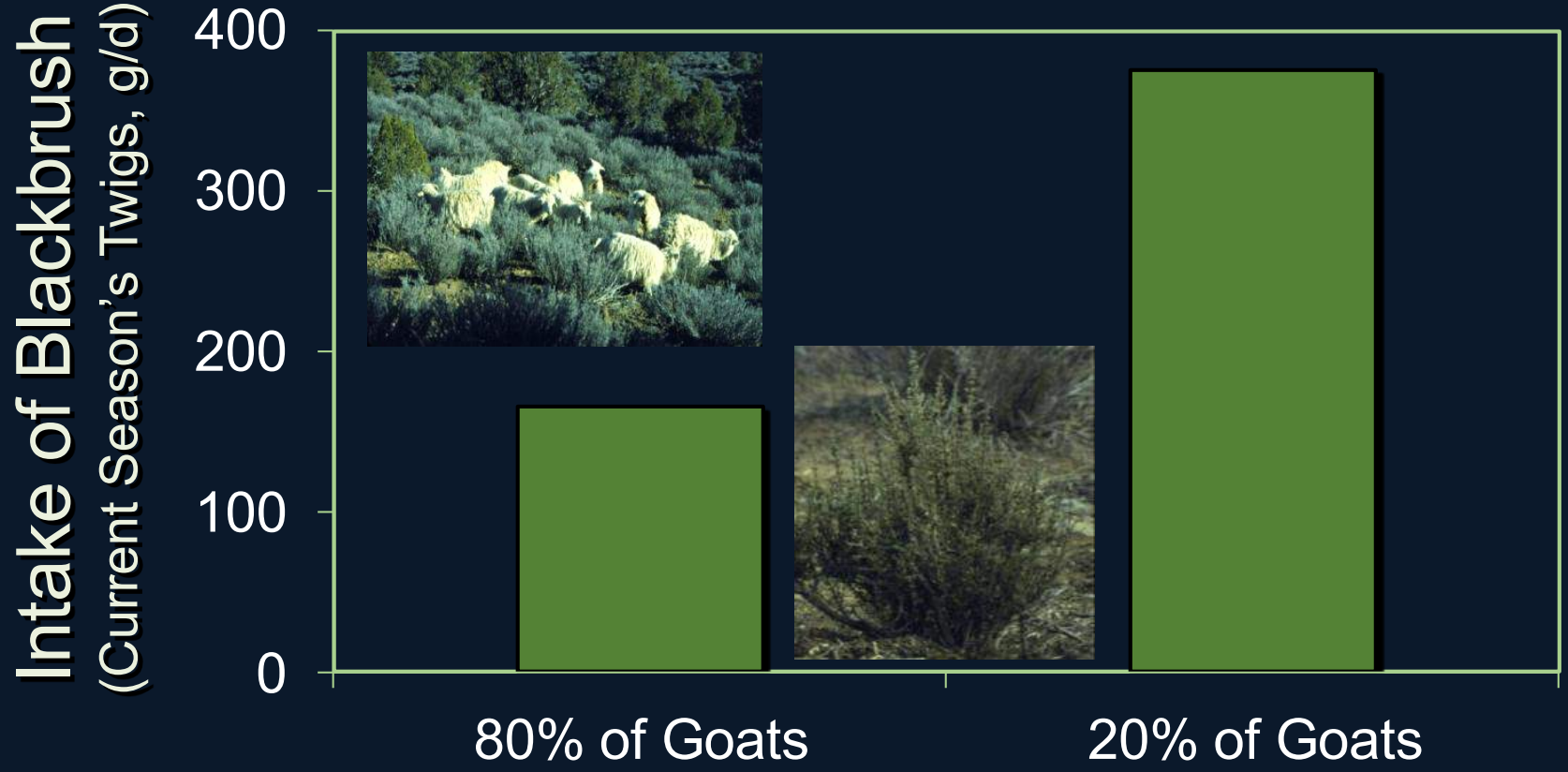
- ✓ Stimulate appetite/intake
- ✓ Target grazing to enhance/ maintain biodiversity
- ✓ Enable individuals to regulate intake of primary and secondary compounds

(Meuret and Provenza, 2015)




Offering forage diversity
enables individuality

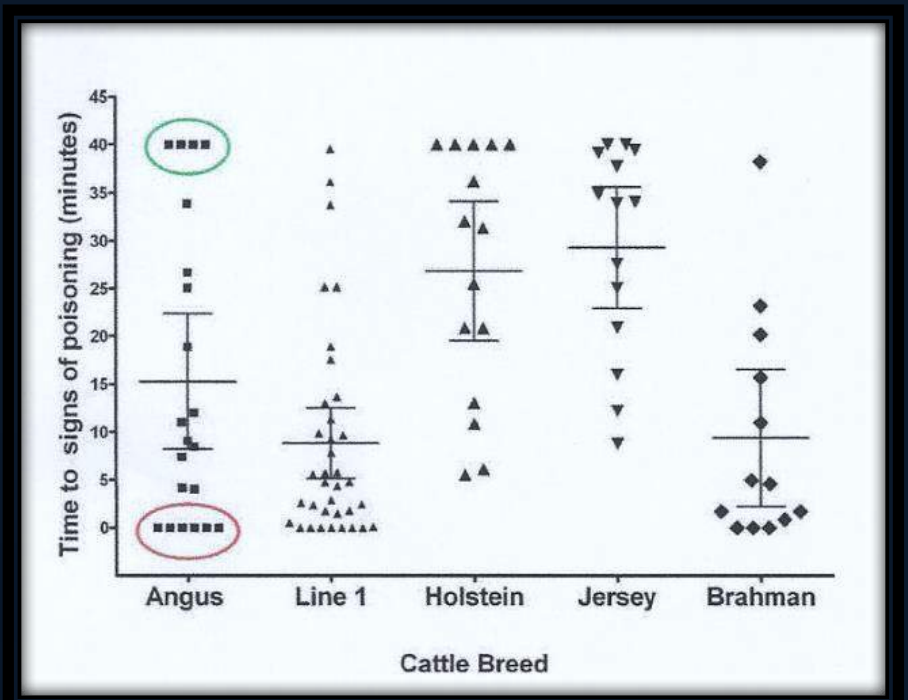
Variation among Goats



(Provenza *et al.*, 1990)

Variation among breeds of cattle and individuals with respect to larkspur toxicity

(Green *et al.*, 2014)



Looking Ahead

Furthering
the exchange of
knowledge between
farmers, herders and
scientists…

Timing of Sequences

Mixing Plant Compounds

Reducing Stress

Learning Early in Life

Create new and complimentary "Grazing Resources"

…by rekindling our relationships with livestock and landscapes, rather than relying on fences as livestock-sitters.