

No grazing? No cow!

About the intrinsic value of
ruminants, pigs and chickens



Kees van Veluw
LBI, WUR

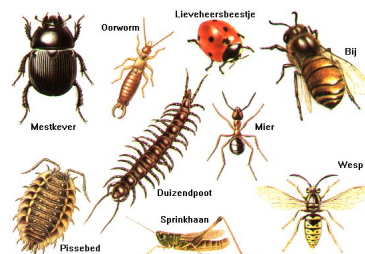
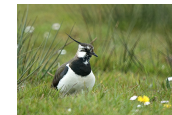
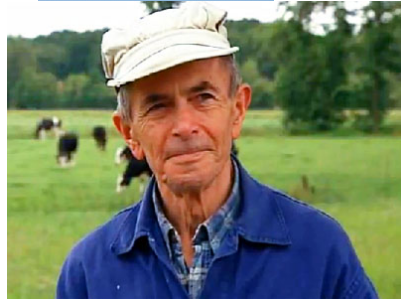


19 april 2012

Symposium Lekker Buiten
Boerengroep Wageningen



The Cow Ecosystem



To graze or not to graze?

- How to get an answer on this question?
- **Assessment of welfare by science is not satisfying**
- Animal rights (after human rights, children rights, emancipation of women) are coming!
- Look to the intrinsic characteristics of ruminants and look to the **evolutionary development of grasses and grazers** give a clear answer!! (Evolution of rumen, symbiosis between animals and vegetation)
- Origin and development of ruminants and grasses
- Understanding the **animal's consciousness / soul**
- Practical approach: grazing is the best!
- Grazers, browsers and graze/browsers
- Underestimation: **Crop rotation and animal rotation**: mixed grazing
- Practical examples of mixed grazing / mixed animal husbandry



Definitions of welfare

1. The 'five freedoms' :

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury and disease
- Freedom to express normal behaviour
- Freedom from fear and distress

Farm animal welfare council / Brambell committee 1960

2. Welfare defines the state of an animal as regards its attempts to cope with its environment.”

Fraser and Broom, 1990.

3. The welfare is fine when an animal can satisfy the following 'core emotions': seeking, rage, fear, panic, lust, care and play

Temple Grandin in: Animals make us human; creating the best life for animals, see <http://www.grandin.com/inc/animals.make.us.human.ch1.html>

4. The welfare is fine, because it lays every day an egg if an animal is healthy and producing well, it is faring well.

My father

How to measure ??????

Evolution of the ruminant system

Origin of the earth:

First bacteria:

First sea animals and plants

First land plants

First seed plants and ferns

Pine forests, ferns and insects

First dino's and small mammals

First flower plants, birds

First apes, tropical forests without grasses

First grasses, herbs, ancestors of horses & ruminants

Real horses and ruminants

Real grasses and large mammals (ruminants)

First humans

First domestication of animals: dogs

First domestication of arable crops

First domestication of ruminants (goats)



5.000 million years ago

3.000

500

450

400

300

250

145

65 (dino's die)

56

35

23

6

12.000 years ago

11.000

10.000

Sources: <http://www.vob-ond.be/Leden%20melden/Geoltijdschartikel.htm>

T.J. Hackmann and J.N. Spain. 2010. Invited review: Ruminant ecology and evolution: Perspectives useful to ruminant livestock research and production. Journal of Dairy Science 93: 1320-1334

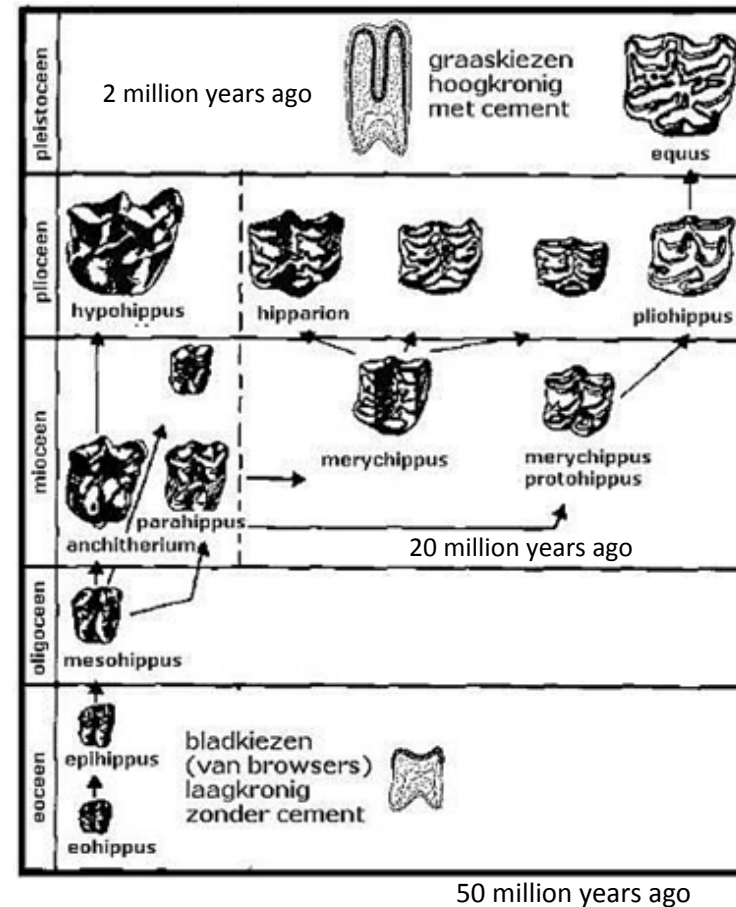
Co-evolution of Ruminants and Grasses ?

Evolved together since 50 million years ago:
natural symbiosis, mutual beneficial

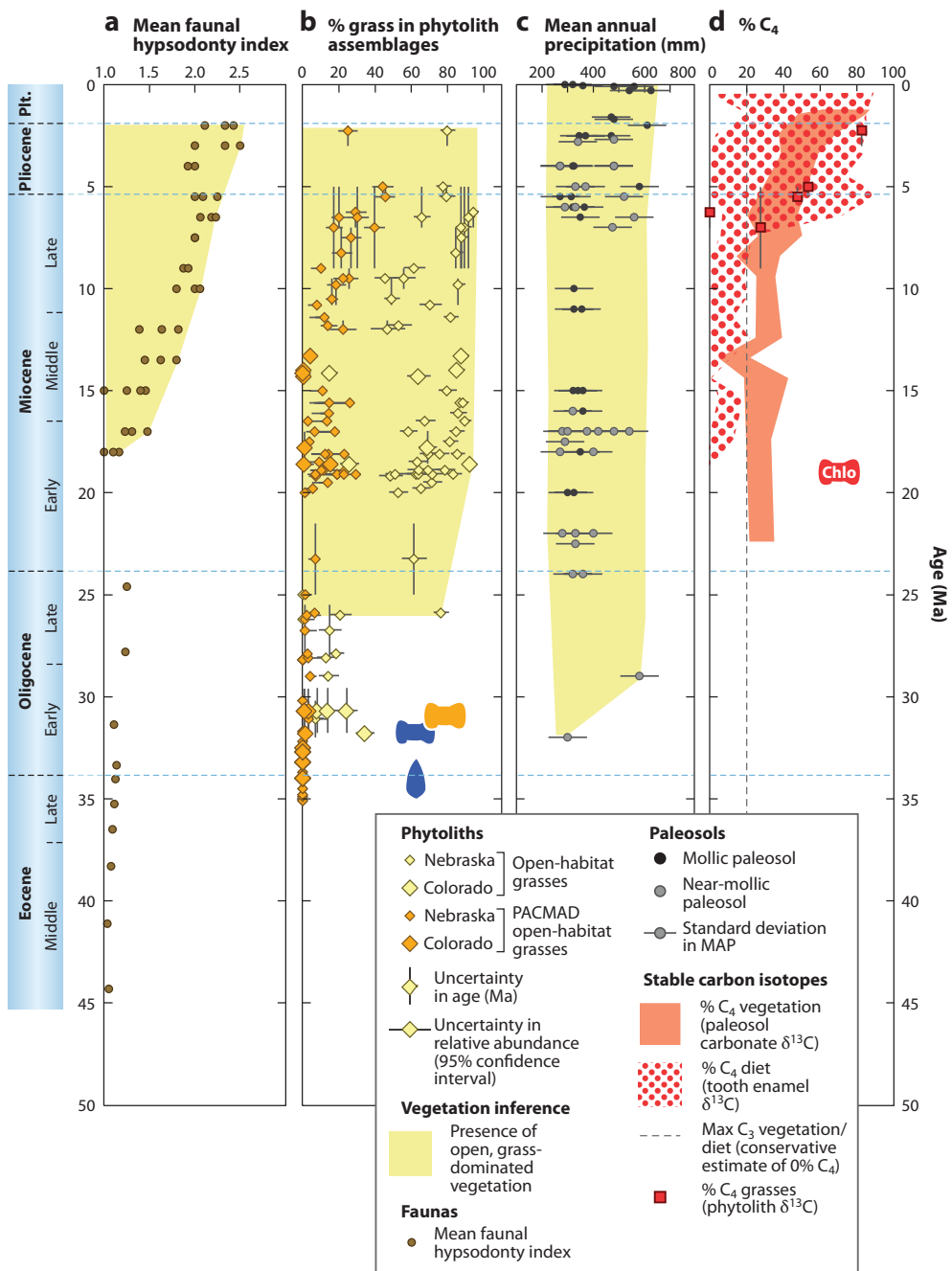
Development studied by molar changes:

Bladkiezen van browsers: low, without cement

Graaskiezen: high, with cement



Source Kiezen: <http://www.dynamisch.nu/feno/12paard.html>



Fossielen geven de ontwikkeling aan van bladkiezen naar graaskiezen



Fossil molars of a camel (Miocene) <http://www.fossil-treasures-of-florida.com/camel-llama-fossils.html>

Evolution of horses and ruminants

758

C. JANIS

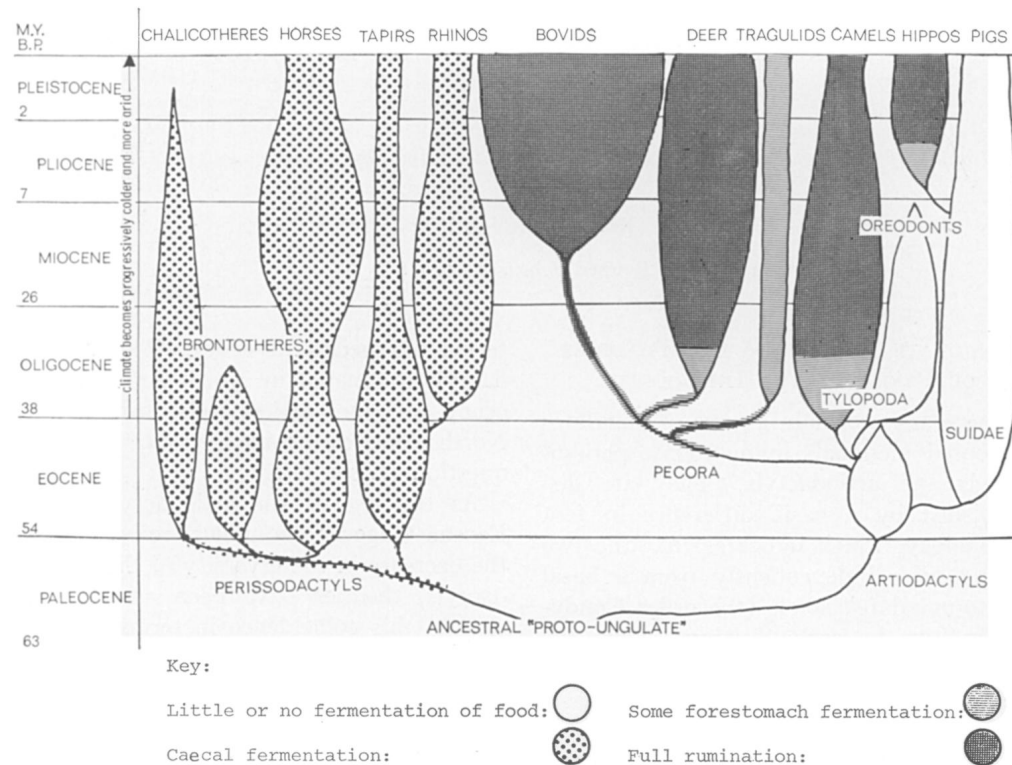
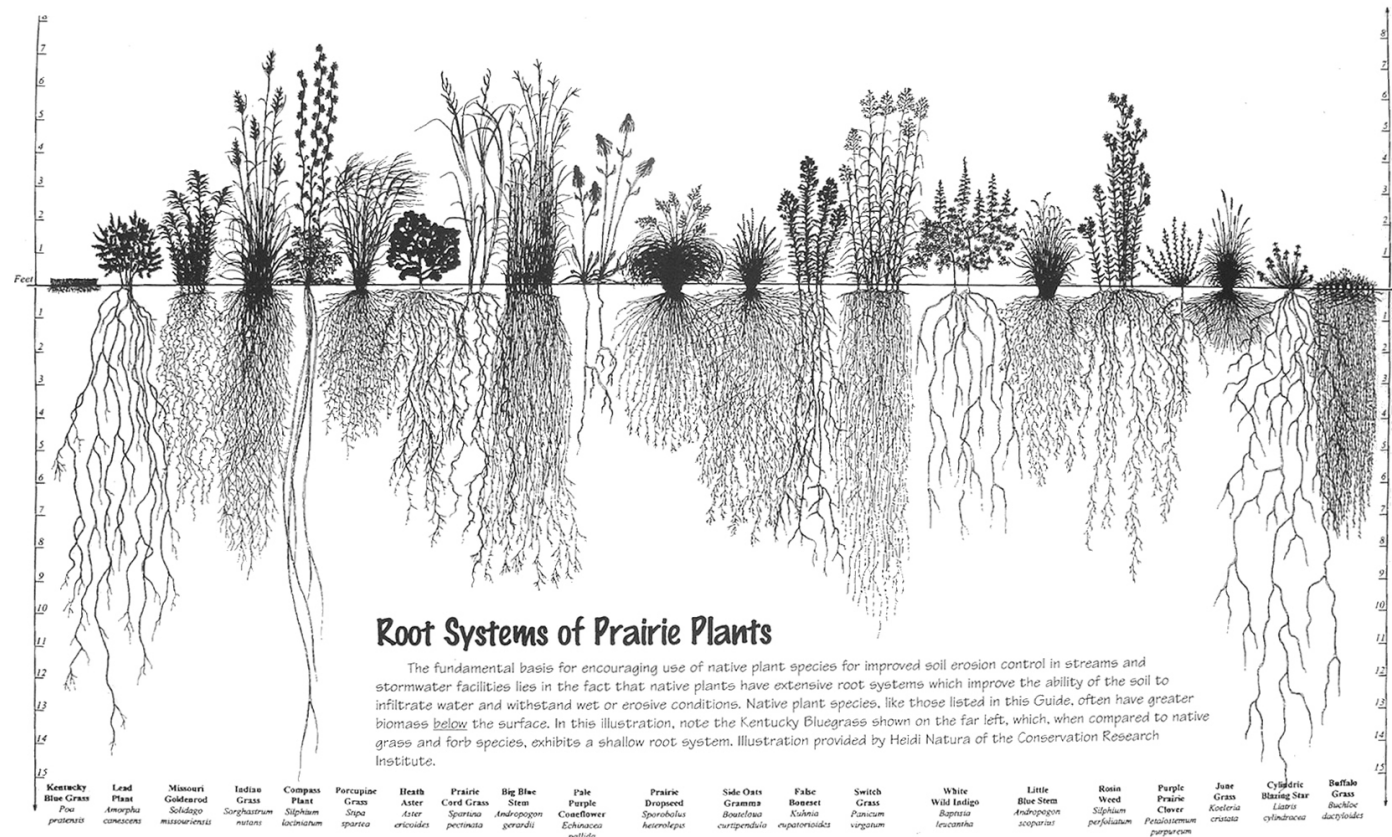


FIG. 1. Simplified diagram of ungulate evolution during the Tertiary. Width of envelope indicates approximate compromise between species diversity and number of individuals. See text for discussion of digestive modes in fossil ungulates.

- Horses were first
- Fed on soft and reproductive parts of plants in tropical forests. First ruminants in marginal areas
- Climate change: cold and dry
-> grasses developed -> seasonal growth of grasses
- Ruminants started to dominate: rumen versus cecal digestion

Evolution of Grasses

Grazing influences grass growth, grass development, weeds (rootstocks like kweek) and survival strategy



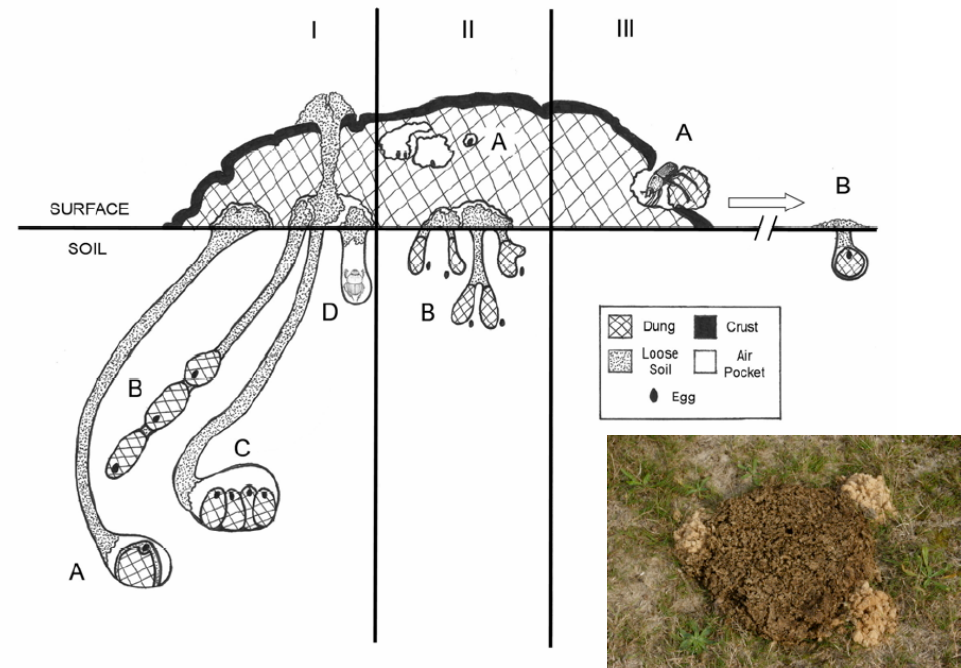
The root exudation explosion!!
Grazing -> roots release sugars to activate soil life -> mineralization of organic matter increases -> grasses start regrowth

The ethylene release of acacia leaves after grazing by animals or insects

The low growing point of grasses as adaption to grazing?

More biodiversity with grazing

- Digestion of dung pads
- Dung pads provide meadow birds food
- Diversification of grasslands by grazing, trampling, selection
- If no grazing: increase of rootstock weeds
- How to use the 'marginal' lands (peat, dry savannah, toendra's etc)



Figuur 2: Indeling van mestkevers naar levenswijze in de mest (uit Bertone et al., niet gedateerd).

I: Tunnelers

- A - Eén tunnel met één broedkamer met één mestbol met daarin een ei.
- B - Tunnel met verschillende mestballen met elk een ei.
- C - Tunnel met meerdere mestballen in een broedkamer.
- D - Juvenile kever graaft zich uit de tunnel, waarbij de vrijkomende bodem door de mestkorst wordt heen geduwd.

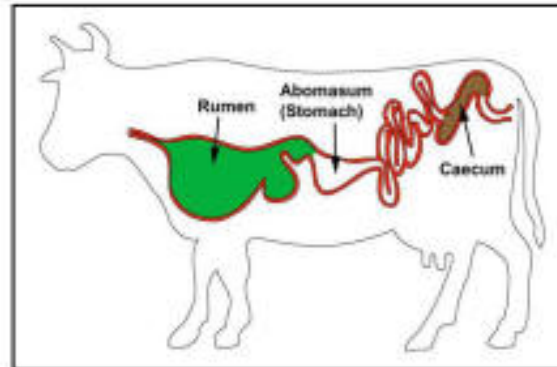
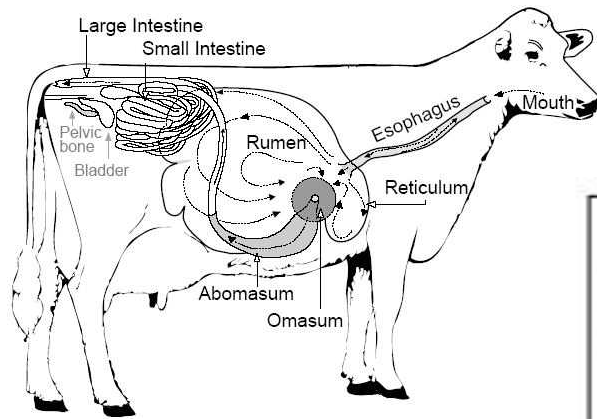
II: Dwellers

- A - Individuele of groepen van eieren gelegd in de mest zelf (al dan niet in luchtbellens of gegraven tunnels).
- B - Eieren direct onder de mestflats gelegd in de grond met daarnaast voorraad mest voor ontwikkeling.

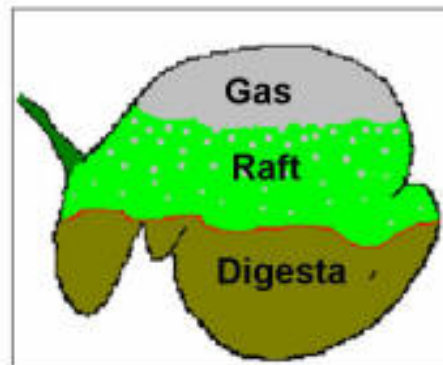
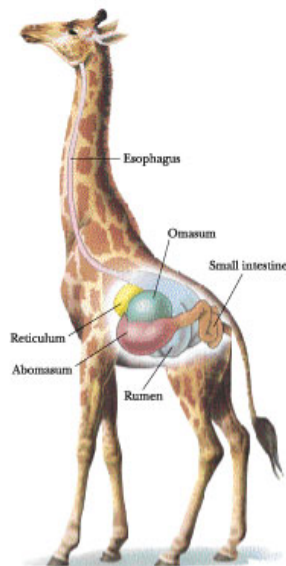
III: Rollers

- A - Uitgraven van mest en het vormen van een mestbal.
- B - Het wegrollen van een mestbal en ondiep begraven in de omgeving. De eieren worden in de mestballen gelegd.

Digestive track of cattle



Size: 100 – 150 l capacity
 Temperature – 39 °C
 Saliva: 100 - 150 l/day
 Gas: 30 – 50 l/h
 Bacteria: 5×10^9 ml⁻¹
 Protozoa: 5×10^5 ml⁻¹
 Fungi: 5×10^4 ml⁻¹

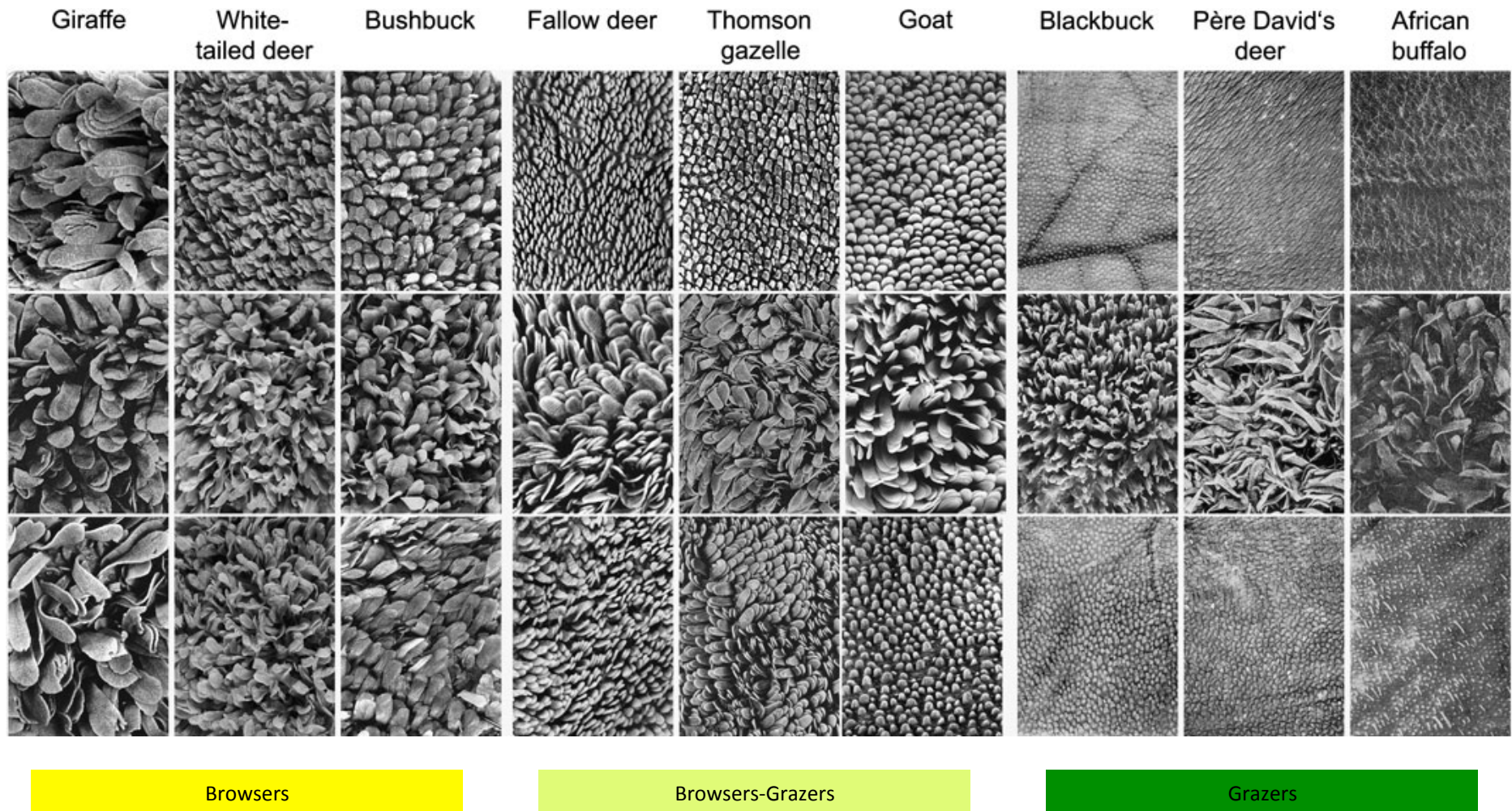


Temporal pattern of grazing behaviour



■ Grazing ■ Ruminating ■ Idling

Figure 6 Samples of mucosa from the dorsal rumen (top set), the atrium ruminis (middle set) and the ventral rumen (bottom set) of nine ruminant species. Note that while the atrium ruminis is always heavily papillated, papillation of the dorsal and ventral wall appears to decrease from the browsing species (left) to the intermediate feeders (centre) and the grazers (right) (from Clauss *et al.*, 2009c).



Source: M. Claus *et al.* 2010. Evolutionary adaptations of ruminants and their potential relevance for modern production systems. In *Animal* (2010), 4 : pp 979-992
http://foreignpolicybulletinmonitor.com/action/displayFulltext?fromPage=online&type=6&fid=S1751731110000959&aid=7791474&next=true&jid=ANM&volumeld=4&issuelid=07&next=Y#cjofig_fig9

Understanding the animal's consciousness / soul



What is happening with the introvert cow when it goes out, after wintertime, for grazing?

<http://www.youtube.com/watch?v=f-ENDzHM2p4>

Koeiendans at the Beekhoeve!



What is an animal?

The four kingdoms of Goethe



stone

plant

animal

human

The Four Kingdoms of Goethe

	Mineral	Plant	Animal	Men
Life	dead	living	feeling group conscious ness	ego self conscious ness
Awareness	dead	sleeping	dreaming	awake
Assessment	thing	process	value	aim
Communication	no	grows	moves	speaks
Sciences	maths chemistry	biology physiology	psychology sociology	philosophy ethics
Welfare	body damage	illness & plagues	specific behaviour	identity

- Does the cow oversee / realise the consequences of her choice?
- Animals do not fight for their own rights
- Animals are always 'willing' to adapt to a certain situation
- Dieren 'zijn' wat mensen 'hebben'

Animal Rotation

Animal rotation/
mixed grazing
just as crop
rotation

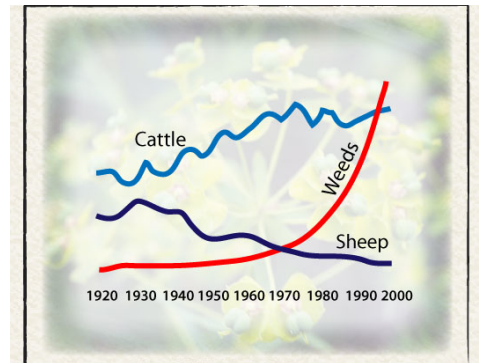
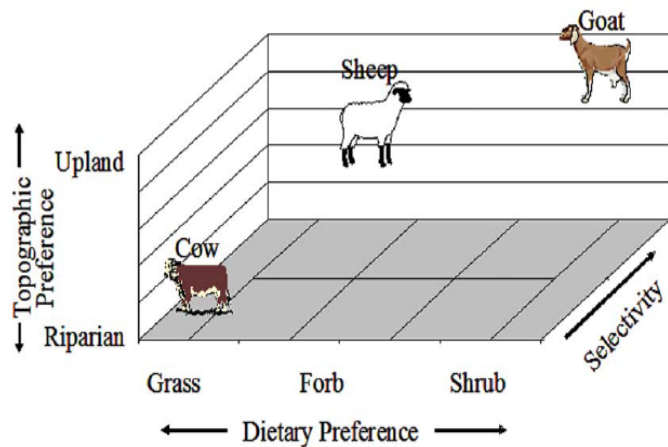
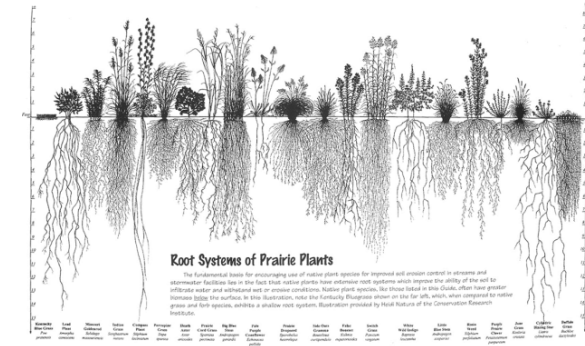


Figure 4.4 Grazing sequence in a savanna: Elephant, buffalo, zebra, hartebeest, Mongalla gazelle, Egyptian goose. For explanation see text. (or.)



Animal rotation/ Mixed grazing



The X axis of this three-dimensional depiction of the relative dietary habits of cattle, sheep, and goats shows the relative preference for grass, forb, and shrub. The Y axis shows increasing ability to select higher quality components from diverse vegetation. The Z axis shows preference from low riparians to upland hilltops (John W. Walker et al., 2006).

<http://www.cnr.uidaho.edu/rx-grazing/Handbook.htm>

Crop rotation: better use of minerals, disease control, building and using of organic matter

Animal rotation: better use of vegetation, animal disease control, organic matter build up

Pure Graze for Cows

Conventional Dairy:

- Factories want milk throughout the year -> calving also throughout the year -> feed conservation for winter time -> fertility problem solved by hormones
- Working against natural processes

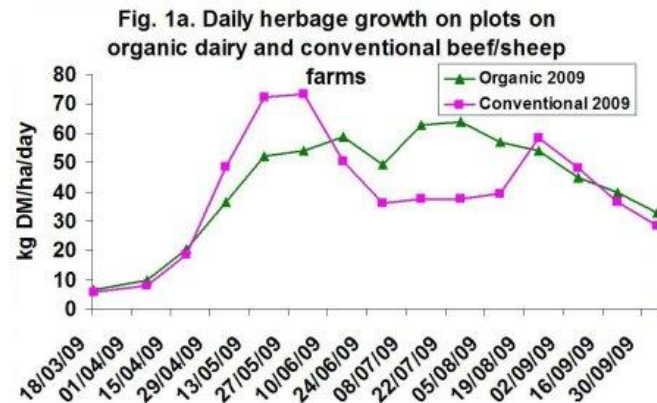


Pure Graze Dairy:

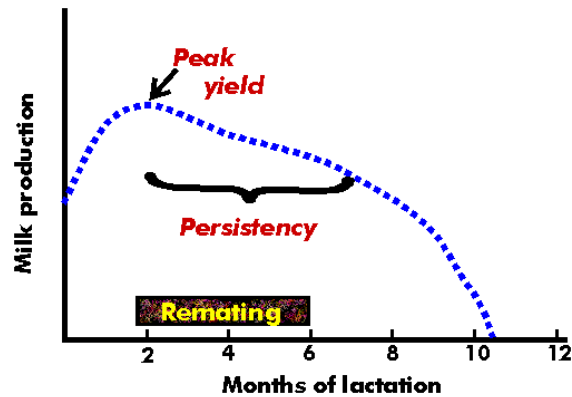
- Natural milk production after calving in spring -> cows dry in the wintertime -> less conservation of fodder -> less fertility problem
- Working with natural processes
- Sources: www.puregraze.com/ and www.eatwild.com

Pure Graze

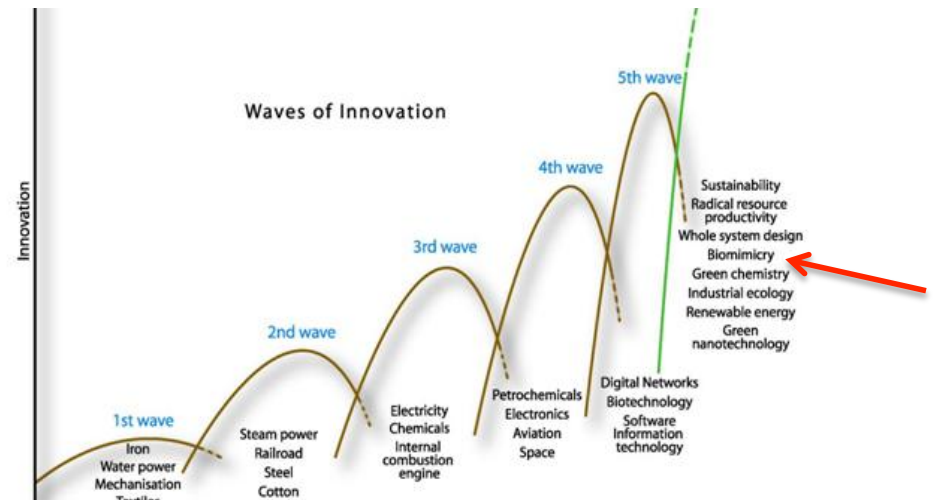
Using the natural ritmes of grass growth and lactation



Grass clover growth



Lactation curve



To graze or not to graze?



"Het is de simpele waarheid dat koeien van nature dol zijn op het eten van gras", zegt Jim Regli, eigenaar van één van de boerderijen waarop 'Organic Valley Grassmilk'-koeien grazen.

Use the digging behaviour!



Pigs are excellent in removing not harvested potatoes!

Chicken tractor



Layers or broilers can use the pasture after dairy cows to graze the left overs and the cowpatches on seeds, insects and larvae of insects

My conclusions

- Cows need to graze, pigs need to root and chickens need to scratch and peck. These emotions should be satisfied. Outdoors and not indoors!
- It is not so much a matter of 'better welfare', but far more a matter of 'natural evolution', 'intrinsic value of animals' and 'mutual dependency / cooperation'
- The (scientific) challenge is: How to work together with the natural forces, with evolution, in stead of controlling nature by scientific techniques?
- Mixed grazing / animal rotation is underdeveloped