System innovations
Cow Power

MAD Aeres Applied University

Dronten

Maarten Vrolijk

November 9th 2016

Livestock Research

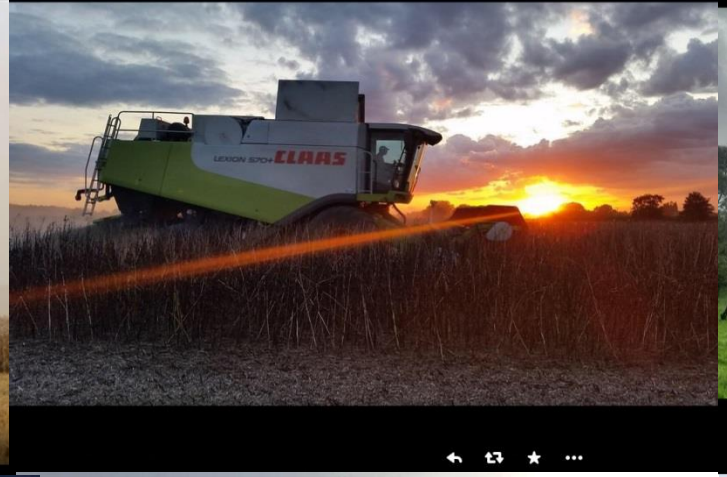
WAGENINGEN UR
For quality of life

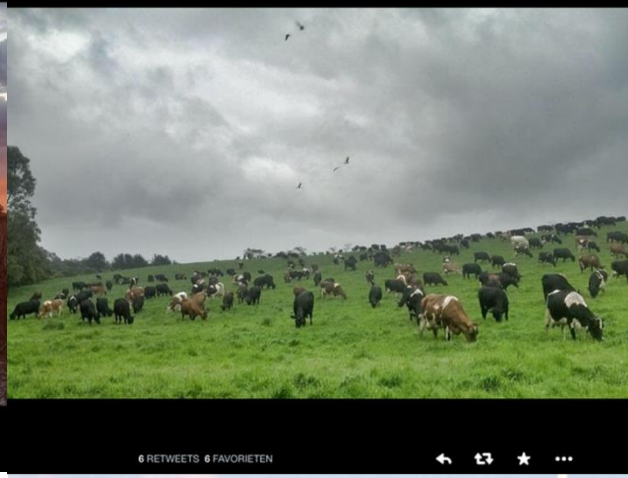
Agenda

- Feeding the world
- Sustainability
- System innovation
- Different ways to produce knowledge
- Cow Power


NEW HOLLAND


CLAAS
CLAAS
870
JAGUAR
Veenhuis


CLAAS


6 RETWEETS 6 FAVORIETEN


6 RETWEETS 3 FAVORIETEN

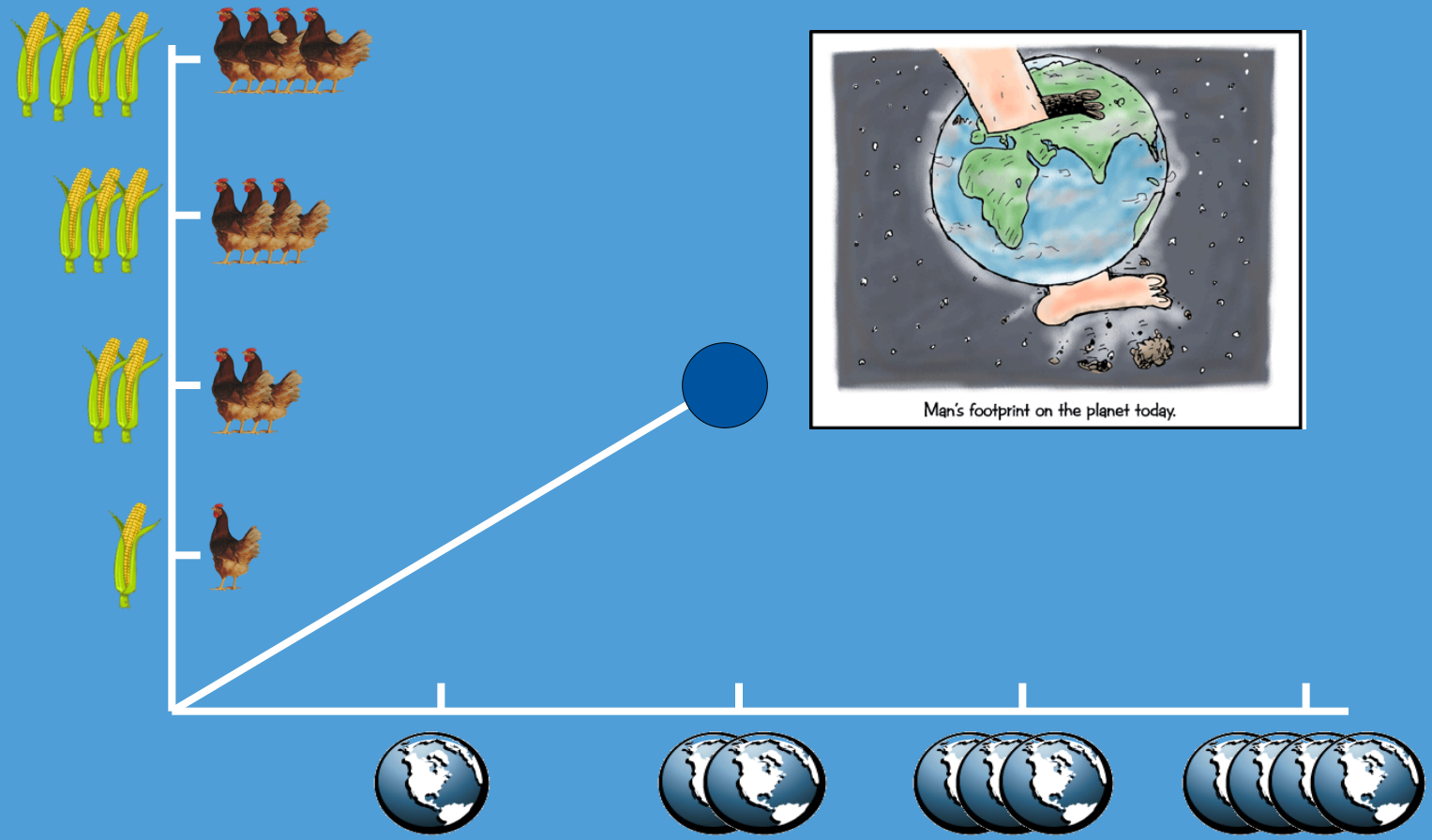

5 RETWEETS 6 FAVORIETEN

Earth overshoot day

- Earth Overshoot Day = the day we have used all the resources for that year

- 1992 → October 21
- 2002 → October 03
- 2012 → August 22
- 2014 → August 19
- 2016 → August 08

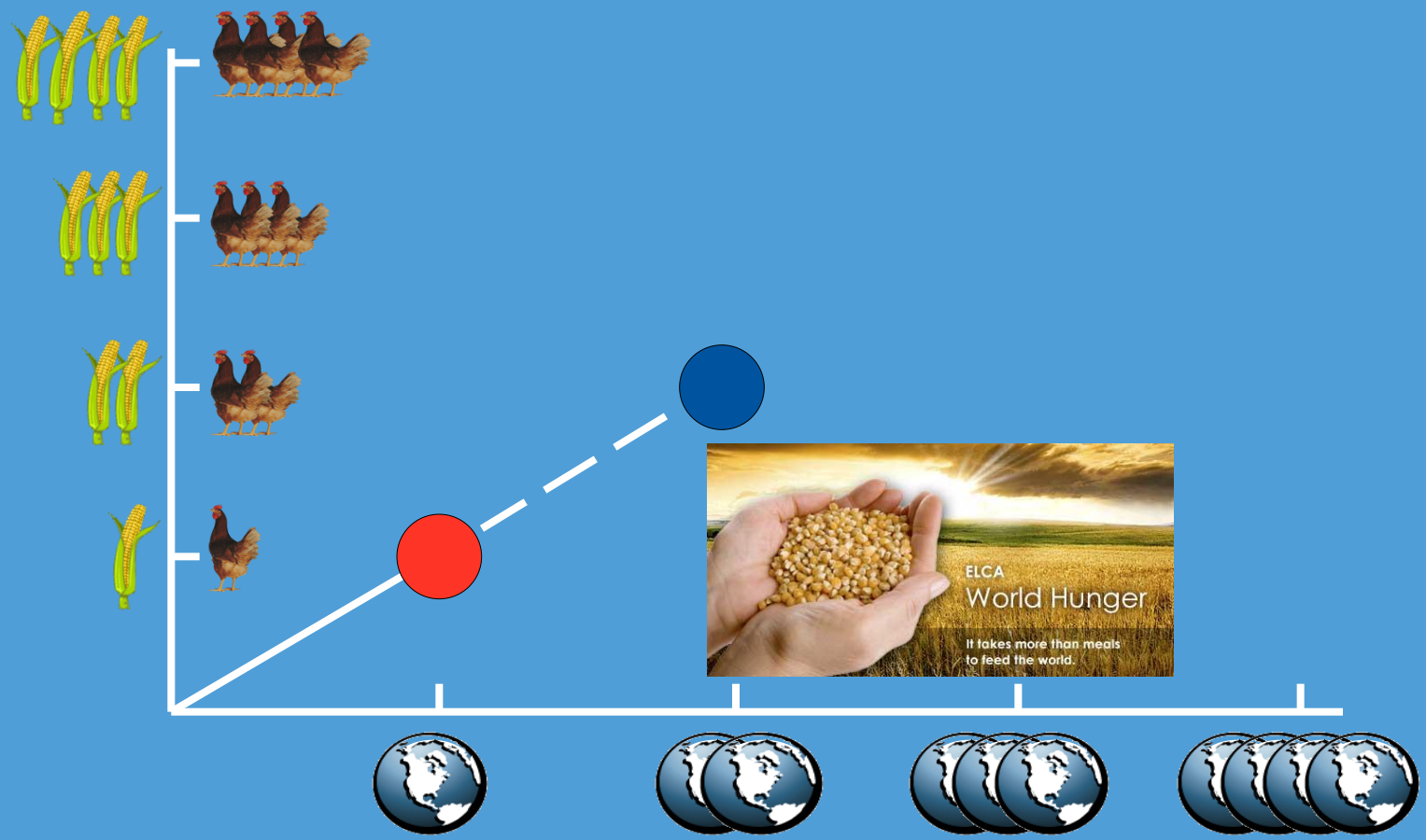
We are exceeding the carrying capacity



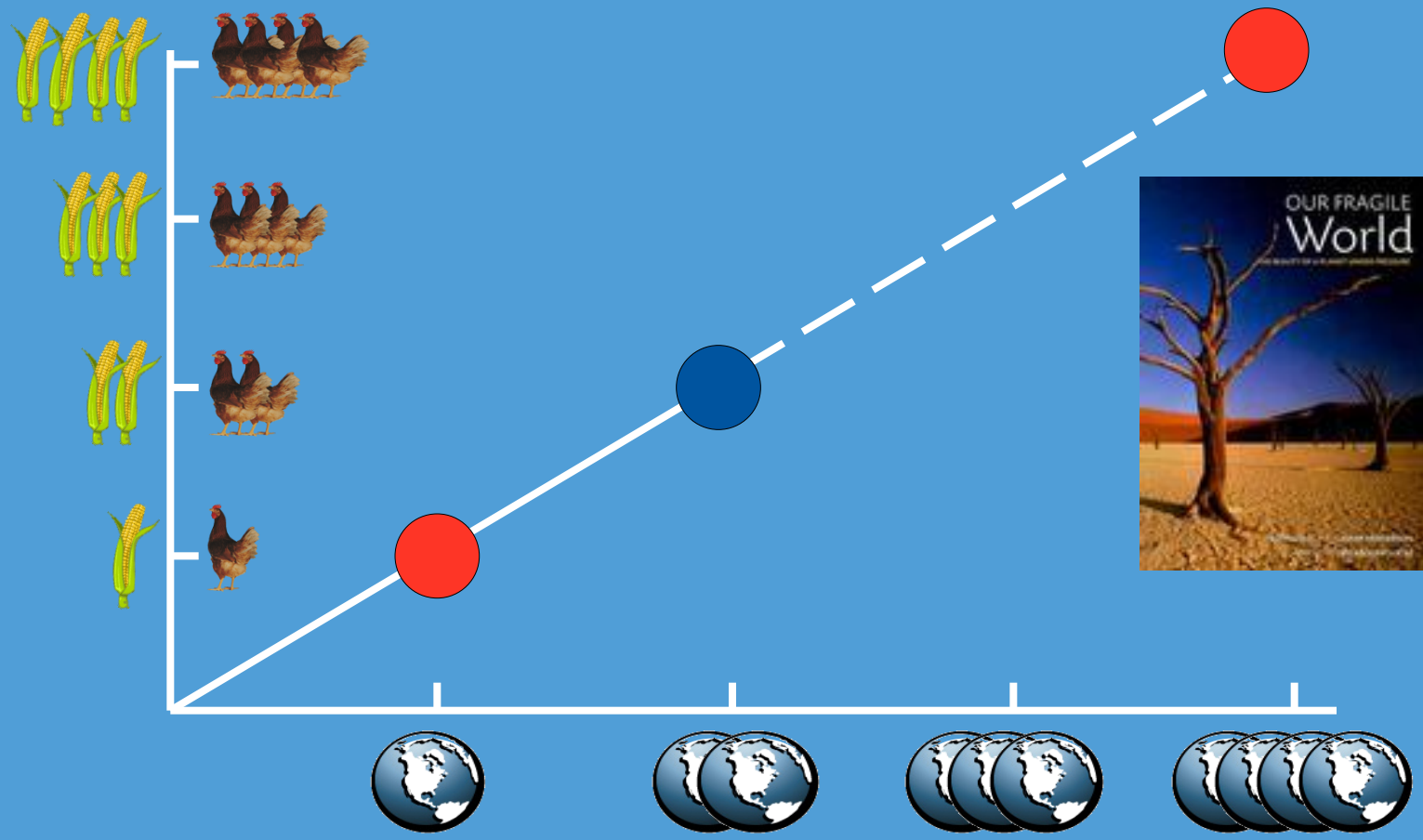
World Population (1965 – 2050)

Source: Population Division of the Department of Economic and Social Affairs of the UN (2007)

Just reducing the production creates a problem



Just increasing the production is not an option




793F
CAT
5227


NEW HOLLAND

20:54 53%

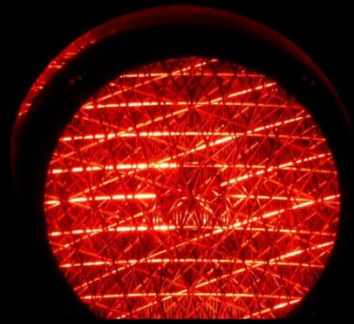
3 RETWEETS 1 FAVORIET

TractorPicsDaily @TractorPictures 21-08-14
#towing #big

3 RETWEETS 10 FAVORIETEN


16 RETWEETS 7 FAVORIETEN


20 RETWEETS 24 FAVORIETEN



Acceleration of Sustainable Animal Husbandry

‘The burden is no longer acceptable for society’

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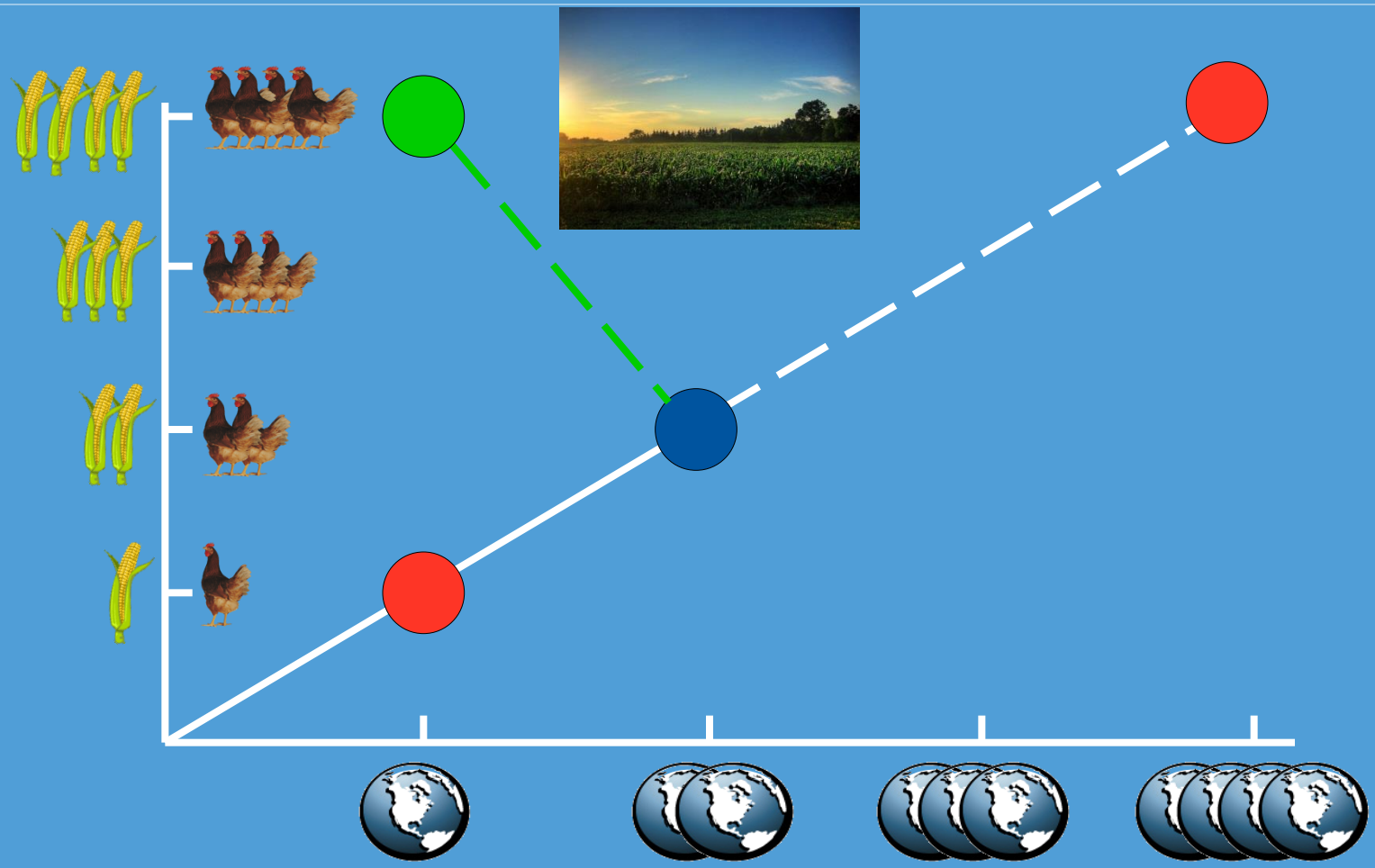
For quality of life

But we can make a shift in another direction



A double task is a challenge for all of us!!

Feeding the world within the carrying capacity of planet earth

2 x 2

- Doubling Production
- Halving Ecological Footprint

Like us on Facebook

In the media

Aus Food News: 'Meat look-alikes from vegetables swallow up Europe'.

NOMINATION MVO AWARD 2014

MVO NEDERLAND AWARD

Tweets

Follow

Vegetarian Butcher 42m
@Vegebutcher

"Brook Headley hopes vegetarianism becomes a mass epidemic: fandw.me/1snr5HO @workingpastry pic.twitter.com/ddxUOF3vmF"

Signals

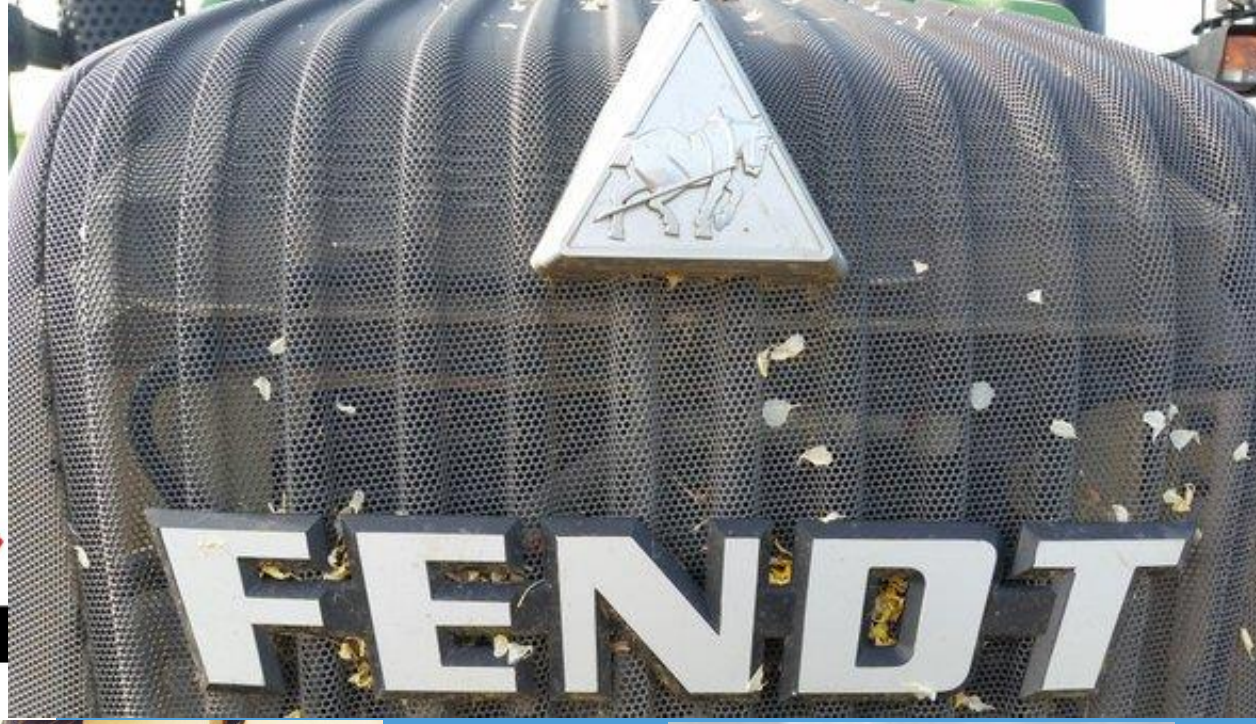

BIO &
VEGAN
DE VEGETARISCHE SLAGER®
WINNAAR SMAAK VAN NL
Bio Bamischijf
200 gram - 2 stuks
DIEPVRIES

Signals


unox
Vegetarische gehackt balletjes
IN SATÉSAUS
DE VEGETARISCHE SLAGER
Per portie (40 g):
323 kJ
77 kcal
4%
Per 100 g:
807 kJ / 192 kcal
400 gram

Signals

Dieselross
TRACTOR



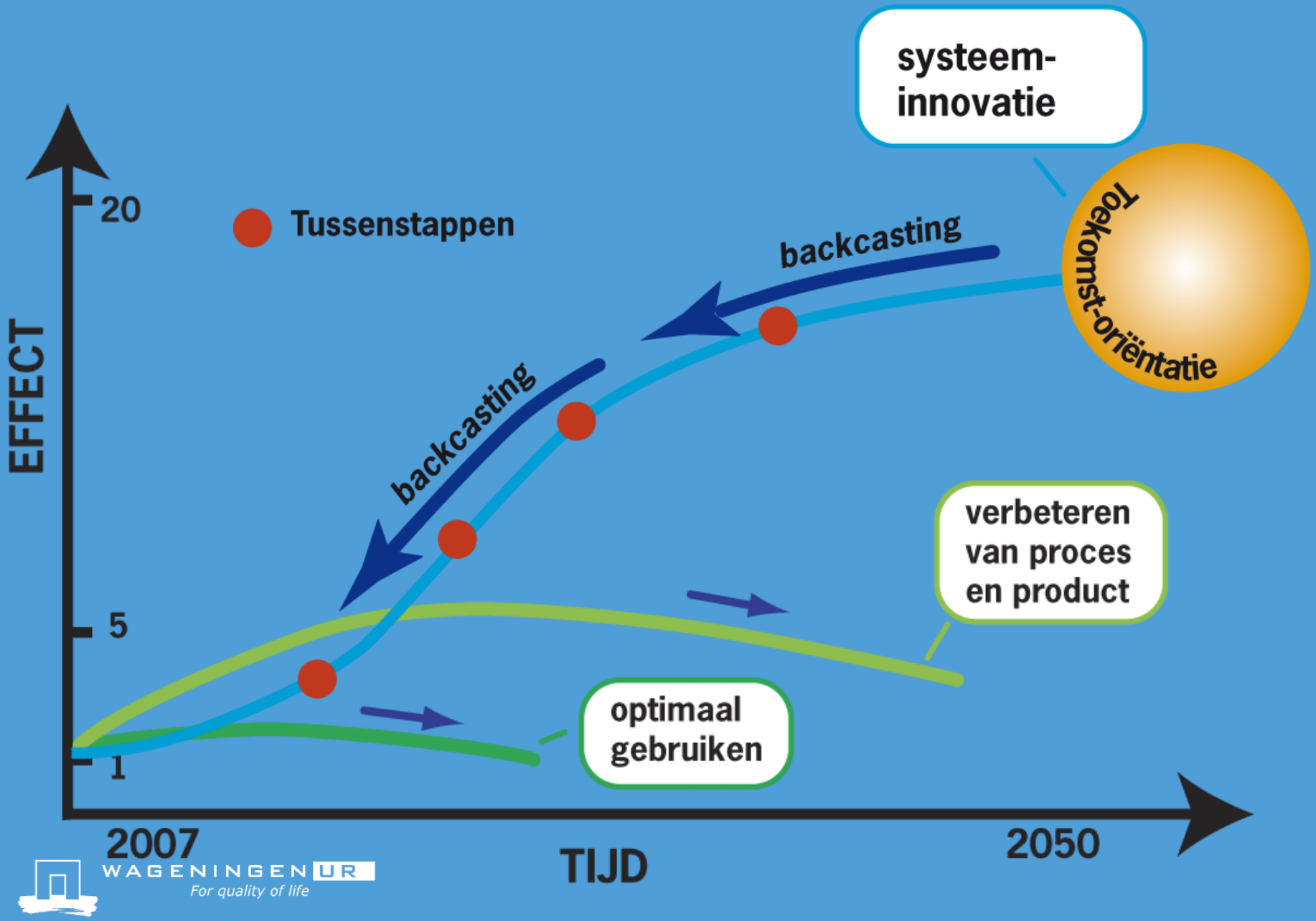

FENDT

Sustainability

What is your definition of sustainability?

Definition Brundtland:

"Sustainable development is development that meets the *needs* of the present without compromising the ability of future generations to meet their own *needs*."



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System innovation

- Multi actor
- Multi level
- Multi disciplines
- Co-creation

- We cannot solve our problems with the same knowledge and way of thinking we used when we created them

  Albert Einstein

Innovation quick test

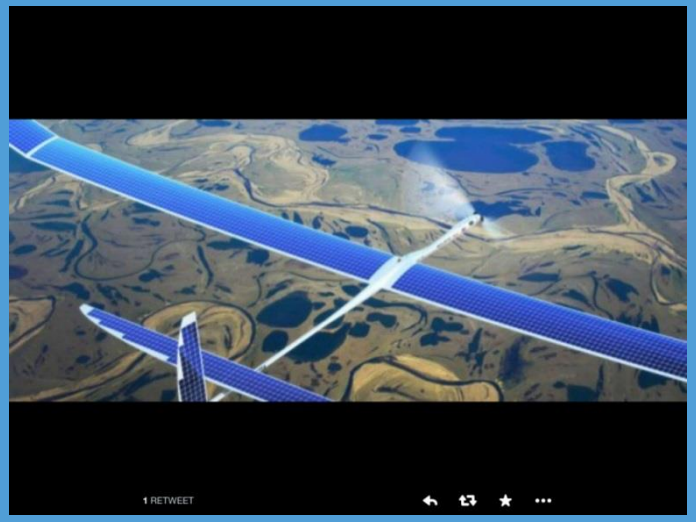
- Flower
- Piece of furniture
- Color


© 2001 KenRockwell.com


7354
7354

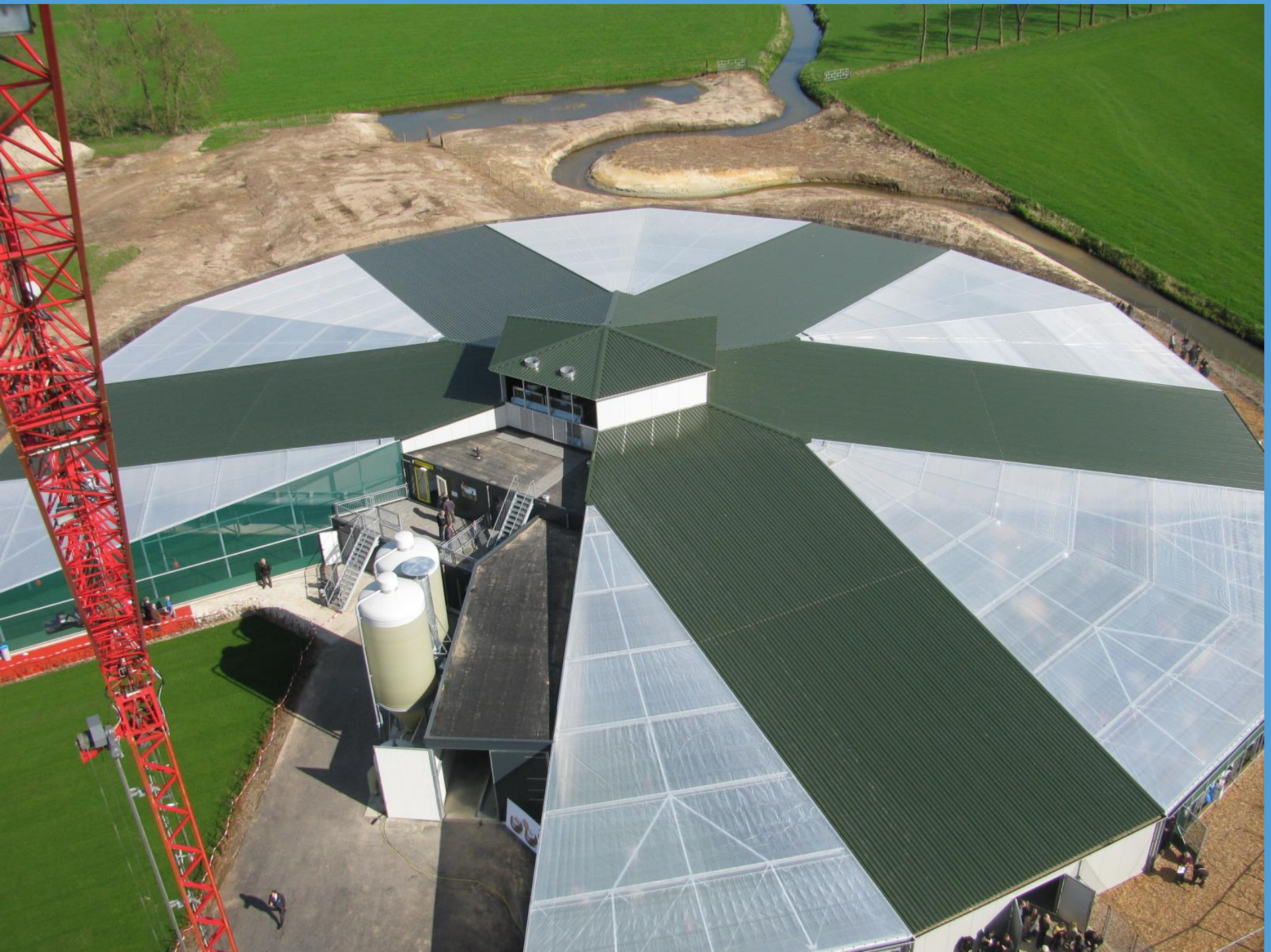
Robot Cowboys replace dogs and cowherds - Newlaunches

Robot Cowboys replace dogs



Animal Husbandry Network


LELY LUNA



Windstreek

Het Kwatrijn

de melkveestal van de toekomst

Contact K
H
antonissenadv
+

SWAANS BETON

JOZ

AANNEMERSBEDRIJF VAN DE SANDE BV

VISTA

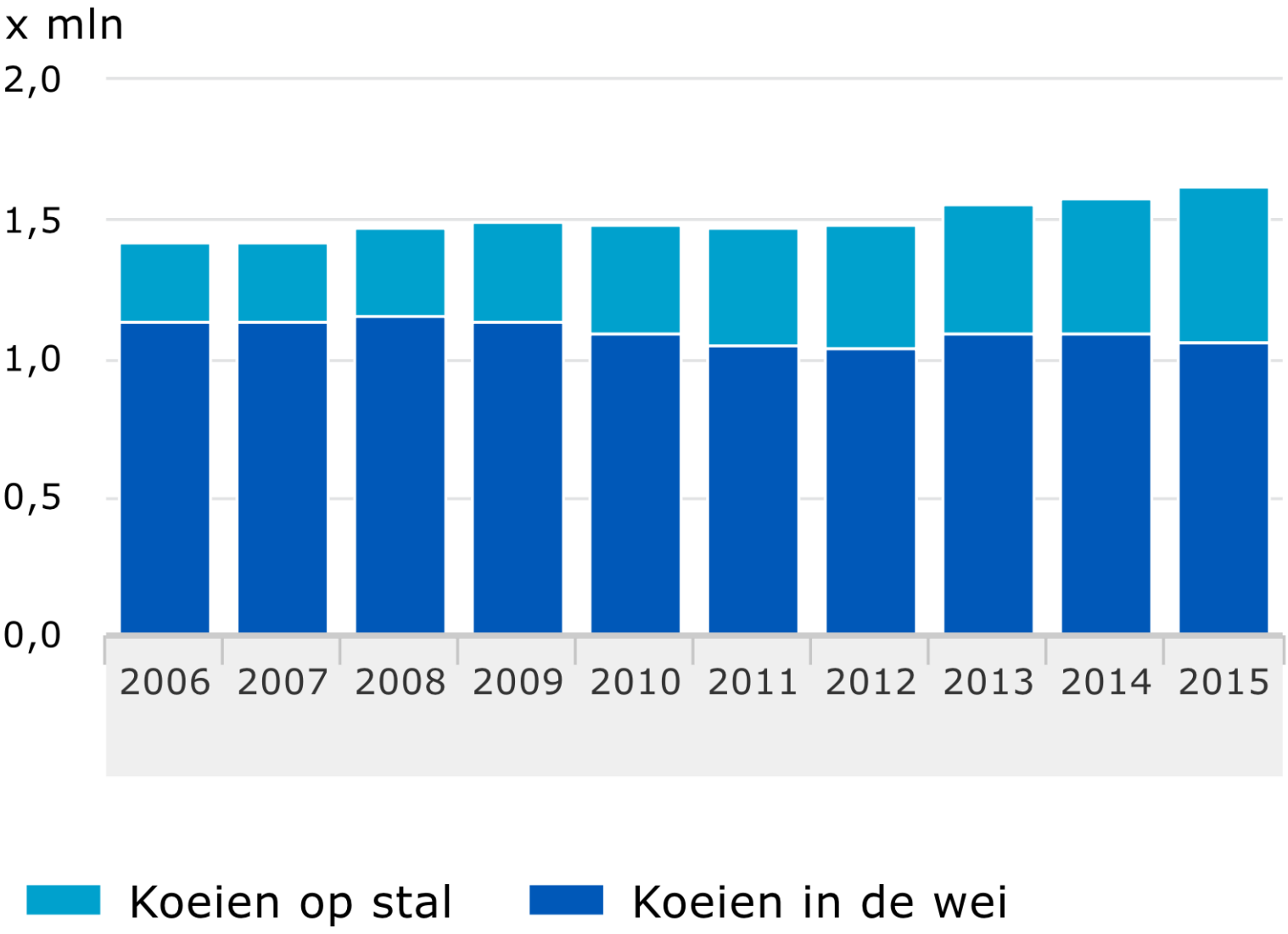
Sjaak Sprangers melkveehouder

ZLTO

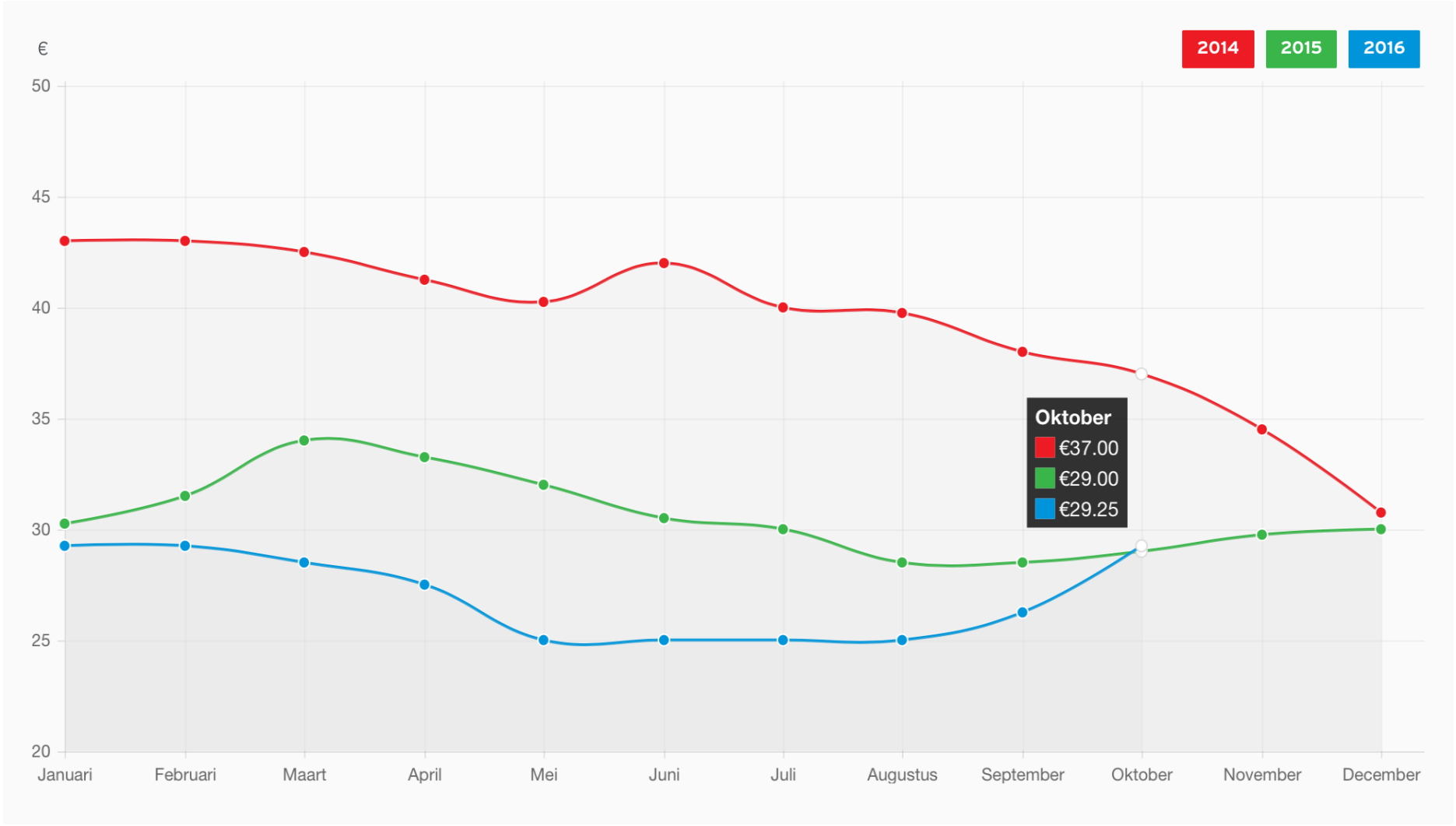
LIVEST

Concept

Beweiding




Biologisch
rundvlees



Garantieprijs per maand


Backspace
Dutch
Page Up
Home
Page Down
Insert
Shift


ProViva
Vanilj
lätt yoghurt
Yoggi
ACTIVIA
drick! yoghurt
frukt yoghurt


Trouw Duurzame 100
4
De keurmerkjungle
@De_Zwijger
#trouwduurzame100
Trouw
100
PAKHUIS DE ZWIJGER

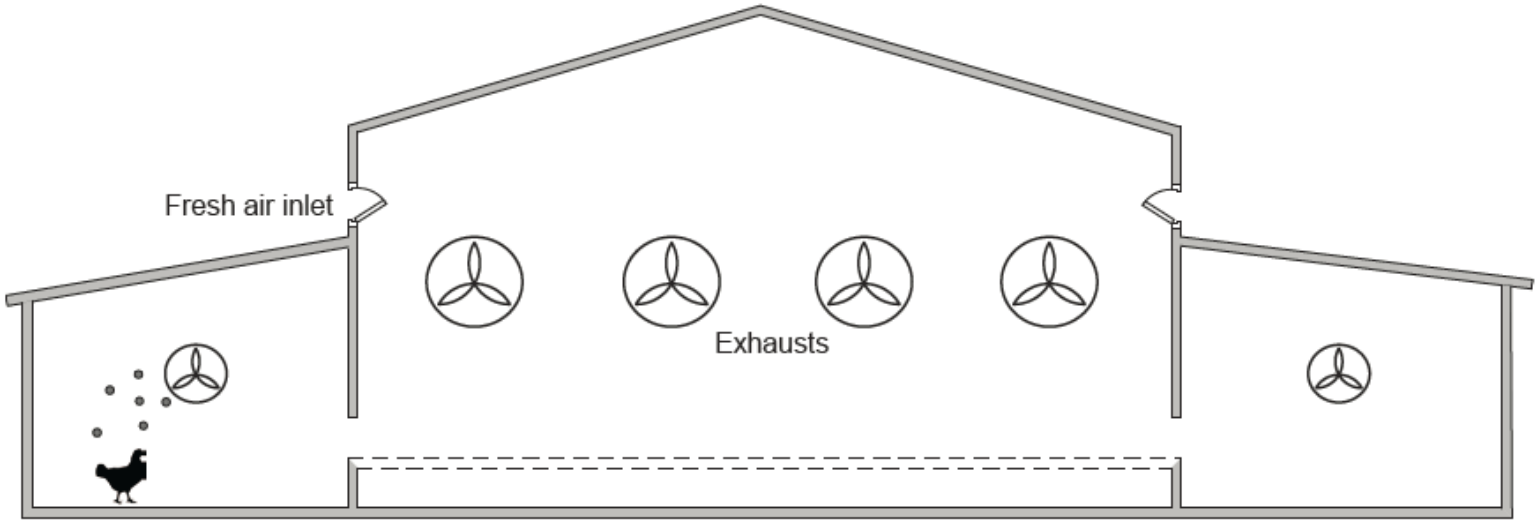

De keurmerkjungle
Beter Leven
HALAL
FAIRTRADE
kippenvlees
rundvlees
MSC
www.msc.org
asc
CERTIFIED
VIS


Foto: Yolanda Gaona

Dust concentrations and emissions: major concern in laying hen houses

- EU ban on battery cages > shift towards loose housing on litter floors > emissions of PM_{10} in NL increased with a factor 17 (1995 to 2014) (Winkel et al., 2016)
- Effects on residents in farming areas: increased prevalence of pneumonia, lower lung function, more exacerbations and medicine use in COPD patients (Heederik et al., 2016)
- Animal welfare problem swapped for air quality problem! (Winkel et al., 2016; Proposition nr. 1)

Combating dust in laying hen houses by integrated system design



Litter room
- Functions: dustbathing and scratching
- Minimal ventilation rate required for the birds and litter quality
- Use of further low-PM design principles and abatement systems inside and/or at exhaust

Main room with slatted floors and aviary frames (no litter)
- Functions: feeding, drinking, laying, and resting
- Low PM concentration
- Main ventilation rate
- No abatement of PM needed

Source:
Winkel, A. (2016). *Particulate matter emission from livestock houses: measurement methods, emission levels and abatement systems*. PhD Thesis (dissertation), Wageningen University.

Combating dust in laying hen houses by integrated system design

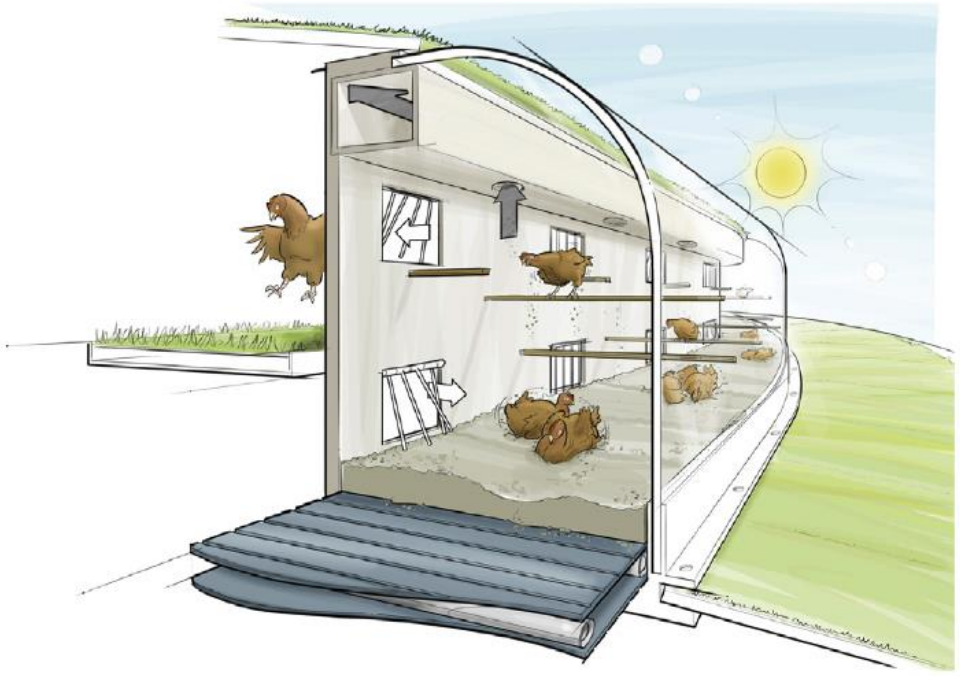


Fig. 2 – Dust bath unit for laying hens with one-way entrances to sand or turf on conveyor belts at the bottom, and perches that enable hopping to one-way exits in the top. Transparent walls let sunlight in and makes dust bath behaviour visible from the outside.

Source:

Van Weeghel et al. (2016). Involving the animal as a contributor in design to overcome animal welfare related trade-offs: The dust bath unit as an example. *Biosystems Engineering* 145:76-92.

Agenda

- Feeding the world
- Sustainability
- System innovation
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- Cow Power

Knowledge-co-creation

- **From**
  Knowledge production in univeristy / applied research and advisors streaming information to farmers

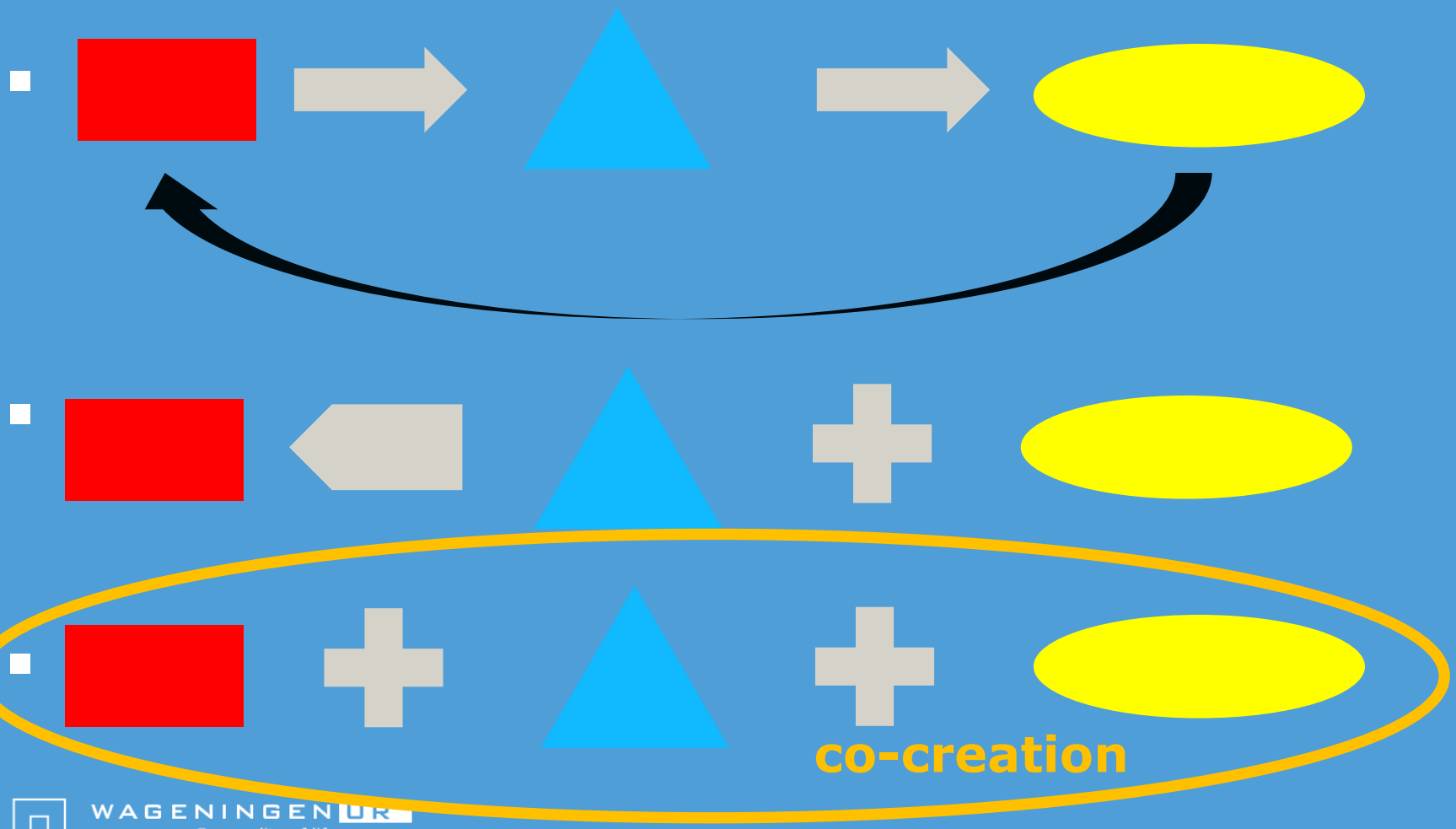
- **To**
  Knowledge production in the same context as the knowledge is used, in dynamic and semi-permanent networks (co-creation)

Critical successfactors co-creation

- Knowing new roles of each other
- Respect for each other and roles
- Common goal, all actors active
- Common language
- Joint reflection and learning
- Continuous efforts in creating learning environment
- Needs more time and effort than espected, point of trouble
- Celebrate success

Working together

- Researcher Extension -worker Producer/Farmer



Critical successfactors working together

- Knowing new role of each other
- Respect each other
- Common goal, all actors active
- Common language
- Joint reflection and learning
- Continuous efforts in creating learning environment
- Needs more time and effort than espected, point of trouble
- Celebrate success

Working together: innovation and learning

- Take time for learning (knowledge and process)
- Feel safe and comfortable, to think out of the box / to say *I do not know*
- Everyone contributes on learning 'climate'
- Free actor has extra focus on this
- Equal does not mean: a copy
- Be aware of all communication languages

Networks: what's so special?

Networks in animal husbandry

- 2004 - 2007
- 125 networks of > 3 farmers and other actors
- 35 knowledgeworkers (knowledge, process, movement)
- More sustainable agriculture
- Knowledge-co-creation, new arrangements
- Farmers articulate the topics, not the researchers
- No theory or approach, but ambition to bridge the gap between research and farmers

Free actor

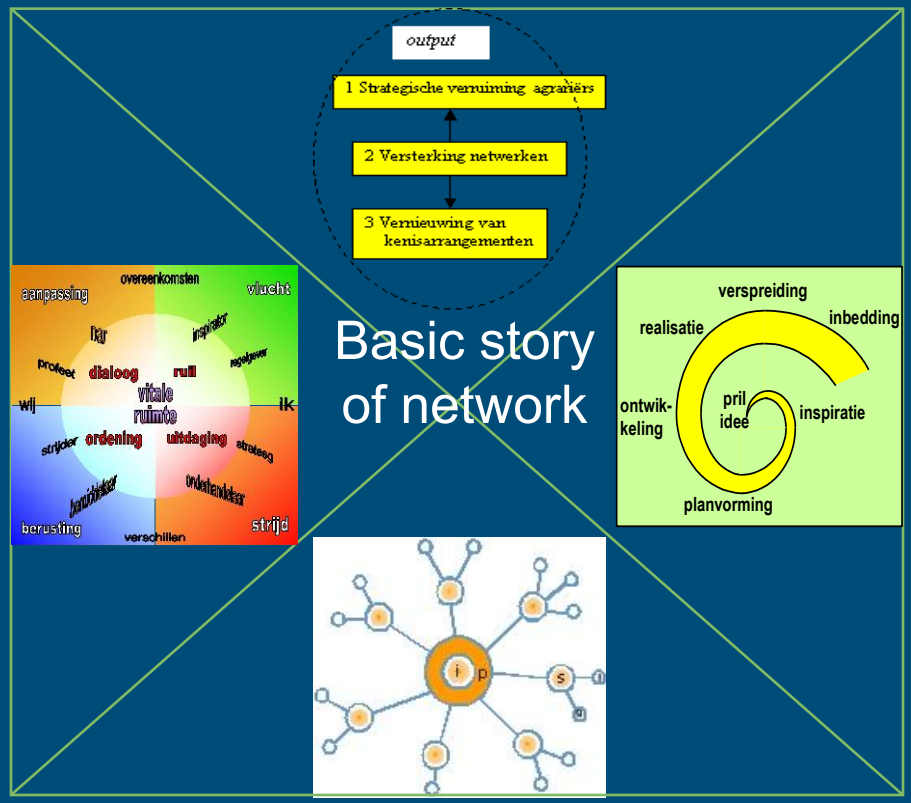
- Knowledge worker (Wageningen UR and other organisations)
- Involved in network but not a member!
- Link to other sources/networks of knowledge
- Reflection and learning process
- Coaching network members but never in the drivers seat
- Other competences needed than usual

Output and results

- Permanent coöperation of researchers and farmers
- Results of some networks communicated to >20.000 farmers in EU
- Every week E-communication to 5000 subscribers
- More usable knowledge for sustainable animal husbandry
- Tools and FAN-approach used in courses (~100 trainees in different domains)
- 2008 – 2010 continued by LNV
- Journal of Agricultural Education and Extension (vol15-2)
- IFSA 2008

Methods for reflection & learning

Effectmonitor



Circle of coherence

Basic story of network

Spiral of innovation

Timeline

Learning History

Networkanalysis

Journal of Agricultural Education and Extension
Vol. 15, No. 2, 205–217, June 2009

Routledge
Taylor & Francis Group

Language and Tools for Networkers

EELKE WIELINGA and MAARTEN VROLIJK
Wageningen University and Research Centre, Wageningen, The Netherlands

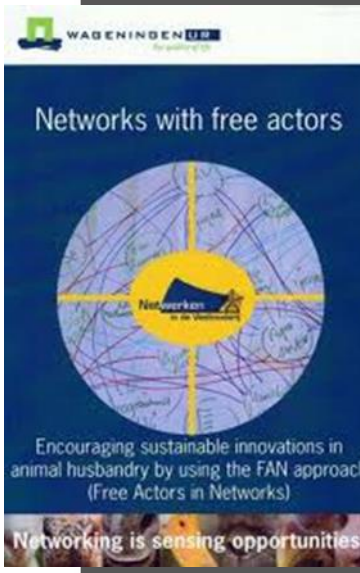
ABSTRACT *The network society has a major impact on knowledge systems, and in agricultural and rural development. It has changed relationships between actors such as farmers, extension workers, researchers, policy-makers, businessmen and consumers. These changes require different language, concepts and tools compared to the time that it was thought that science led the way and new findings had to be disseminated to target groups. Also the language of the market, talking about clients and knowledge producers, demand-driven systems and calculable results, is insufficient to describe what actually happens in innovative farmers' networks or to guide knowledge workers in what to do for speeding up such processes. This article describes experiences from a large scale experiment in the Netherlands: the 'Networks in Animal Husbandry' programme (2004–2007). The basic idea was to ask farmers to come up with innovative ideas that could help the sector farther along the track of sustainable development, and then to assist them with scientific expertise. The facilitators were embedded in a learning community and provided with language, tools and methods that grew along the way. After a total of 120 networks and many peer consultation meetings with the facilitators, a huge number of experiences have been registered. Their work required a new generation of tools: as 'free actors' they had to learn how to navigate in unknown areas, recognise at any moment what was at stake and intervene appropriately. The FAN approach emerged: Free Actors in Networks.*

KEY WORDS: Innovations, Linkages, Knowledge infrastructure, Networks, Facilitation

The Experiment: Networks in Animal Husbandry

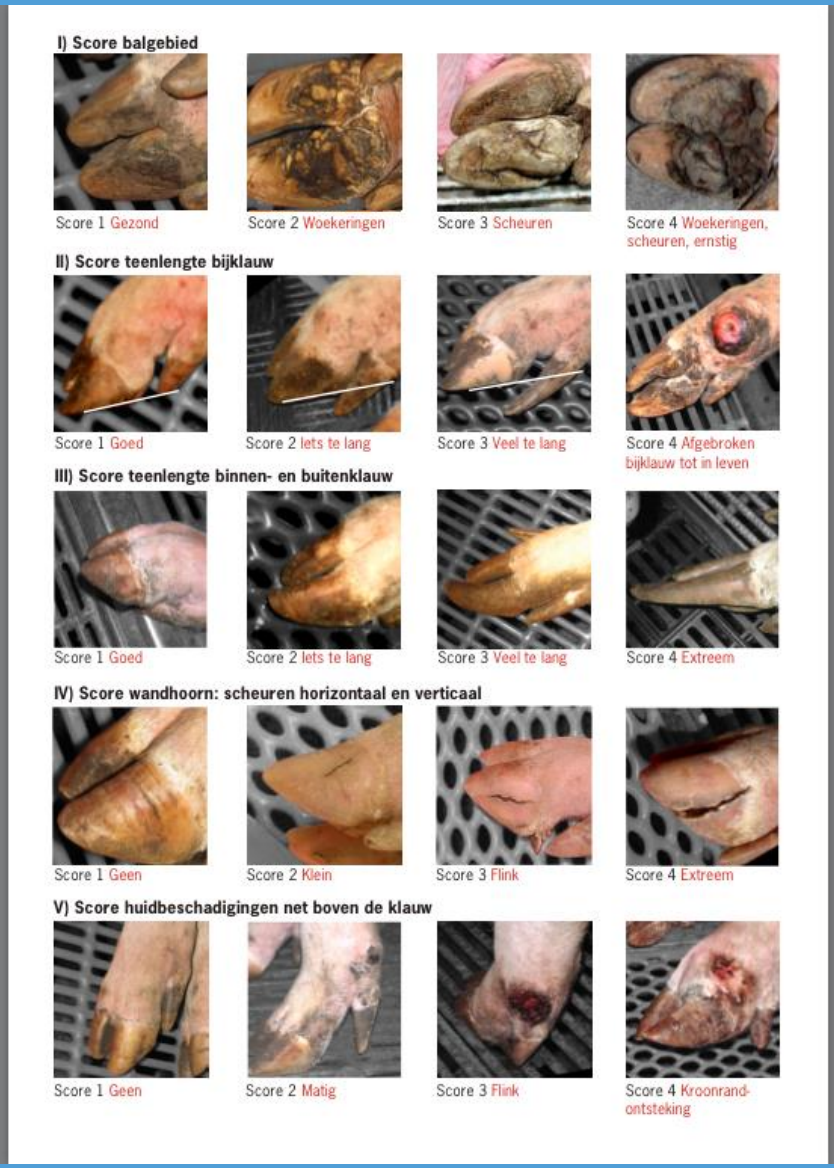
Basic Features

In 2003, awareness was raised amongst researchers and policy-makers that, for a more sustainable animal husbandry, it would be necessary to stimulate cooperation between many actors who would have to engage in a process of knowledge co-



Animal Husbandry Network

Animal Husbandry Network



I) Score balgebied

Score 1 Gezond | Score 2 Woekeringen | Score 3 Scheuren | Score 4 Woekeringen, scheuren, ernstig

II) Score teenlengte bijklauw

Score 1 Goed | Score 2 Iets te lang | Score 3 Veel te lang | Score 4 Afgebroken bijklauw tot in leven

III) Score teenlengte binnen- en buitenklauw

Score 1 Goed | Score 2 Iets te lang | Score 3 Veel te lang | Score 4 Extreem

IV) Score wandhoorn: scheuren horizontaal en verticaal

Score 1 Geen | Score 2 Klein | Score 3 Flink | Score 4 Extreem

V) Score huidbeschadigingen net boven de klauw

Score 1 Geen | Score 2 Matig | Score 3 Flink | Score 4 Kroonrand-ontsteking

Hennovation

- '*Closing the research and innovation divide: the crucial role of innovation support services and knowledge exchange*" of the Horizon 2020 EU Research and Innovation programme *(website)*

- Translate scientific knowledge into practical advice
- Integrate practical advice into farmers led innovation process
- Integrating scientific knowledge into producers' networks
- Dialogue between professionals

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5 principles for the practice of knowledge exchange in environmental management

Journal of Environmental Management 146/2014 337-345
Reed, M.S. *et al*.

Design	know what you want to achieve with KE
Represent	identify users of research / embed stakeholders in research
Engage	build long term relations / 2 way dialogue
Impact	focus on deliverable results as soon as possible
Reflect & Sustain	monitor to learn and refine / share good practices / how continue after project ends?

Hennovation

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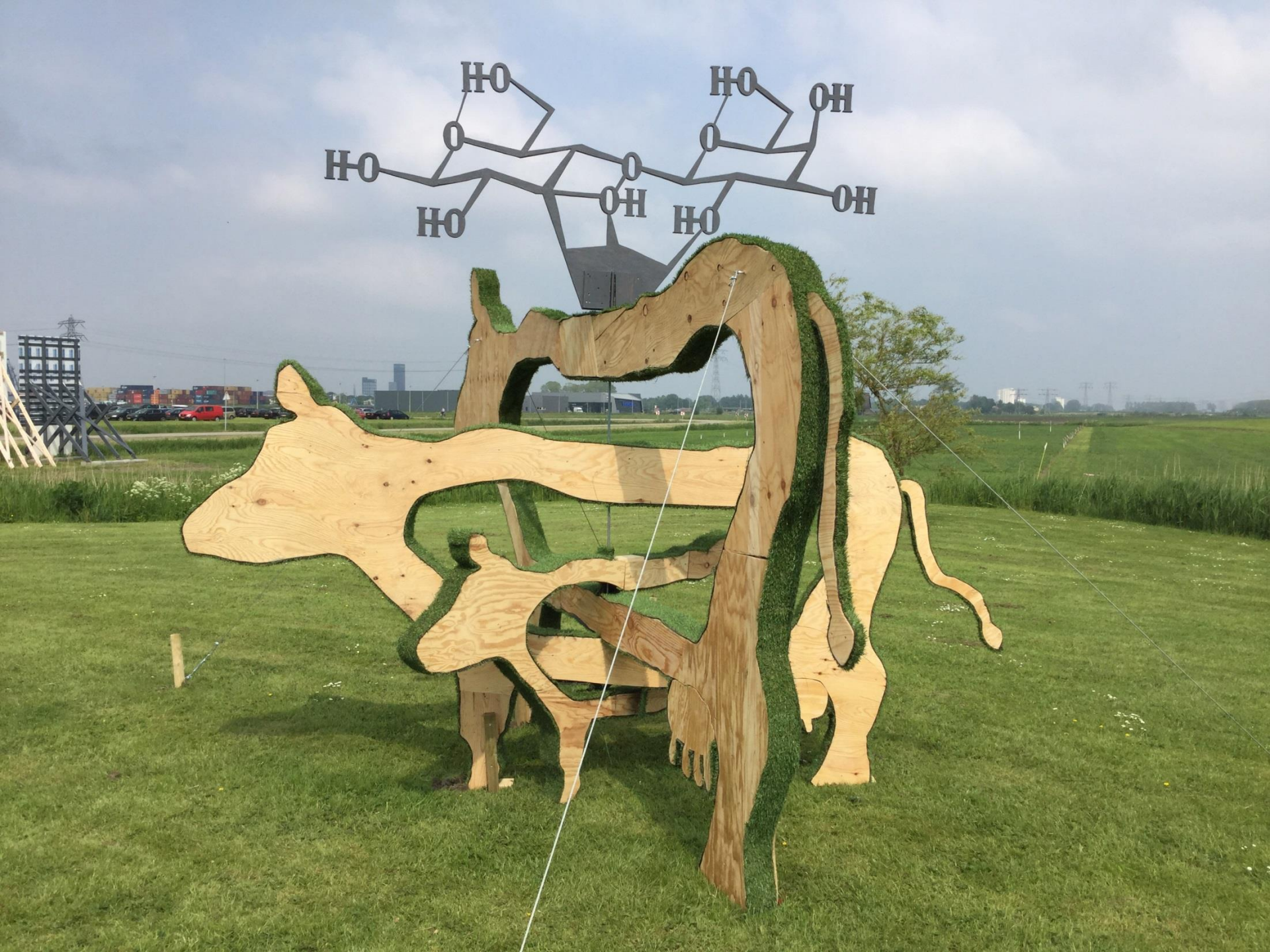
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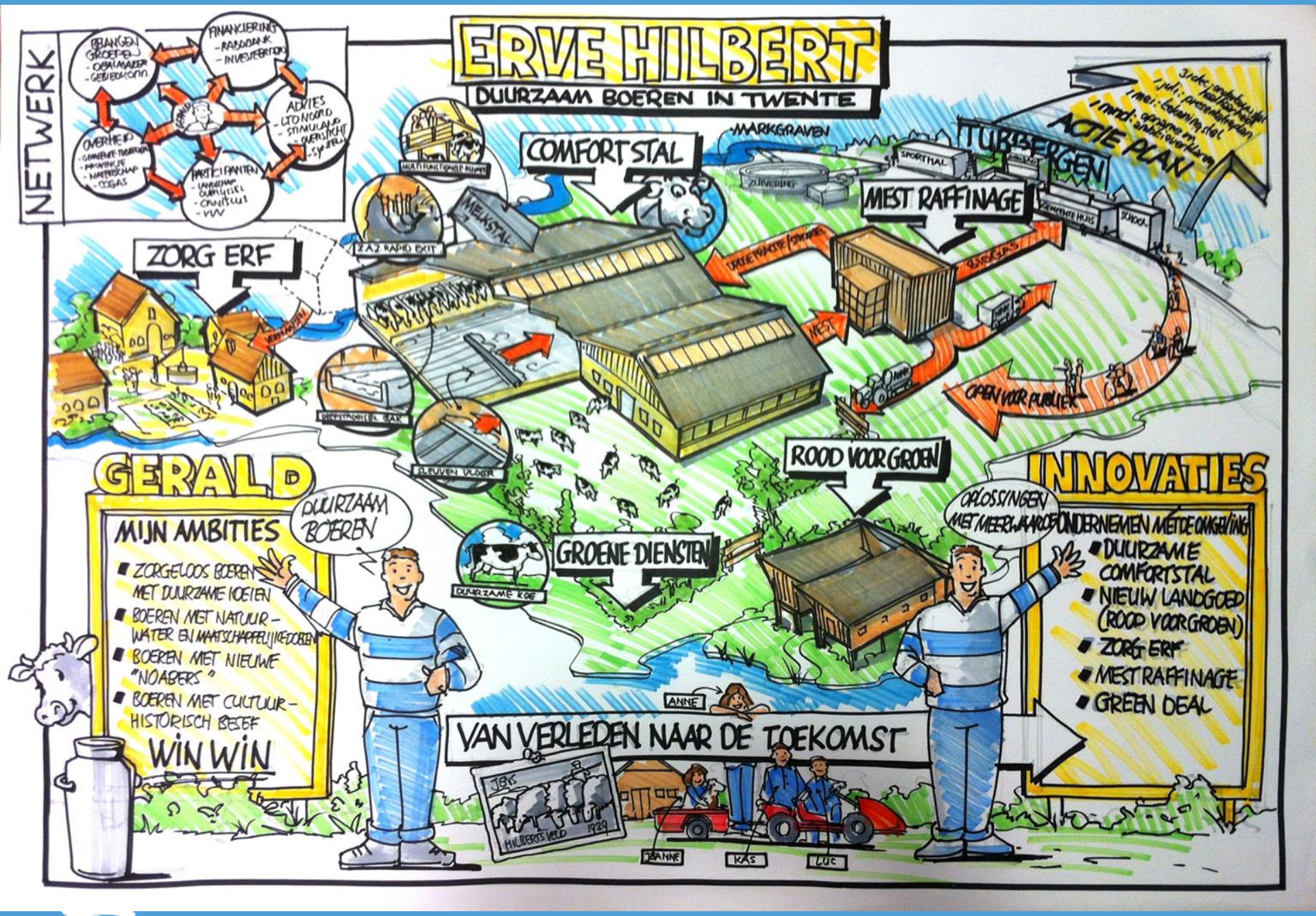
Dairy is our future


NETWERK
FINANCIERING
- RABOBANK
- INVESTEERDERS
BELANGEN GROEPEN
- OPDRAAGGEVER
- GEMEENTEN
ADVIES
- LTO NOORD
- STIMULADO
- OVERIJSSCHT
OVERHEID
- GEMEENTE TWENTE
- PROVINCIE
- WATERSCHAP
- CCGAS
PARTICIPANTEN
- LANDSCHAP OVERIJSSEL
- CONNECTUS
- VVV
ERVE HILBERT
DUURZAAM BOEREN IN TWENTE
COMFORT STAL
MARKGRAVEN
TURBBERGEN
ACTIE PLAN
MEST RAFFINAGE
ZORG ERF
MELKSTAL
MULTIFUNCTIONELE RUIMTE
2 X 2 RAPID EXIT
MEST
OPEN VOOR PUBLIEK
ROOD VOOR GROEN
GROENE DIENSTEN
DUURZAME KOE
GERALD
MIJN AMBITIES
- ZORGELOOS BOEREN MET DUURZAME KOEIEN
- BOEREN MET NATUUR-WATER EN MAATSCHAPPELIJKE DOELEN
- BOEREN MET NIEUWE "NOABERS"
- BOEREN MET CULTUUR-HISTORISCH BESEF
WIN WIN
DUURZAAM BOEREN
INNOVATIES
OPLOSSINGEN MET MEERWAARDE ONDERNEMEN MET DE OMGEVING
- DUURZAME COMFORTSTAL
- NIEUW LANDGOED (ROOD VOOR GROEN)
- ZORG ERF
- MEST RAFFINAGE
- GREEN DEAL
VAN VERLEDEN NAAR DE TOEKOMST
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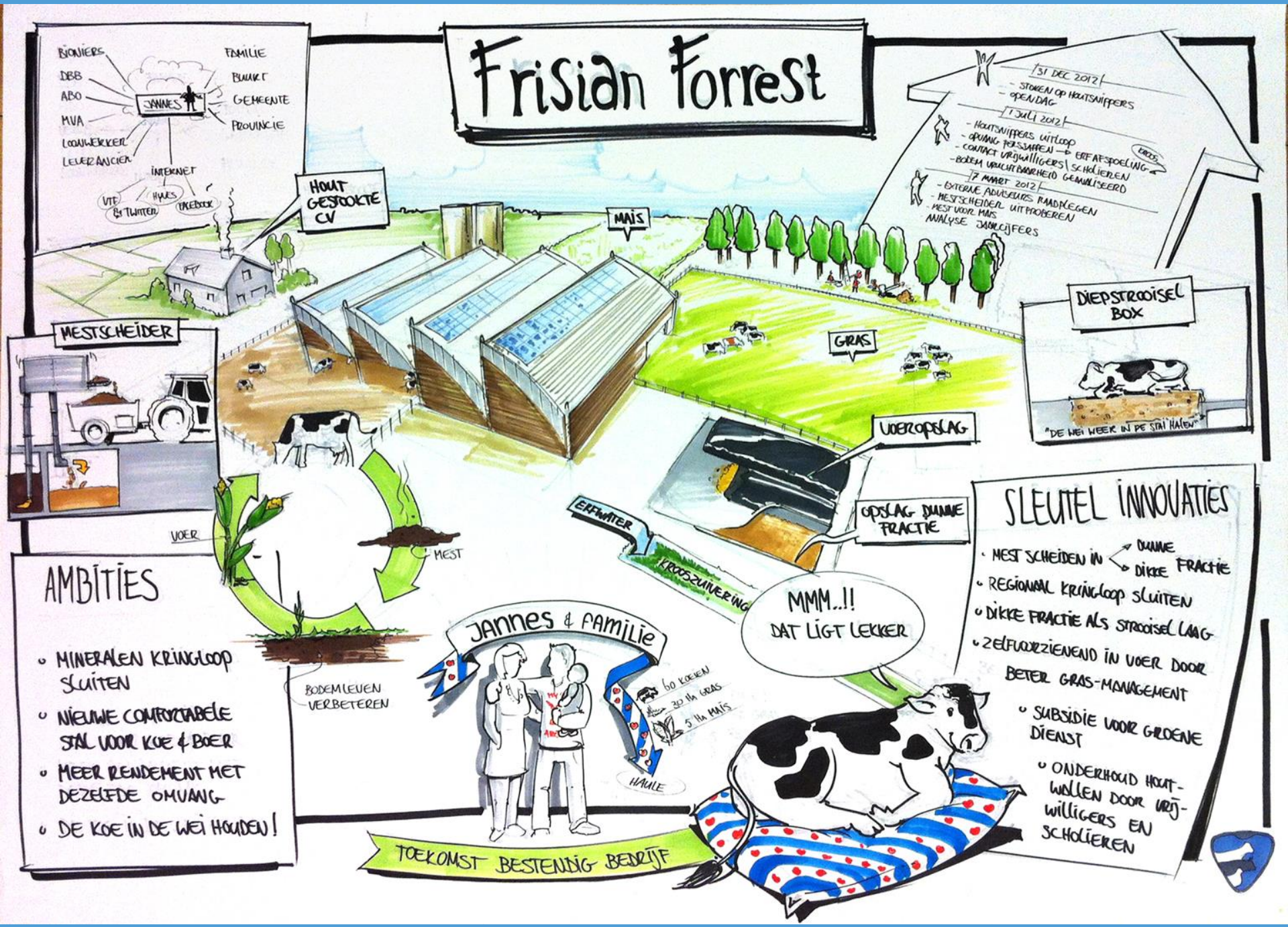
Frisian Forrest
BIONIERS
DBB
ABO
MVA
LOONWERKER
LEVERANCIER
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INTERNET
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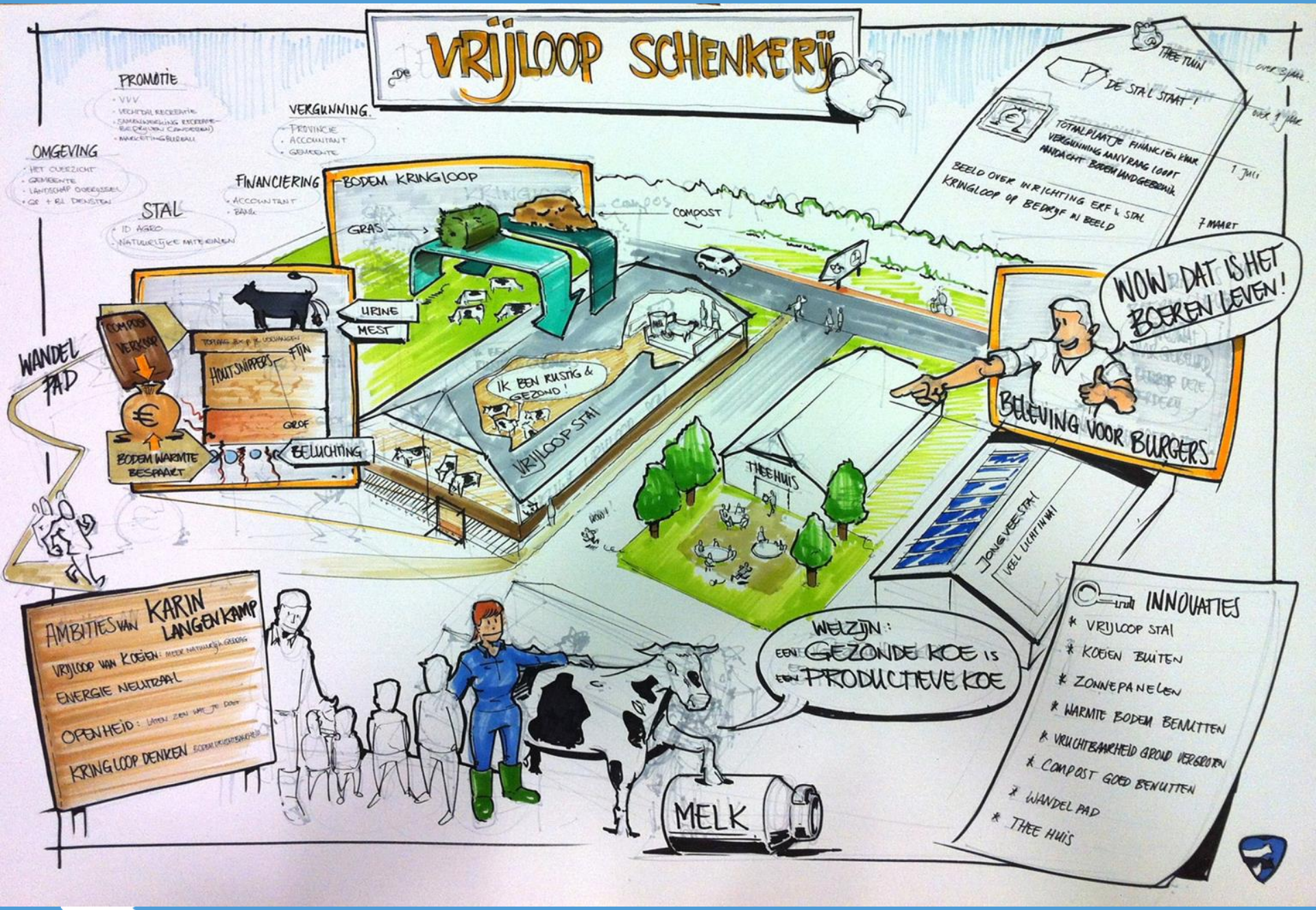
FACEBOOK
HOUT GESTOOKTE CV
MAÏS
GRAS
MESTSCHEIDER
DIEPSTROOISEL BOX
"DE WEI WEER IN DE STAL HALEN"
VOER
MEST
OPSLAG DUNNE FRACTIE
ERFWATER
KROOSZUIVERING
BODEMLEVEN VERBETEREN
JANNES & FAMILIE
60 KOEIEN
30 HA GRAS
5 HA MAÏS
HAULE
MMM..!! DAT LIGT LEKKER
TOEKOMST BESTENDIG BEDRIJF
31 DEC 2012
- STOKEN OP HOUTSNIPPERS
- OPEN DAG
1 JULI 2012
- HOUTSNIPPERS UITLOOP
- OPRUIMING RESTANTEN → ERFAFSPOELING
- CONTACT VRIJWILLIGERS | SCHOLIEREN
- BODEM VRUCHTBAARHEID GEMANIFESTEERD
17 MAART 2012
- EXTERNE ADVISEURS RAADPLEGEN
- MESTSCHEIDER UITPROBEREN
- MEST VOOR MAÏS
ANALYSE JAARCIJFERS
AMBITIES
- MINERALEN KRINGLOOP SLUITEN
- NIEUWE COMFORTABELE STAL VOOR KOE & BOER
- MEER RENDEMENT MET DEZELFDE OPPERVLAKTE
- DE KOE IN DE WEI HOUDEN!
SLEUTEL INNOVATIES
- MEST SCHEIDEN IN DUNNE FRACTIE EN DIKKE FRACTIE
- REGIONAAL KRINGLOOP SLUITEN
- DIKKE FRACTIE ALS STROOISEL LAAG
- ZELFVOORZIENEND IN VOER DOOR BETER GRAS-MANAGEMENT
- SUBSIDIE VOOR GROENE DIENST
- ONDERHOUD HOUTWALLEN DOOR VRIJWILLIGERS EN SCHOLIEREN


De VRIJLOOP SCHENKERIJ
PROMOTIE
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FIJN
GROF
BELICHTING
BODEM WARMTE BESPAART
IK BEN RUSTIG & GEZOND!
VRIJLOOP STAL
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THEE TUIN
DE STAL STAAT!
TOTAALPLAATJE FINANCIEN KWIK
BEELD OVER INRICHTING ERF & STAL
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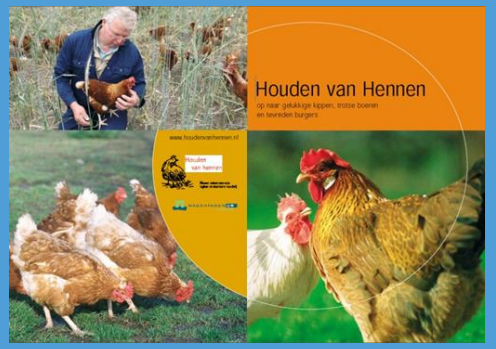
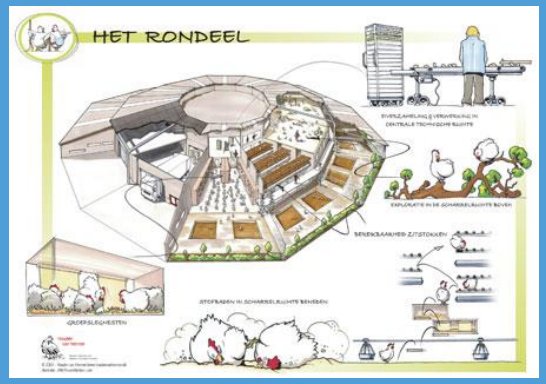
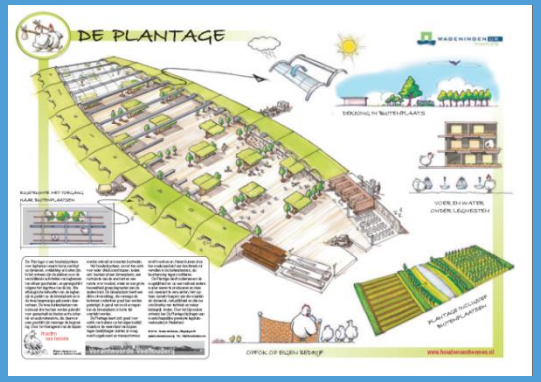
7 MAART
WOW DAT IS HET BODEMLEVEN!
BELEVING VOOR BURGERS
JONGVEESTAL
VEEL LICHTINVAL
WANDEL PAD
AMBITIES VAN KARIN LANGENKAMP
VRIJLOOP VAN KOEIEN:
ENERGIE NEUTRAAL
OPENHEID:
KRINGLOOP DENKEN
WELZIJN: EEN GEZONDE KOE IS EEN PRODUCTIEVE KOE
MELK
INNOVATIES
* VRIJLOOP STAL
* KOEIEN BUITEN
* ZONNEPANELEN
* WARMTE BODEM BENUTTEN
* VRUCHTBAARHEID GROND VERGROTEN
* COMPOST GOED BENUTTEN
* WANDEL PAD
* THEE HUIS

From science to realisation







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Agenda

- Feeding the world
- Sustainability
- System innovation
- Different ways to produce knowledge
- Cow Power

Cow Power

System innovation in dairy husbandry

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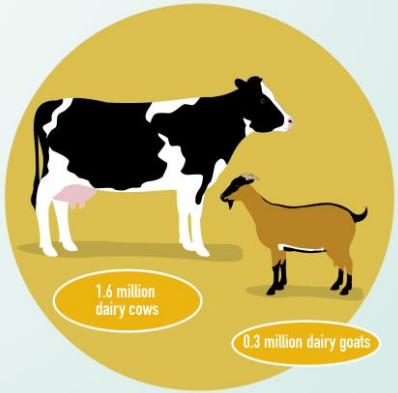
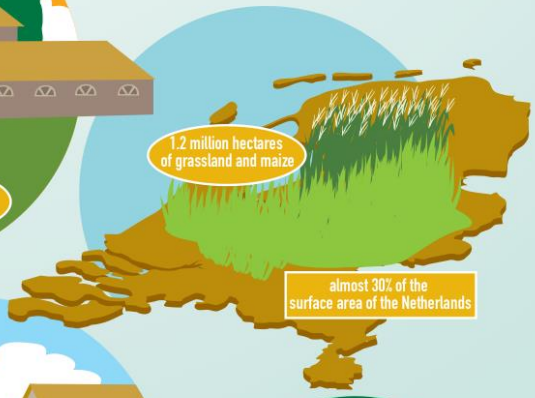
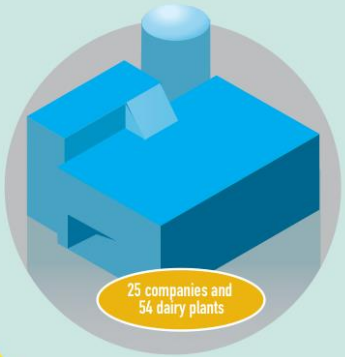
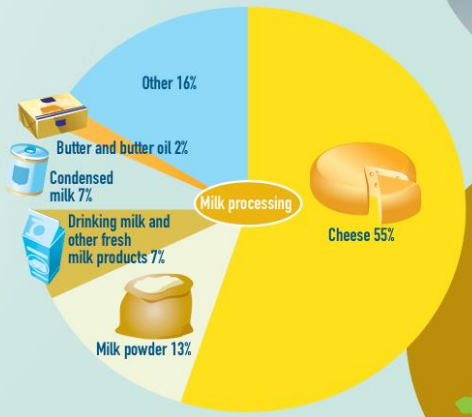
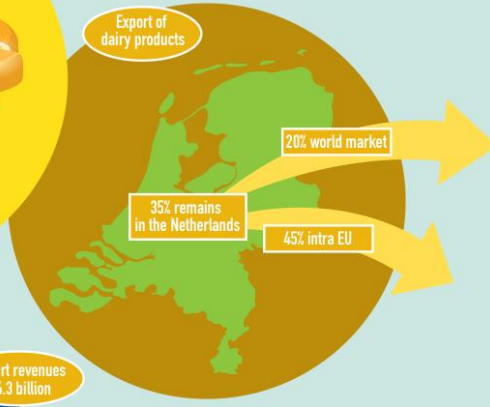
Dutch dairy at a glance

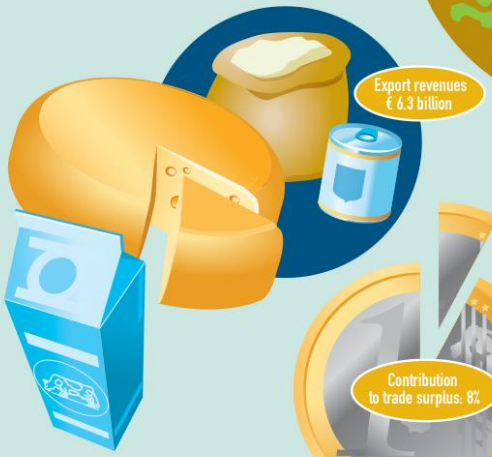


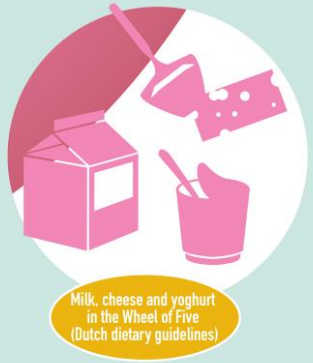












source: ZuivelNL, RVO.nl,
Statistics Netherlands (CBS),
Sustainable Dairy Chain, The Netherlands Nutrition Centre

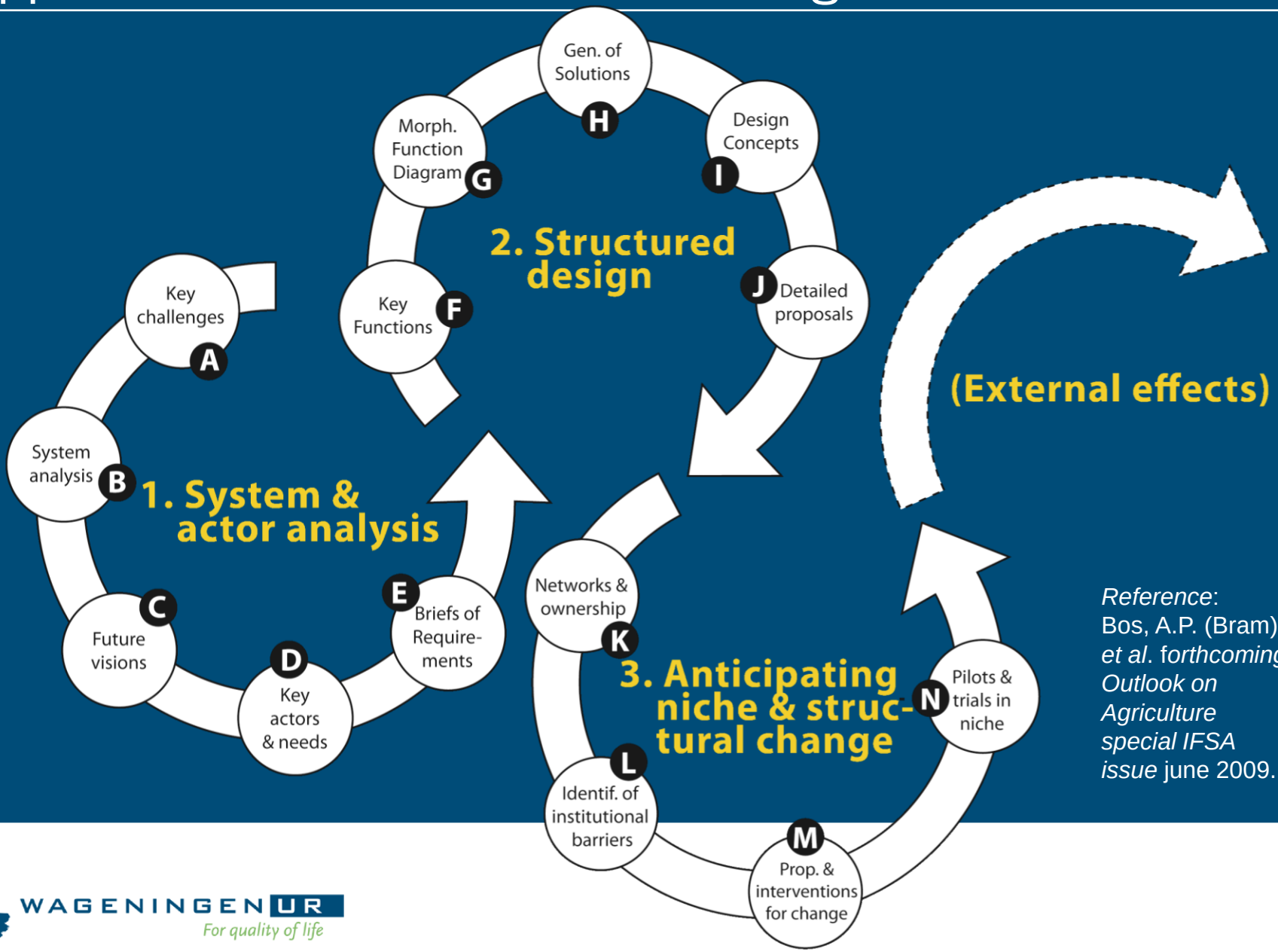
Sustainability issues in Dutch dairy farming

- Environment
  - Local: manure surplus, ammonia, nitrate, dust; Global: climate change
- Animal Welfare
- Economy
  - Profit & continuity
  - Labor (quantity & quality)
- Use of natural resources & biodiversity
  - Global footprint, LCA, north-south relation
  - Limited resources (energy, minerals)
- Health (of man and animal)
  - Veterinary risks; antibiotics and residues; hormones
- Landscape

The problem & the challenge

- Traditional approach and experience: small adaptations of current systems hardly improve welfare
- Welfare improvements are often in contradiction with economy & environment
- These goals cannot be met at the same time
- Solution & approach:
  - Design for inspiration and stimulation for sustainable development
  - Use adequate design method & redesign
  - Set aside current assumptions and be reflexive

Approach: Reflexive Interactive Design (RIO)



Reference:
Bos, A.P. (Bram) *et al*. *forthcoming*. *Outlook on Agriculture special IFSA issue* june 2009.

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Goal of the design concepts

- Not an blue print, nor daydreams
- Inspiration and agenda for present and future
- Make plausible that far reaching goals are in reach and can be combined

Apparent contradictions

Apparent contradictions between BoR and other requirements in *current* systems:

- Space per cow versus cost of infrastructure
- Space per cow versus emissions of ammonia
- Feeding for health versus feeding to increase mineral (N & P) efficiency

Opening up the solution space

- Some contradictions in dairy husbandry
  - Animal welfare vs environment
  - Animal welfare vs economics
  - Environment vs economics
  - Sharing costs of investment vs ‘one farmer business’
  - Farming in urban areas vs economics
  - More manure = more coststst

Brief of Requirements

- The farmer
  - qualitatively, global, focus groups
- The citizen / consumer
  - NextExpertizer ® -method
  - 98 interviews, quantitatively
- The environment
  - Requirements much higher than policy targets
- The dairy cow
  - BoR
  - and Cowel: model to compare husbandry systems

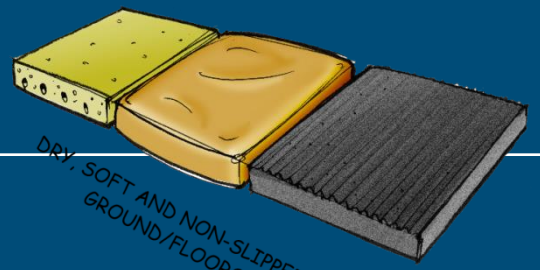
BoR defines requirements, not solutions

- BoR is solution-free
- Main benefit: opens up the solution space
- Increases the chance of synthesizing requirements, that seem to be contradictory in current systems and practices
- BoR and the system analysis are leading for determination of the key functions

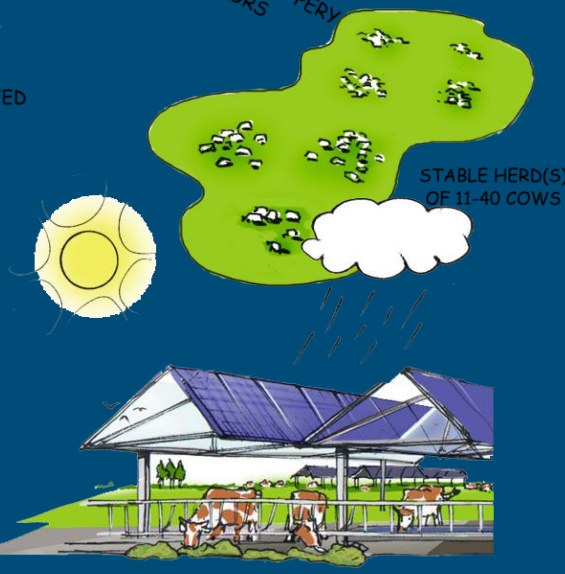
BoR: important design attributes

- Number of resting places
- Feed quality
- Negative conditioners & stray electricity
- Freedom of movement & behaviour
- Size of resting area
- Handling of animal
- Temperature humidity index (THI)
- Floor type of walk ways
- Floor type of feeding alleys
- Light intensity daylight hours

- brown: most critical ones -

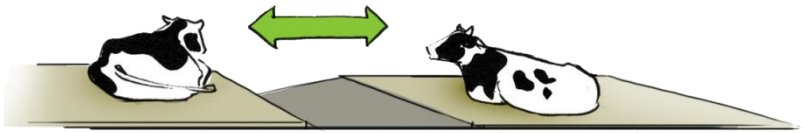



GOOD, TASTY AND NUTRITIOUS FEED



SHELTER AGAINST HEAT, RAIN AND WIND


SPACE FOR LOCOMOTION, FREE CHOICE AND NATURAL BEHAVIOUR


SPACIOUS RESTING PLACE AND PERSONAL DISTANCE

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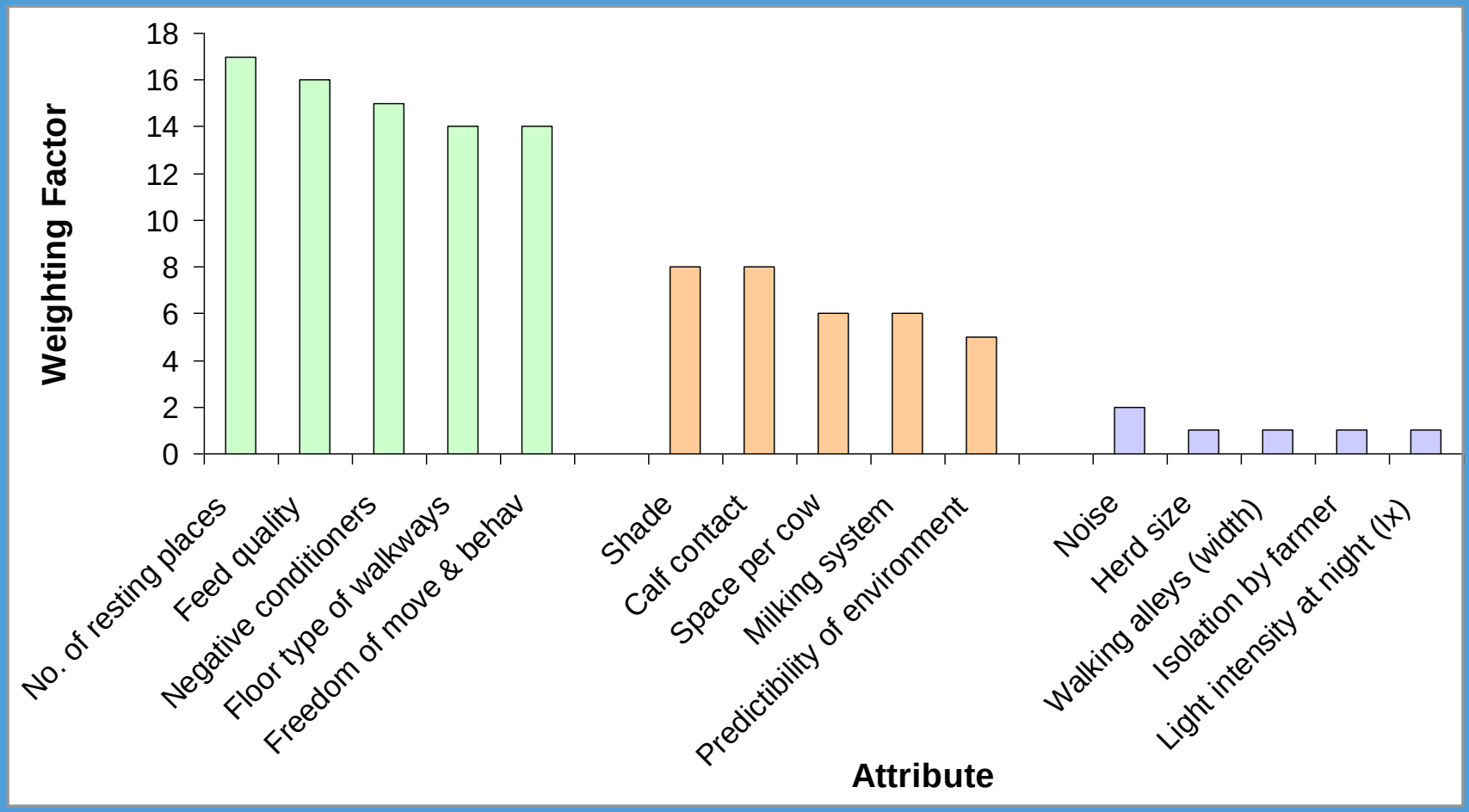
The COWEL model

- Each attribute has one or more levels (e.g. different bedding materials, ranging from best to worst: pasture, straw/sand, mattress, mat, concrete)
- COWEL links levels of the attributes with animal welfare effects (positive and negative): using 12 weighting categories:
  - Pain, illness, reduced survival, decreased fitness, HPA (hypoyhalamic-pituitary-adrenocortical) axis, SAM (sympathetic-adrenal-medullary) activation, aggression, abnormal behaviour, frustration & avoidance
  - natural behaviour, preference and demand

Welfare scores: WF of the attributes

The top 5, mid 5 and last 5 attributes (42 in total)



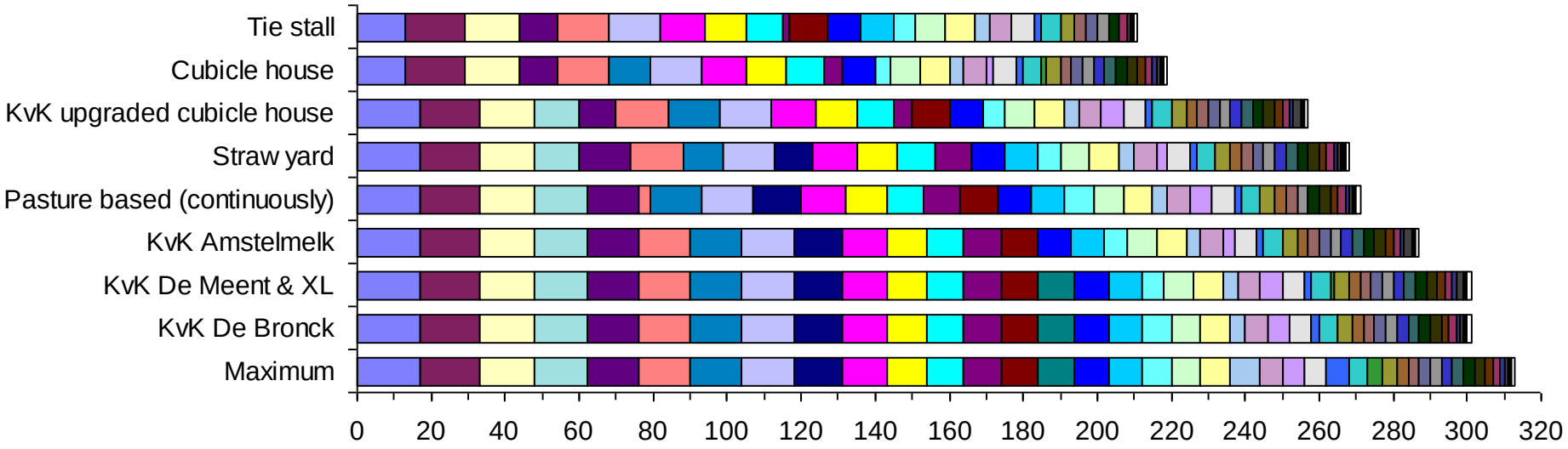
Tie stall

Cubicle house

Straw yard

Pasture based (continuously)

Welfare scores: housing system benefits



BoR dairy cow: some examples

- Number of resting places:
  - >1 per cow
- Freedom of movement & behaviour:
  - ≥ 360 m2 per cow
  - Indoor and outdoor access
- Size of resting area
  - Free resting place (no obstacles)
- Floor type of walk ways
  - Friction, roughness, hardness

BoR Citizen / Consumer (critical elements)

- Enough space for free movement of cows
- Animals well treated (like brother and sister)
- Feed is fresh and on natural basis
- Willing to pay little higher price for animal welfare
- Natural environment for animals
- Animal products (milk, meat) are tasty
- Fair and sustainable production process
- Professional attitude of farmers
- Enough margin for farmers, to make a good living
- Quality assurance by regulations / Q-programs

Increased impact by

ha thinking

Change in acting

A. All needs of the cow

- Enough space all year round
- Enough resting place(s)
- Freedom of choices
- Sufficient floors
- Locomotion
- No stress treatments or injuries
- Enough feed / good quality

B. Minerals are useful products

- Use of plants
- No power of feed
- Separate feaces and urine
- No artificial fertilizer
- More organic drymatter and better quality of life in soil

C. Share €, labour and land

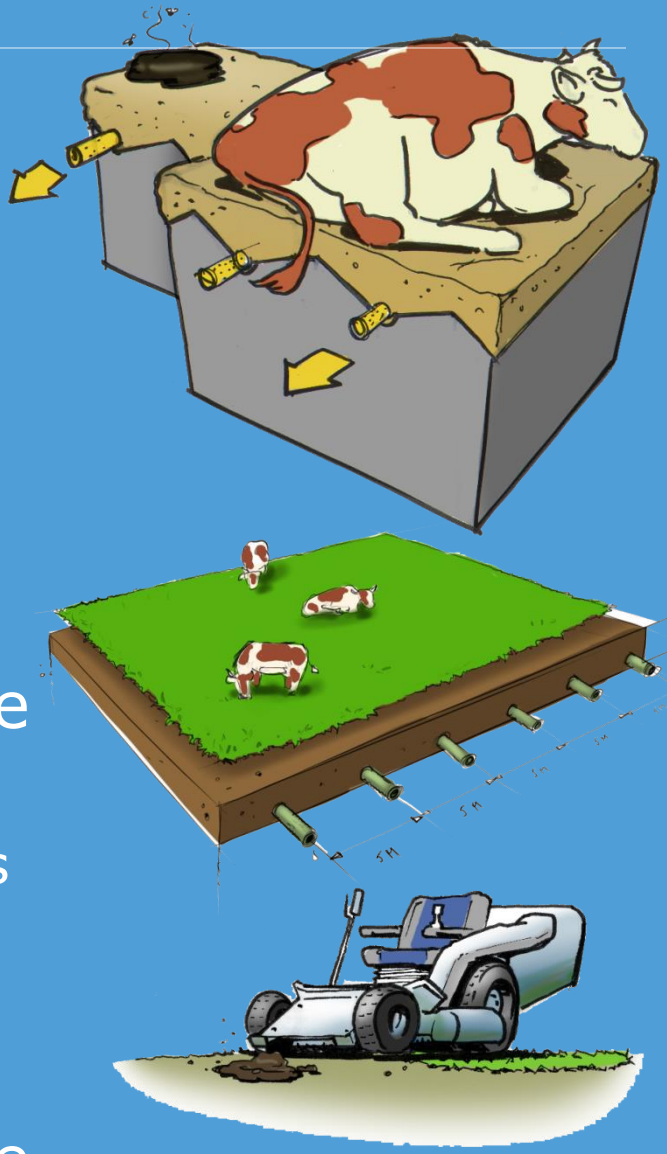
- Space for cow without an expensive stable
- Shared investments in milking parlour, machines, land, etc
- Co-operation
- Higher yield in grass- and cropproduction
- Energy production
- Higher quality of labour
- New functions

D. Soil is ecosystem

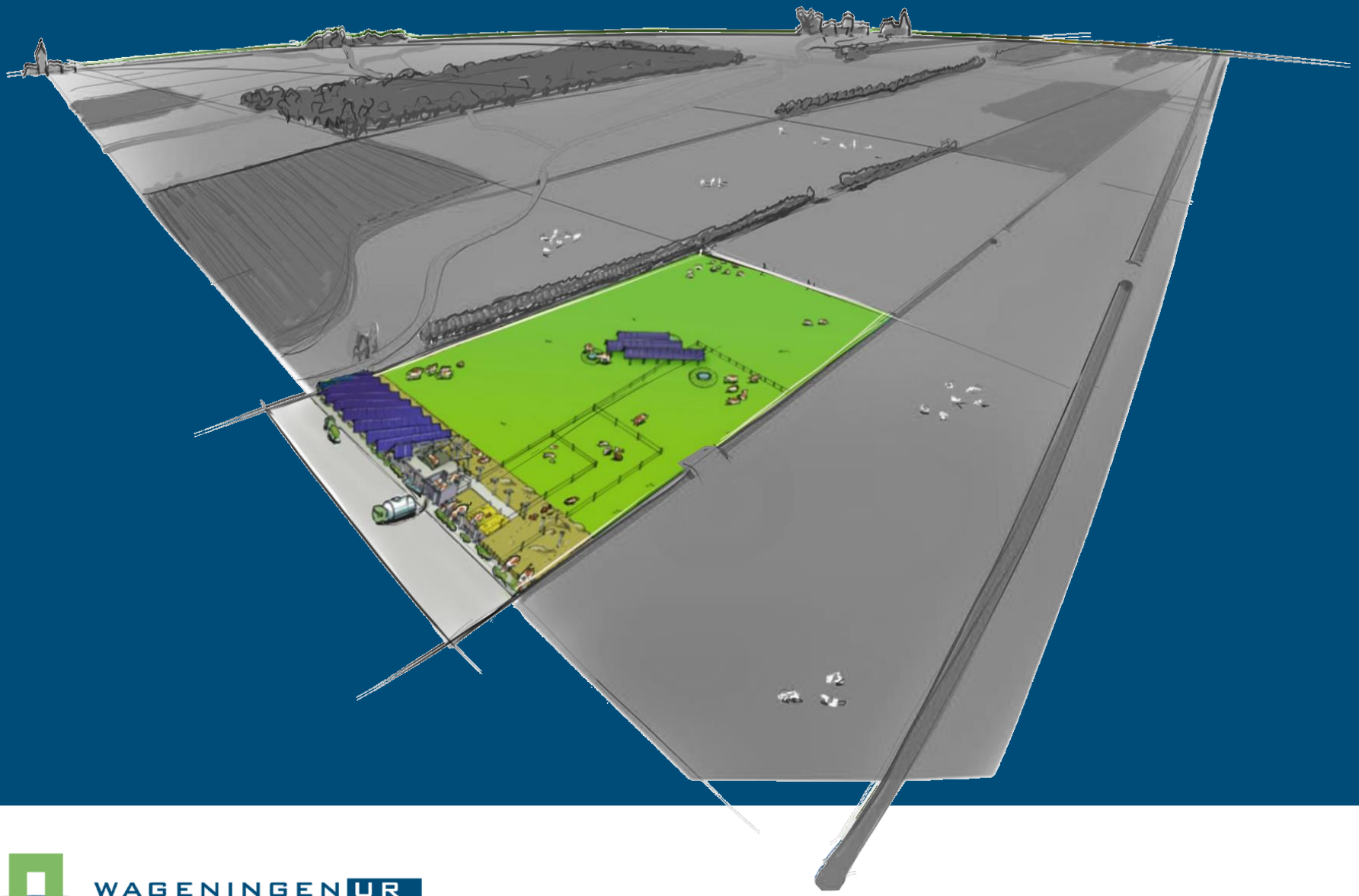
- Use organic drymatter in manure
- Intensivation and extensivation on the same farm
- Optimize management of N fertilizer (quantity, type of fertilizer, exact gifts at right place, etc)
- Minimize tillage
- No soil compression

Key solutions to overcome contradictions

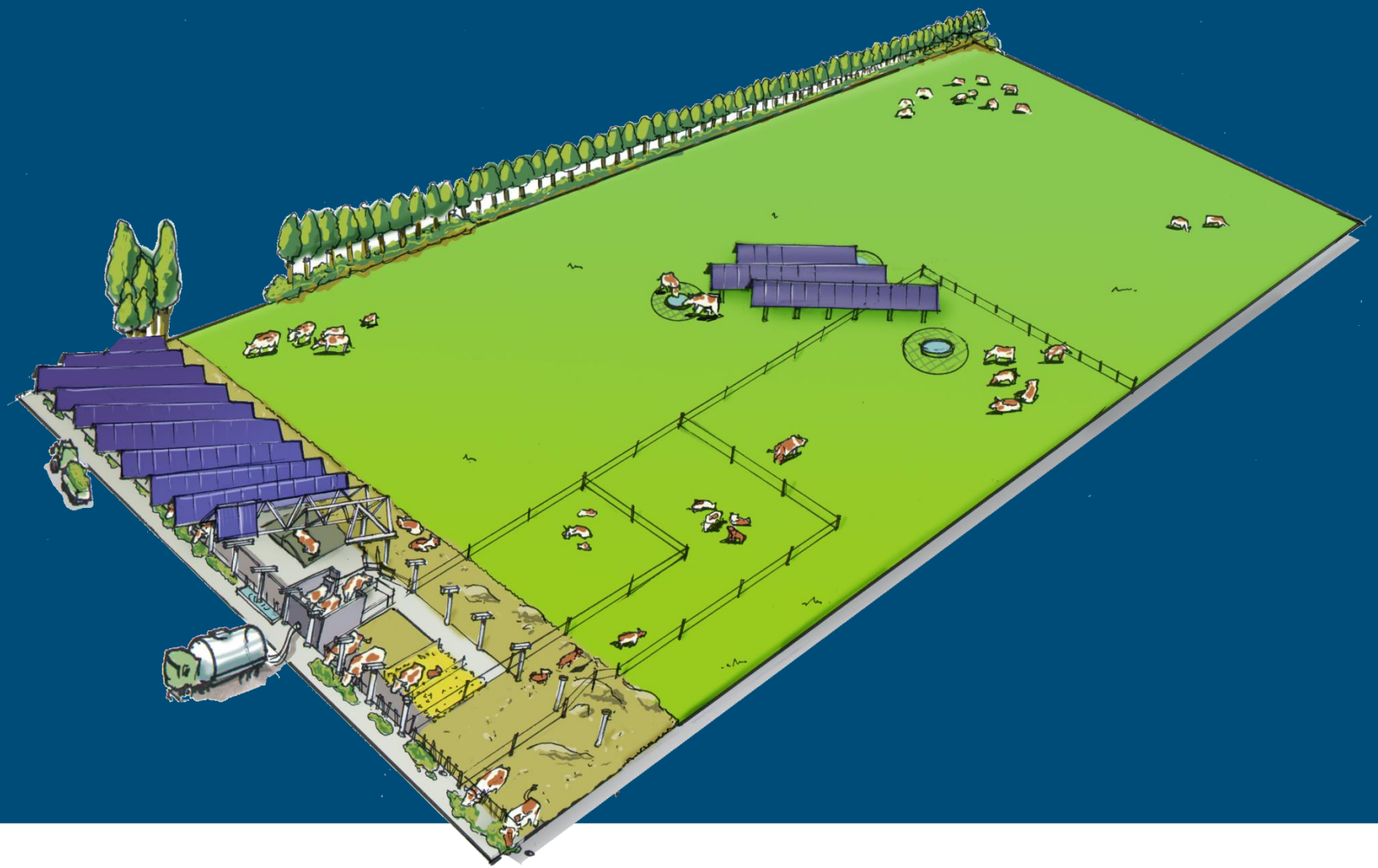
- Allow for much more space, but cheap
  - Equip all areas with dry, non-slippery floors
  - Outside and inside as one continuous whole
  - Limit ‘inside’ to basic shelter
- Keep faeces and urine apart in the system
  - Various solutions possible on floors and grounds
  - Process them as separately applicable fertilizers
- Remove faeces and urine from the system



Design example: bird's-eye view of *De Meent*



De Meent



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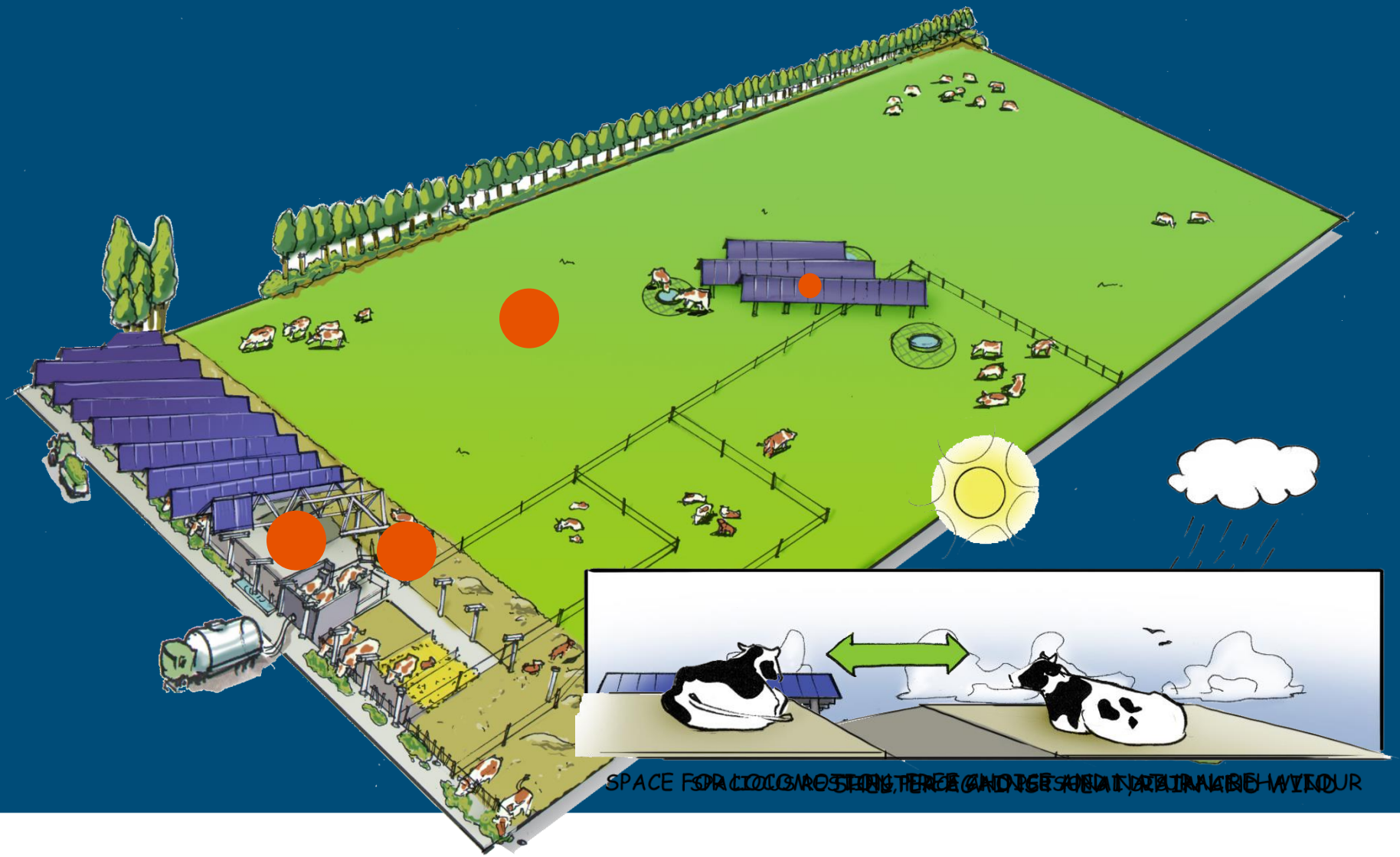
Three permanently accessible zones



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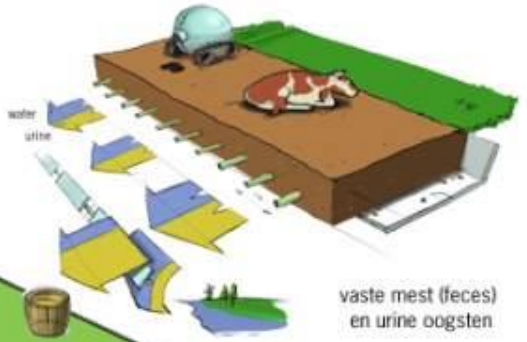
De Meent

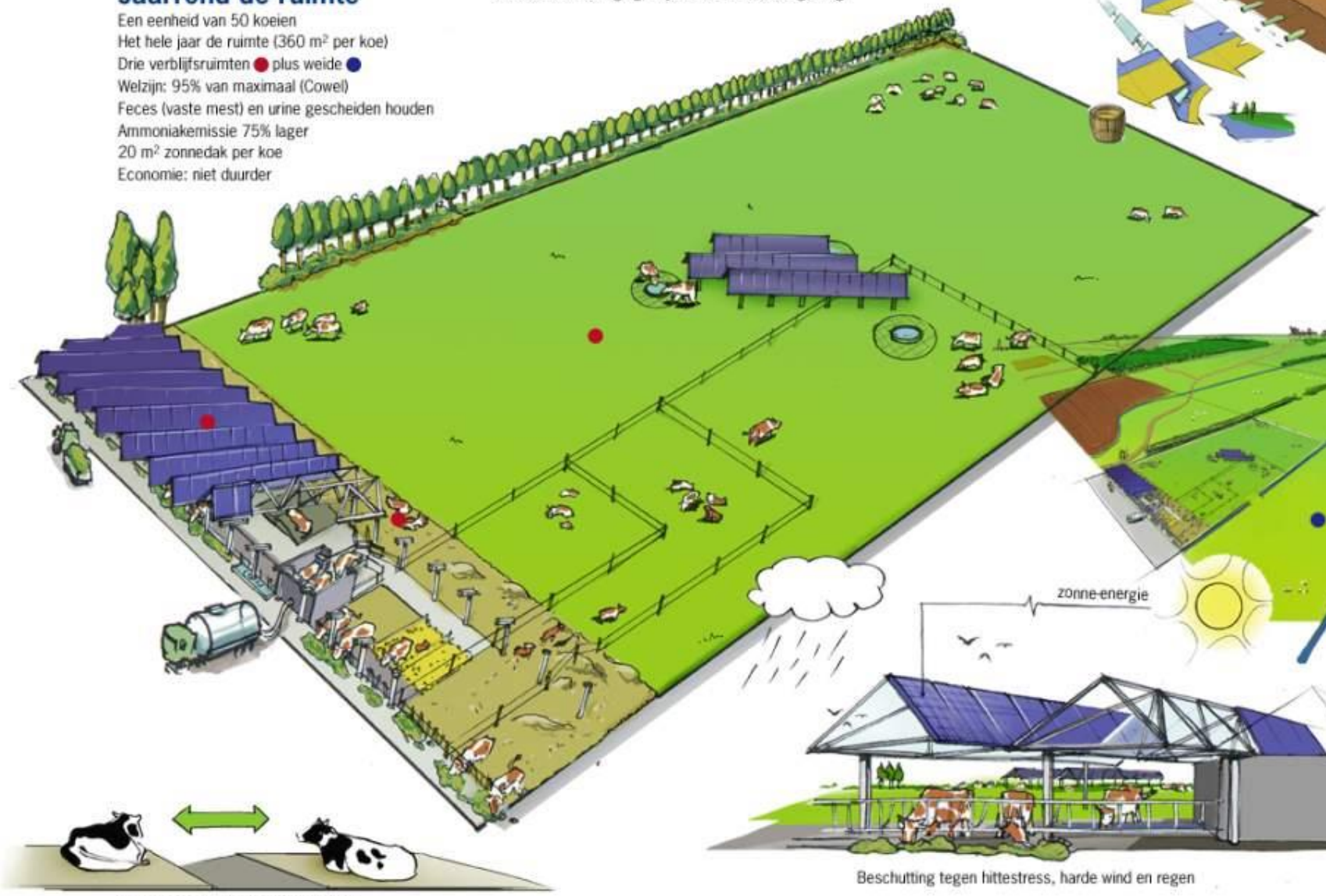
Jaarrond de ruimte

Een eenheid van 50 koeien
Het hele jaar de ruimte (360 m² per koe)
Drie verblijfsruimten ● plus weide ●
Welzijn: 95% van maximaal (Cowel)
Feces (vaste mest) en urine gescheiden houden
Ammoniakemissie 75% lager
20 m² zonnedak per koe
Economie: niet duurder

Ruimte voor beweging, vrije keuze en sociaal gedrag



vaste mest (feces)
en urine oogsten

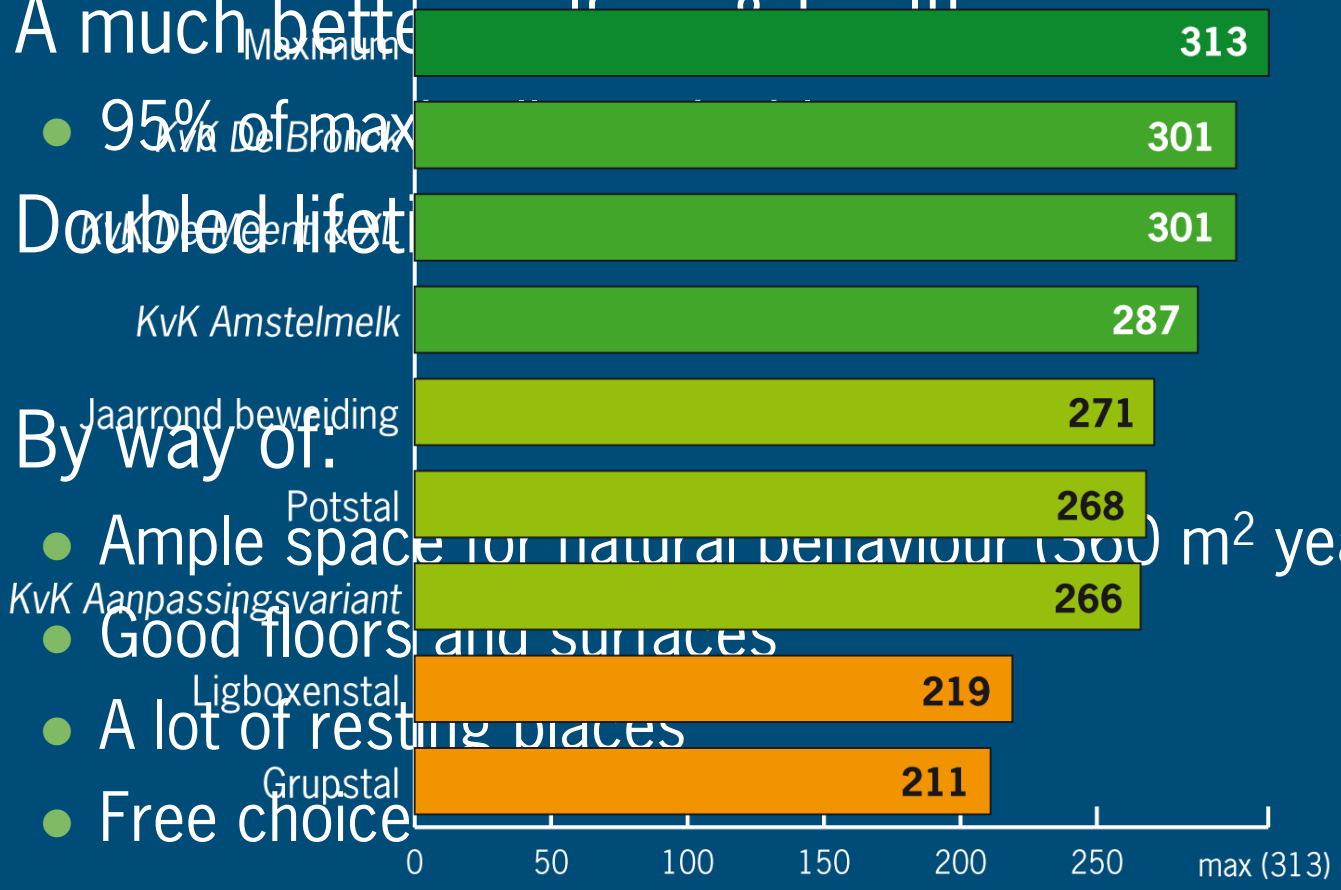


Beschutting tegen hittestress, harde wind en regen

Ruime ligplaats en afstand tot elkaar

Results for the cow

- A much bette
  - 95% of max
- Doubled lifeti
- By way of:
  - Ample space for natural behaviour (360 m^2 year round)
  - Good floors and surfaces
  - A lot of resting places
  - Free choice



De Meent XL

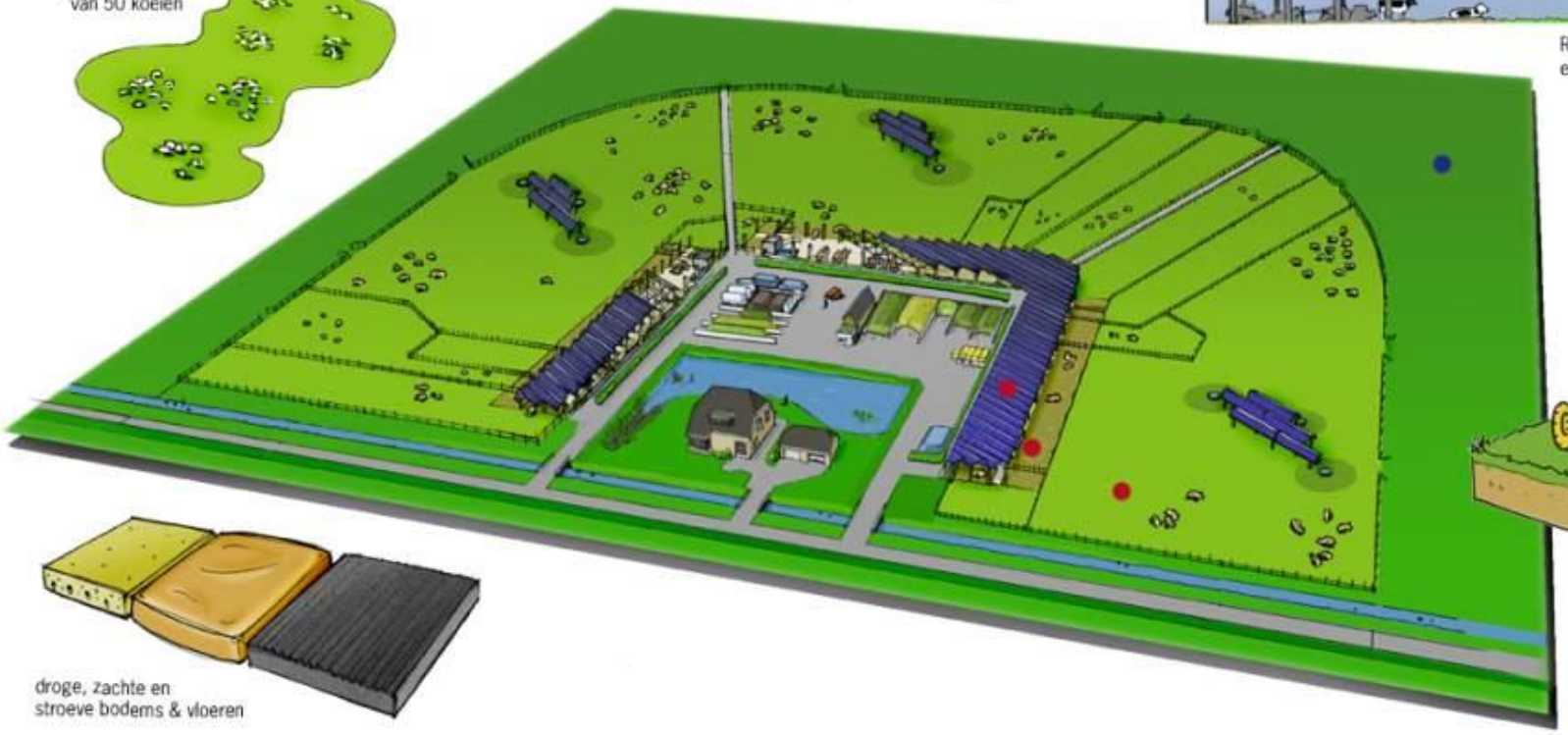
Voor wie groter wil

Drie keer 50 koeien
Het hele jaar de ruimte (360 m² per koe)
Drie verblijfsruimten ● plus weide ●
Welzijn: 95% van maximaal (Cowel)
Feces (vaste mest) en urine gescheiden houden
Ammoniakemissie 75% lager
20 m² zonnedak per koe
Economie: niet duurder

Beschutting tegen hittestress, harde wind en regen

Ruimte voor beweging, vrije keuze en sociaal gedrag

Stabiele kuddes van 50 koeien



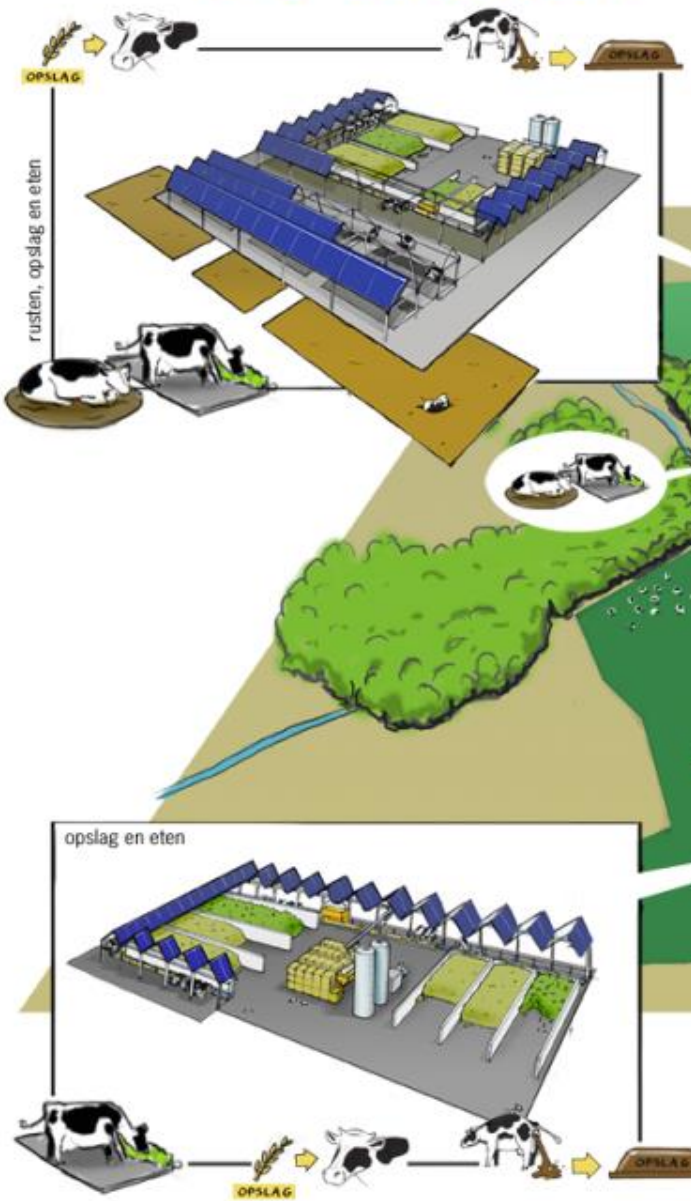
droge, zachte en stroeve bodems & vloeren

Results for the environment

- Energy neutral
- Reduction of greenhouse gases: 50-75%
- Climate neutral if efficiency PV-cells doubles
- Reduction of local emissions of nitrogen (NH_3) with 75%.
- Smaller ecological footprint of (concentrate) fodder production.

- By way of:
  - Keeping faeces and urine separated
  - Precision fertilization; no artificial fertilizer needed
  - Utilizing regional leftover streams, restricted pasturization
  - Combine solar energy with shelter
  - Manure digesters without adding components (co-products)
  - Focus on ecology of a living soil

De Bronck



Beweging in het landschap

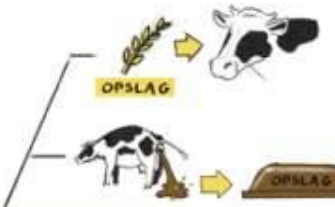
200 koeien trekken dagelijks door het landschap. Bestaande bedrijven zijn omgebouwd voor voeren, rusten, schuilen, opfok jongvee of geautomatiseerd melken. Koeien trekken over groene buitenpromenades van 360 m² per koe jaarrond, en staan 's zomers in de wei.

Results for the farmer

- Economically competitive
- Labour flexibility; time for a social life
- Compatible with Natura 2000 and peri-urban area

- By way of:
  - No expensive buildings or cellars
  - Sharing of capital goods, land and labour
  - Automation
  - Increasing soil yield by precision fertilization and irrigation
  - Very low ammonia emissions

Amstelmelk



De kracht van koeien bij de stad

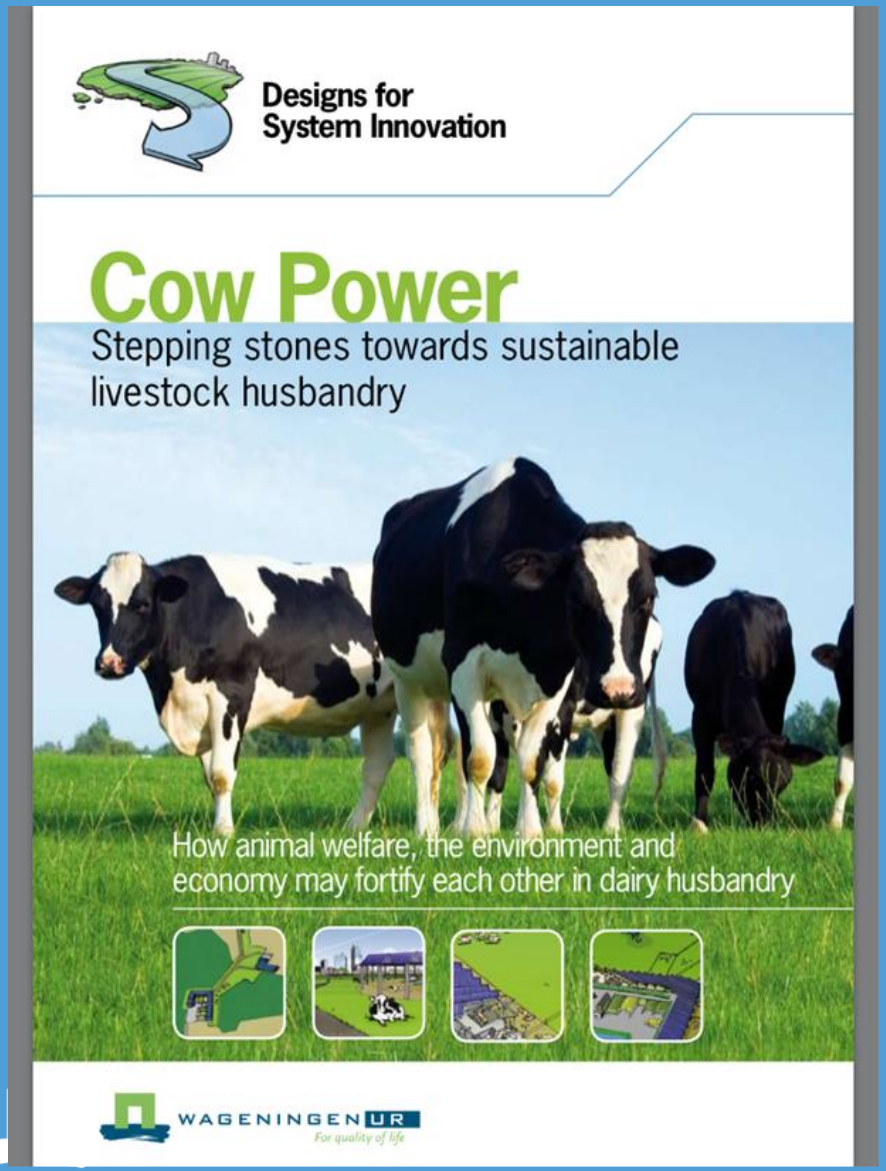
Melkveehouderij aan de stad. 300 koeien trekken dagelijks van zes bedrijven op en neer naar de gezamenlijke melkstal. De bedrijven hebben elk een stabiele kudde van 50 dieren. 's Zomers worden de koeien geweid, 's winters is er minimaal 13,5 m^2 leefruimte per koe. Grond, arbeid en kapitaal worden gedeeld, met elkaar en met de nabije stad. Directe verkoop van producten is een kans, maar niet economisch noodzakelijk.

Results for society

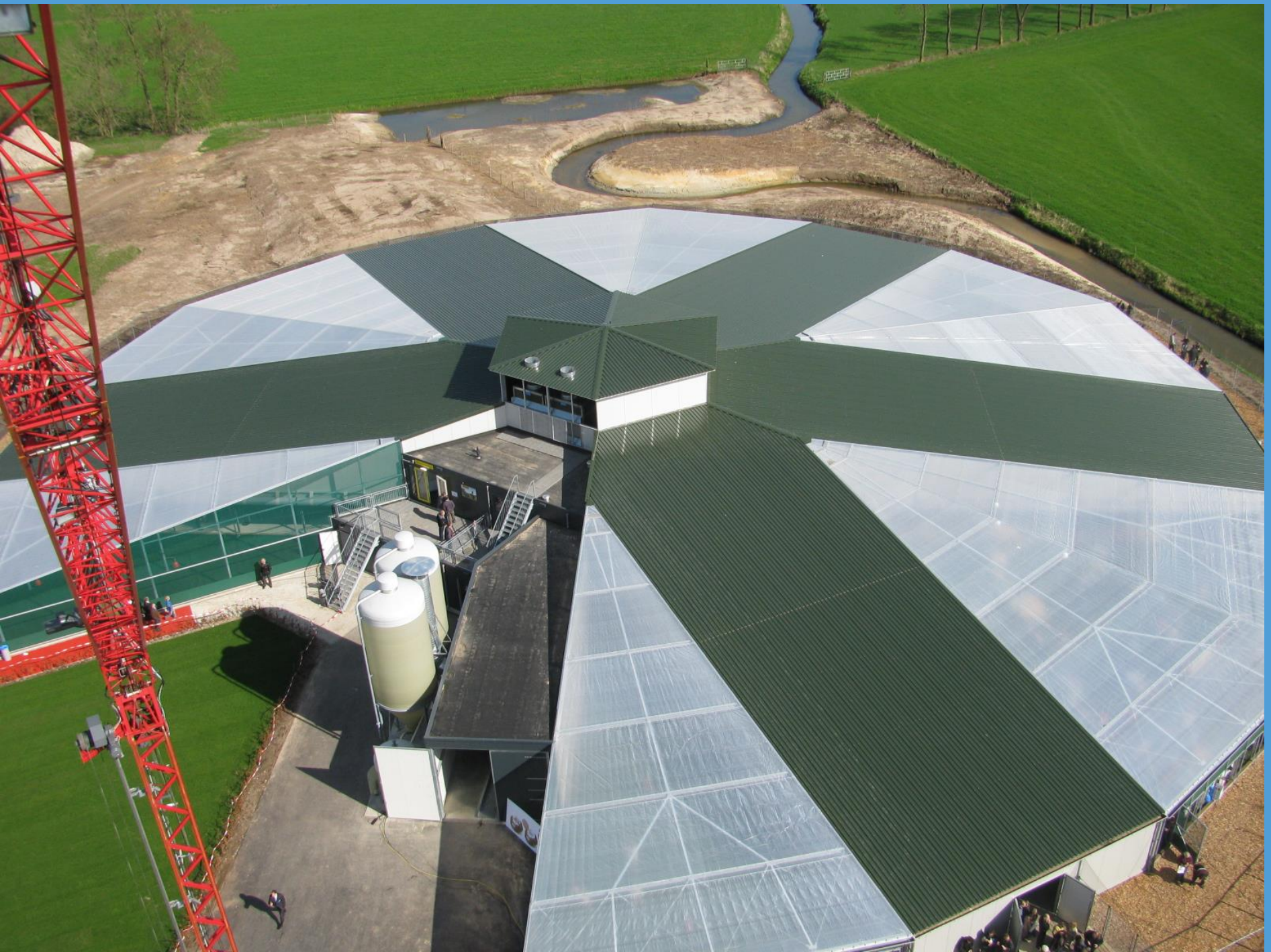
- Interweaved with other societal functions
- Fits in Natura 2000 and peri-urban area
- Responds to important societal requirements towards animal husbandry

- By way of:
  - Fulfil the needs of the dairy cow
  - Transparency: open systems
  - Sharing land functions
  - Very low ammonia emissions
  - Cows in pasture; cows outside year round

Cow Power

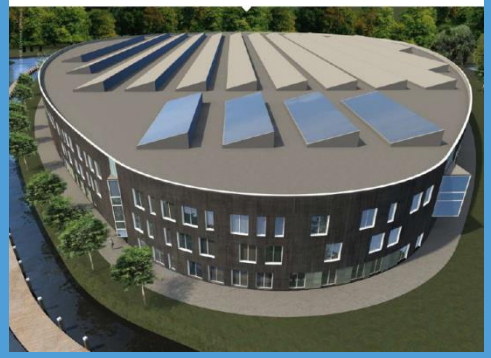


http://edepot.wur.nl/12251

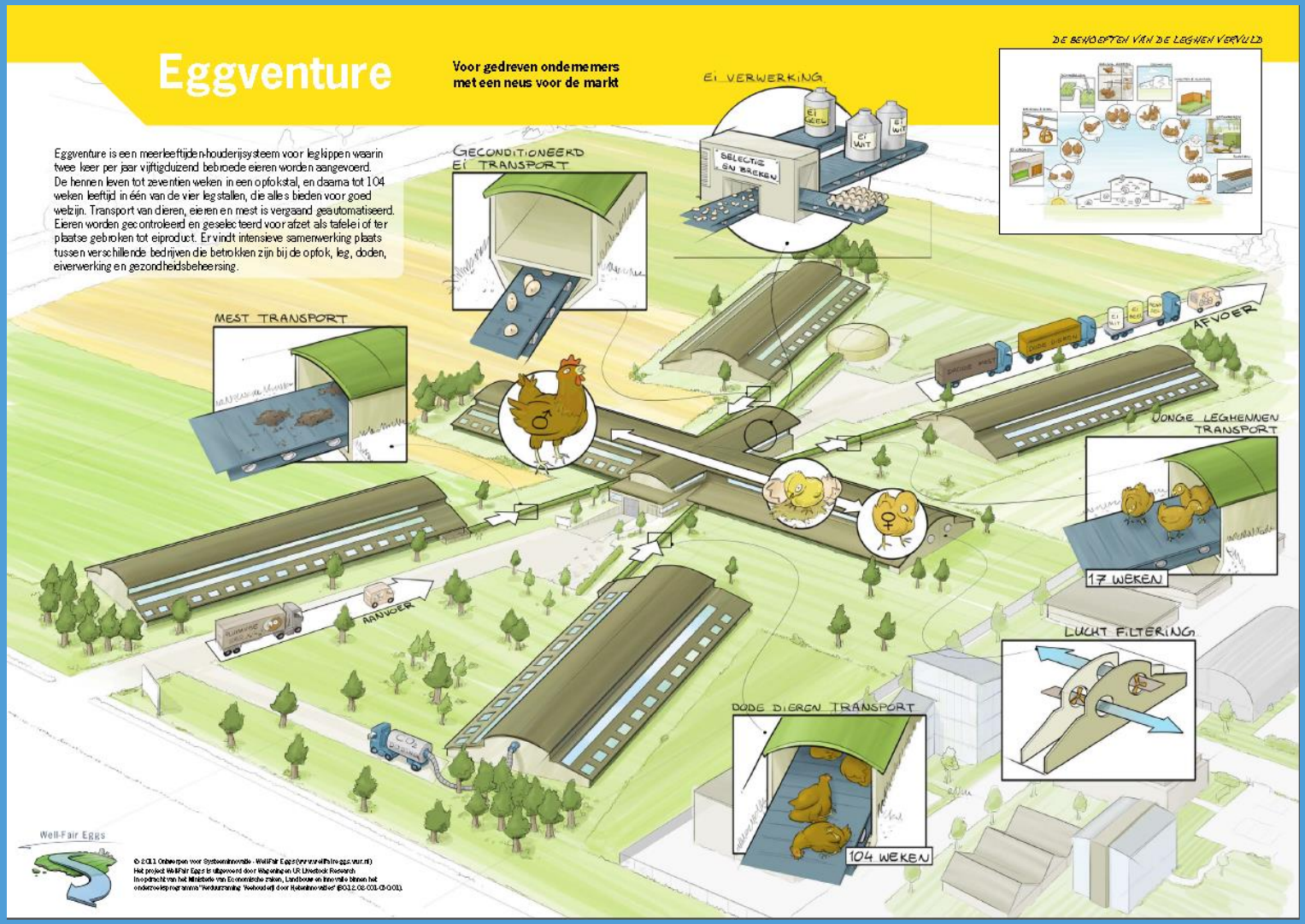



Prinzen

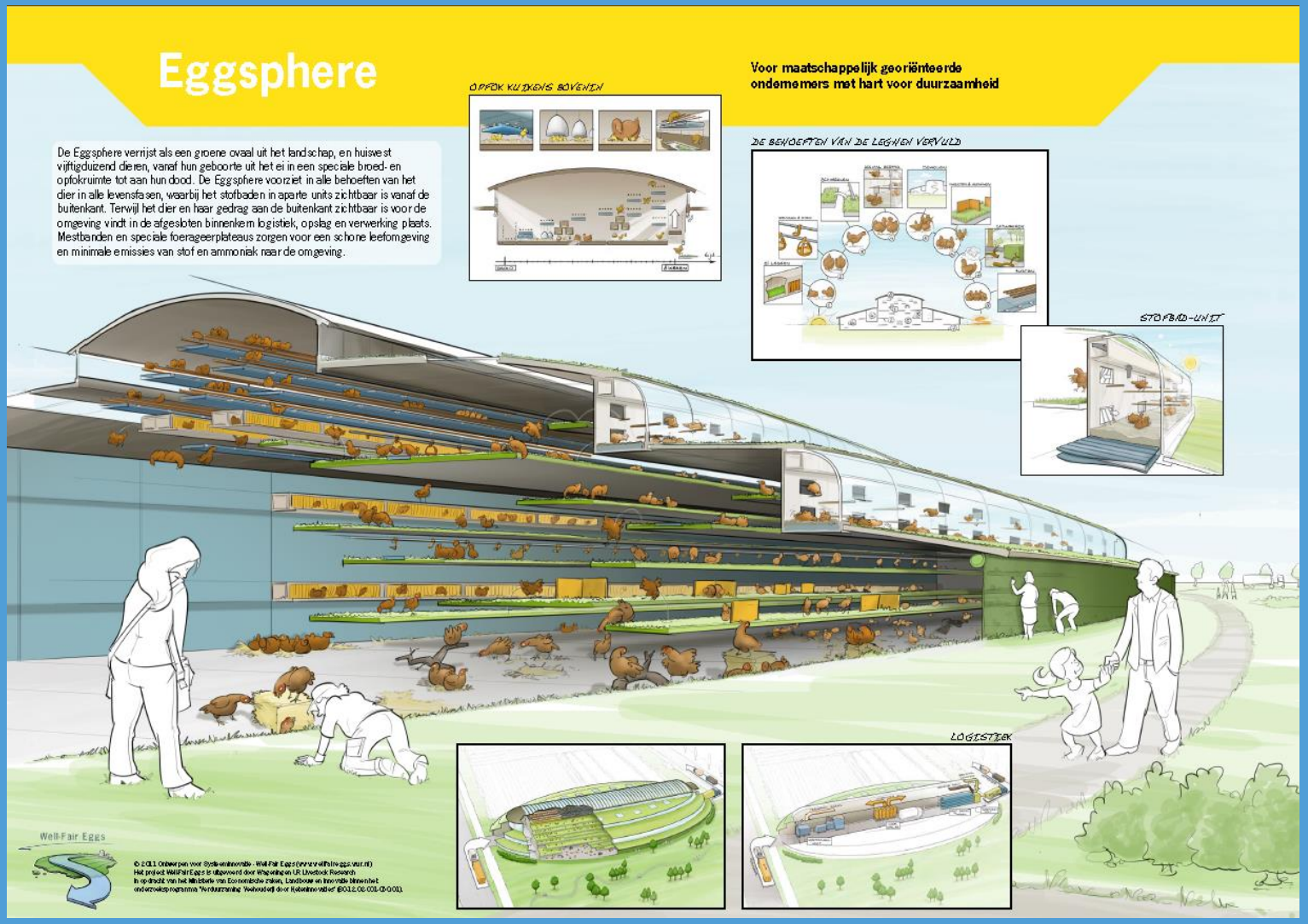
Venco Campus



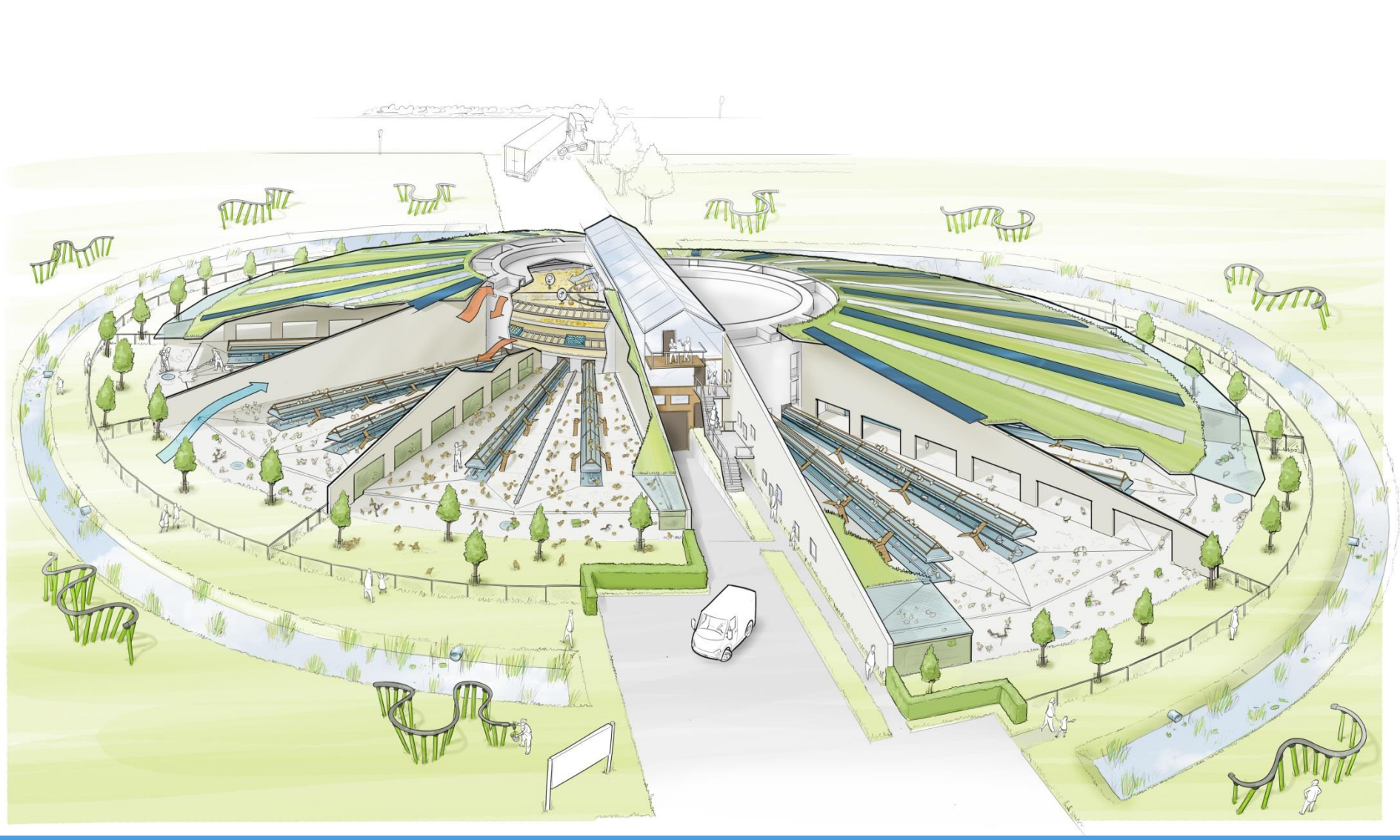
Egg venture


Eggventure
Voor gedreven ondernemers met een neus voor de markt
Eggventure is een meerleeftijden-houderijsysteem voor legkippen waarin twee keer per jaar vijftigduizend bebroede eieren worden aangevoerd. De hennen leven tot zeventien weken in een opfokstal, en daarna tot 104 weken leeftijd in één van de vier legstallen, die alles bieden voor goed welzijn. Transport van dieren, eieren en mest is vergaand geautomatiseerd. Eieren worden gecontroleerd en geselecteerd voor afzet als tafelei of ter plaatse gebroken tot eiproduct. Er vindt intensieve samenwerking plaats tussen verschillende bedrijven die betrokken zijn bij de opfok, leg, doden, eiverwerking en gezondheidsbeheersing.
DE BEHOEFTEN VAN DE LEGHEN VERVULD
EI VERWERKING
SELECTIE EN BREKEN
GECONDITIONEERD EI TRANSPORT
MEST TRANSPORT
AFVOER
JONGE LEGHENNEN TRANSPORT
17 WEKEN
AANVOER
LUCHT FILTERING
DODE DIEREN TRANSPORT
104 WEKEN
Well-Fair Eggs

Eggsphere


Eggsphere
Voor maatschappelijk georiënteerde ondernemers met hart voor duurzaamheid
De Eggsphere verrijst als een groene ovaal uit het landschap, en huisvest vijftigduizend dieren, vanaf hun geboorte uit het ei in een speciale broed- en opfokruimte tot aan hun dood. De Eggsphere voorziet in alle behoeften van het dier in alle levensfasen, waarbij het stofbaden in aparte units zichtbaar is vanaf de buitenkant. Terwijl het dier en haar gedrag aan de buitenkant zichtbaar is voor de omgeving vindt in de afgesloten binnenkern logistiek, opslag en verwerking plaats. Mestbanden en speciale foerageerplateaus zorgen voor een schone leefomgeving en minimale emissies van stof en ammoniak naar de omgeving.
OPFOK KUIKENS BOVENIN
DE BEHOEFTEN VAN DE LEGHEN VERVULD
STOFBAD-UNIT
LOGISTIEK
Well-Fair Eggs

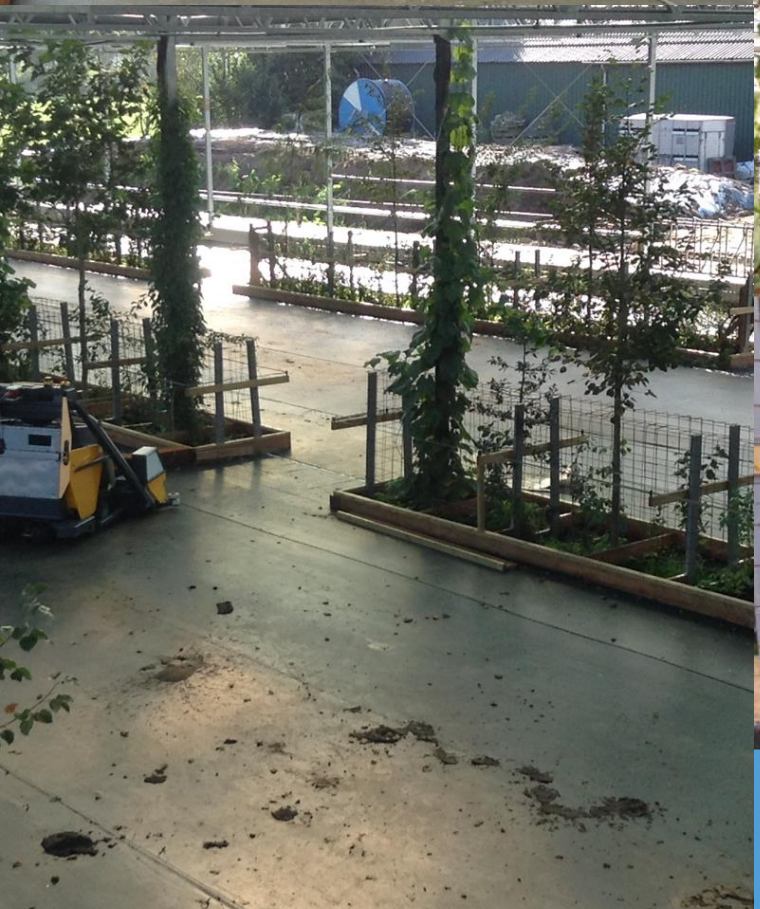
Sum of parts



Windstreek

Cow Garden

Cow Garden



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