Explore the cutting-edge innovation and research from Germany on nursery challenges and „climate trees“

Dr. Heinrich Lösing

Generals remarks

Labour situation

- Minimum wage is around 12,50 €/h in Germany and above 22 € Danmark
- skilled local people are nearly impossible to find
- huge competion on young people in general
- other industries like Airbus offer better oppertunities
- seasonal labor from eastern Europe is demanding good working surrounding, accomodation ect.

Conclusion:

- bring in work as much inside as possible (grading, bundeling ect.)
- Automation as much as possible, container production has done a lot, but bare root production in the field needs improvement
- Product price has to go up
- Still you need good people

Labor is one of the limiting factors in production !

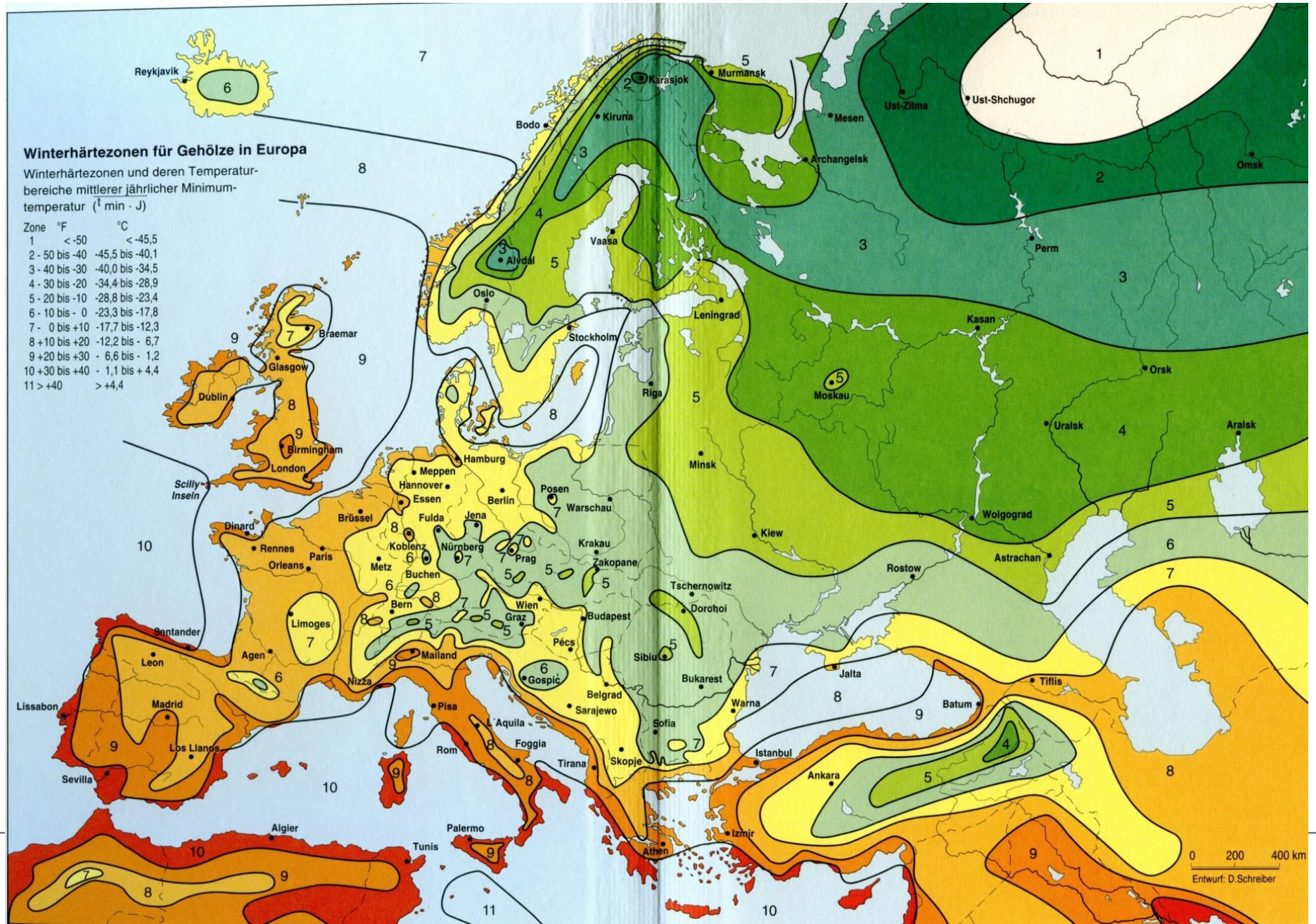
Pesticide use

- New european guidline, SUR = Sustainable Use Regulation (generally 50% reduction, no more use in protected areas)
- further reduction of chemical products
- further dosis reduction per ha, extrem in Skandinavia already
- trend for biological cultivation (inside the greenhouse easier than outside)
- Biological products and plant strengthener have limited effects

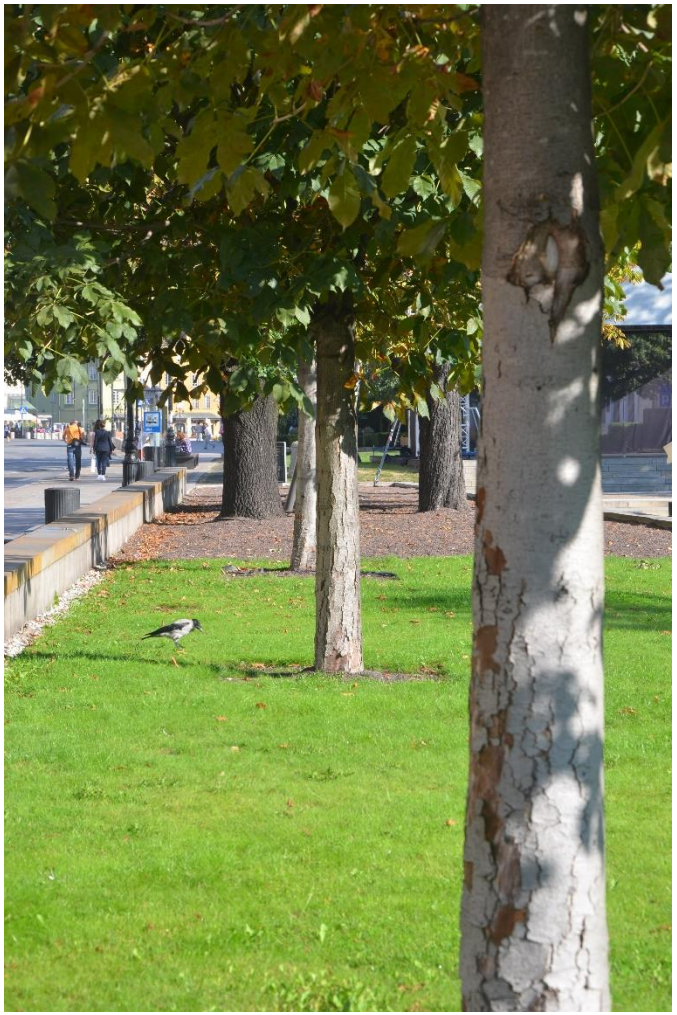
And there is more:

- peat reduction
- limitation of water use
- use of plastic
- Investment companies are starting to buy nurseries to get a better, greener image
- reduction in the use of fertilzer, especially Nitrogen

Winter hardiness zones in Europe



Climatical changes – trees for the future, sunburn and frost is a growing problem for trees



Sunburn on Aesculus and Tilia

Climatical changes – trees for the future

sunburn and frost is a growing problem for trees

- sun damage is always on the same side of a tree, where sun hits the trunk around 15:00 in the afternoon

- frost craking and Verticillium-craking spreads around the trunk of a tree

Protection of trees after planting

- Especially problems Aesculus and Tilia
- Liquidambar and others never get it
- Special protectant called Arboflex (www.fluegel-gmbh.de)

Watering helps avoiding sunburn as well

Specification for trees in the future in Germany

- Trees and plants should be compatible in the future with:
    - high temperatures above 30 °C in summer
    - only 600 mm of rainfall per year
    - low temperatures around minus 20 °C in winter

- work carried out by Prof. Roloff, Dresden and others

Invasive plant species, so called Neophyte, around 17 tree species are involved

Examples: Acer negundo, Ailanthus altissima, Buddleja davidii, Robinia pseudoacacia , Mahonia aquifolium, Prunus serotina u.a

Solutions/answers:

- no more planting
- Use of seedless varieties

Examples: Acer negundo 'Sensation', or varieties of Fraxinus americana, F. pennsylvanica, Liquidambar 'Cherokee'

Conclusions:
Results from Germany and central Europe might not be useful for Ireland

Inside the city or public land

- running a test programme for testing new species, wind and saltinity has to be included in Irleand

Suggestions: Acer, Alnus, Amelanchier, Betula, Carpinus, Castanea, Ginkgo, Gleditsia, Liquidambar, Pinus, Quercus, Robinia, Sophora, Sorbus, Tilia, Ulmus, Zelkova ect.

- planting of many different species to be aware of new pest and diseases like Xylella, Emerald ash borer ect.

Outside the city

- use of different native species, grown from seedlings with local seed source

Fertilisation in the field in Germany

- soil sample every 2-3 years recommanded or before each new crop planted 2-4 years

- foliar samples only when a problem is showing

- cover crops and cow manure is used as a basic to improve content of organic matter before planting a nursery crop

- limitation for use of nitrogen is difficult to achieve because different species on the same field need different amounts.

Example: Salix - very little, Fagus - demanding

Basic soil analysis:

- pH
- Calcium
- main nutrients: phosphorus, potassium, magnesium
- Trace-Elements: copper, manganese, boron, zinc
- Taken mainly in the winter period
- Nitrogen during growing season seperately

Use the right Potassium fertilizer

- Patentkali (Kalimagnesia)

  30% K_2O + 10% MgO

- Polysulfat gran.

  14% K_2O + 6% MgO

- Korn-Kali
- 40er Kali
- 60er Kali → contain potassium **chloride**
- Magnesia-Kainit

Potassium fertilizer

Chlorid damage on spruce

- using compost (mushroom compost) can cause similar symptom

- especially when applied in spring before planting

Fertilizer for field cultivation

NovaTec premium

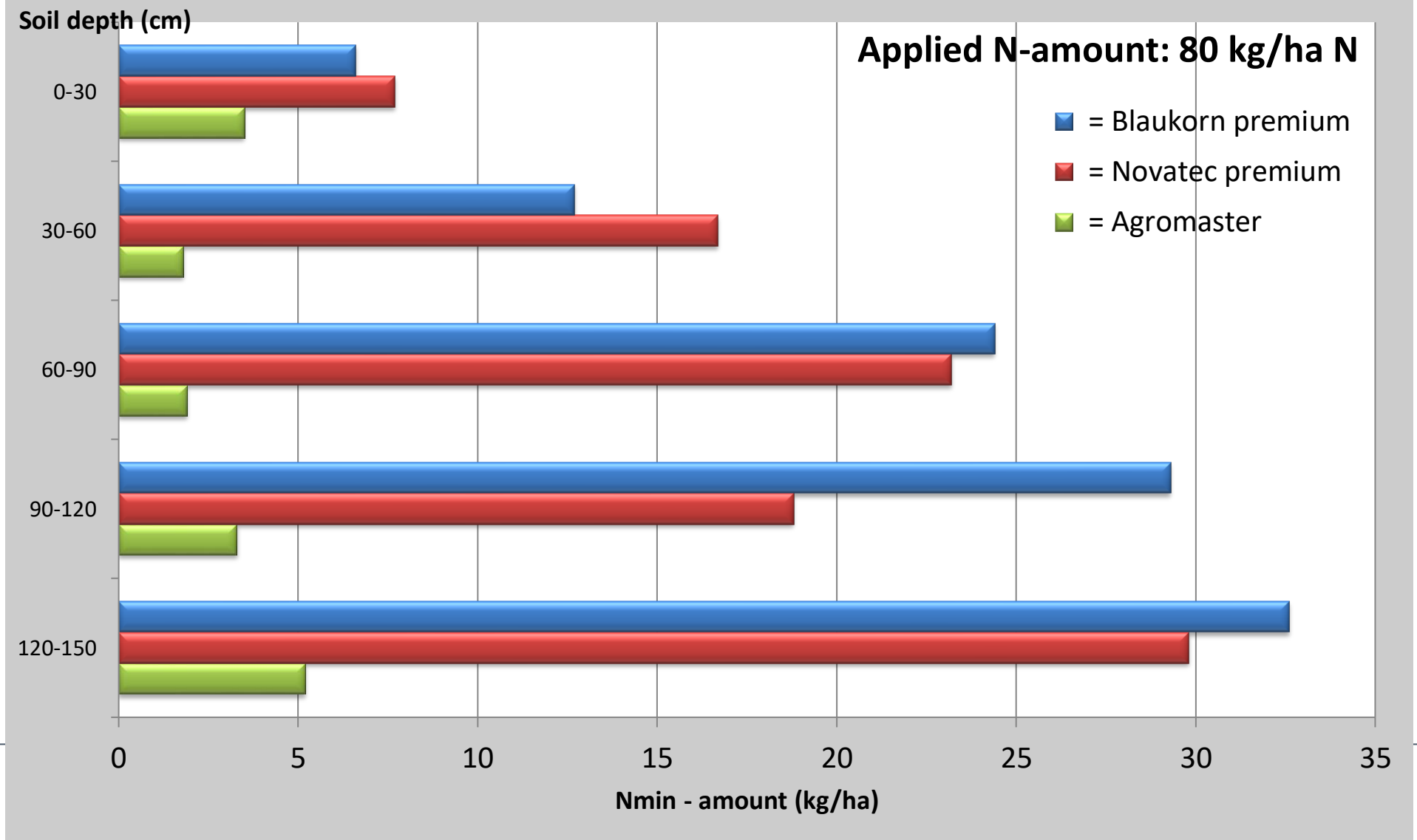
- **15 – 3 – 20 – 3**
- Fertilizer with ammonium-stabilizer
- Potassium-strong and phosphate-reduced
- application-time: march-june
- Amount: 300-500 kg/ha

NovaTec 15-0-20-3 is getting more and more important, because enough Phosphate in the soil of nurseries

N_{min}-Analysis

- NO_3-N and NH_4-N
- immediate cooling of the sample (max. +4°C)
- time:
  - in spring on some sample plots to get an overview of the residual levels of nitrogen after winter (0-60 cm)
  - just before giving the second fertilizer charge in summer (0-30 cm)
- in trials we measure the nitrogen content of the soil also in fall. The sampling was carried out separately fore each soil depth 0-30, 30-60 and 60-90 cm, sometimes deeper

Lower nitrogen leaching using the partly-coated Agromaster …



How much nitrogen is needed for nursery crops

Species	Age	Number of plants per ha	Nitrogen uptake
Carpinus betulus	1	2.000.000	20 kg/ha
Carpinus betulus	2	530.000	213 kg/ha
Picea abies	1	1.000.000	3,3 kg/ha
Picea abies	3	666.000	100 kg/ha
Amelanchier sp	2	400.000	111 kg/ha
Thuja occidentalis	6	67.000	77 kg
Cornus alba	3	44.500	189 kg/ha

Nitrogen use of a crop is depending on age, number of plants per ha and overall growing conditions (Alt 1990, Obermayer 1991)

Soil analysis or foliage analysis ?

- **Soil analyzes** determines the current supply of the soil
  - ➢ a specific filling up with nutrients is possible

- **Soil analyses** not always indicates, if the nutrients are available to plants. Despite good soil values, deficiency symptoms may occur
  - ➢ we use **Leaf analyzes** as a complement

Example:
Tip dying occurred with *Ligustrum*

- the dieback occurs mostly in late summer, often in combination with drought
- Foliar- and soil analyzes indicates a lack of copper and/or boron

Fertilizer for container plants

- Liquid fertilizer are rarely used. Only for fast elimination of deficiency symptoms or in the late summer to improve leaf-colour
- Disadvantages of liquid fertilizer are:
  - great loss of nutrients when applying the fertilizer through irrigation
  - As a result, strong growth of algae in irrigation-reservoirs
  - Increased weed growth on pot-surface and culture-area
- In combination with drip-irrigation, for example in avenue trees, liquid fertilizer often are used

History of Roundup, Glyphosate

- Patentet by Monsanto company 1970
- Distribution world wide from 1974
- Patent expired in 2000
- Many other companies started to produce it since then in many different formulations
- 360 g/l active ingrediant is still regular, but also other ones
- Still a very important product in the whole world for control of established weeds and grass.

Glyphosate – what makes it so special

- Action mainly by contact, limited soil action
- Systemic action in the plant (weed)
- Active ingrediant cannot be broken down by the plant
- Selectivity and weed control relies very much on the applied rate
- Lowest rate for top dressing in Germany would be 1 l/ha of the 360 g/l a.i.
- Works when applied in the winter month as well
- Effect does slow down with cold temperatures

Is there any replacement for Glyphosate ?

Tests are going on for a few years, especially after our best product Finale (Basta) lost registration as well in Europe

Overview:

- Pelargonic acid (Finalsan), Katoun Gold
- Hormans like MCPA, Dicamba
- Mesotrione (Callisto), Sulcotrion (Mikado), Tembotrion (Laudis)
- Carfentrazone (Shark),
- Pyraflufen Gozai, Kabuki, Quickdown
- Flazasulfuron (Chikara), Forumsulfuron + Iodosulfuron (MaisTer), Thifensulfuron (Harmony), Tribenuron (Pointer)
- Pyridate (Lentagran, Onyx)

Infra-Red technology used after sowing and before germination of the nursery crop

www.hoaf.nl

www.abflammtechnik.de

Alternative: Use of Reglone (200 g/l Diquat) – no activity against grass, 1.5 l/ha or Finalsan (Pelargonic acid)

Use of Finale (Glufosinate-ammonium, 120 g/l) or Roundup-products is not safe to apply shortly before germination !!!!

Hood or cap steaming from Egedal, DK and Regero, F

- Hot steam goes into the soil with pressure from above
- Goes only 5-8 cm deep in the ground, depending on standing time for each application
- Working speed: about 100 bis 300 m/hour
- Needs open ground to let the steam go in

Fully automatic steaming in the field

- Hood steamer, does press the steam into the soil
- First machine world wide
- Built by www.zeyer.biz
- Price: about 400.000 €

Optimiertes Dämpfgerät von Fa. Zorn Sonder-maschinenbau und Dampferzeuger von MSD

Fahrgeschwindigkeit ca. 100 m/Stunde

Steaming with Mobildampf.de or Zorn machines

- Machine injects the steam into the soil at about 10 cm depth, afterwards it is mixed and the temperature is protected by a special blanket.
- Used in Pinneberg region since 2012
- Since 2013 on bigger scale (20-40 ha per year)
- about 80 ° C soil temperature necessary
- Speed: 150 m/h, work distance 1-1,80 m
- Amount of oil needed per qm: 0,45-0,75 l

Alternative options of weed control

Elmo, Rheine, www.flaechenpflege.de

Hoaf, Oldenzaal, www.hoaf.nl

IproTech, Iserlohn, www.ipros.de

Mantis, Geesthacht, www.mantis-ulv.com

u. a.

No long lasting effect

Fotos: Werkbilder Fa. Huismann u. Fa. Mantis

Alternative options of weed control

- Can be used with tractor or fork lift nowadays

- No long lasting effect
- Demanding in time and energy

- **www.mv-tuchscherer.de**

Weed control with high water pressure

- New technology since 2018 in nurseries
- Special nozzles for cutting marble in Italy produce 1000 bar pressure and is killing the weed
- first demonstration at v. Ehren nursery in Hamburg
- Risk of damage is big

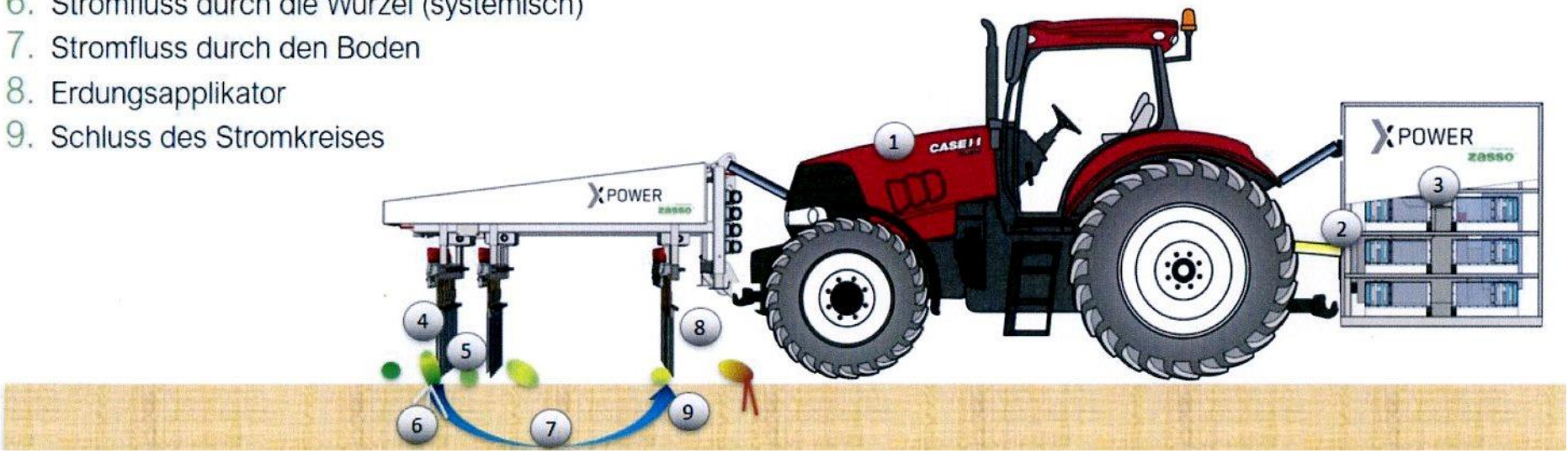
- Pictures: B. Zielke, H. Lösing

Weed control with electric power, Zasso company

Wie es funktioniert

XPOWER zasso

1. Mechanische Energie (Motor)
2. Umformung in Drehstrom (Zapfwellengenerator)
3. Modulare Hochspannungstransformation (4000-7000 V, Modulgröße 3 kW)
4. Elektrischer Applikator
5. Stromfluss durch die Pflanzen
6. Stromfluss durch die Wurzel (systemisch)
7. Stromfluss durch den Boden
8. Erdungsapplikator
9. Schluss des Stromkreises



Weed control with electric power, Zasso company

- First machines with 3 m are available
- Machines for smaller stripes are in developement
- Also against problem weeds like thistle, Scotch gras
- Working speed: 3-5 km/h
- 5-20l Diesel per ha for producing the electric power

Picture: Zasso company

Ironing hoe specially made for small seedlings after germination, so far limited experience

www.feldklasse.de

Mechanical weed control in transplants

- Distance 25 cm between the rows is easy, problem is between the plants
- Power Rake from Egedal company, Denmark
- Risk of mechanical damage

Companies:
www.egedal.dk
www.elco-machinebouw.nl
www.jacobsconstructie.nl
www.handelsondernemingschrauven.nl

Mechanical weed control in transplants with power rake

- Prongs are driven by oilmotor
- Each prong is 60-70 cm long
- Producer:
- www.jacobsconstructie.nl
- One or 3-bedsystem available

Damage on spruce with power rake, summer treatment

New stearing system for 3 beds

- Improves working speed while interrow spraying or cultivating
- Mechanical sensor with photocell is stearing hydraulic cylinder
- One system for each bed

- No GPS-system for planting necessary
- Producers are Braspenning, Schrauwen and Elco in NL
- First application in Germany from 2019 in nurseries

Finger weeder for transplants and trees

- Working well on dry and sandy soils
- Damage possible in stony fields

Problems with drip irrigation

- Overhead irrigation is wasting a lot of water, drip pipes are make mechanical weed control difficult
- Some growers put drip pipes in the soil or hanging in the trees

New machine in trees

Weedelete from van Tuijl is working in between drip irrigation as well

Risk of damage is high (Liquidambar)

- Straight rows making things easier
- Betula and Prunus-species are very sensitive especially before flushing
- Big difference between fruit- / wine growers and ornamental trees

Use of cover crops

- Only in bigger trees and shrubs useful
- Competion for light, water and nutrients
- Alleys along the trees should kept free
- Total cover is not recommanded

Problems with sowing cover crops

Peas in Douglas fir

- Should be mulched before seed set
- Control often needs handweeding
- Mixtures are nice but causing trouble easier

Oil radish in oak seedbeds

Example of a mixture

Oil redish comparission of varieties

- Sowing begin of June, 25 kg/ha
- No difference in flowering time, picture taken 8 th of July
- Later sowing makes a difference

Marygold (Tagetes) is still the best ‘Nemamix‘, 10 kg/ha

Picture: June

October

- Now less problems with polished seed
- Herbicid treatment essential (Pendimethalin, Metamitron)
- Better start with extra nitrogen

Marygold ‚Nemamix' plus Japanese oat, 5 + 60 kg/ha

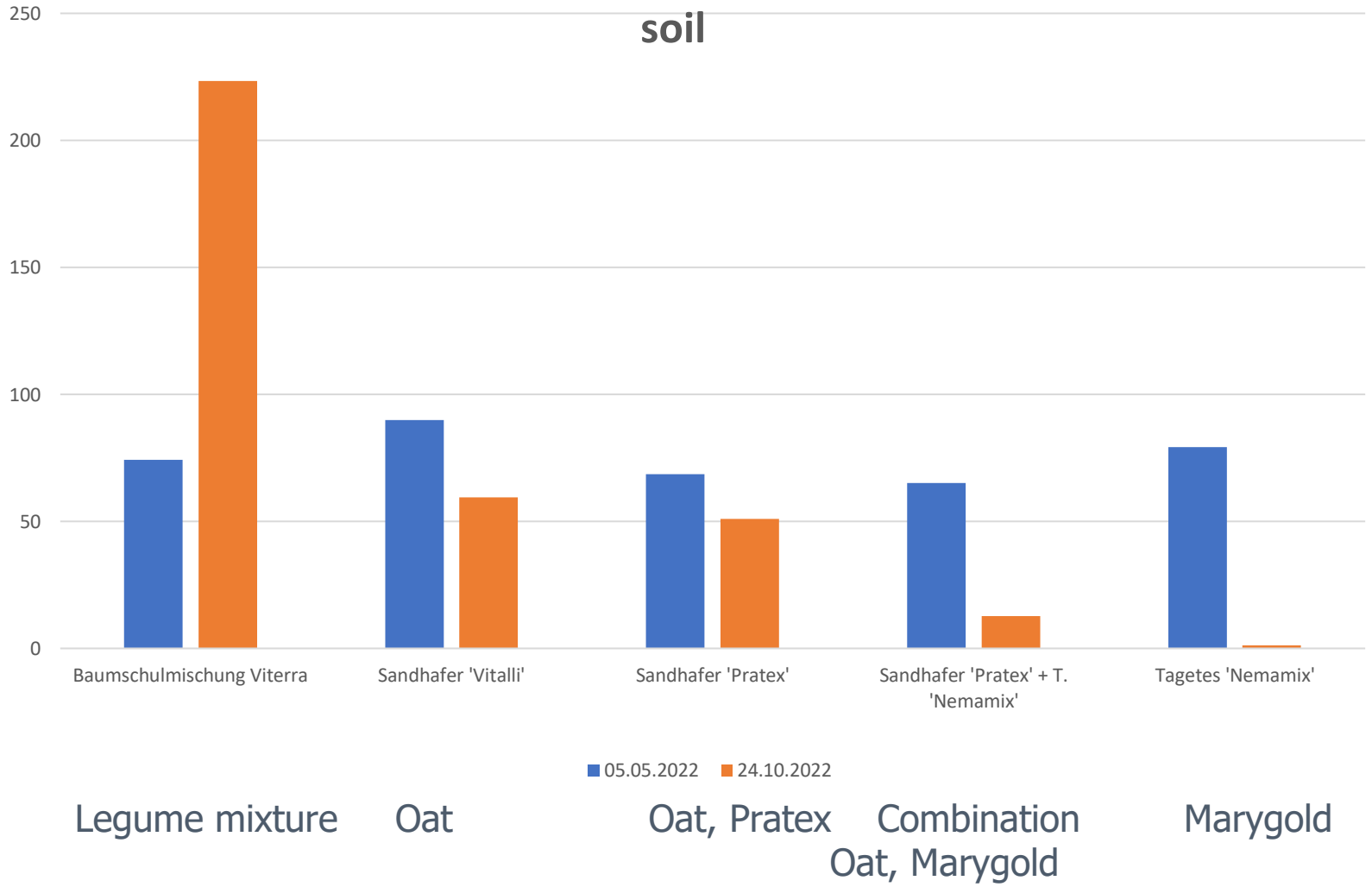
Picturer: June

October

- Easier for sowing

- Nematode control slightly less

Results: Number of Pratylenchus-nematodes per 100 ml soil



Cover crops against nematodes, results after one season

Understock: Rosa corymbifera ‚Laxa'

Understock: Malus 'Bittenfelder Seedling'

T. erecta /Oilseed/Millet/J. Oat/Oilseed/T. Nemamix

Robotics – everybody is waiting for

- making big steps towards professional use
- self steering systems have to fullfill special requirements by law to be alone on a field for protection of people ect.
- Steered by GPS, camera or other sytems or in combination
- so far they do not identify the weed, they detect the main crop like corn

Farmdroid, autonomes machine for sowing and weeding

- Used for sowing and weeding sugarbeet, onions ect.
- Energy from solar panel
- Starting from 12 cm distance in between the rows
- Each sowing point is a GPS-coordinate
- Price: about 70.000 €

Agrointelli from Danmark working in the field

- Combination with Egedal machine

Robots are coming, example Fa. Naio, www.naio-technologies.com

Naio, model Orio in forest seedbeds

- Independent cultivation of soil without driver with Dino (minimum 25 cm distance in between the rows) oder Oz (minimum 75 cm), available on the market already

Naio, model Ted, in ornamental nursery

Roboter Oz

Who is learning quicker from each other

FendtOne

Farmdroid FD 20 with solar panel

Orio, Fa. Naio

Digging and grading plants takes a lot of time and people

Machinery can improve the situation

New 5-row harvestor for transplants in the field

New 5-row harvestor for transplants in the field

5-row harvestor for transplants in the field running by:

Ralph Lüdemann, Hollenstedt, Germany

Demonstration in the field:

Thursday, 26 of October 2023, Start: 13:30

Grading belts and grading machines need a lot of inside space

Don‘t panic – innovate !

Greta Thunberg

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It is essential to follow the instruction on the approved label for your country before handling, storing or using any crop protection product.

Always start on a small scale with new products !