

BASF's vegetable seeds business


nunhems

 **BASF**
We create chemistry

Our motivation

Make healthy eating
enjoyable and
sustainable

Our outreach

200

billion seeds

Per year

50

billion kg
vegetables

Per year

137

million kg
vegetables

Per day

500

million consumers

Per day



How we achieve our goals



Global presence

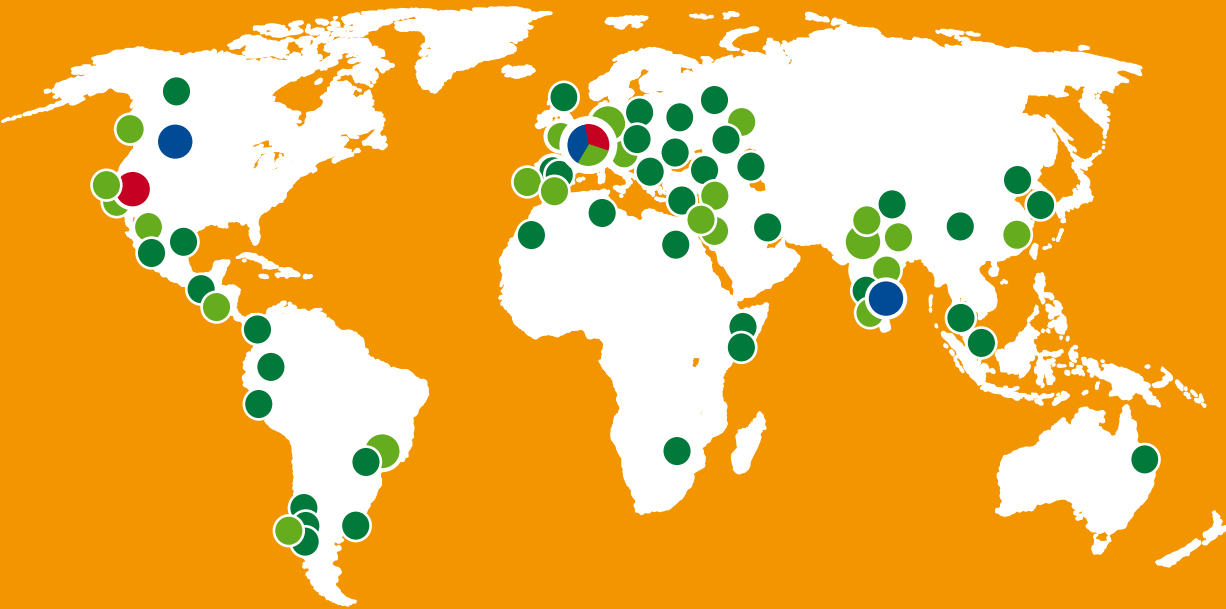


Market insights



Innovative breeding

Global presence



- Main operations centers for seed processing
- Breeding stations
- R&D Center
- Other staff locations



2000+ employees in
37 countries



Researchers
740 = 37%



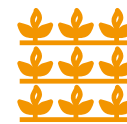
Breeding stations
23



Production in
21 countries



Research centers in
2 countries

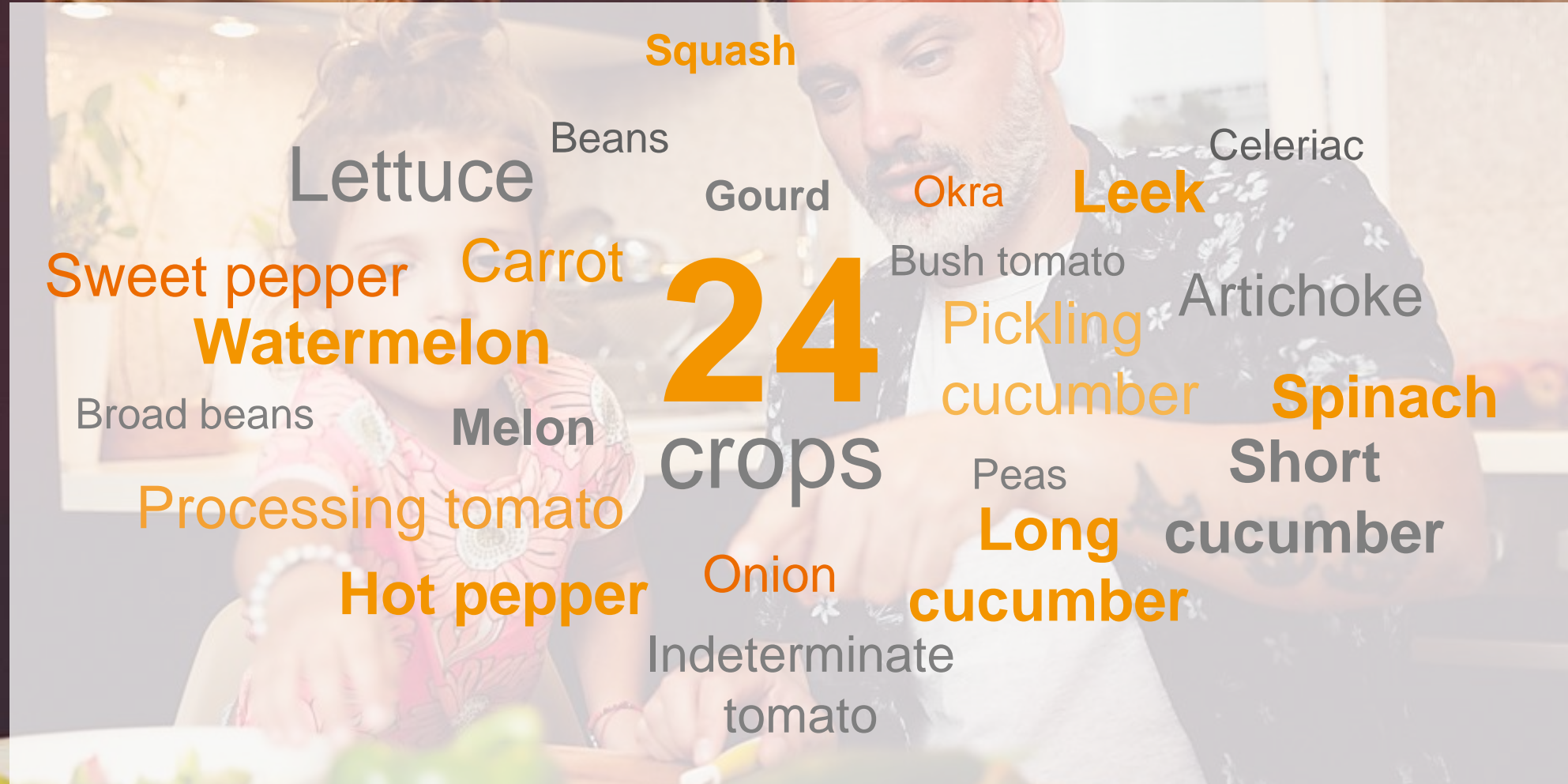


Crops
24



Commercial varieties
1200

Our crops

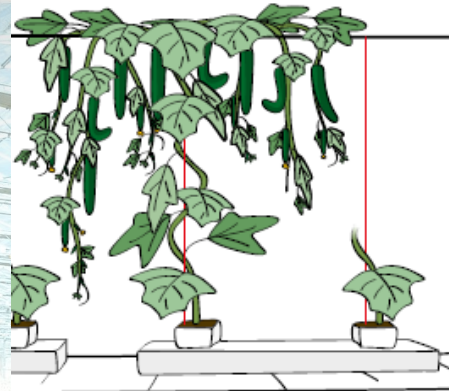


Cucumber

Bringing knowhow into the market

Delivering value to growers by combining genetics and growing technologies

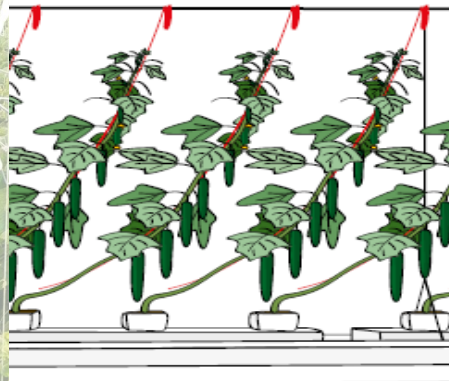
“Traditional”
cucumber
growing system



High-wire cucumber
growing system

Portfolio

- **HiRevolution** with the exceptional COMPACT trait
- **UpBeat**



The benefits of high wire cucumber cultivation:

- Significantly higher (10-35%) and plannable production
- Constant high quality fruits due to open, clearly arranged crop and 100% stem fruits
- Yearround supply
- Plannable, balanced & more efficient labor
- Higher profit for the grower

Cucumber concentration areas

- Netherlands
- Canada
- France
- Finland

Nunhems varieties in different areas

- Netherlands: HiPower, HiLight, HiPace, Upstage, Springscore, SEverance, SEncere, Beesan
- Canada: SEquence, Beesan
- France: SErein, Adinda, Beesan
- Finland: SEnsate, SEculaire

The future of growing cucumber

Data driven growing is the future for cucumber.

How we can talk with the plant ?

Collecting data in cucumber

- Climate data
- Plant data
- Calculation models behind the data

Plant data (explanation in next slides)

- Number of leaves per week
- Number of new set flowers per week
- Leaves from head till flower
- Number of fruits on the plant from flower till harvestable
- Grow out time of fruits from flower till harvest
- LAI Leaf Area Index

Number of leaves

- Labour:
 - Deleafing 2000 leaves per hour cut on stem
 - Deleafing 3000 leaves per hour breaking in middle
 - Deleafing with robots
 - More leaves pruning (3000-4000 leaves per hour)
 - More leaves more plantlength (1 day earlier clipping ?)

- Pruning system
 - Fruits according to possible production
 - More leaves more 1 in 1 out
 - Less leaves more sets of 2

Number of new set flowers

- Number of new open flowers per week
- Balance with light levels (sunlight + artificial light)
- Example: 4 new flowers with plant density of 2,5 stems is 10 new flowers per m²
 - Light level per day 25 mol = 175 mol per week
 - Theory 22 grams / mol possible
 - Theory 3,85 kilo possible
 - With fruit weight of 400 grams this is 9,6 fruits per m²
 - If we have 12 flowers per m² plant gets less selective / generative
 - Remove leaf from the head
 - Deleaf more aggressive
 - More aggressive heating
 - If we have 8 flowers per m² plant gets more selective / generative
 - Use curtain at lower levels f.i. 500 Watt
 - More even day and night temperature
 - Slowly and early to night temperature

Leaves from head till flower

- Head is leaf of about 10 centimeter length
- Flower is real open flower
- Ideal is app. 8 leaves from flower to head
- 10 leaves below means vegetative growth
 - Remove leafs from head to get flowering higher in the plant
- 6 leaves below means generative growth
 - Use curtain early to not heat up bigger fruits too much
 - Not to hot growing pipes, fruits should not be stimulated in bottom
 - Use more sprinkling system to keep higher humidity
 - No fast pre nights

Number of fruits per stem flower-harvest

- Number of fruits from open flower till harvestable fruit per stem
- Ideal number is around 7 in all circumstances
- With 9 fruits steer more generative
 - Remove leaves from the head
 - Some cases remove leaf in middle of the plant
 - More aggressive with pipe temperatures, more pressure on bigger fruits
- With 5 fruits steer more vegetative
 - Don't remove leaves from the head
 - Use sprinkling system / curtain / coatings on roof
 - Slowly to night and late to night

Grow out time fruits from flower to harvest

- How many days it takes the fruit to size up from flower to app. 400 grams
- Ideal depends on situation
 - Lighted / Unlighted
 - Summer / Winter
- Between 10-18 days
- Shelflife starts at opening of flower depending on season
 - Longer on plant, less days good shelflife
 - Shorter on plant, more days good shelflife

LAI (Leaf Area Index)

- Square meters of leaves compared to 1 square meter of soil
- Measured with excel file length of leaf. Calculation
- Ideal depends on greenhouse set up
 - Diffuse glass lower LAI can be accepted
 - Fog system lower LAI can be accepted
 - Higher LAI less power in the head
 - LAI 2,0-2,5 ideal
- Removing leaves from the head to reach ideal LAI
- Future measuring LAI by light interception top of greenhouse compared to bottom of greenhouse

Data Driven Growing 's Gravenzande

Greenhouse setup data driven growing

- Greenhouse 965 m2, height 5,30 under trellis
- Height of wire 3,80
- 350 umol dimmable LED lights (75-9-9-9)
- Planting dates; November 16th, March 2nd, June 15th
- Data driven growing equipment
- Curtain, fog system

Data Driven Growing

- RTR around 2,5
- LAI around 2-2,5
- Maximum Mol per day around 30
- Dimmable lights
- 18 hours day length
- Fog system MJ tech

Future developments high wire cucumber

- Dealeafing robot
- Harvesting robot
- Full autonomous growing
- Plant measurements automatically LAI length etc
- Dynamic lights FR

Thanks for your attention / Questions

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