



Geohumus[®] – Sustainable Soil Management

Gerindtec GmbH

Finkenstrasse 5
72358 Dormettingen
Germany

www.gerindtec.com

www.gerindtec.eu for solar based sustainable desalination solutions



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- 1. Geohumus[®] - History**

 - 2. Geohumus[®] - The product**
 - 3. Geohumus[®] - Features**
 - 4. Geohumus[®] - Customer benefits**
 - 5. Geohumus[®] - Differentiation from existing products**
 - 6. Geohumus[®] - Applications**
 - 7. Geohumus[®] - Proof of concept**

Geohumus® – History

2005

• R & D Phase

- Establishment of Geohumus after 7 years of product development
- First field tests followed by first product sales
- Winner of several awards for entrepreneurship and innovation

2006

• Pilot Phase

- Planning of larger scale production facilities
- International expansion, e.g. field tests in Saudi Arabia and Japan
- Aqua Holding AG becomes shareholder in Geohumus®
- Start of production and entry into retail market

2007

- Further international expansion, e.g. JV announcement in Saudi Arabia and exports to Turkey

2008

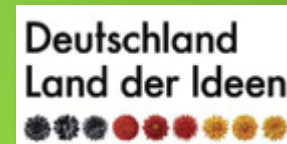
• Large-Scale Production

- Shift to large-scale production
- Patent registration in 140 countries
- Further international expansion to Spain, Saudi Arabia, Australia, India, and the USA
- Expansion of retail platform

2009

- Skion becomes shareholder of Geohumus®
- Establishment of Geohumus® USA

Awards:



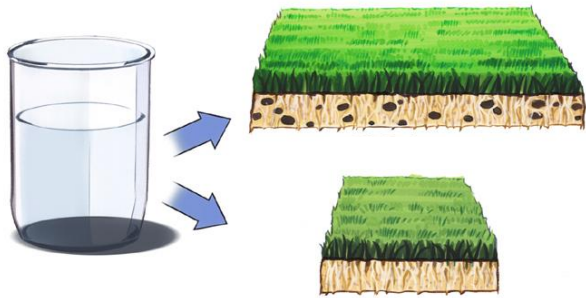
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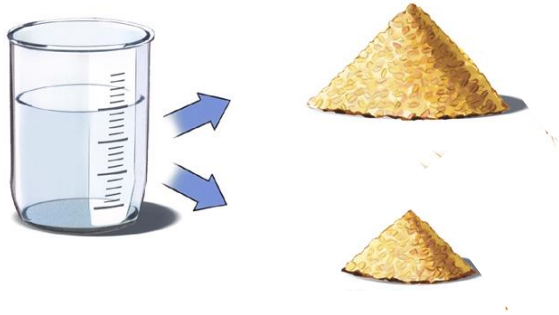
Geohumus[®] – The product

More yield per water unit



with
Geohumus[®]

without
Geohumus[®]



with
Geohumus[®]

without
Geohumus[®]



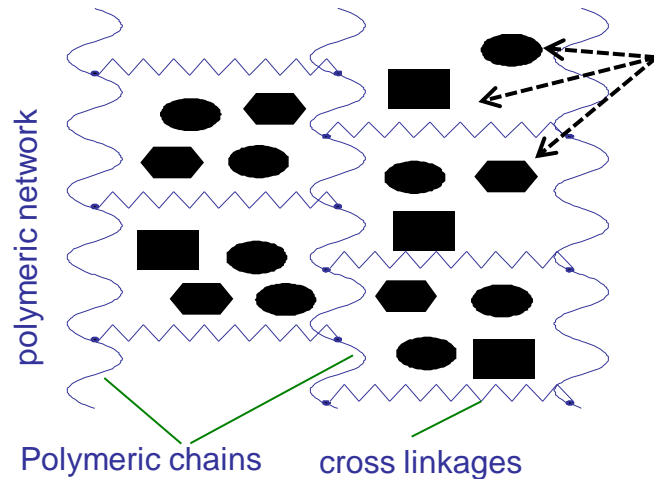
Sustainable Soil Management

- **water storage capacity up to 40 times of own weight**
(1 kg Geohumus[®] stores 40 litres of water)
- **long term delivery of plant nutrients**
- **environmentally safe**
- **product lifetime: 3 - 5 years**
- **main ingredients**
hybrid material with super absorbing polymers and
inorganic components like rock flour



Geohumus[®] is:

- a composite with organic & inorganic components
- a three dimensional network of acrylic acid with functional units
- absolutely nontoxic and harmless

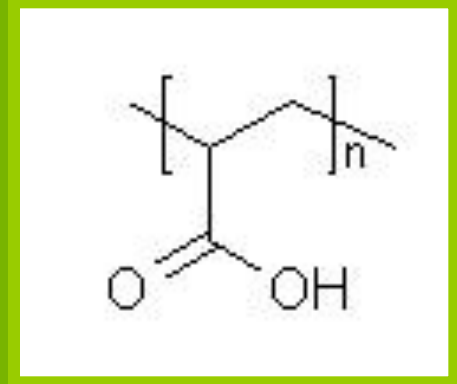


Minerals:

- Volcanic rock flour
- Clay minerals

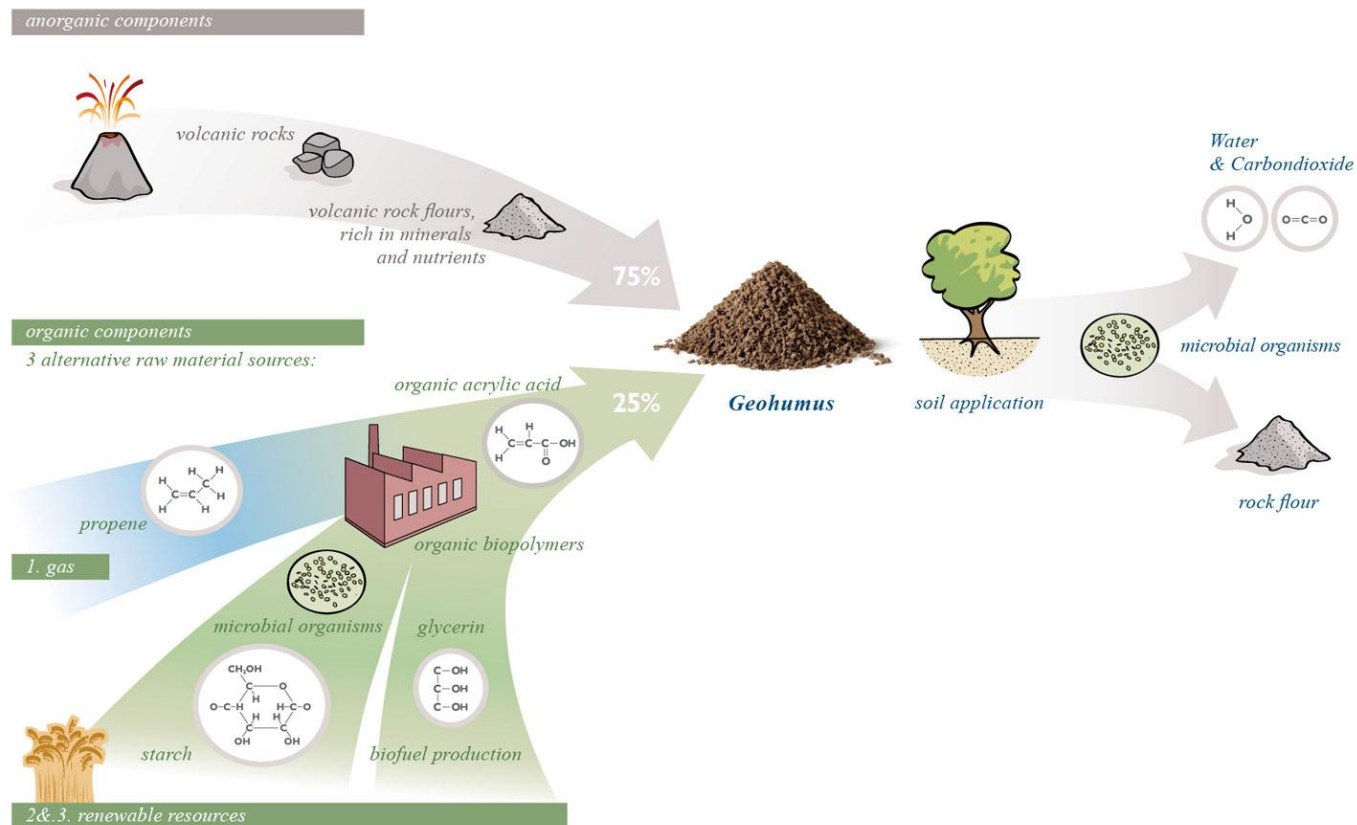
Customisation with additional functionalities:

- special nutrients
- pesticides



Geohumus[®] – The product

Production and degradation of Geohumus[®]



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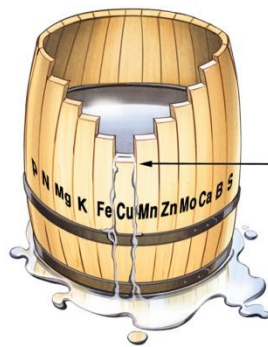
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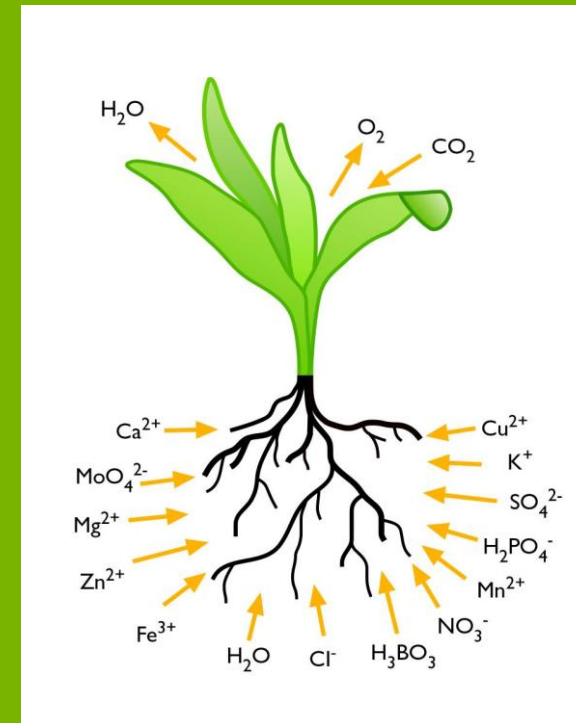
Basic Plant Nutrition Principles

- All plant nutrients have to be water solved to be plant available
- Each plant needs for its growing water, light & different nutrients
- One of these elements missing results in reduced growth

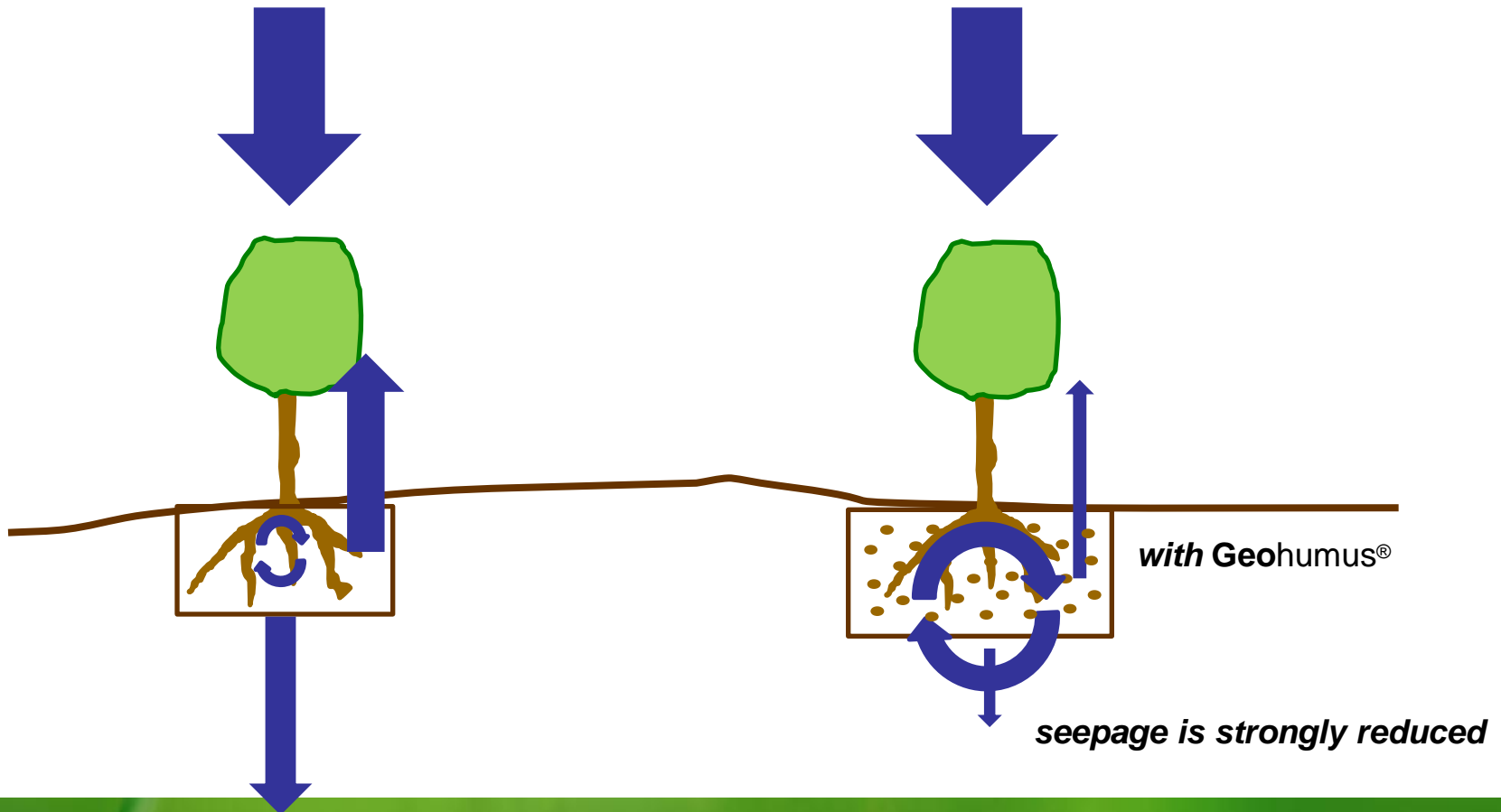
Liebig's mineral substance theory



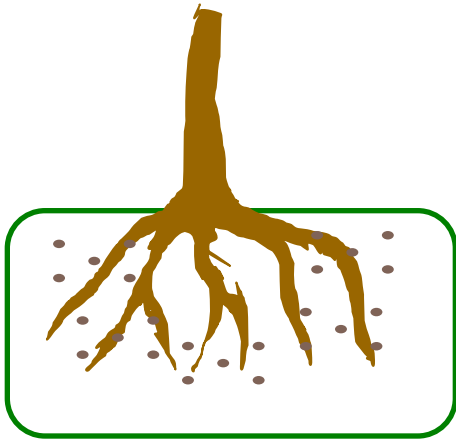
The lowest level symbolizes the limited nutrient for the growing of the plant



The Geohumus[®] Effect:



The Geohumus[®] Effect:



- **Water storage**
 - more water accessible for roots
 - homogenous water distribution
 - higher water concentration
 - better solution of nutritional minerals

- **Expanding**
 - loosening of the soil
 - activates soil life
 - enhances gas exchange



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- **Less irrigation effort required**
 - Plants require regular watering which is time consuming and can represent a physical challenge e.g. for older people
- **Think green – Reduce water consumption**
 - Optimised water management through reduction of seepage and evaporation
 - Sustainable water management, reduced water consumption
- **Increased water availability within the plants' root area**
 - Increased water availability and homogeneous water distribution
 - Stimulation of root and plant growth, healthier and stronger plants
- **Improved soil quality**
 - Swelling and shrinking of Geohumus leads to loosening of the soil
 - Improved aeration and ventilation: faster CO₂ removal while O₂ supply is improved
- **Sponge like structure instead of gel formation**
 - Gels are usually impermeable to water and cause waterlogging
 - The sponge like structure is water permeable and therefore avoids waterlogging



Geohumus[®] – Customer Benefits

- **Invisibility within soil mixtures**

- Colour and consistency of Geohumus are similar to soil, furthermore due to its structure Geohumus anchors to the soil and does not migrate to the surface

- **Improved soil temperature**

- Geohumus provides an improved soil climate due to the relatively high specific heat capacity of water and can therefore protect roots from temporary frost

- **Reduction of fertiliser consumption**

- Geohumus reduces fertiliser leaching as it stores liquid fertilizer and can therefore act as a nutrient depot

- **Significantly improved root growth**

- Root growth is stimulated by improved water availability, soil aeration and mineral supply
- Reduction of plant growth failure rate



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Geohumus[®] – Differentiation

Product	Water absorption ¹	Nutrition capacity	Physical properties	Biological degradation	Environmental safety	Additional functionality
Geohumus	++	+	+		++	++
Algosorb	+		-	-		-
Terracottem	+	++	-	-		-
Sanoplant	+	--	-	--	-	-
Stockosorb	+++	--	-	--	- 2)	-
Luquasorb	+++	--	-	--	-	-

1)*free swelling capacity

2) Acrylamid!

Comparison of Geohumus[®] and other SAPs

Geohumus



- structurally stable
- interlocking with the soil
- no migration to the surface
- no clogging effect
- releases water easily to the soil
- provides micro nutrients
- no acrylamide

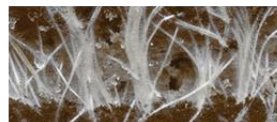
Main application fields:

- ✓ gardening & landscaping
- ✓ agriculture
- ✓ reforestation
- ✓ golf- and sports arenas
- ✓ home plants

- **of limited use in traditional SAP application fields**



Healthy plant growth with good root development



Disturbed plant growth with root rot



Comparative analysis of plant roots by the Institute of Resource Management, Justus Liebig University, Gießen, Germany

Superabsorber (SAP)



- forming a gel
- soft gel particles
- relocation in the soil
- migration to the surface
- reduced or blocked gas exchange
- clogging of soil horizon
- very high water retention
(Superabsorbers are competing with the roots for water)
- often with acrylamide

Main application fields:

- ✓ sanitary products (baby diapers)
- ✓ building materials
- ✓ detergents
- ✓ packaging materials

- **of limited use in soil application fields**

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Potential Applications

- Gardening and landscaping
- Golf courses and sport fields
- Hotels, Parks, roadside greening
- Public green areas
- Tree nursery, reforestation
- Market gardening (flowers, vegetables and fruits)
- Agriculture
- Combat desertification
- Suppression of salination
- Horse riding and livestock farming
- Reclamation of marginal land
- Etc.



Geohumus[®] – Geoinjector

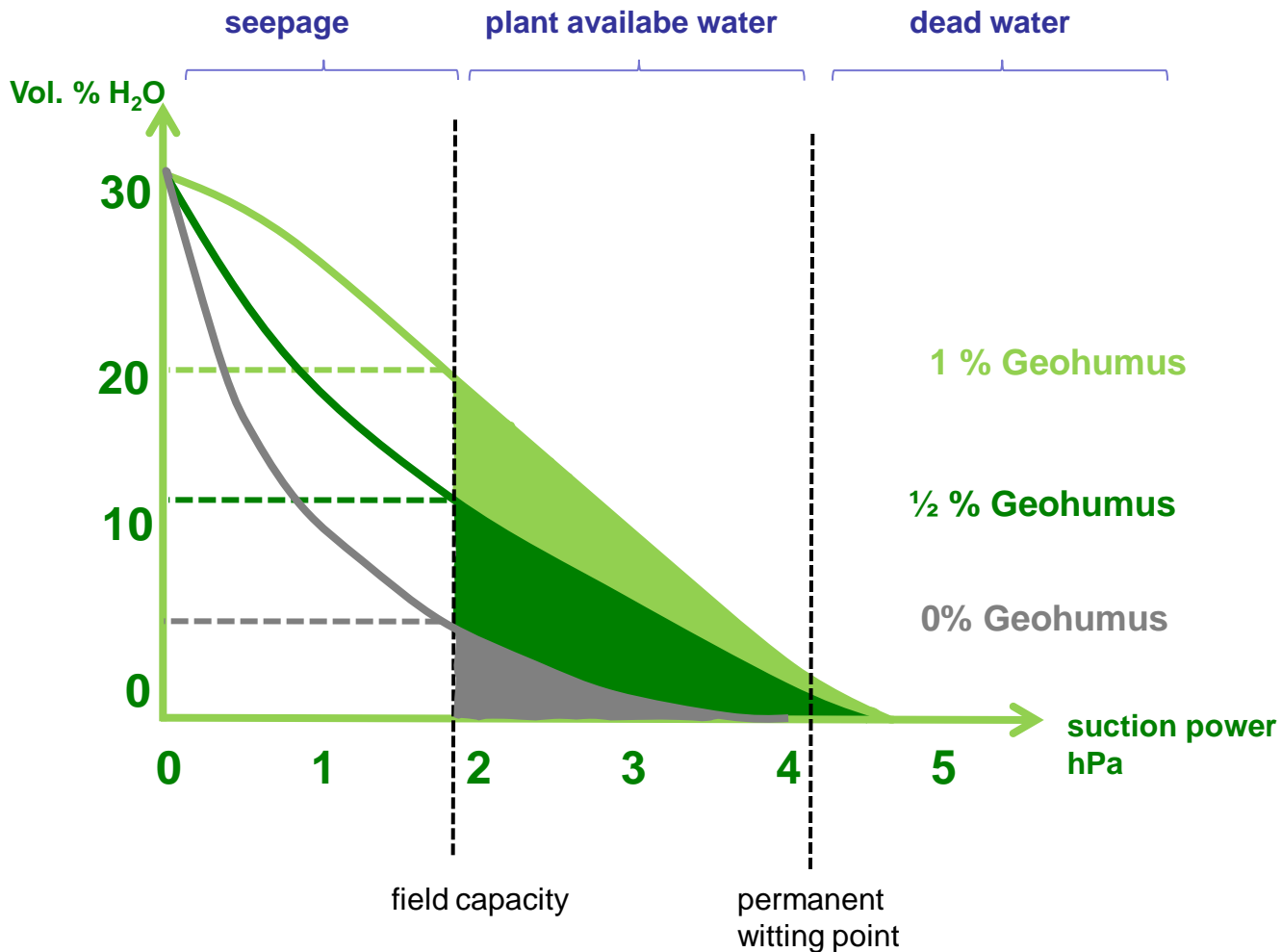
Inserting granulate and fertilizer into soil for raising nutrients density and water storing facility

By soil improvement with Geohumus the continuous water supply can be assured. Aridity-damaged trees can prosper again. Thereby councils save money for watering trees during droughts.



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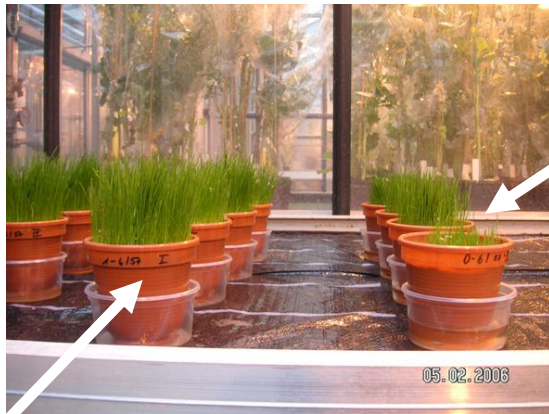
1. Justus-Liebig Universität, Giessen



JUSTUS-LIEBIG
 UNIVERSITÄT
GIESSEN

1. Justus-Liebig Universität, Giessen

- Leading University for Landscaping Ecology and Resources Management in Germany
- Prof. Dr. Hans-Georg Frede consults the government in all aspects of soil physics and water management



Without Geohumus®:
Water is lost by seepage
and is thus **not**
available for the plant

With 1 % Geohumus®

JUSTUS-LIEBIG
 UNIVERSITÄT
GIESSEN



2. Date Palm Tests in the UAE by Prof Zaid Uni Al Ain

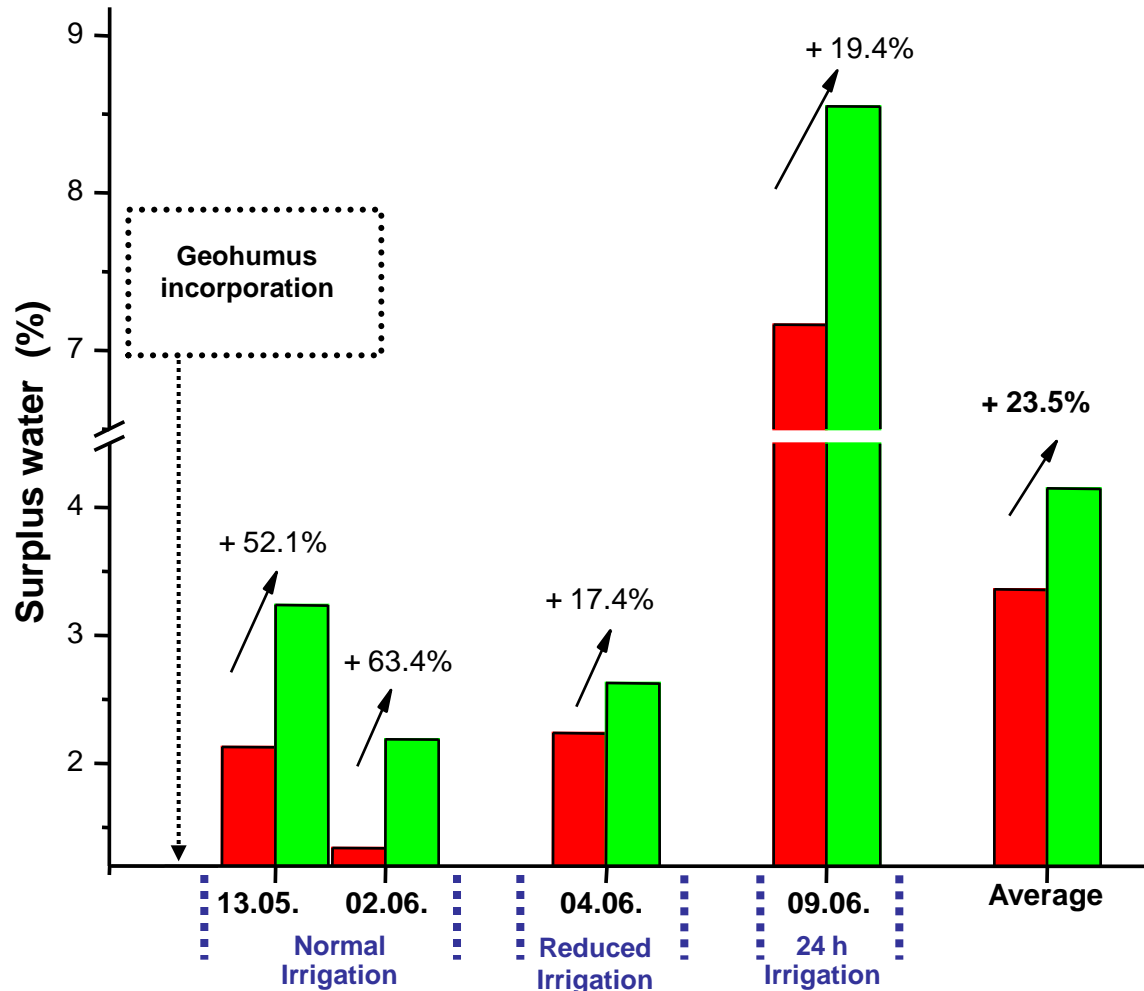
One Date Palm needs 300 l Water per Day
Enhanced plant vitality with less water!

Addition of Geohumus[®] 0.5% and 1% leads to:

- taller plants
- more and bigger leaves
- better root system
- the reduction of the quantity of irrigation water

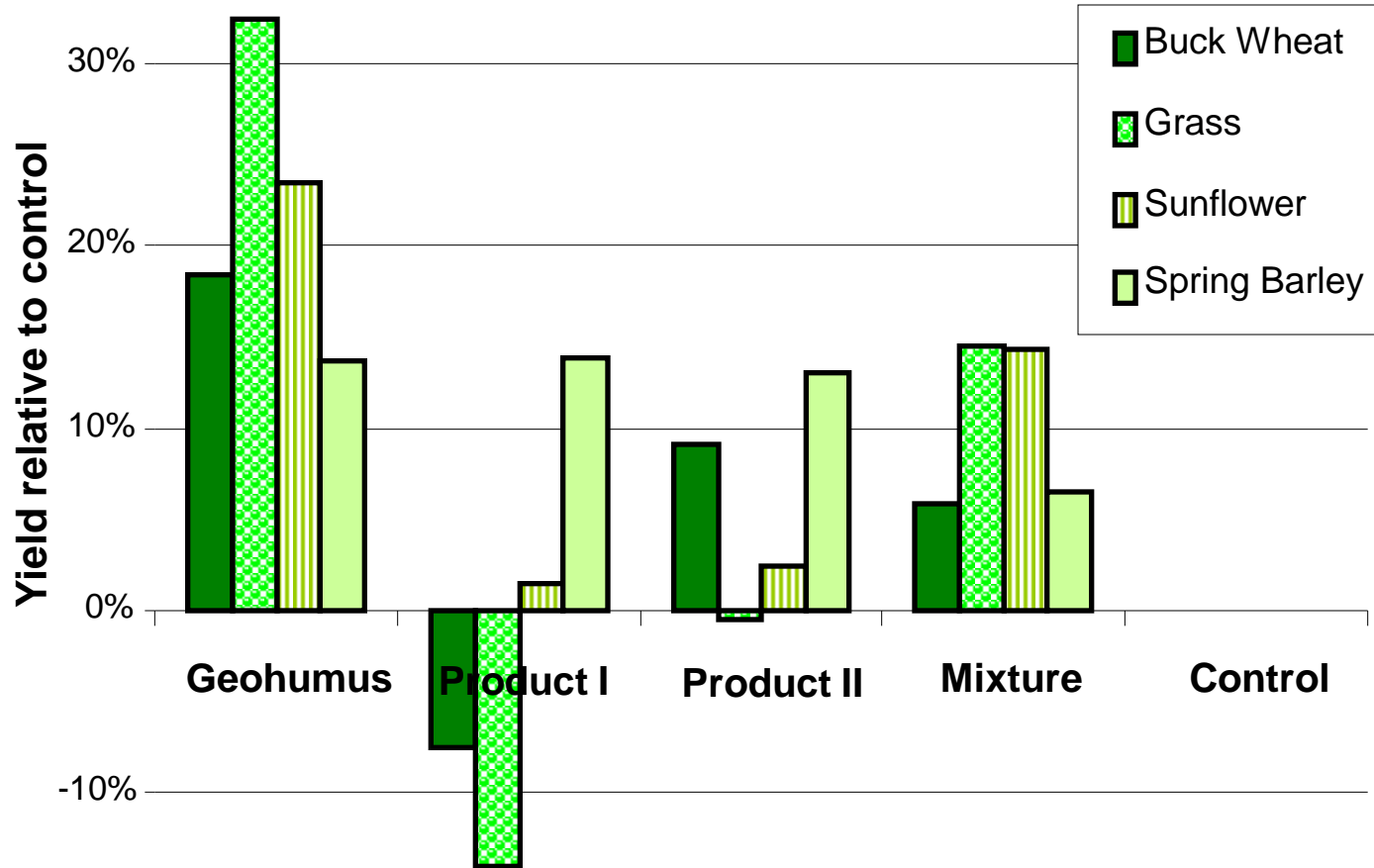


2. Water conservation in date palm



in arid
horticulture
and
landscaping

3. Reclamation of marginal land with Geohumus and competitor products



Geohumus[®] – Ready for Global Sales



Down to earth

the soil solution