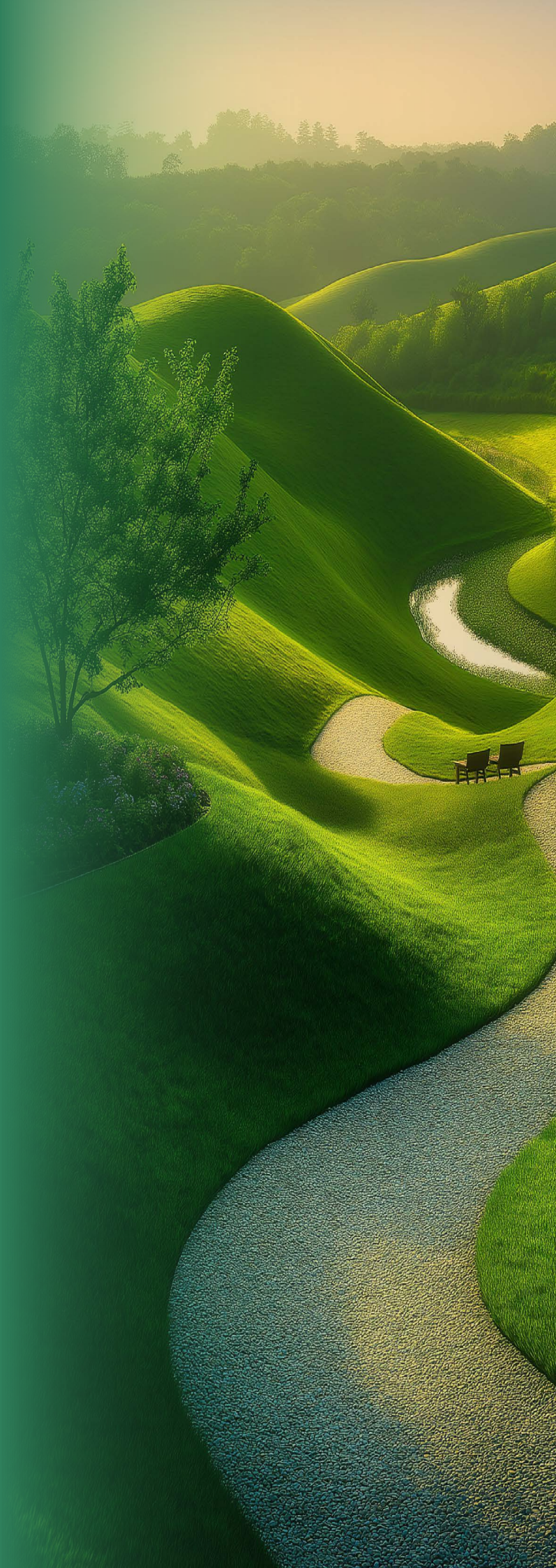
nanotern™

SMART SUBSOIL WATER RESERVOIR



ANT Systems™

AGRICULTURAL NANO-TECHNOLOGY

CONTENTS

ACADEMIC PARTNERS

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Disclaimer

Some of the images shown are for illustrative purposes only and may not reflect the actual appearance, size, or performance of the product. Visual content is intended for marketing and informational purposes only.

This product will swell upon contact with water. Do not dispose of it into drains, sewage systems, or waterways. Improper disposal may cause environmental harm. Please follow local waste management regulations.

01 OVERVIEW

NANOTERN™ is an advanced super absorbent polymer (SAP) designed to function as a water reservoir for plants. Upon contact with irrigation or rainwater, Nanotern absorbs and stores water, gradually releasing it as the soil dries out. This controlled hydration minimizes water stress, supporting plant growth even under drought conditions.

Beyond water retention, Nanotern enhances soil structure and forms a water reservoir around the root zone, limiting evaporation and ensuring consistent moisture even in extreme conditions. By buffering against temperature fluctuations—both hot and cold—it protects the root zone, reduces plant stress, and naturally supports healthier flowering and higher yields.

PATENTED PATENTED

BIODEGRADABLE

FEATURES

- Reduces water consumption by up to **50%**
- Enhances plant efficiency by up to **25%**
- Expands up to **1800 times** its weight in water
- Retains water up to **7 times** longer than competitors
- Minimizes evaporation losses
- Protects the root zone from temperature fluctuations—both hot and cold
- Reduces plant stress, supporting healthier flowering and higher yield
- Free from heavy metals and safe for plants
- Does not cause toxicity or nutrient deficiencies

02 PRODUCT RANGE

Nanotern™ offers a specialized range of products tailored for **Agriculture and Landscaping**, each formulated to meet the specific needs of diverse environments and growing systems. The Agriculture range is engineered for use in open-field cultivation, orchards, seedling production, greenhouses, and hydroponic systems—enhancing root zone hydration, nutrient uptake, and overall plant resilience. The Landscaping line is optimized for turfgrass, ornamental plants, flowerbeds, and urban greenery, supporting quick establishment and long-term soil moisture retention, particularly in water-scarce regions.

Both product lines are available in **5 kg, 15 kg, and 25kg packaging options**, allowing flexible use from small-scale applications to large-scale agricultural and municipal projects.

1 AGRICULTURE

Nanotern™ is a high-efficiency soil additive designed to optimize water and nutrient use in agricultural systems. Applied at the root zone during planting or sowing, it enhances soil moisture retention, improves nutrient uptake efficiency, and stabilizes the plant's growing environment. Suitable for row crops, vegetables, trees, orchards, and open-field vegetable production, Nanotern reduces irrigation frequency, mitigates drought stress, and supports higher yield potential under both normal and water-limited conditions. It is compatible with standard fertilization equipment and scalable for use in large agricultural operations.

For horticulture purposes it supports ornamental plants and turfgrass. And for other purposes such as seedling cultivation, it promotes healthy root development and better rates, ensuring strong seedlings from the start. The package includes bags in sizes from 5kg to 25 kg.

5KG

Designed for smallholder farmers, nurseries, and landscape contractors managing limited plots of land or ornamental plantings

15KG

A practical choice for mid-sized operations, such as orchards, vineyards, or diversified vegetable farms

25KG

Optimized for large-scale field applications, including cereal crops, legumes, and industrial farming

2 LANDSCAPING

Nanotern's™ super-absorbent polymer, which can absorb up to 1,800 times its weight in water and release moisture gradually over approximately 50 days. Designed for diverse applications, from small flowerbeds and lawns (10 to 100 g/m²) to large parks (covering up to 250 m² coverage per 25 kg bag), this eco-friendly polymer reduces irrigation needs by up to 50 percent and enhances plant growth efficiency by around 25 percent.

It remains stable across extreme temperatures, from –60 °C to +70 °C, and supports healthy landscapes by protecting plants against drought and heat stress. The package includes polymer bags in sizes from 5 kg to 25 kg, application tools, and optional soil preparation and irrigation accessories, providing a practical and sustainable solution for resilient, vibrant green spaces.

5KG

~50 m² lawn or 20 pots

Home gardens, balconies, landscaping projects

15KG

~150 m² lawn or shrub beds

Medium commercial/ residential landscaping

25KG

~250 m² lawn or full park beds

Parks, municipal plantings, large estates

03

HOW IT WORKS

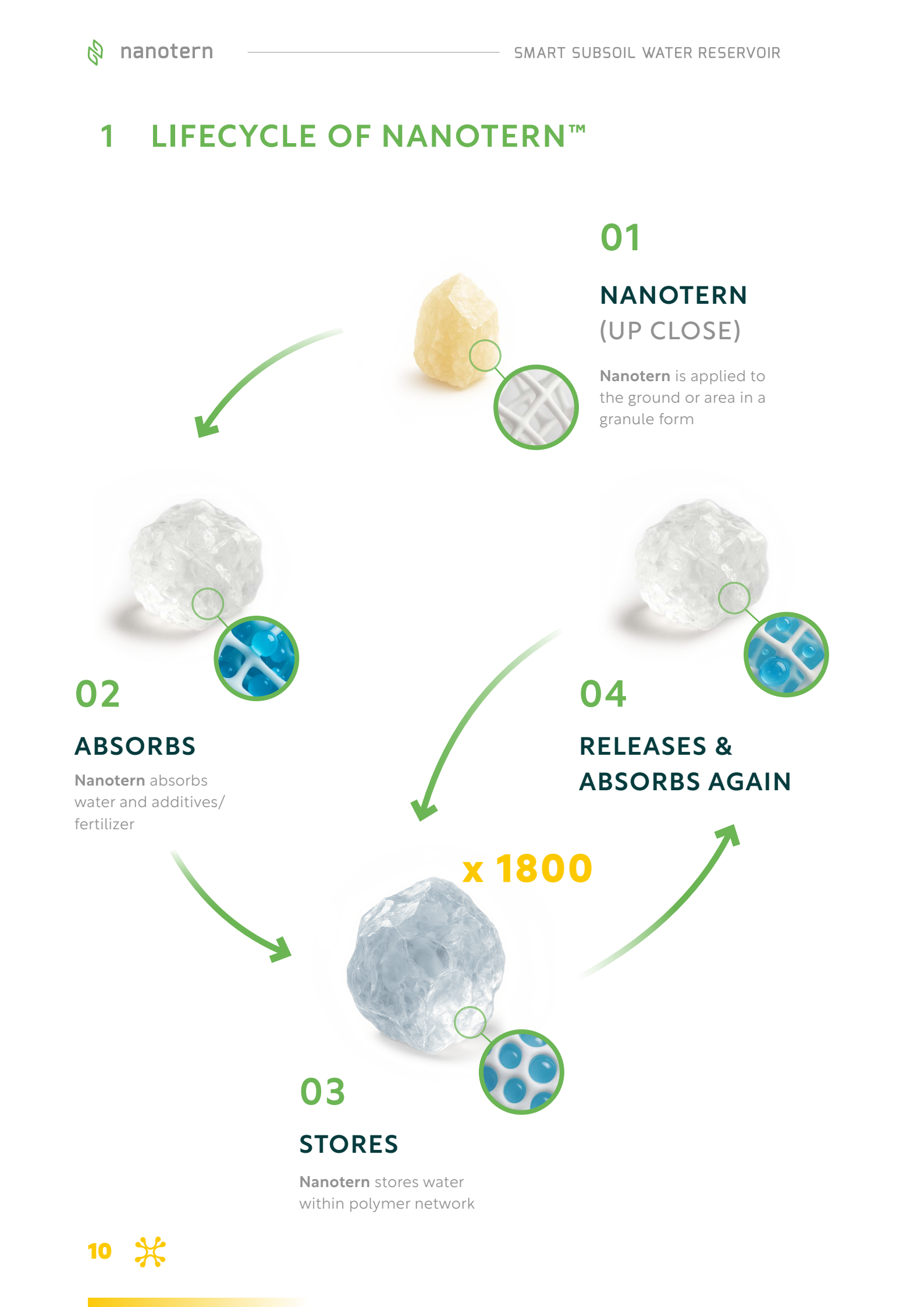
03 HOW IT WORKS

Nanotern™ is a hydrophilic, cross-linked three-dimensional polymer network designed to absorb, store, and slowly release water within the soil. When water is introduced—through rainfall or irrigation—the dry polymer granules quickly absorb it, expanding into a gel-like structure. Each granule can absorb up to **1,800 times** its own weight in water.

Once swollen, the polymer stores the water and gradually releases it as the surrounding soil dries. This process creates a self-regulating moisture buffer in the root zone, reducing the frequency and volume of irrigation required. Under typical conditions, a single application of Nanotern can sustain plants with gradual water release over a period of **40 to 50 days**, depending on soil type, plant demand, and environmental factors.

The polymer remains stable and active in the soil across multiple wet–dry cycles, undergoing the absorb–release process over **4 to 5 times** over a span of several months. This not only improves water-use efficiency but also promotes deeper root growth, better nutrient uptake, and greater plant resilience in periods of heat or drought. Nanotern can also hold and be applied over time onto any fertiliser or solution, allowing these products to be used more efficiently.

1 LIFECYCLE OF NANOTERN™



01

NANOTERN (UP CLOSE)

Nanotern is applied to the ground or area in a granule form

02

ABSORBS

Nanotern absorbs water and additives/ fertilizer

03

STORES

Nanotern stores water within polymer network

x 1800

04

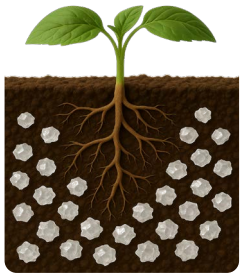
RELEASES & ABSORBS AGAIN

04
THE PHASES

04 THE PHASES

1 ABSORPTION PHASE

Water enters the polymer through a diffusion mechanism, causing the hydrogel structure to swell.

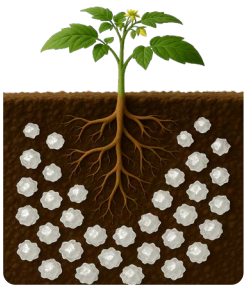


2 RELEASE PHASE

As the soil dries and plant roots extract water, the stored water is **gradually released through osmotic pressure differences.**

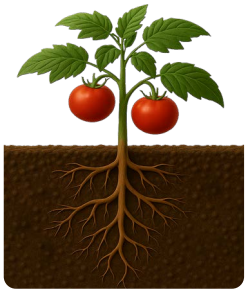
3 CONTROLLED RELEASE DURATION

The rate of water release varies depending on weather conditions, soil and types.



4 REUSABILITY PHASE

Once all stored water has been released into the soil, the polymer dries out. When exposed to water again, it can **reabsorb and release water for 4–5 cycles**, ensuring long-term functionality.



5 BIO-DEGRADE PHASE

At the end of the 4 to 5 cycles, which is a span across **40 days**, the product bio-degrades safely into the soil matching the length of crop growth cycles.

05
APPLICATION AREAS

05 APPLICATION AREAS

LARGE SCALE FARMING

GREENHOUSE

HYDROPONIC FARMING

SAPLINGS

LANDSCAPING

DRONE

06
METHODS OF APPLICATION

06 METHODS OF APPLICATION

1 LARGE SCALE FARMING APPLICATION

For broad-acre farming and large planting areas, **Nanotern™** is applied during fertilization or sowing using standard equipment such as a fertilizer spreader or seed drill. The polymer granules are distributed evenly across the field and incorporated into the soil at the appropriate depth to align with the crop's active root zone, typically between 10 and 20 centimeters.

This ensures that as roots develop, they encounter the water-absorbing polymer exactly where it is needed most. The granules absorb irrigation or rainwater, storing it near the roots and gradually releasing moisture over time. This targeted placement significantly improves water-use efficiency, reduces runoff and evaporation, and helps maintain consistent soil moisture levels throughout critical growth stages.

Nanotern is compatible with most mechanized farming systems and can be blended with fertilizers or organic amendments, allowing seamless integration into existing field operations.

2 GREENHOUSE APPLICATION

In soil-based greenhouse systems, small planting holes are prepared manually for transplanting seedlings. Before placing each vegetable seedling, a measured amount of dry **Nanotern™** is added directly into the hole. The seedling is then positioned and the hole is backfilled with soil. This method ensures efficient moisture retention at the root zone, promoting healthy, uniform plant growth and reducing irrigation frequency.

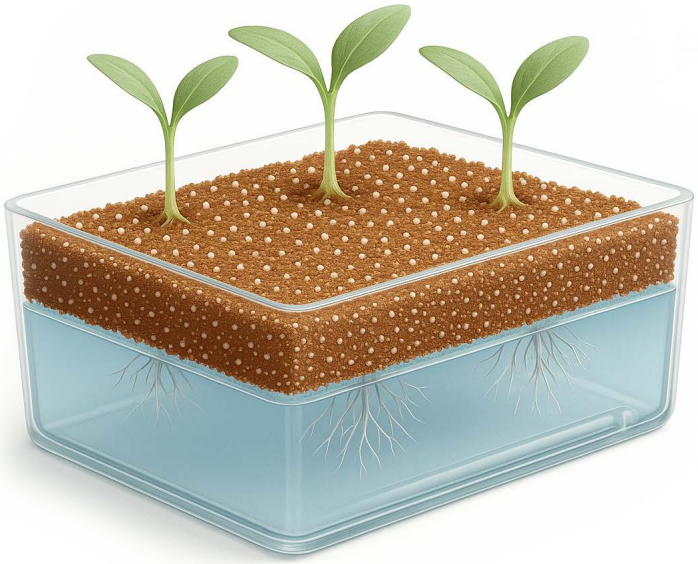
01 Prepare the area for planting

02 Apply **Nanotern** to the area

03 Watch your harvest flourish

3 HYDROPONIC FARMING APPLICATION

In hydroponic systems, **Nanotern™** enhances water and nutrient retention in the root zone during the critical seedling stage. The pre-inflated polymer can be placed beneath the seedling bed or mixed directly into the growing medium, such as cocopeat or perlite. This creates a consistently moist environment around the roots, reducing overall water consumption while promoting healthy root development. Nanotern performs especially well in vertical farming and recirculating hydroponic setups, where efficient water use and nutrient delivery are essential for high-yield, sustainable growth.



Nanotern mixed in the growing medium

Nanotern placed under the seeding bed

4 APPLICATION TO SAPLINGS

When planting young trees, prepare a planting hole appropriate to the size of the root ball. Before placing the sapling, add a measured amount of dry **Nanotern™** granules directly into the bottom of the hole. Position the seedling carefully, ensuring the roots are spread naturally, then backfill with soil to ensure firm root-to-soil contact. Water thoroughly after planting to activate the polymer and support early root establishment.

01

Prepare the area for planting

02

Apply **Nanotern** in the area

03

Plant the desired sapling

04

Water and watch the sapling flourish

5 LANDSCAPING APPLICATION

In landscaping applications, especially in arid and drought-prone regions, **Nanotern™** significantly shortens the grass establishment period by forming a water-retaining gel matrix that supports seed germination, root anchoring, and early-stage growth. When used in turfing or hydroseeding systems, the polymer ensures that water is retained directly in the root zone, reducing evaporation and minimizing the need for frequent irrigation.

This method ensures faster rooting, improved turf density, and enhanced survival rates in extreme conditions, making it ideal for residential lawns, public parks, golf courses, and large-scale greenbelts. It is recommended to use 1 kg per every 4 m^2 of lawn.

01

Prepare **Nanotern** and evenly distribute the polymer across the soil

02

Evenly water over the soil and the **Nanotern**

03

Roll sod or lay turf over the treated layer

5 LANDSCAPING APPLICATION

Nanotern™ is laid on the sand and grass is planted. Its lightweight structure makes it ideal for roof gardens, while its ability to function without soil enables use in urban greening projects. By reducing the need for multiple layers and simplifying irrigation systems, Nanotern cuts hydroseeding input costs by up to 40% and promotes healthy, sustainable vegetative growth.

7 LAYERS WITHOUT NANOTERN

- Substrate
- Insulation
- Filter Fabric
- Drainage Layer
- Root Barrier
- Waterproof Layer
- Roof Surface

5 LAYERS WITH NANOTERN

- Substrate
- Nanotern
- Drainage Layer
- Waterproof Layer
- Roof Surface

6 APPLICATION TO TREES

For established trees, create a circular trench around the root zone, approximately 25 cm wide and 15 cm deep, forming a ring or “bagel” shape. Apply **Nanotern™** in its activated gel form evenly along the trench, mix it thoroughly with the excavated soil, then backfill and cover. This method delivers moisture directly to the tree’s feeder roots, significantly improving water availability and reducing drought stress. It promotes deeper root growth, enhances nutrient uptake, and helps maintain overall tree health during hot and dry conditions.

Recommended dosage for young trees are 20–40 grams per tree (mixed into the planting hole near the root zone), with medium trees having 50–100 grams per tree (applied in a ring/trench around the root zone). For mature trees, 150–200 grams or more per tree is recommended.

01 Prepare the area for **Nanotern**

02 Apply **Nanotern** to the area

03 Cover the **Nanotern** with soil

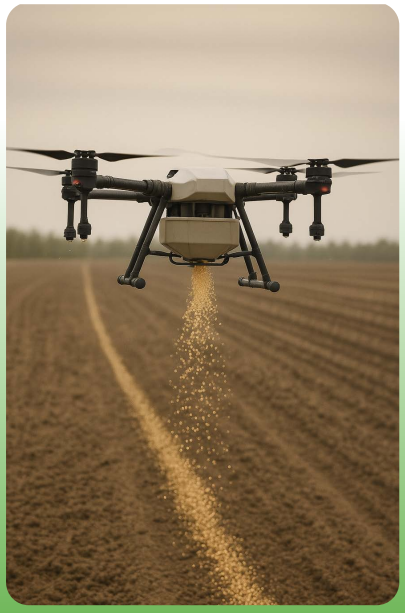
7 APPLICATION WITH DRONES

Before application, the field must be plowed and leveled to ensure uniform distribution. **Nanotern™** is applied using an agricultural drone equipped with a calibrated granular spreader, capable of accurately dosing material according to particle size. Alternatively, a seed or fertilizer broadcasting module can be used. Application should follow a line-by-line pattern, laying down clearly defined strips across the field.

Example of using technological tools such as drones for more efficient application.

7 APPLICATION WITH DRONES

Immediately after drone application, a seed drill or planting implement must pass over the same lines. The critical point is precise alignment—the seed drill must follow the exact tracks created by the drone, embedding the seed directly where **Nanotern™** has been applied. This ensures the polymer is positioned at an optimal depth (approximately 10 cm below the surface) in the root zone. GPS coordination is recommended for accuracy, but if unavailable, physical marking of application lines is also acceptable. Additionally, the drone's application width should match the drill's row spacing, and both operations must move in the same direction to maintain consistent alignment (e.g., east–west).



01

The drone is equipped with a spreader and is loaded with **Nanotern**

02

The drone flies over the field and systematically applies the **Nanotern**

03

The drill seeder tractor matches the lines made by the drone

07
APPLICATION FOR CROPS

07 APPLICATION FOR CROPS

WHEAT

LENTILS

POTATOES

TABLE GRAPES

HAZELNUT

WALNUT

PISTACHIO

APPLICATION FOR WHEAT

LARGE SCALE FARMING

LARGE SCALE FARMING

DRY FARMING METHOD FOR WHEAT

The Purpose

To evaluate the effects of soil moisture, water use efficiency, and yield under dry farming conditions in wheat cultivation.

The Method

Before the trial, ANT Systems™ will analyze the soil samples you send, measuring pH, salinity, and the available nutrient elements (such as N, P, K).

Experimental Design and Application Groups

The trial will be arranged in a Randomized Block Design (RBD) and will include the following groups:

Control (No Irrigation)

- Crop grown with natural rainfall
- Soil cultivation and maintenance applied, but no irrigation

Nanotern-0.5

(0.5 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall

Nanotern-1

(1 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-2

(2 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-4

(4 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-x Pre-Swollen (x = 0.5–4

- Nanotern moistened with 1 L water per 1 g Nanotern and left for 4 days before application.
- Applied to the field in swollen form.
- No irrigation, grown with natural rainfall.

LARGE SCALE FARMING

RBD Method

Randomized Block Design is widely used in agricultural research to minimize environmental variation effects (soil structure, drainage, micro climate differences).

- Land is divided into homogeneous blocks (A, B, C), each containing all treatments (control and application groups).
- Placement within each block is randomized.

Advantages:

- Reduces environmental variability effects.
- Increases experimental reliability and accuracy.
- Ensures fair comparison between groups.

Plot Layout and Replication

- Three replications for each group.
- Minimum plot size: 10×10 m.

Nanotern Application Method

For Wheat Cultivation:

- Measure required Nanotern amount (0.5–4 kg).
- Apply during sowing or fertilization.

Soil Preparation for Dry Farming:

- Prepare soil to reduce evaporation, using deep tillage and mulch to conserve moisture.

Rainfall and Soil Moisture Monitoring:

- Regularly monitor rainfall and soil moisture.
- Nanotern helps retain water longer in the soil.

LARGE SCALE FARMING

Data Collection and Observations

Soil Data:

- Regular soil moisture measurements (15, 30, 45 cm depths).
- Measure water holding capacity and infiltration rate.

Plant Growth:

- Monthly measurement of plant height, root development, leaf/head count, and general plant health.

Yield and Quality:

- Yield per plant (kg).
- Quality parameters (grain fill rate, husk thickness, etc.).

Water Use Efficiency (WUE):

- Formula: WUE = Yield (kg) / Water Applied (m^3)
- For dry farming, calculated from natural rainfall.

Soil and Water Management:

- Evaluate Nanotern's effect on water retention and evaporation reduction.

The Results

This design allows comprehensive evaluation of Nanotern under full irrigation, reduced irrigation, and sensor-based irrigation regimes.

- Nanotern increases soil water retention, enabling better water use efficiency.
- Supports healthy wheat growth even under drought.

Climate Data:

- Regular temperature and humidity recording.

Statistical Analysis:

- ANOVA for comparing treatment effects.
- Turkey HSD for post-hoc analysis.

APPLICATION FOR LENTILS

LARGE SCALE FARMING

LARGE SCALE FARMING

DRY FARMING METHOD FOR LENTILS

The Purpose

To evaluate the effects of soil moisture, water use efficiency, and yield under dry farming conditions in lentil cultivation.

The Method

Before the trial, ANT Systems™ will analyze the soil samples you send, measuring pH, salinity, and the available nutrient elements (such as N, P, K).

Experimental Design and Application Groups

The trial will be arranged in a Randomized Block Design (RBD) and will include the following groups:

Control (No Irrigation)

- Crop grown with natural rainfall
- Soil cultivation and maintenance applied, but no irrigation.

Nanotern-0.5

(0.5 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-1

(1 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-2

(2 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-4

(4 kg Nanotern per decare)

- Applied dry to the field.
- No irrigation, grown with natural rainfall.

Nanotern-x Pre-Swollen (x = 0.5–4

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Nanotern Application Method

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Rainfall and Soil Moisture Monitoring:

- Regularly monitor rainfall and soil moisture.
- Nanotern helps retain water longer in the soil.

LARGE SCALE FARMING

Data Collection and Observations

Soil Data:

- Regular soil moisture measurements (15, 30, 45 cm depths).
- Measure water holding capacity and infiltration rate.

Plant Growth:

- Monthly measurement of plant height, root development, leaf/head count, and general plant health.

Yield and Quality:

- Yield per plant (kg).
- Quality parameters (grain fill rate, husk thickness, etc.).

Water Use Efficiency (WUE):

- Formula: WUE = Yield (kg) / Water Applied (m^3)
- For dry farming, calculated from natural rainfall.

Soil and Water Management:

- Evaluate Nanotern's effect on water retention and evaporation reduction.

The Results

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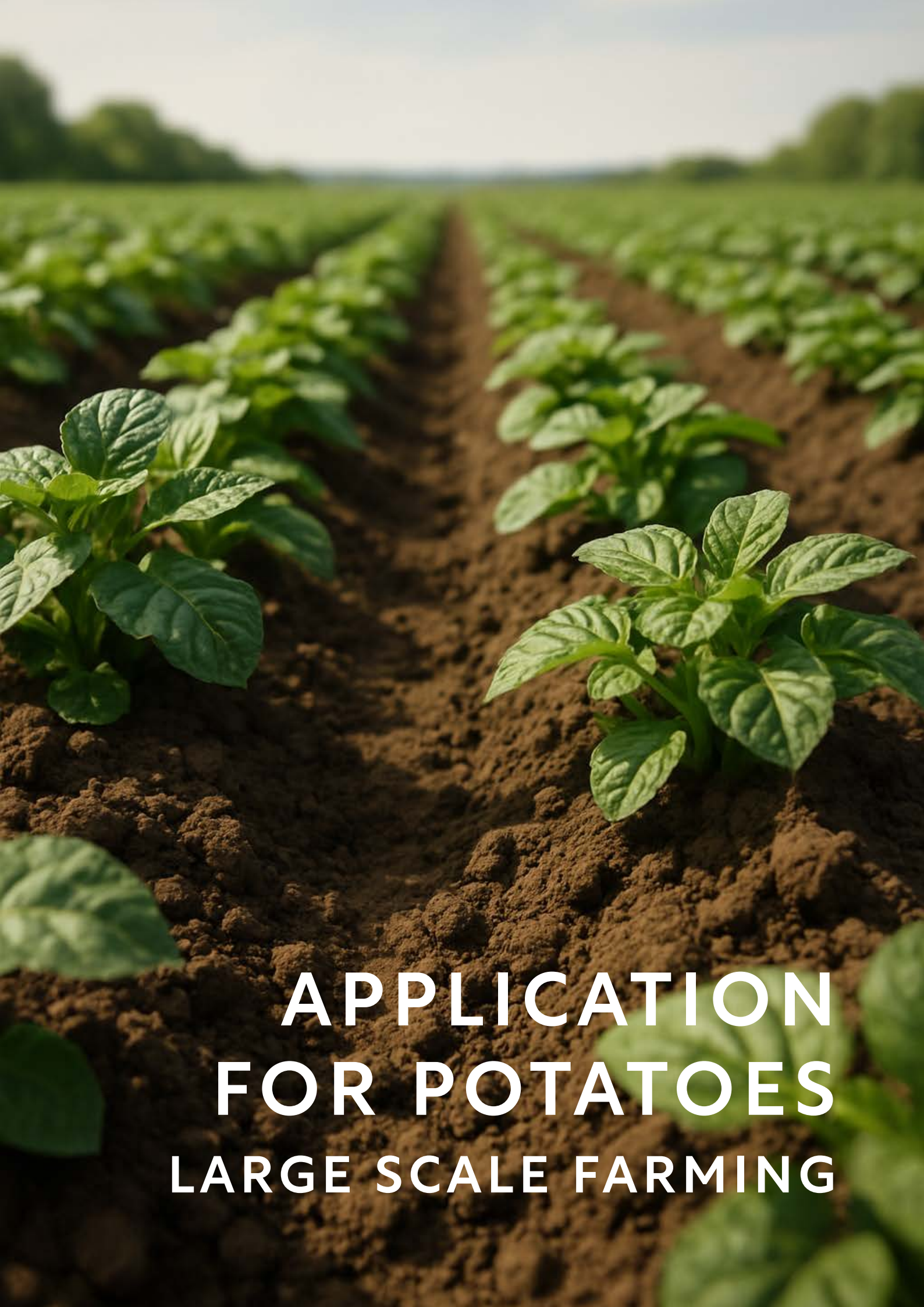


APPLICATION FOR POTATOES

LARGE SCALE FARMING

LARGE SCALE FARMING

APPLICATION METHOD FOR POTATO VARIETIES

Please Choose a Method Suitable to Your Equipment.

A) In-Row Band Application (Recommended)

1. **Application Point:**

   Applied along the planting row at a depth of 20–25 cm from the soil surface.

2. **Dosage:**

   10 kg of Nanotern™ per decare (1,000 m^2), distributed evenly along the rows.

3. **Mixture:**

   Mix 1 part Nanotern with 5–10 parts dry soil before application. This prevents clumping.

4. **Step-by-Step:**

- Spread the Nanotern-soil mixture in rows at a depth of 20–25cm.
- Cover with soil.
- Place potato seed and close as usual.

B) Spot Application (Alternative Method)

1. **Application Point:**
   Applied directly into each planting hole.

2. **Dosage:**
   Apply 2–3 grams of Nanotern per potato tuber,

3. **Step-by-Step:**

- Spread the Nanotern at the base and sides of the planting hole.
- Cover with small amount of soil.
- Place the seed and cover.

LARGE SCALE FARMING

C) Full Field Mixing (Suitable for Mechanized Operations)

1. **Application Point:**

   Mix Nanotern™ uniformly into the top 20–25cm of the soil.

2. **Dosage:**

   10 kg of Nanotern™ per decare (1,000 m^2), distributed evenly along the rows.

3. **Use Case:**

   Preferred in mechanized systems for uniform field application.

4. **Note:**

   Less efficient and more prone to polymer waste; a general application method.

Irrigation

- After planting and SAP application, apply a generous initial irrigation, this helps the SAP swell and form a moisture reservoir near the root zone.
- The soil does not need to be muddy or excessively wet.
- With Nanotern, irrigation frequency can be reduced by up to 70%.
- Soil moisture should be monitored during the first 2–3 weeks, and drip irrigation intervals adjusted accordingly.
- Nanotern retains and gradually releases water, so regular irrigation is still necessary.

LARGE SCALE FARMING

Precautions

- Nanotern should not come into direct contact with seed tubers (to prevent rot).
- The maximum recommended dosage is 10kg/decare.
  Do not exceed.
- Nanotern absorbs less water when used irrigation water containing high salinity. This may reduce performance.

Storage and Transport

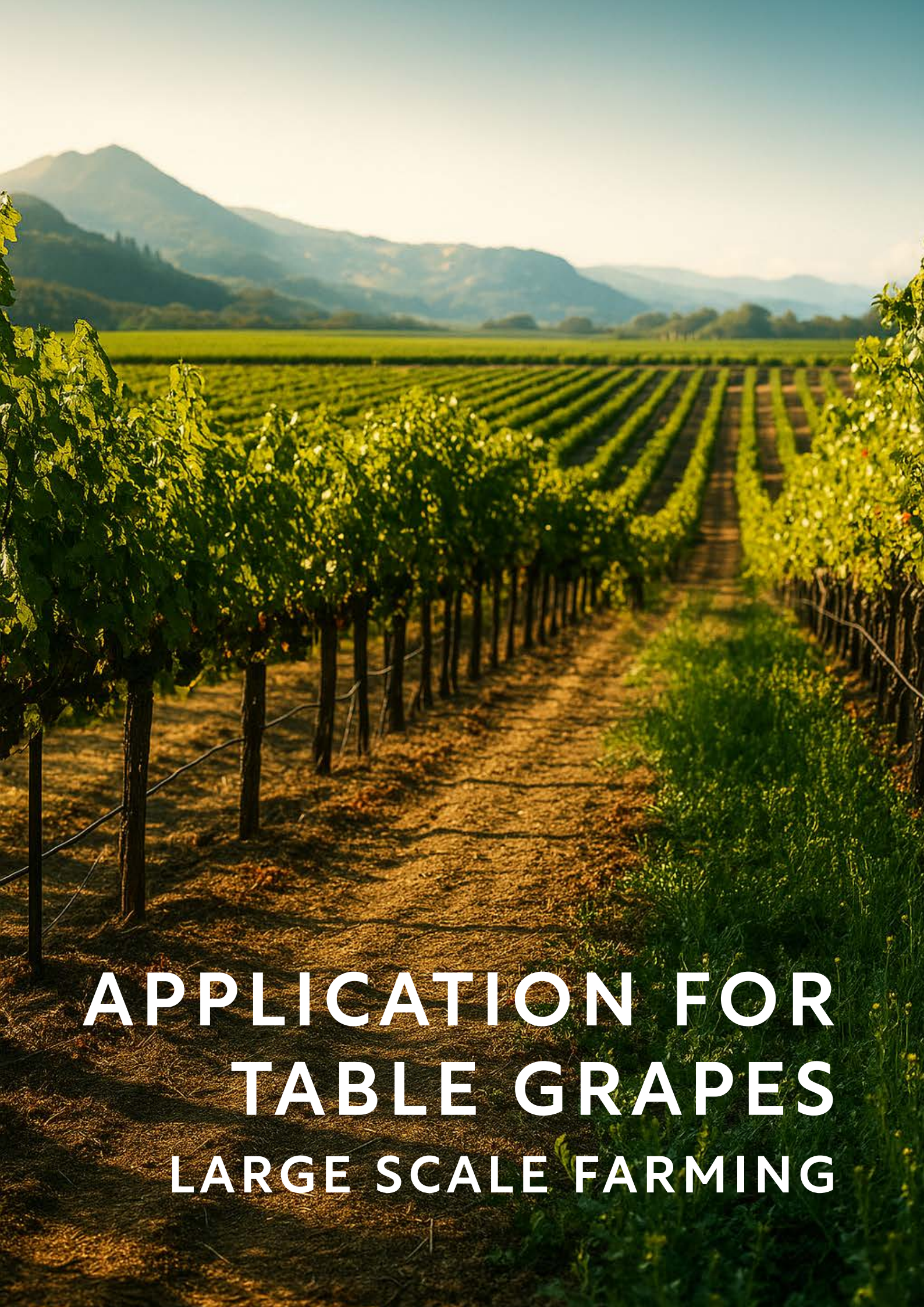
- Store in a dry, cool and shaded place.
- Keep sealed and protected from moisture.
- Do not expose to water during transport.

Safety

Non-toxic and environmentally friendly.

Expected Benefits

- Increases the water-holding capacity of sandy soils.
- Reduces irrigation needs and improves water efficiency.
- Supports stronger plant development and higher potato yield.
- Improves tuber size and market quality.



APPLICATION FOR TABLE GRAPES

LARGE SCALE FARMING

LARGE SCALE FARMING

METHOD FOR TABLE GRAPES (VINEYARDS)

Primary Method: Strip Application Along the Row (Recommended)

When to Apply:

- Apply during early growing season (budding to flowering).
- Avoid disturbing major roots; ideal during light maintenance window.

How to Apply:

1. **Dig a shallow trench** (~20–25 cm deep) along the vine row, just below or slightly offset from the drip line.
2. **Mix Nanotern** with 5–10 parts dry soil or compost before application.
3. **Apply the mixture evenly** into the trench along the row.
4. **Cover with at least 5–10cm of soil** to prevent UV exposure.
5. **Irrigate generously** after application to activate the polymer.

Dosage:

- **100–120 kg per hectare.** (Approx. 10–12 g of Nanotern per linear meter of vine row, depending on spacing.)

LARGE SCALE FARMING

Alternative Method: Per Vine Application (Optional)

When to Apply:

- Anytime during the active season, ideally early (bud stage to pre-flowering).

How to Apply:

1. **Dig two small holes** (~20–25 cm deep) per vine – under or just beyond the drip emitters.
2. **Mix 50 g of Nanotern with dry soil or compost** for each hole.
3. **Place the mixture** at the bottom of the hole (avoid direct contact with woody roots).
4. **Cover with soil** and ensure no polymer is exposed.
5. **Irrigate well** immediately after.

Dosage:

- **100 g per vine** (50 g in each of 2 holes).
- Equivalent to **100–120 kg per hectare** based on typical vine density.

LARGE SCALE FARMING

Irrigation Tips Post-Application

- Perform a **deep irrigation cycle** after application to fully hydrate the polymer.
- SAP will reduce water loss and slowly release moisture near the root zone.
- Monitor soil moisture and **adjust drip irrigation intervals** — up to **70% reduction** in frequency may be possible.
- **Do not skip irrigation entirely.** SAP buffers moisture but doesn't replace irrigation.

Important Notes

- Do not leave **SAP exposed to sunlight** – always cover with soil.
- Avoid direct contact with vine trunks or thick roots.
- Nanotern is **non-toxic and environmentally safe** when used as directed.
- For saline irrigation water, expect slightly reduced absorption but continued benefit.

APPLICATION FOR HAZELNUT TREES

SAPLINGS & TREES

SAPLINGS & TREES

DRY FARMING METHOD FOR HAZELNUT TREES

The Purpose

To evaluate the effects of Nanotern on soil moisture, water use efficiency, and yield of hazelnut plants under dry farming conditions.

The Method

Before the trial, ANT Systems™ will analyze the soil samples you send, measuring pH, salinity, and the available nutrient elements (such as N, P, K).

Experimental Design & Application Groups

The experiment will follow a Randomized Complete Block Design (RCBD) with the following groups:

Control (No Irrigation)

- Hazelnut seedlings grown with natural rainfall.
- Soil cultivation and maintenance applied, but no irrigation.

Nanotern-50

(100 g Nanotern per seedling)

- Nanotern applied to increase the soil's water retention capacity
- No irrigation, grown with natural rainfall.

Nanotern-100

(200 g Nanotern per seedling)

- Nanotern applied to increase the soil's water retention capacity.
- No irrigation, grown with natural rainfall.

Nanotern-150

(300 g Nanotern per decare)

- Nanotern applied to increase the soil's water retention capacity.
- No irrigation, grown with natural rainfall.

Nanotern-200

(400 g Nanotern per decare)

- Nanotern applied to increase the soil's water retention capacity.
- No irrigation, grown with natural rainfall.

Nanotern-x Pre-Swollen (x = 50–200)

- Nanotern is pre-moistened with 1 L water per 1 g Nanotern, left for 4 days, then applied to the soil.
- Nanotern applied to increase the soil's water retention capacity.
- No irrigation, grown with natural rainfall.

SAPLINGS & TREES

Application Method

Repetitions & Plot Design:

- Each group will have 3 replications
- Each plot must contain at least 5 hazelnut seedlings.

For Seedling Cultivation:

- Measure the required amount of Nanotern (100 g, 200 g, 300 g).
- Place evenly around the root zone in the planting hole.
- Ensure thorough mixing with soil before planting.

Soil Preparation under Dry Farming:

- Soil prepared to minimize evaporation (deep tillage with protective surface structure).
- Mulching used to reduce evaporation and conserve soil moisture.

Rainfall Monitoring & Soil Moisture Control:

- Rainfall recorded regularly.
- Soil moisture monitored to assess Nanotern's water retention effect.

Data Collection and Observations

Soil Data:

- Continuous monitoring of soil moisture at 15, 30, and 45 cm depths with sensors. Soil water retention capacity and infiltration rates tracked.

Plant Growth:

- Seedling height, root development, branch width, and leaf count measured monthly.
- Flowering, fruit set rate, and overall health monitored.

Yield and Quality:

- Yield measured as kg of hazelnuts per plant.
- Quality parameters: shell thickness, kernel fill ratio, etc.

SAPLINGS & TREES

Data Collection and Observations

Water Use Efficiency (WUE):

- WUE = Yield (kg) / Applied water (m^3)

Soil & Water Management:

- Evaluate Nanotern's effect on soil moisture retention.
- Observe role of mulching and tillage in reducing evaporation.

Post-Harvest

Soil samples will be re-analyzed (pH, salinity, nutrients N, P, K) by ANT Systems™.

Results

- Nanotern improves soil water retention, enabling more efficient use of water resources.
- Supports healthy hazelnut growth even under drought conditions. Climatic data (temperature, humidity) recorded regularly.
- Statistical Analysis: ANOVA used to compare groups; Turkey HSD or similar post-hoc tests applied

APPLICATION FOR WALNUT TREES

SAPLINGS & TREES

SAPLINGS & TREES

DRY FARMING METHOD FOR WALNUT TREES

The Purpose

To evaluate the effects of Nanotern™ on soil moisture retention capacity, water use efficiency, tree growth, and yield in walnut trees.

The Method

Before the trial, ANT Systems™ will analyze the soil samples you send, measuring pH, salinity, and the available nutrient elements (such as N, P, K).

Irrigation Regimes

Three irrigation regimes will be applied:

Full Irrigation (100%):

- Water applied according to traditional irrigation practice.

Reduced irrigation (50%):

- Half the amount of traditional irrigation water applied.

Sensor-based irrigation:

- Soil moisture sensors placed at 15 cm, 30 cm, and 45 cm depths. Irrigation triggered when soil moisture falls below a set threshold (e.g., 30% field capacity), either manually or automatically. The amount applied restores target soil moisture.

SAPLINGS & TREES

Experimental Design & Application Groups

The trial will follow a Randomized Complete Block Design (RCBD) with the following groups:

Control (No Nanotern):

- Full irrigation (100%)
- Reduced irrigation (50%)
- Sensor-based irrigation.

Nanotern-50

(100 g Nanotern per tree)

- Same three irrigation regimes.

Nanotern-100

(200 g Nanotern per tree)

- Same three irrigation regimes.

Nanotern-150

(300 g Nanotern per tree)

- Same three irrigation regimes.

Nanotern-200

(400 g Nanotern per decare)

- Same three irrigation regimes.

Nanotern-x Pre-Swollen (x = 50–200)

- Each gram of Nanotern pre-soaked in 1 L water, kept for 4 days, then applied. Same three irrigation regimes.

Nanotern Application Method

For Existing Trees:

- Measure the required Nanotern amount (100 g, 200 g, or 300 g).
- Dig a trench 15–20 cm deep along the drip line.
- Evenly distribute Nanotern and cover with soil.
- Apply full irrigation immediately to activate.

New Plantings:

- Mix Nanotern into the planting hole, 10–15 cm below the root zone.
- Ensure roots do not directly touch Nanotern.
- Irrigate after planting.

Each group will have 3 replications, and each plot should contain at least 5 walnut trees.

SAPLINGS & TREES

Data Collection and Observations

Soil Data:

- Continuous monitoring of soil moisture at 15, 30, and 45 cm depths with sensors. Soil water retention capacity and infiltration rates tracked.

Tree Growth:

- Trunk diameter, canopy width, and height measured monthly.

Yield and Quality:

- Kernel yield (kg per tree), fill ratio, shell thickness, and other quality parameters recorded at harvest.

Water Use Efficiency (WUE):

- WUE = Yield (kg) / Applied water (m^3)

Economic Analysis:

- Comparison of Nanotern application costs with water savings and yield improvements.

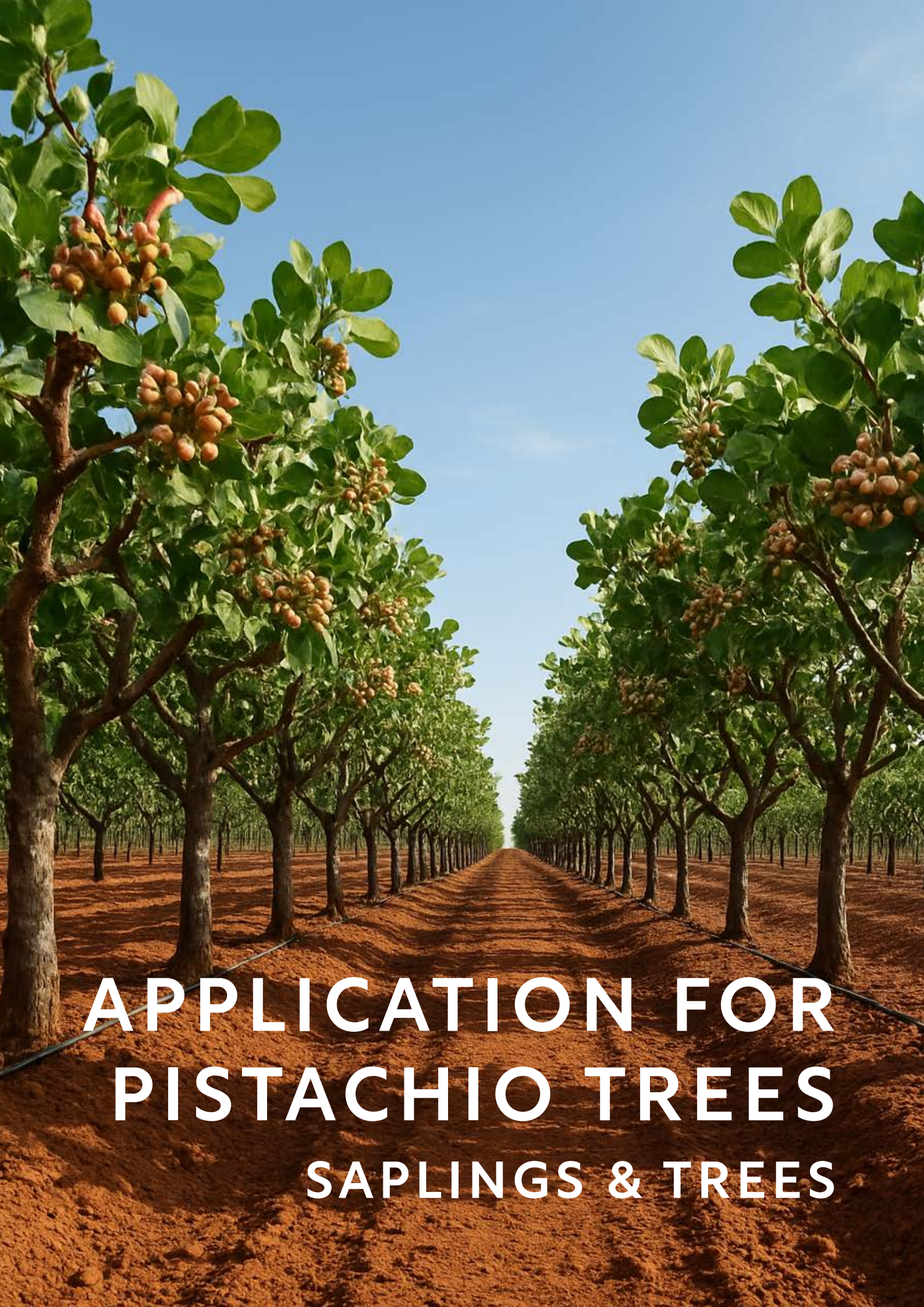
Post-Harvest

Soil samples will be re-analyzed (pH, salinity, nutrients N, P, K) by ANT Systems™.

Results

This design is suitable for studying the effects of Nanotern effectiveness under full, reduced, and sensor-based irrigation.

- Climatic data (temperature and humidity) will also be recorded during the trials.
- Statistical analysis will include ANOVA, with Tukey HSD or similar post-hoc tests for group comparisons



APPLICATION FOR PISTACHIO TREES

SAPLINGS & TREES

SAPLINGS & TREES

DRY FARMING METHOD FOR PISTACHIO TREES

The Purpose

To evaluate the effects of Nanotern™ on soil moisture, water use efficiency, and yield under dry farming conditions in pistachio cultivation.

The Method

Before the trial, soil samples you send will be analyzed by ANT Systems™ Measurements will include pH, salinity, and available nutrients (N, P, K, etc.).

Experimental Design & Application Groups

The trial will follow a Randomized Complete Block Design (RCBD) with the following groups:

Control (No Irrigation):

- Crops grown only with natural rainfall.
- Soil management and care applied, but no irrigation.

Nanotern-0.5

(0.5 kg Nanotern per decare)

- Nanotern applied dry to the field.
- No irrigation, grown with rainfall.

Nanotern-1

(1 kg Nanotern per decare)

- Nanotern applied dry to the field.
- No irrigation, grown with rainfall.

Nanotern-2

(2 kg Nanotern per decare)

- Nanotern applied to dry to the field.
- No irrigation, grown with rainfall.

Nanotern-4

(4 kg Nanotern per decare)

- Nanotern applied dry to the field.
- No irrigation, grown within rainfall.

Nanotern-x Pre-Swollen (0.5–4kg)

- Nanotern pre-soaked with 1 L water per gram, left for 4 days before application.
- Applied in swollen form to the field.
- No irrigation, grown with rainfall.

SAPLINGS & TREES

RBD Method

Randomized Block Design is widely used in agricultural research to minimize environmental variation effects (soil structure, drainage, micro climate differences).

- The land is divided into homogeneous sub-blocks.
- Each block contains all treatment groups (control + Nanotern applications).
- Placement within blocks is randomized to reduce environmental bias.
- 3 blocks (A, B, C) are used.
- Each block has at least one control group and two Nanotern groups

Advantages:

- Minimizes environmental variability (soil type, drainage, microclimate).
- Increases experimental reliability and accuracy.
- Ensures fair comparison between groups.

Plot Layout and Replication

- Three replications for each group.
- Minimum plot size: 10×10 m.

Nanotern Application Method

1. Measure required Nanotern (0.5–4 kg).
2. Apply during sowing or fertilization.
3. Soil preparation should minimize evaporation and maintain structure.
4. Use mulching to reduce evaporation and conserve moisture.
5. Monitor rainfall and soil moisture regularly – Nanotern helps soil retain water longer

SAPLINGS & TREES

Data Collection and Observations

Soil Data:

- Continuous monitoring of soil moisture at 15, 30, and 45 cm depths with sensors. Water retention and infiltration capacity tracked.

Plant Growth:

- Plant height, root development, vegetative growth, and counts of leaves/fruits/seeds measured monthly.

Yield and Quality:

- Harvested yield per plant (kg), shell thickness, kernel fill ratio, etc.

Water Use Efficiency (WUE):

- WUE = Yield (kg) / Applied water (m^3)

Soil & Water Management:

- Evaluate Nanotern's impact on water retention and mulching effects on evaporation

Post-Harvest

Soil samples will be re-analyzed (pH, salinity, nutrients N, P, K) by ANT Systems™.

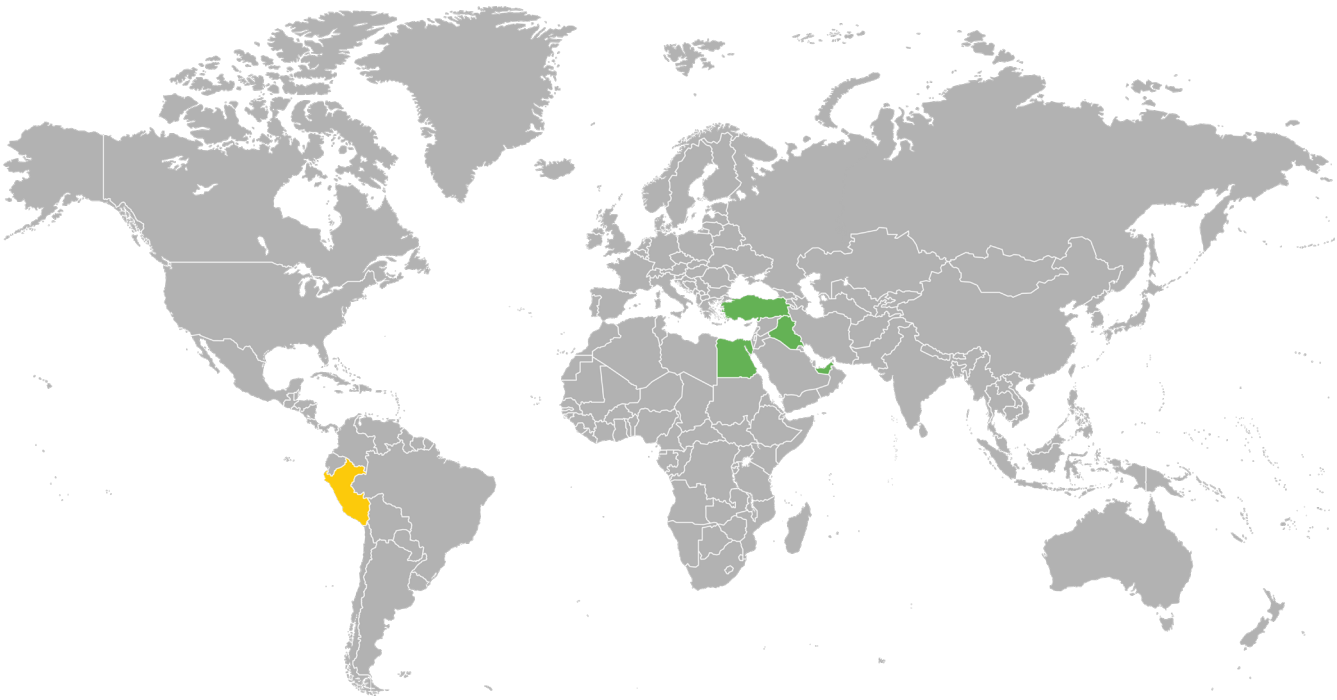
Results

- Nanotern improves soil water retention, enabling more efficient use of water resources.
- Supports healthy pistachio growth even under drought conditions.
- Climatic data (temperature, humidity) will be recorded throughout the trials.
- Statistical Analysis: ANOVA used to compare groups; Tukey HSD or similar post-hoc tests applied.

08

APPLICATIONS & TECHNICAL RESULTS

08 APPLICATIONS & TECHNICAL RESULTS



ONGOING USES AND GLOBAL REACH

Nanotern™ is currently undergoing extensive field and greenhouse demonstrations across a range of crops and climates to validate its performance and versatility. Completed trials include wheat (in greenhouse conditions) and cherry trees (in open-field settings), with ongoing studies in lentils, sunflowers, pistachios, hazelnuts, grapes, and tomatoes. These trials span diverse geographical regions, including Iraq, the United Arab Emirates (for landscaping), and Turkey's Southeastern, Eastern, and Central Anatolia regions. Preparations are also underway for demonstrations in Peru.

1 LARGE SCALE FARMING

Field trials were conducted across the Trakya region to evaluate the performance of **Nanotern™** in dry farming agriculture of wheat production.

FIELD TRIAL RESULTS ON WHEAT

Water Retention Improvement

Nanotern-treated soil retains moisture 50% longer than untreated soil.

Crop Yield Enhancement

Nanotern-treated fields show a 20% increase in crop yield due to improved moisture availability.

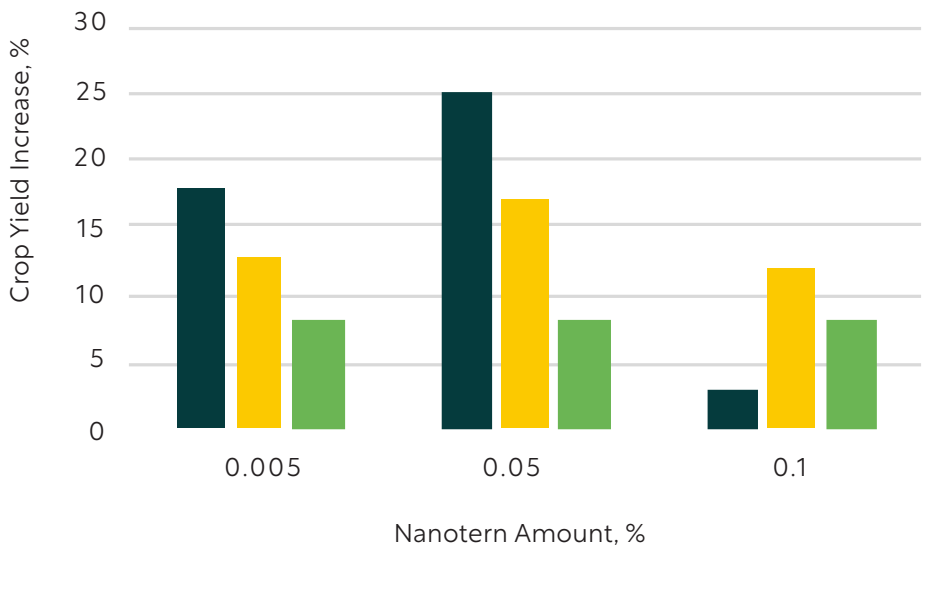
Field trials were conducted across the Trakya region in Turkey (known as the, East Thrace area which includes Turkish provinces of Edirne, Tekirdağ and Kırklareli).

2 GREENHOUSE

GREENHOUSE TRIAL RESULTS ON WHEAT

Greenhouse trials conducted at Sabancı University and Gebze Technical University demonstrated the effectiveness of **Nanotern™** and **Nanotern Bio+™** on wheat under different irrigation and drought regimes, using various fertilizers. The results highlighted Nanotern's superior performance in improving crop yields and managing water retention.

Effect of Nanotern Basic on Wheat Yield under Different Irrigation Conditions



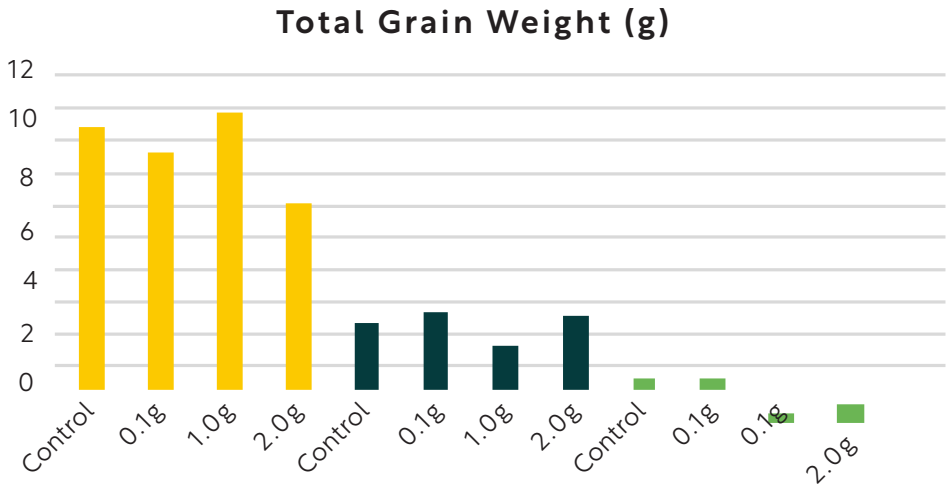
2 GREENHOUSE

CROP YIELD ENHANCEMENT

Nanotern increases crop yield by up to 24% under different irrigation/ drought regimes.

GRAIN YIELD ENHANCEMENT

Greenhouse trials showed that **Nanotern™** boosted wheat grain yield by up to 114% under extreme drought, proving its effectiveness even at low application rates under moderate stress.



Total grain weight of plants grown under different Nanotern concentrations and irrigation with 80% (yellow), 60% (blue), and 40% (green) of the field capacities.

3 HYDROPONIC FARMING

Trial Locations:	Denizli, Turkiye
Application Method:	Soil-less farming using gel-based growing medium
Crop Tested:	Tomato



Water Type	pH	EC (dS/m)
Drip Water	5.8 - 6.0	3.2
Nanotern Drainage Water	6.5 - 6.8	4.0

3 HYDROPONIC FARMING

KEY FINDINGS

PLANT PHYSIOLOGY

Nanotern™ prevents an increase in salinity in the root zone.

ROOT DEVELOPMENT

Nanotern enhanced root development, with 30% more root growth.

SECONDARY ROOT FORMATION

Nanotern promoted the formation of secondary roots, allowing the plant to better absorb nutrients from the root zone.

FERTILIZER EFFICIENCY

The use of Nanotern resulted in more efficient nutrient uptake with less fertilizer applied, leading to improved plant growth and development.

IRRIGATION EFFICIENCY

Nanotern decreases drip irrigation frequency up to 85% per day in tomato seedlings growth. This is because Nanotern retains water and slowly releases it into the root zone, reducing the need for frequent irrigation.

By reducing irrigation frequency and improving nutrient retention, Nanotern helps optimize water and fertilizer usage, leading to better resource efficiency and cost savings for growers.

4 LANDSCAPING

LANDSCAPING TRIAL RESULTS ON GRASS

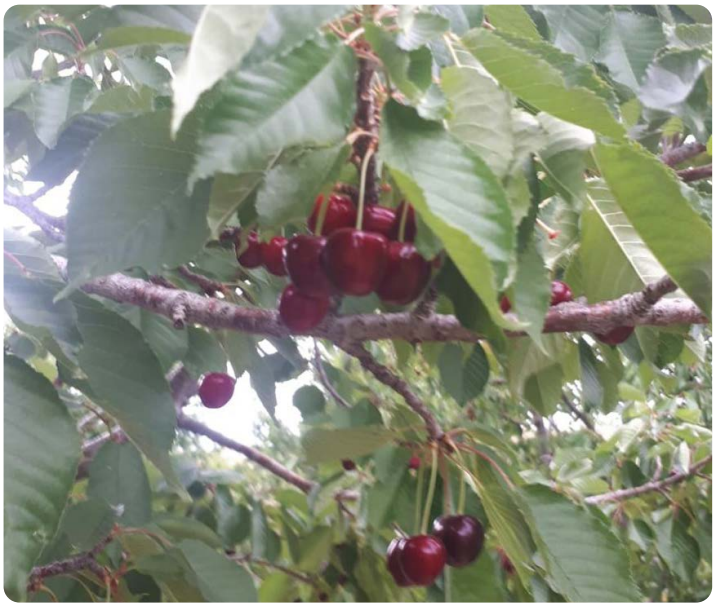
In a controlled demonstration using only sand as the growing medium and no soil, two identical grass plots were observed—one treated with **Nanotern™**, the other left untreated. After 20 days without any irrigation, the untreated grass on the left showed clear signs of dehydration and stress, while the Nanotern-treated grass on the right remained visibly green and healthy. This striking difference highlights Nanotern's ability to retain moisture and sustain plant vitality even in extreme conditions where water is unavailable, making it an ideal solution for arid landscaping and water-sensitive environments.

Example of the significant positive difference of using **Nanotern** (seen on the right).

5 TREES

FIELD TRIAL RESULTS ON CHERRY TREES

Field trials were conducted in the Ankara region over a 2-hectare area with cherry trees to evaluate the performance of **Nanotern™** basic in manual irrigation farming. These trials provided key insights into the product's efficiency in water management and crop yield enhancement.



Example of the results of **Nanotern** found in cherry trees.

Easy Application

Nanotern is applied around the roots in a trench, either as granules or water-infused gel, with both forms providing the same results. Trees treated with Nanotern were irrigated 50% less during trials.

Crop Yield Enhancement

A 10% increase in export-quality cherry yield was observed with 50% less irrigation. Nanotern improves water and nutrient efficiency, supporting plant growth in water-scarce conditions.

5 TREES

CASE STUDY ON HAZELNUT TREES

The two charts present detailed application guidelines for a hazelnut cultivation case study using **Nanotern™**

The first chart compares application parameters between standard and newly planted hazelnut pits, outlining differences in width, depth, dosage reference, and application methods, highlighting the tailored approach depending on planting maturity.

The second chart offers a dosage table for Nanotern based on soil type within open-field hazelnut orchards, ranging from sandy to clay-loamy soils. It specifies dosage per tree and emphasizes best practices such as monitoring soil moisture, even distribution across the canopy, and post-application irrigation.

Together, these charts serve as a technical reference for precision application of Nanotern in hazelnut orchards to optimize effectiveness across different soil conditions and planting stages.

Example of the use of hazelnut plantations.

5 TREES

Application Specifications Comparison

	Value (Standard Pit)	Value (Newly Planted Pit)
Application Width (cm)	100	80
Application Depth (cm)	40 - 50	40 - 50
Per Pit Application Dose (kg)	Dosage Table*	Dosage Table*
Row Spacing	2.5 m (from tree trunk)	2.5 m
Plant Spacing	3.5 m	3.5 m
Application Method	Spread within a 2.5 m circular band around the trunk (dry or slightly mixed)	Spread and mix into the planting hole or under the trunk

Application Dosage Table

Area Type	Plant Type	Soil Type	Dosage	Unit
Open Field - Fruit Orchard	Hazelnut	Sandy	1.0	kg/tree
Open Field - Fruit Orchard	Hazelnut	Clay	0.8	kg/tree
Open Field - Fruit Orchard	Hazelnut	Clay-Sandy	0.8	kg/tree
Open Field - Fruit Orchard	Hazelnut	Clay-Sandy-Loamy	0.7	kg/tree

Notes

Nanotern should be applied dry or preferably slightly swollen, across the canopy diameter. Heavy irrigation after application is recommended.

- Check soil moisture before application
- Ensure uniform distribution over the entire canopy diameter
- Irrigate 1–2 times after the first application
- Wait 4–6 weeks to observe results

6 EXAMPLE OF NANOTERN™ IN USE

01

For a 10% moist (gel) application, **Nanotern** is mixed with water

02

10% swollen (gel) **Nanotern** is applied around the circular trench of the tree

Example of the use of **Nanotern** in pistachio trees.

09

NANOTERN PHYSICO-CHEMICAL PROPERTIES

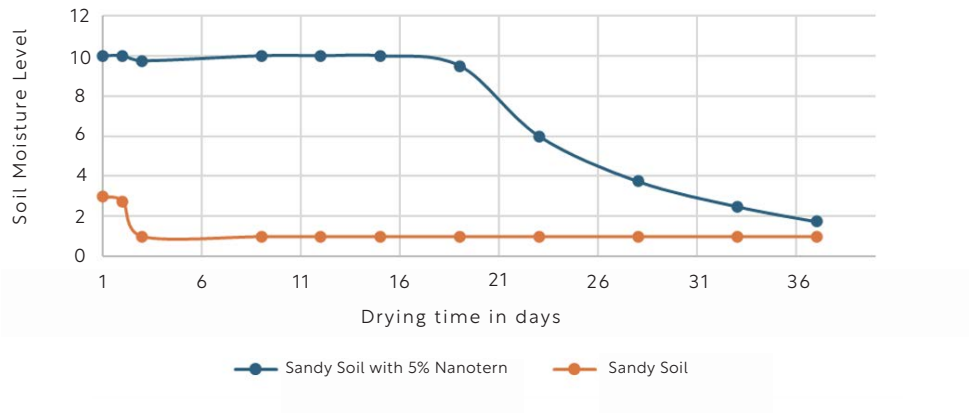
09 NANOTERN PHYSICO-CHEMICAL PROPERTIES

Description	Value
General Appearance	White Granules
Particle Size	1–4 mm
Moisture Content	2%
Max Water Absorbency Capacity	1800x [1]
Water Slow-Release Duration	50 Days [1]
Service Temperature	(-60)°C - (+70)°C
Melting Point	200°C
Degradation Temperature	255°C
Storage Modulus	1.2 GPa
Density	1.4 g/cc
pH	N/A [2]
Molecular Weight	1200 kDa [3]

DRYING SPEED IN SANDY SOIL

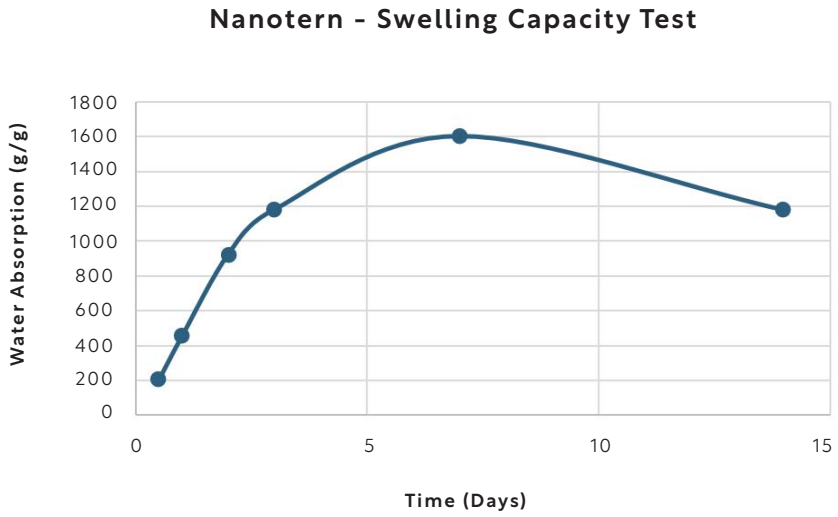
In sandy soils, which are typically unsuitable for agriculture due to poor water retention, **Nanotern™** maintained soil moisture at levels suitable for crop growth for one month with a single irrigation.

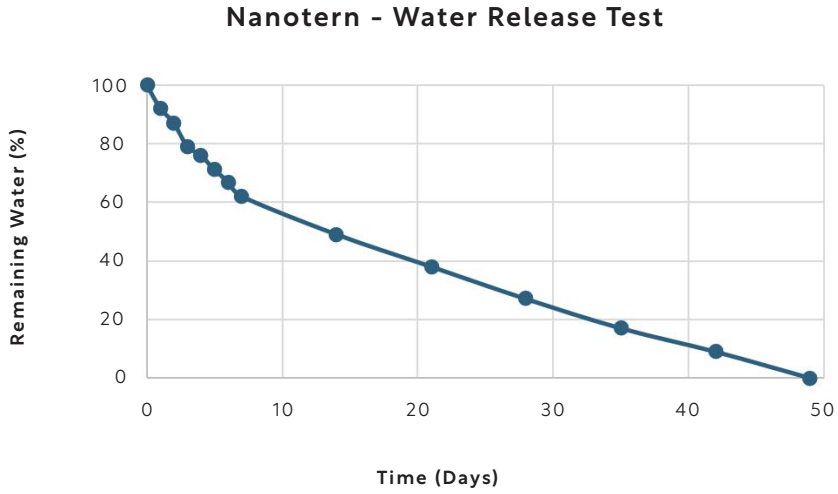
Effect of Nanotern on Moisture Level of Sandy Soil



WATER ABSORPTION CAPACITY

The swelling and water release behavior of **Nanotern™** in water over time is illustrated in the following graph. Nanotern can absorb up to 1800 times its own weight in water. Approximately 50% of the stored water is released within the first 15 days, while complete release occurs over 50 days, ensuring a sustained water supply for plants.





nanotern™

SMART SUBSOIL WATER RESERVOIR

ANT Systems™

AGRICULTURAL NANO-TECHNOLOGY

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