

14<sup>th</sup> CDTI - NEDO Joint Workshop  
“Food Technology”  
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From Fruit Waste to Soil  
Resilience: EF Polymer Soil  
Conditioner



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EF POLYMER



# Problem: Water scarcity for crops is a world-wide issue.



In India alone, there are 50 Million farmers affected by drought.

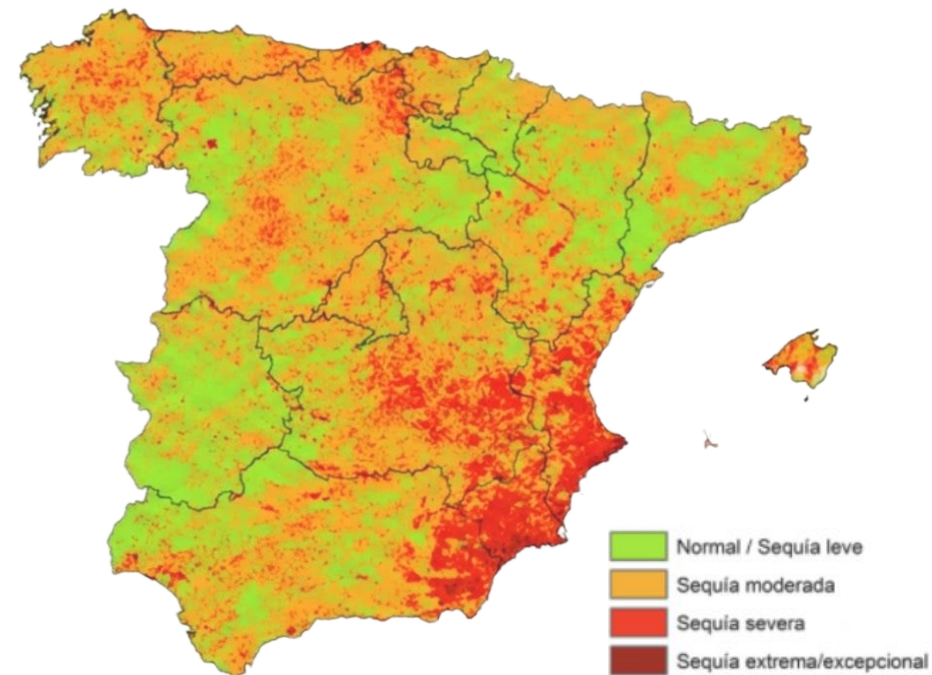




# Problem: Water scarcity for crops is a world-wide issue.



- ✓ Water scarcity and soil moisture loss in Mediterranean agriculture
  - Spain: 70%+ of freshwater consumed by irrigation | drought events increasing in frequency and severity
    - EF Polymer reduces crop-level water demand by 20-40% without yield penalty | payback in a single stress event
  
- ✓ Regulatory and environmental pressure on conventional synthetic polymers
  - Polyacrylamide-based SAPs do not biodegrade | EU regulatory risk for persistent soil additives is increasing
    - EF Polymer fully biodegrades in 3-5 years | no microplastic accumulation | certified OMRI, ECOCERT, CE Mark





# Profile of Organization / Company



- ✓ EF Polymer is an Indo-Japanese agri-tech company producing biodegradable **superabsorbent polymers from upcycled agricultural waste**.
  - Founded 2019 | HQ in Japan, manufacture in India | Active in 10+ countries across Asia and Europe
    - Certifications: OMRI (organic inputs), ECOCERT, CE Mark
- ✓ European operations | Spain, France, Portugal, and Benelux coverage.
  - France: Advanced distribution negotiations | Trials in Barley, Wine, Potatoes.
  - Spain: IDEAGRO irrigated crop trials ongoing | Land Life Company reforestation trials | FY26 priority for distribution in Castilla y Leon and Castilla-La Mancha
  - Benelux: Advanced distribution negotiations



# Our Founder & Team



**NARAYAN GURJAR**  
Founder / CEO

## ✓ Narayan Lal Gurjar — Founder & CEO

- Grew up in Rajasthan, India | began research at age 16 | product developed at OIST, Okinawa, Japan
  - EF Polymer K.K. incorporated in Japan | active in 10+ countries across Asia and Europe



**PURAN RAJPUT**  
Co-Founder / COO (India)



**ANKIT JAIN**  
Co-Founder / CBDO



**HIROSHI YOSHIKAWA**  
CFO



**KYOJI NAKAO**  
CMO



# The Feedstock: Upcycled Fruit Processing Waste



## ✓ Sourcing strategy

- Raw materials sourced directly from waste generation sites — no dedicated crop or virgin resource consumption
- The core active material is Pectin: a natural structural polysaccharide found in the cell walls of fruit peels

## ✓ Primary waste materials

- Orange peels and banana peels — byproducts of commercial juice factories and Ayurvedic medicinal centers





# The Entire Loop: Circularity as an essential part of our DNA



## Tackling Bio-waste Issue

## Our SAP

## Tackling Water Issue





# The Technology: Not all SAPs are created equal



### Synthetic (Polyacrylate-based SAPs)

- Polyacrylate
- Monomer
- Crosslinker/Initiators

### Semi-synthetic (EFP-precursor, using waste)

- Starch/Cellulose
- Acrylate Monomer
- Crosslinker/Initiator

### Natural (EF Polymer)

- Pectin
- Organic Monomer
- Organic Crosslinker





# The Technology: Chemical-Free Processing of Pectin



## ✓ Step 1 — Chemical-Free Extraction

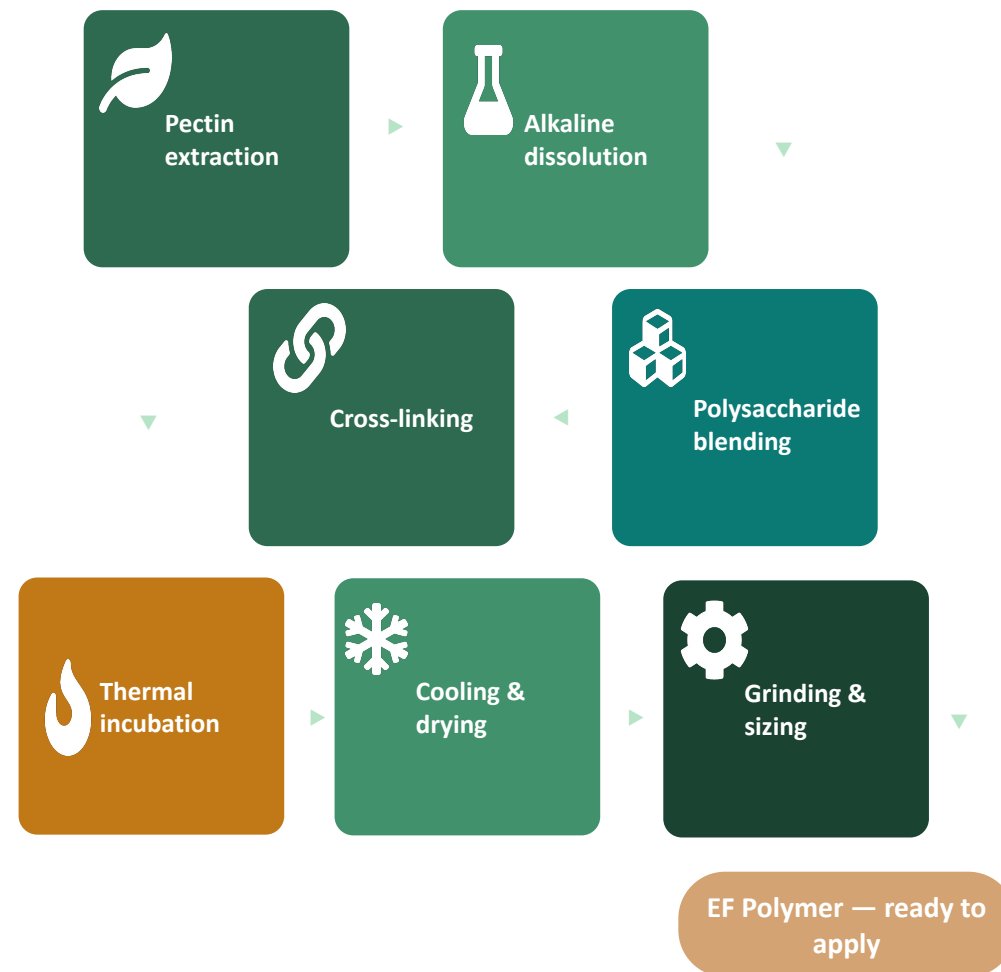
- Pectin is extracted from orange and banana peels using a strictly chemical-free process
  - Green extraction preserves the natural molecular structure of the pectin — its innate biological properties remain intact [IMAGE: Extraction process / lab photo or process diagram]

## ✓ Step 2 — Drying and Grinding

- Extracted pectin undergoes controlled drying to remove moisture, then ground to a particle size customized for agronomic application

## ✓ Step 3 — Physical Blending and Structural Modification

- Specialized physical blending engineers a highly porous, pocket-like structure that dramatically increases surface area
  - No chemicals, no synthetic additives — the final product is 100% bio-derived and fully biodegrades in soil within 12 months





# The Technology: Chemical-Free Processing of Pectin



- ✓ 100% biodegradable — proven across 3 soil types over 12 months
  - Initial weight 110g (polymer + soil) converges to 100g control by month 12 across gray, red, and dark red soils
    - Biodegradation rate accelerates sharply after month 5 — effective for a full 6-month crop season before breakdown
  - Safety: non-irritant (GHS 2021) | oral LD50 5,000 mg/kg (non-toxic) | no earthworm toxicity | salinity-resistant

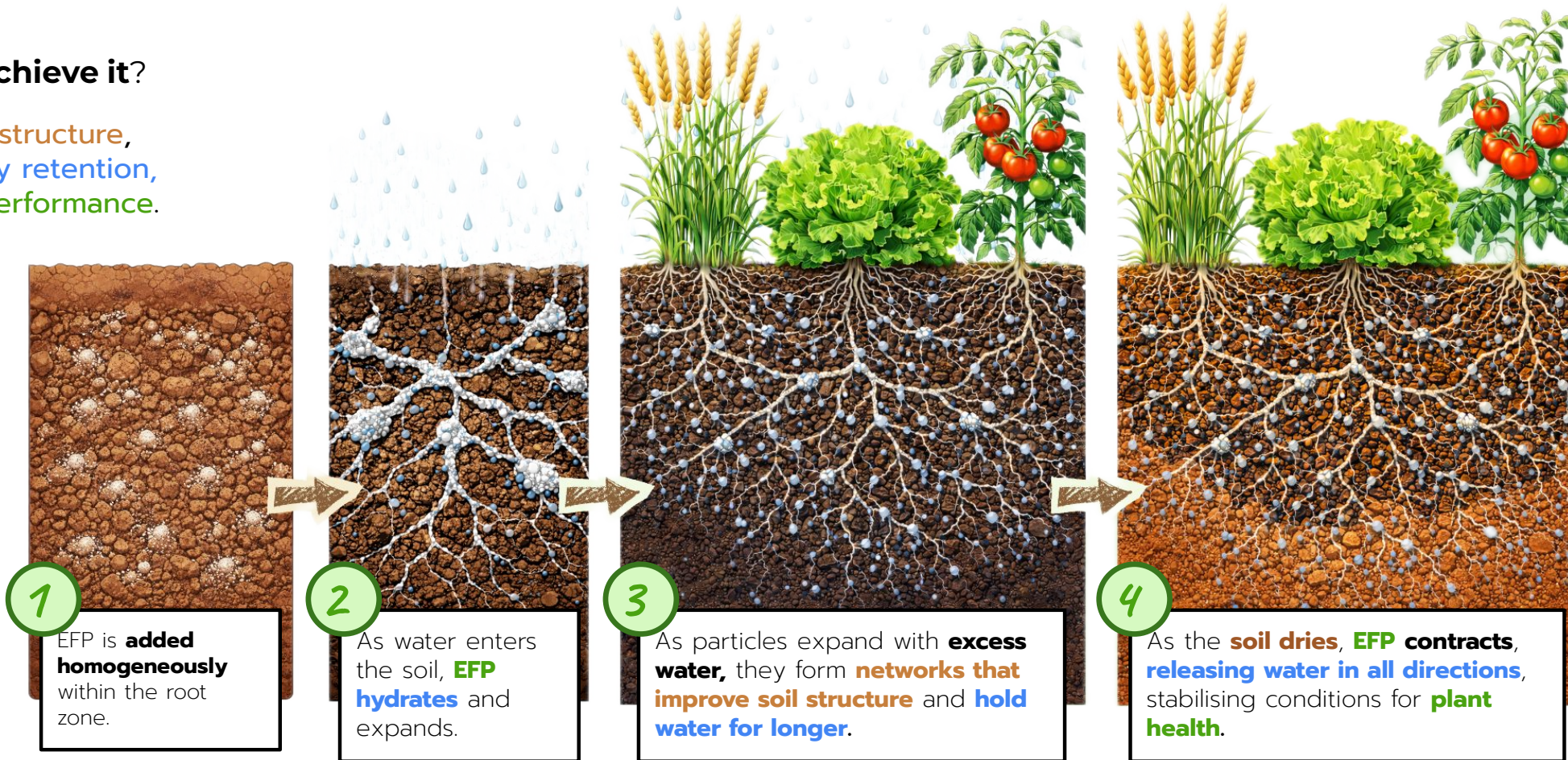


# How It Works: Mechanism of Action in the Field



How does **EFP** achieve it?

By enhancing **soil structure**,  
improving **humidity retention**,  
increasing **plant performance**.





# Waste Valorization to Improve Soil Hydration

- ✓ EF Polymer Soil Conditioner (agricultural grade)
  - Application rate 20 kg/ha | absorbs up to 50x its weight in water, releases it to roots under drought stress
    - 20-40% reduction in irrigation frequency | 10-20% yield protection under water stress conditions
- ✓ EF Polymer for new tree-crop plantations and Ecological Restoration
  - Applied at planting in drought-stressed sites | reduces transplant mortality | no soil accumulation
    - Pending trials: 200 trees at Land Life Company sites in Teruel and Toledo, Spain (2026 season)





# Waste Valorization to Improve Soil Hydration



- ✓ Some validated performance across crops and geographies
  - Wheat (India, BAIF): +14.2% yield, 31% water savings, 15% fertiliser savings @ 20 kg/ha
  - Onion (Japan): up to +37.5% yield | 19.6% water savings | productivity maintained at -15% fertiliser
  - Rice (Japan): +1.2 t/ha yield increase | 38% less fertiliser | 1-2 fewer irrigations per season
  - Millet (Portugal): +17% germination improvement | +35% average plant height
  - Recognition: Forbes Asia 100 to Watch 2024 | Japan Minister's Award 2021 | Moët Hennessy Impact Award 2024



# Main challenges and solutions in the project/ case presented



- ✓ The farmer case: economics of adoption under water stress
  - Spring barley baseline: 5.28 T/ha | EFP dose: 20 kg/ha | break-even: +15% yield improvement under stress
    - Cost-benefit ratio exceeds 11:1 in target crops at current commodity prices
  
- ✓ EFP functions as yield insurance: drought events convert cost into guaranteed return
  - In a drought year: a single avoided yield loss event fully pays back polymer cost with surplus
  - In a normal year: water savings reduce input costs | soil structure improvement compounds over seasons



## Ideas for a Japan – Spain collaboration

- ✓ Joint agronomic validation: co-design independent trials with Spanish research institutions (IRTA, INIA) across Mediterranean crops (Onion, garlic, melon, maize, potato, tomato).
- ✓ Institutional co-funding for first-mover adoption
  - CDTI instruments, EU Horizon, and public-private pilot programs to de-risk entry for distributors and cooperatives
- ✓ Industrial symbiosis: Spanish agro-processing waste (olive, citrus) as raw material for EU-based EFP manufacturing expansion
  - NEDO as the bridge: Japanese-origin technology finding commercial footing in the CDTI food-tech ecosystem



# Thank you for your attention

## Contact information:

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