Functional Electrolyzed Water

Agriculture • Post-Harvest Processing • Food Safety

Updated base deck integrating Agricultural Booklet II, regulatory standards, produce studies, sugarcane, corn and supporting literature

By: Paul E. Seaver
Palm Beach Springs Water Company Inc.
Arcadia, Florida

Team base deck resource
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Not intended as a handout
Although NOT confidential

Presentation Roadmap

Best of the original booklet plus updated regulatory, scientific and crop-specific support.

01 Technology Foundation

FEW origin, dual-polarity electrochemistry and acidic/alkaline/neutral media.

02 Regulatory Alignment

EPA, FDA, USDA-FSIS and USDA-NOP pathways and guardrails for HOCl and chlorine materials.

03 Produce & Food Safety

Pathogen reduction on leafy greens, tomatoes, onions and processing surfaces.

04 Field & Crop Applications

Vineyards, soil/irrigation, greenhouse/hydroponics and plant wellness positioning.

05 Corn & Sugarcane

Post-harvest handling, mycotoxin context, sugarcane deterioration and mill integration.

06 Deployment Plan

Operational sequence, monitoring, documentation and commercial opportunities.

Executive Summary

A technology platform for plants, process water, food-contact surfaces and post-harvest preservation.

Core Position

Functional Electrolyzed Water is a controlled electrochemical conversion of water and electrolyte into application-specific functional media.

The presentation preserves the original agricultural concept while upgrading the evidence base and regulatory framing.

Use is positioned as a process platform, not as a blanket claim or substitute for label compliance.

Updated Support

Produce studies document reductions of key foodborne pathogens on lettuce, spinach, tomatoes and green onions.

Neutral EW research supports a lower-chlorine alternative to conventional sodium hypochlorite in fresh-cut settings.

Organic matter studies justify a practical pre-cleaning step before sanitizing.

Expanded Markets

Field agriculture: foliar support, mildew-pressure programs, soil and irrigation support.

Post-harvest: produce wash, corn processing, sugarcane fogging and mill sanitation concepts.

Food facilities: equipment, conveyors, flumes, spray systems and process water management.

Sources: Agricultural Booklet II; Park et al. lettuce/spinach and onions/tomatoes studies; Abadias et al. NEW; Solomon sugarcane; USDA/FDA/EPA regulatory references.

Why Agriculture Needs Additional Options

Conventional and organic production both need safer, scalable water-based tools.

Food safety expectations continue to increase across fresh produce and minimally processed foods.
Growers face pressure to reduce chemical dependency while maintaining disease control and yield consistency.
Post-harvest losses affect both raw agricultural commodities and industrial value chains such as sugarcane and corn.
Water quality, soil chemistry, organic load and processing design determine treatment success.

FEW fits best as a monitored, standards-based process tool: pre-clean → functional treatment → verification → documentation.

Original Agricultural Booklet II: What Still Matters

The original document framed FEW as a third agricultural option: conventional, organic and functional water-based agriculture.

Chemical reduction

Minimize dependence on pesticide, fungicide, herbicide and fertilizer inputs.

Antimicrobial / antifungal

Use low-pH functional water to create a less favorable environment for microbes and fungi.

Plant support

Use high-pH water and electron / nutrient concepts to support plant structure, root development and recovery.

Yield consistency

Target stronger plants, increased harvests and consistent produce quality.

Update: keep the agricultural thesis, add modern validation, regulatory boundaries and crop-specific post-harvest applications.

Sources: Agricultural Booklet II; Crops documents.

Technology Foundation: Controlled Electrolysis

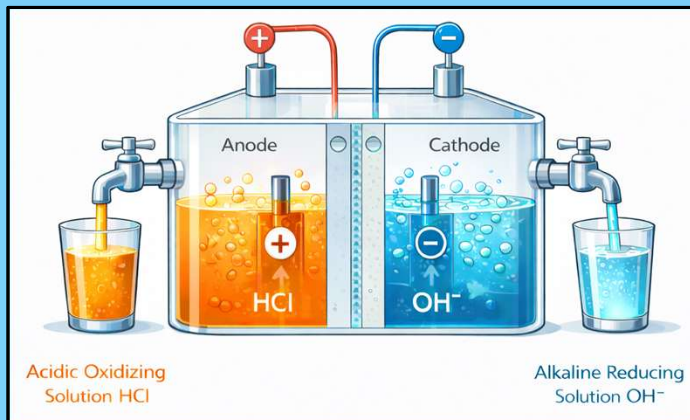
Water, electrolyte and electrical current are organized into functional media with different pH, ORP and chlorine-species behavior.

1 Source Water

Tap or process water becomes the base medium.

2 Electrolyte

A controlled amount of salt or application-specific electrolyte supports conductivity.



3 Dual Polarity Cell

Positive and negative electrodes restructure ions and water properties.

4 Functional Media

Acidic, alkaline and neutral ranges are selected for different uses.

Acidic stream

Low pH, high ORP, antimicrobial chlorine species for sanitation-oriented applications.

Alkaline stream

High pH, reducing potential and cleaning/degreasing support for organic-load removal.

Neutral range

A milder, more stable final-rinse or process-water architecture when lower corrosion and worker comfort are priorities.

Sources: Agricultural Booklet II; Abridged Esperer.H2O; TRI product overview; EW literature.

Three Media Architecture

The strongest presentation is not one product—it is an application-specific water platform.

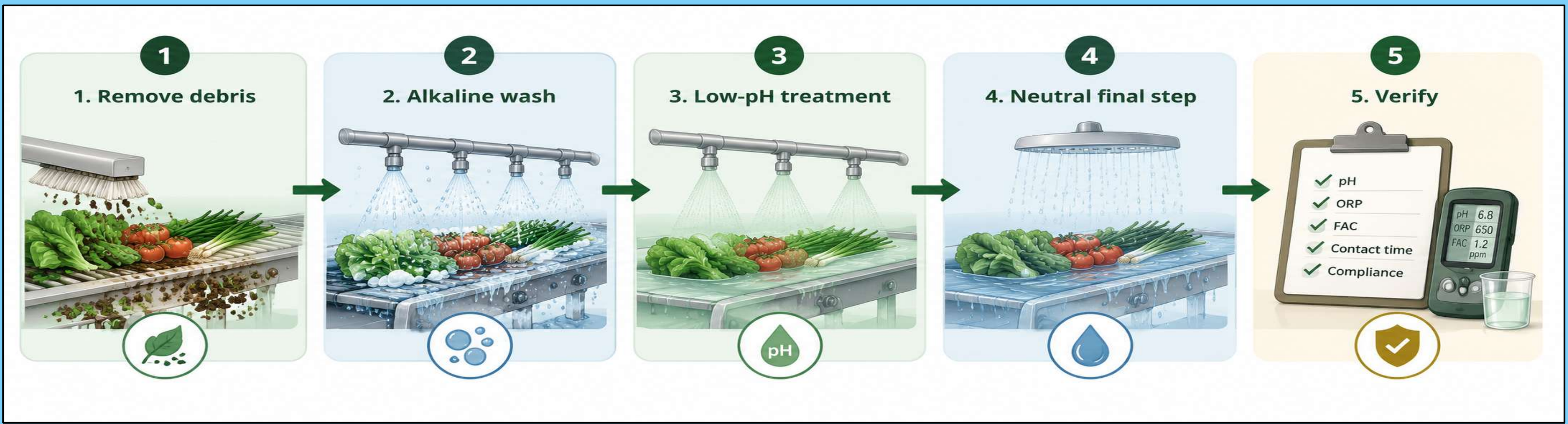
Functional Medium	Typical Range	Primary Role	Process Value
Ultra-High pH FEW	Approx. pH 10–12	Organic-load wash / mild degreasing	Prepares surfaces before sanitizer exposure.
Ultra-Low pH FEW	Approx. pH 2.4–3.0	Sanitizing / microbial-control step	High ORP and chlorine species for short contact.
Neutral pH FEW	Approx. pH 7.5–10	Final rinse / soak / preservation-oriented step	Lower irritation/corrosion profile with process-water advantages.

Recommended operating logic

Clean first to reduce organic load, then treat with the antimicrobial medium, then use neutral/final-rinse architecture where compatible with product and regulatory requirements.

Best-Practice Process Sequence

Organic load is the enemy of chlorine-based sanitizing performance.



1 Remove debris

Physical removal of soil, plant debris, sugar-rich residue or biofilm matrix.

2 Alkaline wash

Use UH pH FEW where cleaning/degreasing and surface wetting support are useful.

3 Low-pH treatment

Apply UL pH FEW / acidic EW at validated dwell time, FAC and ORP.

4 Neutral final step

Use N-FEW rinse/soak where product and regulation support it.

5 Verify

Record pH, ORP, FAC, contact time, organic load, rinse and label compliance.

Operational rule: Do not rely on sanitizer strength alone. Treatment performance depends on contact time, residual chlorine, pH, ORP, temperature, water turnover and organic loading. Use measurable control points rather than broad claims.

Sources: Park et al. organic matter study; Ayebah dissertation; USDA NOP/FDA/EPA label-use concepts.

Regulatory Alignment

EPA • FDA • USDA-FSIS • USDA National Organic Program

The deck frames hypochlorous acid / electrolyzed water within specific, condition-based regulatory pathways—not as a universal blanket approval.

Regulatory Alignment Matrix

HOCl and electrolyzed water are recognized in several U.S. regulatory contexts when used under stated conditions.

Suggested language: "recognized / permitted for defined uses under specific conditions" rather than "approved for all agricultural uses."

Agency	What the source supports	How to present it
USDA NOP	Hypochlorous acid generated from electrolyzed water is listed as a chlorine material for organic crop, livestock and handling operations.	Organic System Plan, residual chlorine and rinse requirements apply.
FDA	Food Contact Notification No. 1811 covers electrolytically generated HOCl at up to 60 ppm FAC for process water/ice used with fruits, vegetables, seafood, shell eggs and meat/poultry contexts.	Use must match FCN conditions and food-contact requirements.
USDA-FSIS	Electrolytically generated hypochlorous acid appears in safe/suitable ingredient guidance for specific meat and poultry processing uses.	FSIS limits/conditions apply; not a substitute for FDA/NOP/EPA controls.
EPA	EPA regulates antimicrobial pesticides and label claims; tolerance exemptions can apply for residues of HOCl on food-contact surfaces under 40 CFR 180.940 conditions.	Disinfectant/pesticide claims require EPA registration and label compliance.

Sources: USDA AMS NOP 5026; FDA FCN 1811; USDA-FSIS Directive 7120.1; EPA pesticide-registration and tolerance-exemption references.

USDA National Organic Program: HOCl from Electrolyzed Water

The strongest organic framing is chlorine-material compliance with monitoring and records.

Key NOP update

USDA NOP guidance states that the 2018 final rule added hypochlorous acid generated from electrolyzed water to §205.601, §205.603 and §205.605 as a chlorine material for crop production, livestock production and handling.

Compliance conditions

Direct crop/food contact water, equipment sanitizing, rinse practices, maximum residual disinfectant limits and monitoring must be reflected in the certified operator's Organic System Plan.

1 Allowed material

HOCl generated from electrolyzed water listed as chlorine material.

2 Defined use

Crop, livestock and handling operations have different annotations.

3 Measured compliance

Monitor residual chlorine at the final point of product contact.

4 Recordkeeping

Document label directions, rinse/residual limits and OSP procedure.

Source: USDA AMS, NOP 5026 Rev03, "The Use of Chlorine Materials in Organic Production and Handling."

FDA Food-Contact Pathway: HOCl in Process Water / Ice

FDA FCN 1811 supports a clear food-processing story for fruits and vegetables, seafood, eggs and protein processing.

FCN 1811 describes hypochlorous acid generated on-site by electrochemical activation of sodium chloride brine.
Generation at pH 6–7 keeps HOCl as the dominant species.

The cited FCN covers use at up to 60 ppm free available chlorine in process water or ice for washing, rinsing or cooling fruits and vegetables, fish/seafood, shell eggs and meat/poultry categories.

This supports process-water design, not uncontrolled field claims.

Best use in the deck: "FDA food-contact notification pathway for process water and ice used in food preparation and processing."

Source: FDA Environmental Assessment for Food Contact Notification No. 1811.

USDA-FSIS and EPA: Protein Processing + Antimicrobial Claims

Separate food-processing safety/suitability from pesticide/disinfectant label authority.

USDA-FSIS

Electrolytically generated hypochlorous acid is identified in FSIS safe/suitable ingredient guidance for specific meat, poultry and egg product processing uses.
Uploaded supporting material states typical limits of 5–50 ppm FAC depending on product/use context.
Use this as support for processing facilities, not as a universal crop input claim.

EPA

EPA registers antimicrobial pesticides and approves label language for disinfectants and sanitizers.
EPA finalized a tolerance exemption for residues of HOCl when used in antimicrobial formulations on food-contact surfaces under listed conditions.
Any pesticidal claim must follow an EPA-registered product label.

Important limitation **Regulatory alignment is use-specific. Claims, sites of use, concentrations, rinsing and contact times must match labels, FCNs, FSIS guidance, NOP annotations and facility HACCP/food-safety controls.**

Sources: USDA-FSIS Directive 7120.1; EPA selected antimicrobial products and tolerance-exemption references.

Food Safety & Produce Processing

Lettuce • Spinach • Tomatoes • Onions • Fresh-cut vegetables • Food-contact surfaces

Leafy Greens: Acidic EW Pathogen Reduction

Controlled studies show acidic EW can significantly reduce E. coli O157:H7, Salmonella and Listeria on lettuce and spinach.

2007/2008 lettuce + spinach study

Inoculated with three-strain cocktails of E. coli O157:H7, Salmonella Typhimurium and Listeria monocytogenes.
Treatments compared acidic EW, alkaline EW, sequential treatments and deionized water.
Acidic EW produced the strongest reduction pattern in the earlier lettuce/spinach work.

Practical lesson

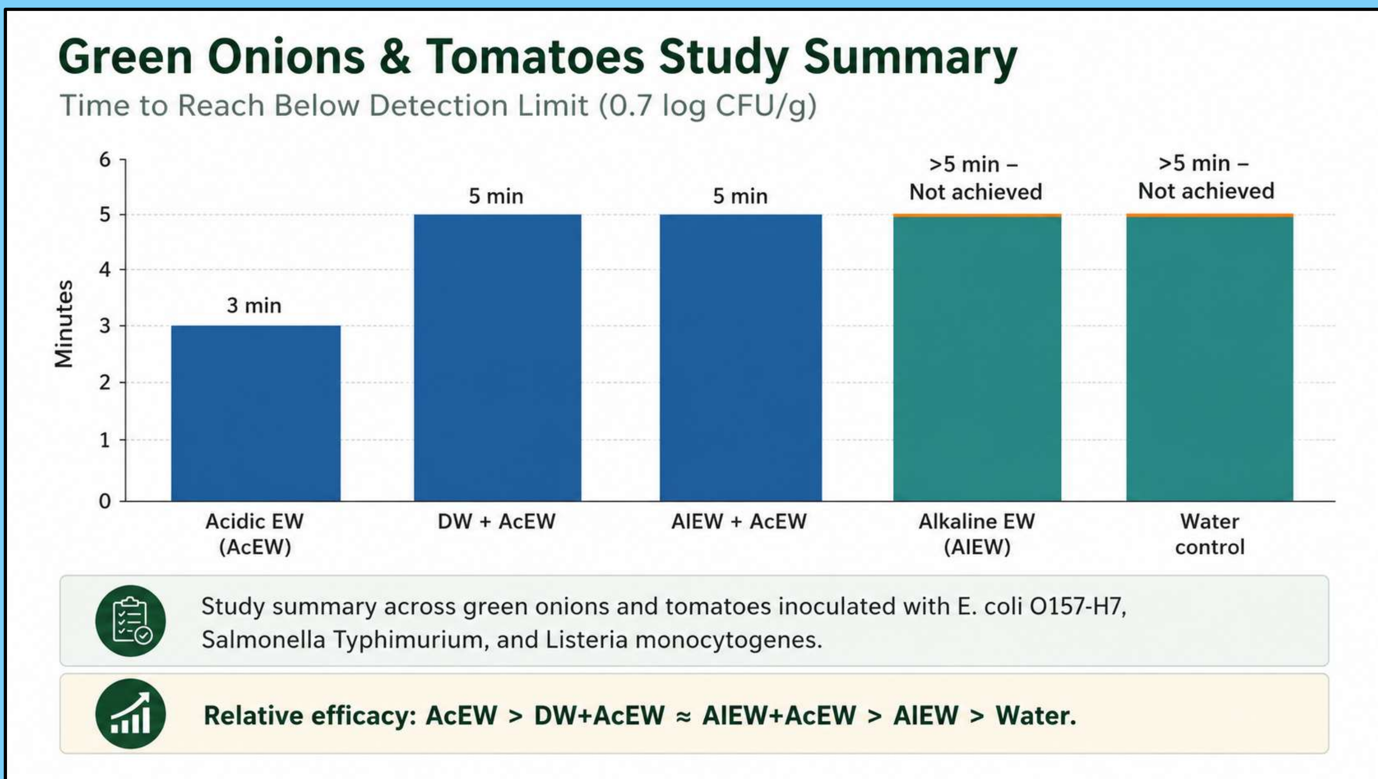
Acidic EW performance improves with exposure time, but commercial process times must be realistic.
Short-time spray/rinse design requires adequate FAC, ORP, coverage and organic-load control.
Use validated treatment windows for each crop and processing line.

3	15s–5m	AcEW	<0.7 log
Target pathogen groups	Treatment windows studied	Highest relative efficacy in study pattern	Detection limit cited in supporting work

Sources: 2007 electrolyzed water spinach/lettuce document; Park et al. 2008 organic matter study.

Tomatoes and Green Onions: Direct Produce Relevance

Supporting work extends the fresh produce story beyond leafy greens.



Study design

Green onions and tomatoes were spot-inoculated with E. coli O157:H7, Salmonella Typhimurium and Listeria monocytogenes and treated with acidic, alkaline, sequential and water controls.

Observed pattern

The relative efficacy pattern matched the lettuce/spinach work: acidic EW showed the greatest reduction, while alkaline EW alone did not materially reduce pathogen levels.

Presentation value

This helps position FEW across commodity categories: leafy, fruiting, bulb and fresh-cut produce.

Sources: Food Safety - Onions and Tomatoes; 2007 lettuce/spinach document.

Neutral Electrolyzed Water: A Lower-Chlorine Alternative

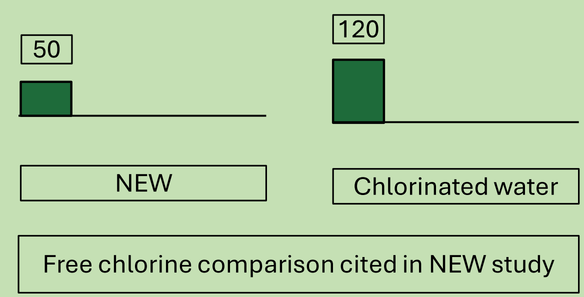
Neutral EW research helps bridge efficacy, handling comfort and equipment compatibility.

Why it matters

Neutral pH is less aggressive than acidic EW for some equipment and worker-contact contexts.
It supports a final-rinse or produce-line discussion after soil removal and validated antimicrobial treatment.
It gives the deck a more flexible architecture than low-pH-only positioning.

Key finding

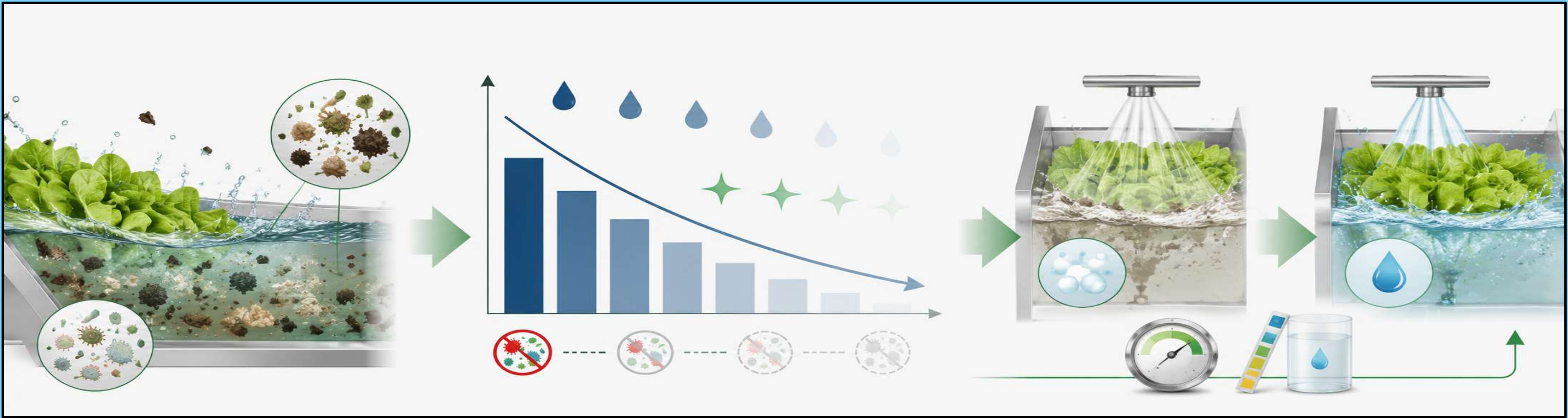
Diluted NEW at approximately 50 ppm free chlorine and pH 8.60 showed bactericidal activity against E. coli O157:H7, Salmonella, Listeria innocua and Erwinia carotovora on lettuce that was similar to chlorinated water at 120 ppm, with 1–2 log reductions.



Source: Abadias et al., "Efficacy of neutral electrolyzed water (NEW) for reducing microbial contamination on minimally processed vegetables."

Organic Matter: The Most Important Practical Control Point

The literature supports a two-step practical design: clean before you sanitize.



What the study showed

Without bovine serum, acidic EW reduced inoculated cells below the 0.7 log detection limit in 5 minutes.
With increasing serum concentration, bactericidal activity decreased.
Protein/organic material reduces free chlorine and oxidizing capacity.

Design implication

Pre-rinse or alkaline cleaning step.
Filter/replace process water as organic load rises.
Measure FAC and ORP, not just initial dose.

Sales implication

Position FEW as a complete operating procedure.
Avoid “one spray solves everything.”
Use verification to build buyer confidence.

Pre-cleaning is not a weakness of FEW; it is a professional process requirement for all chlorine-based sanitizing systems.

Source: Park et al. 2008, effects of organic matter on acidic EW for lettuce and spinach.

Food-Contact Surfaces and Biofilms

Processing facilities need sanitation programs that address resident organisms and equipment realities.

Biofilm challenge

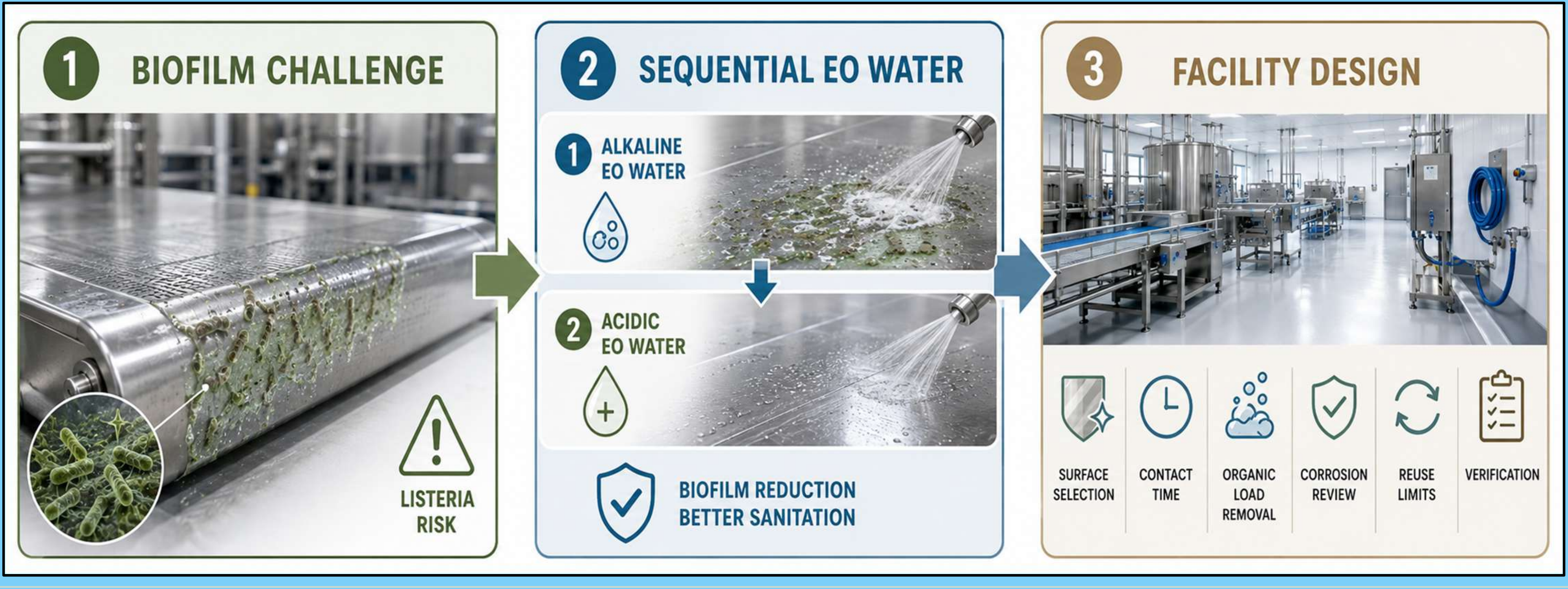
Biofilms can survive normal cleaning and become recurring contamination sources in processing plants. Listeria monocytogenes is particularly important in ready-to-eat and refrigerated environments.

Sequential EO water

Research showed alkaline EO water alone had little bactericidal effect on Listeria biofilms, while acidic EO water produced 4–5 log reductions; sequential alkaline followed by acidic treatment improved results.

Facility design

The deck should show FEW as a sanitation system: surface selection, contact time, organic load removal, corrosion review, reuse limits and verification.



Source: Ayebah, 2006 dissertation: efficacy of electrolyzed water as sanitizer/cleaning agent and effect on food-contact surfaces.

Fresh Produce Framework

A clear framework makes the deck understandable to growers, processors and regulators.

1 Pre-harvest
Water quality, field hygiene, soil/fertilizer controls and potential crop-support use cases.

2 Harvest
Cut surface exposure, equipment hygiene and rapid cooling/handling.

3 Post-harvest
Flumes, spray bars, rinse systems, process water and dwell time.

4 Packing
Conveyor sanitation, bins, cold rooms and worker-contact surfaces.

5 Records
pH, ORP, FAC, contact time, organic load and regulatory pathway.

Sources: FDA GAP/Food-contact concepts; EW produce literature; Agricultural Booklet II.

Field Agriculture & Plant Wellness

Mildew pressure • foliage support • soil/irrigation • greenhouse/hydroponics

Vineyard Field Experience: Mildew + Plant Vigor

Grape growing project data strengthens the agricultural credibility beyond food-processing sanitation.

2003 objective

Determine whether electrolyzed water could remove visible mildew, prevent reappearance and allow affected fruit to continue growing.

2004 objective

Move from response to prevention: test mildew prevention, recovery of untreated infected clusters and foliage/vine nutrient-support observations.

Observed field direction

Documents report prevention in most cases, stopped spread after treatment, healthier clusters, more shoots and longer vine growth in treated areas.

Source: Grape Growing Project.

Soil and Irrigation: Water Chemistry as a Crop Tool

A stronger deck connects FEW to irrigation water, soil pH, penetration and nutrient availability.

Sulfuric-acid replacement documents focused on lowering alkaline irrigation water to target pH levels and improving penetration.
Soil objectives included freeing nutrients, breaking bicarbonates, reclaiming sodic soils and reducing acid hazards.
This is best presented as a soil/irrigation program requiring site-specific water chemistry, agronomic validation and compatibility testing.

Agronomic framing **Move from "replacement chemical" to "water conditioning + soil response platform."**

Sources: Sulfuric Acid vs Acetic Acid; Sulfuric Acid Replacement Solution; Agricultural Booklet II.

Greenhouses, Hydroponics and Controlled Environments

Controlled water systems are natural deployment environments for measured FEW programs.

Why this market fits

Greenhouse and hydroponic systems already monitor water, pH, EC, nutrient dosing, recirculation and sanitation.

FEW value

Potential roles include water hygiene, biofilm management, rinse/sanitize steps, root-zone water support and harvest-area sanitation.

Control points

Avoid phytotoxicity by validating concentration, contact time, crop sensitivity, nutrient compatibility and recirculating-water chemistry.

Sources: Agricultural Booklet II; FEW produce and food-processing literature; regulatory sources.

Crop-Support Claims: Safer Wording

Scientific and regulatory credibility depends on how benefits are described.

Avoid overstating	Use stronger compliant language
"Guaranteed disease cure"	"Designed to reduce microbial and fungal pressure under validated treatment conditions."
"EPA-approved pesticide alternative"	"Water-based functional medium aligned with applicable HOCl/electrolyzed-water regulatory pathways where product labeling and use conditions are satisfied."
"Organic for all uses"	"USDA NOP lists HOCl generated from electrolyzed water as a chlorine material for defined crop, livestock and handling uses."
"No monitoring needed"	"Program requires pH, ORP, FAC, contact time, water quality and organic-load monitoring."

Sources: USDA NOP 5026; FDA FCN 1811; EPA/FSIS references; EW organic matter studies.

Corn & Sugarcane

Post-harvest value chains • processing water • mycotoxin context • sugar recovery

Corn: Post-Harvest and Processing Opportunity

Corn gives the presentation a strong row-crop / commodity processing use case.

Processing-chain FEW concept

UH pH FEW for initial organic-load removal and mild cleaning.
UL pH FEW for cold-water sanitation where compatible with product and label conditions.
Neutral pH FEW for final rinse/soak or process-water support.

Why corn matters

Large-scale production and processing require water-efficient, equipment-compatible sanitation.
Aflatoxin and Aspergillus risk create quality and safety pressure in corn value chains.
Processing facilities need measurable, repeatable interventions.

Needed validation

Commodity-specific contact times.
Kernel/ear surface coverage.
Water recirculation controls.
By-product and residue review.
Food/feed regulatory pathway.

Sources: TRI product overview; Neutral pH FEW overview; corn documents; mycotoxin literature.

Aflatoxin / Aspergillus Context

The deck can include mycotoxin control as an opportunity area while clearly separating proof from concept.

Ozonation study in corn

A published Journal of Food Science abstract reported that ozonation at 10–12 wt% reduced aflatoxin levels in corn by 92%, with no reversion to the parent compound observed; safety findings were nuanced and require careful discussion.

EW study on A. flavus / AFB1

Neutralized and acidic electrolyzed oxidizing water showed strong fungicidal activity against Aspergillus flavus and potential decontamination of AFB1 in peanut models, but further food/feed safety validation is still important.

Important presentation control **Use mycotoxin data as supporting scientific context, not as an unvalidated commercial claim for corn unless field-scale, commodity-specific and regulatory studies are completed.**

Sources: Prudente & King ozonation in corn; Li & Xiong 2010 NEW/AcEW and AFB1; corn/TRI documents.

Sugarcane: From Field to Mill

The uploaded sugar process images create a strong visual bridge into post-harvest deterioration and mill sanitation.

FEW integration opportunities:

cane receiving yard

fogging/storage

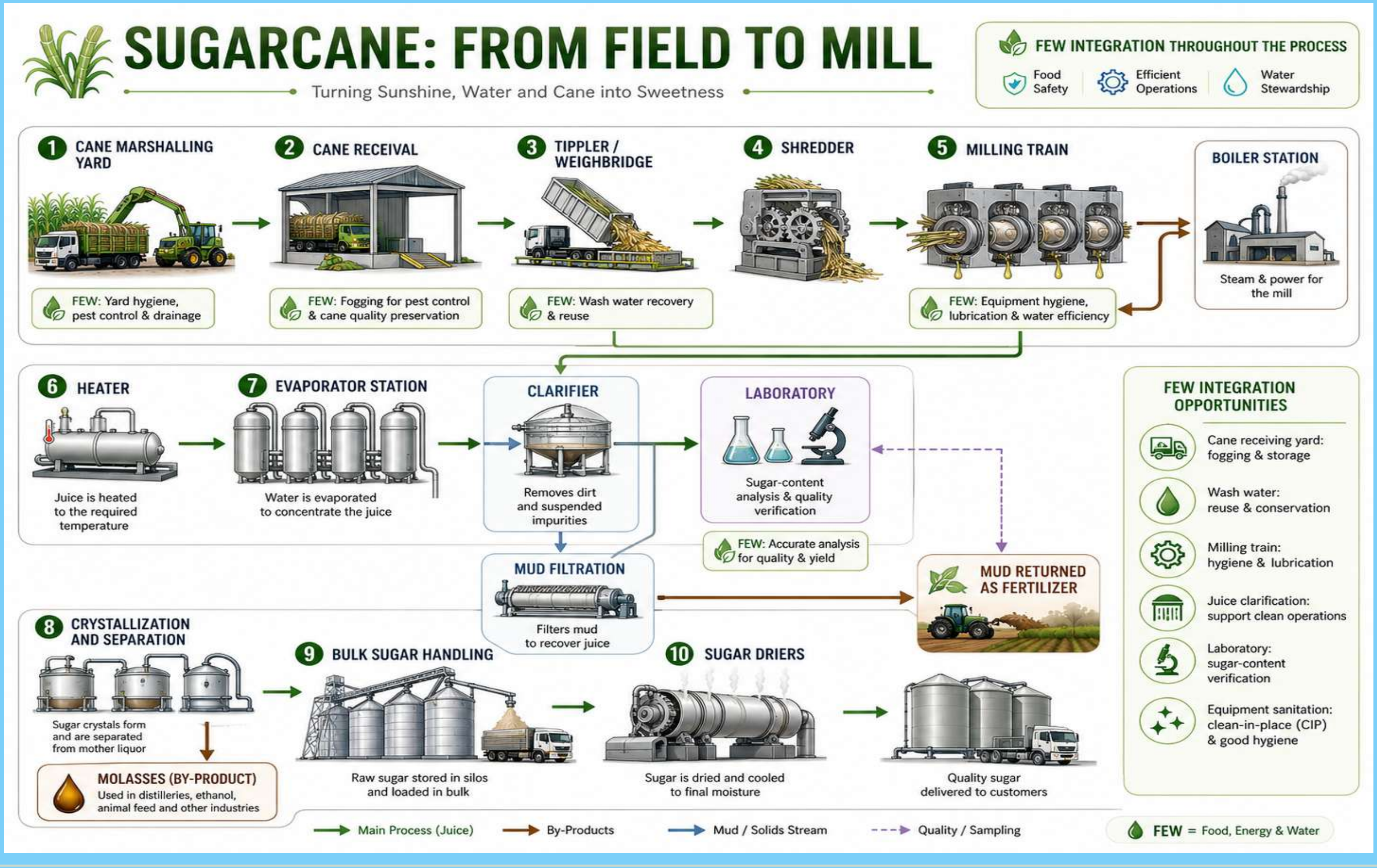
wash water

milling train hygiene

juice clarification support

laboratory verification

equipment sanitation



Source: User-provided sugar manufacturing diagram; sugarcane post-harvest literature.

Sugarcane Deterioration: The Problem FEW Can Address

Sugarcane is perishable; delays between harvest and milling reduce recoverable sugar and complicate processing.

Drivers of loss

Harvest-to-mill delay
High temperature and humidity
Cane variety and maturity
Invertase activity
Microbial growth producing acids, ethanol and dextran

Effects

Lower cane tonnage
Reduced sugar recovery
Lower juice purity
Higher reducing sugars
Processing problems from dextran

FEW opportunity

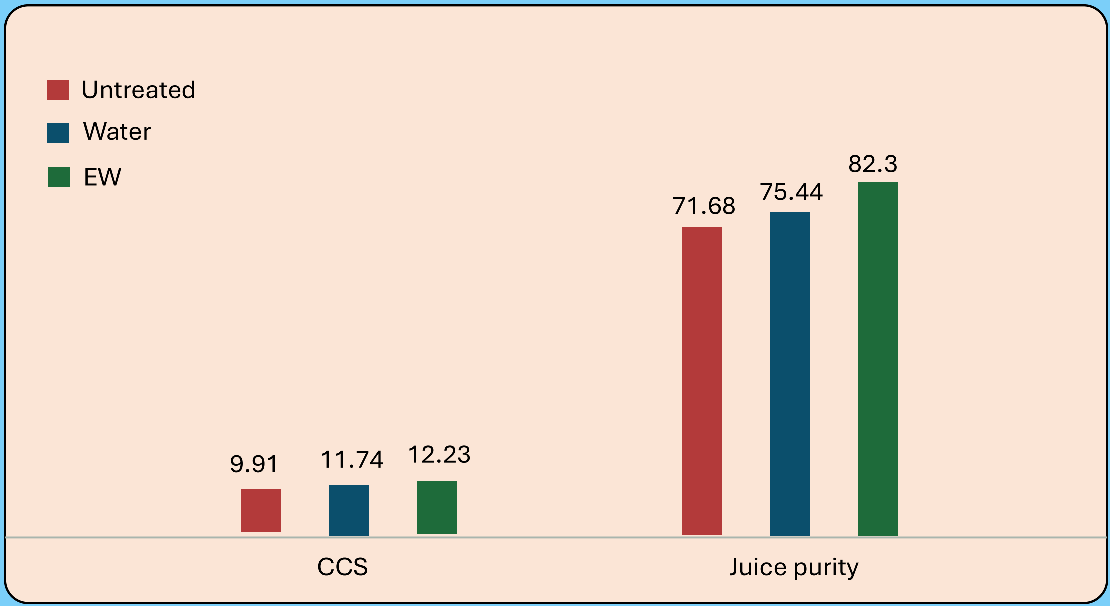
Field or mill-yard fogging
Cane yard stabilization support
Equipment sanitation
Process water hygiene
Integrated mill sanitation program

Use case positioning: “post-harvest quality preservation support” rather than “single-step sugar recovery guarantee.”

Source: Solomon 2009 post-harvest deterioration of sugarcane; Post-Harvest Quantity and Quality Losses of Sugarcane Crop.

Sugarcane EW Fogging: Reported 120-Hour Quality Response

The uploaded Sugar Tech abstract gives specific quantitative support worth highlighting.



Reported result

After 120 hours of storage, untreated cane, water-treated cane and EW-treated cane had CCS values of 9.91, 11.74 and 12.23; juice purity values were 71.68, 75.44 and 82.30, respectively.

Presentation takeaway

EW fogging should be presented as a promising post-harvest preservation support method that merits field-scale and mill-scale validation.

Source: S. Solomon / Priyanka Singh, efficacy of electrolyzed water to minimize post-harvest sucrose losses in sugarcane.

Sugar Mill Integration Points

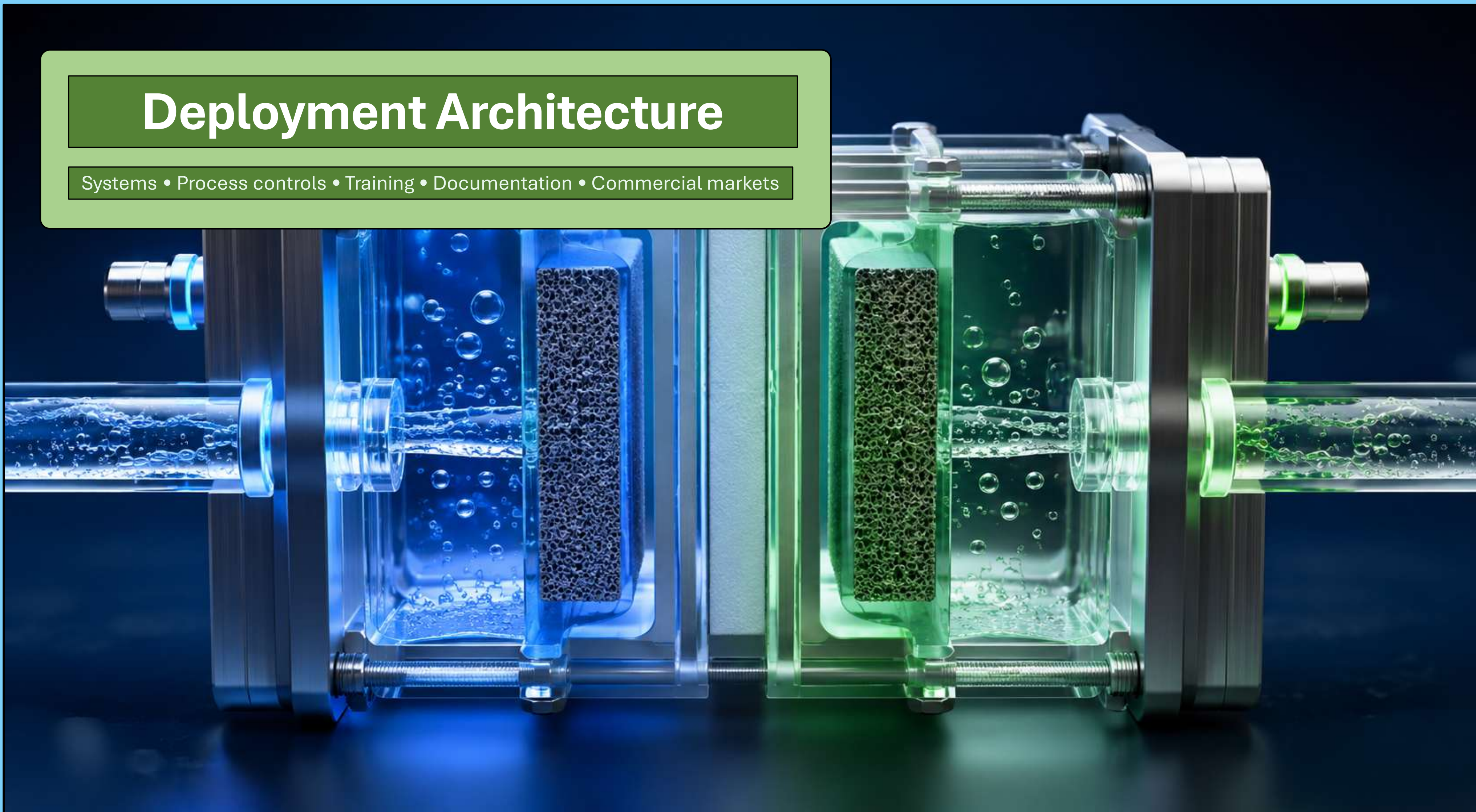
FEW should be shown as a sanitation and preservation architecture across the process, not only as a field spray.

Location	Potential FEW role
Cane yard / receiving	Fogging or spray support to reduce post-harvest microbial deterioration.
Conveyors / cutters / shredders	Equipment sanitation and organic-load control between cleaning cycles.
Milling train / juice contact points	Water hygiene and surface sanitation where compatible with materials and process.
Clarifier / mud filtration area	Target biofilm and microbial-load control under defined operating conditions.
Laboratory / QA	Monitor Brix, purity, reducing sugar, dextran and microbial indicators.

Sources: User-provided sugar process diagrams; Solomon sugarcane documents; sugarcane post-harvest literature.

Deployment Architecture

Systems • Process controls • Training • Documentation • Commercial markets



On-Site Generation and Delivery Options

The technology story should show manufacturing, storage and application as one controlled system.

1 Generate

On-site electrolysis of water + electrolyte with equipment sized for gallons/day.

2 Stabilize

Hold within validated pH/ORP/FAC ranges and shelf-life conditions.

3 Apply

Spray, dip, fog, flume, rinse or sanitation loop depending on use case.

4 Recover / replace

Filter, replenish or discard based on organic load and FAC decay.

5 Document

Capture treatment record for QA, organic inspection and food-safety audits.

Field units

Tank mixing, spray rigs, drip/irrigation compatibility and mobile support units.

Facility units

Process water, conveyor sanitation, flumes, clean-in-place and equipment rinse systems.

Industrial units

High-volume corn, sugarcane, produce and animal protein facility integration.

Sources: TRI product overview; Abridged Esperer.H2O; FEW documents.

Monitoring and Verification Panel

Credibility comes from making the chemistry measurable in the field and plant.

pH

Confirms acidic, neutral or alkaline treatment range.

ORP

Tracks oxidizing/reducing environment and treatment strength.

FAC

Measures free available chlorine / active chlorine capacity.

Time

Controls dwell/exposure period and residual action.

Organic load

Determines whether water must be pre-filtered, replenished or replaced.

Temperature

Affects microbial growth, chemistry stability and product quality.

Water flow

Controls coverage, contact, dilution and replenishment.

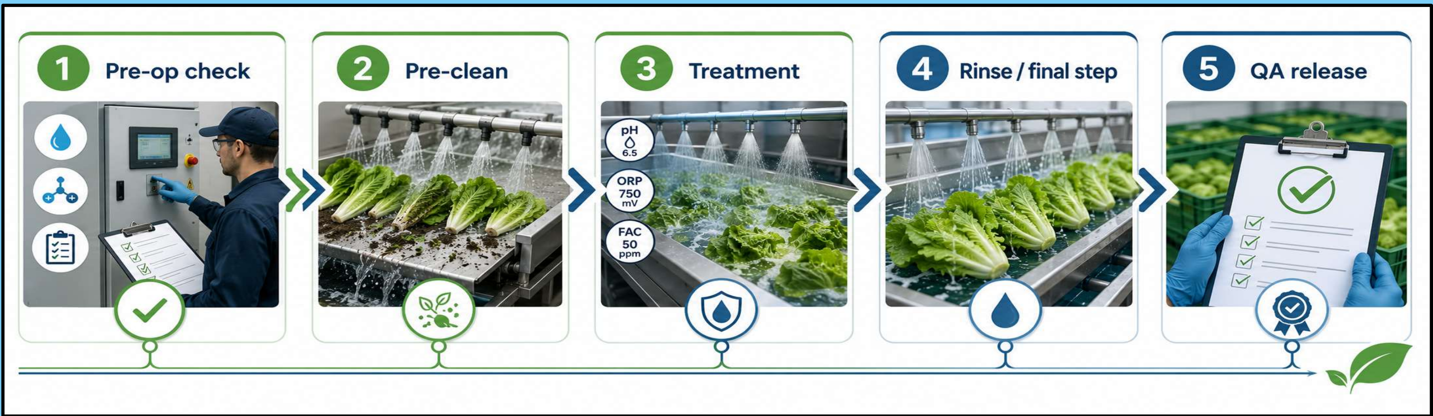
Records

Supports audits, organic inspections and customer validation.

Sources: EW scientific literature; USDA NOP monitoring guidance; organic matter studies.

Sample SOP Flow for Produce or Post-Harvest Facility

Turn the science into an operating protocol a buyer can understand.



Deviation	Corrective action
FAC below validated range	Stop line, replenish or regenerate treatment water, retest before restart.
Excessive debris / turbidity	Drain/filter wash water, repeat pre-cleaning, record water change.
pH/ORP out of range	Check generator and electrolyte; hold product until system is back in specification.
Unclear regulatory fit	Hold claim/use case until label, FCN, NOP or FSIS pathway is confirmed.

1 — Pre-op check

Generator status, source water, electrolyte, calibration and label/FCN pathway.

2 — Pre-clean

Remove soil, organic matter and product residue.

3 — Treatment

Apply FEW medium at validated pH/ORP/FAC and contact time.

4 — Rinse/final step

Follow label, FDA/NOP rinse and residual requirements.

5 — QA release

Record readings, water changes, lot, treatment time and corrective actions.

Evidence Matrix: What Each Source Adds

This slide helps a customer see why the presentation is more than a historical booklet.

Source group	Main evidence	Deck role
Original booklet	FEW as agriculture option; low/high pH streams; plant wellness and melon example.	Platform foundation
Produce studies	Lettuce, spinach, tomatoes and onions pathogen reduction by acidic EW.	Food safety validation
NEW studies	Neutral EW similar to 120 ppm chlorinated water at lower FAC in fresh-cut produce settings.	Milder final-rinse/process-water option
Organic matter studies	Sanitizer efficacy declines as protein/organic load increases.	Pre-cleaning and monitoring requirement
Sugarcane studies	EW fogging associated with improved CCS and juice purity after storage.	Post-harvest preservation opportunity
Corn/mycotoxin docs	Ozone and EOW data support mycotoxin-context discussion.	Future validation opportunity
Regulatory sources	NOP, FDA, FSIS and EPA contexts for HOCl/electrolyzed water.	Compliance framing

Commercial Markets

A single deck can serve growers, food processors and industrial agriculture.

Fresh produce

Leafy greens, tomatoes, onions, peppers, carrots and fresh-cut lines.

Greenhouse / hydroponic

Water hygiene and controlled environment sanitation.

Sugarcane mills

Cane yard fogging, process water and equipment sanitation.

Animal protein

FSIS-context process water and surface sanitation.

Vineyards

Mildew-pressure programs and post-harvest winery sanitation.

Corn processing

Wash, sanitation, soaking and mycotoxin-risk context.

Organic handlers

Chlorine-material programs under NOP restrictions.

Industrial sanitation

Conveyors, stainless steel, bins, tanks and CIP-compatible applications.

Sustainability and Worker-Safety Positioning

The most credible positioning is reduced handling burden and controlled chemical footprint.

On-site generation

Reduces transport and storage of concentrated chemical stock solutions when applicable.

Lower free-chlorine options

Neutral EW studies suggest comparable microbial reduction to higher-chlorine sodium hypochlorite under certain produce conditions.

Wastewater awareness

Organic load and residual chemistry must be managed; FEW should be integrated with facility wastewater and reuse strategy.

Sources: FDA FCN environmental assessment; NEW and EW food-industry reviews; FEW documents.

Compliance Checklist Before Commercial Use

This slide protects the presentation from overclaiming and supports buyer trust.

Define use site

field crop, livestock water, produce wash, food-contact surface, meat/poultry processing, or industrial sanitation

Test product effects

quality, sensory, corrosion/materials, residues and wastewater compatibility

Document SOP

records, calibration, water changes, corrective actions and operator training

Validate process parameters

pH, ORP, FAC, dwell time, temperature, surface/product compatibility and organic load

Confirm regulatory pathway

NOP annotation, FDA FCN/CFR, FSIS guidance, EPA registration/label or state requirement

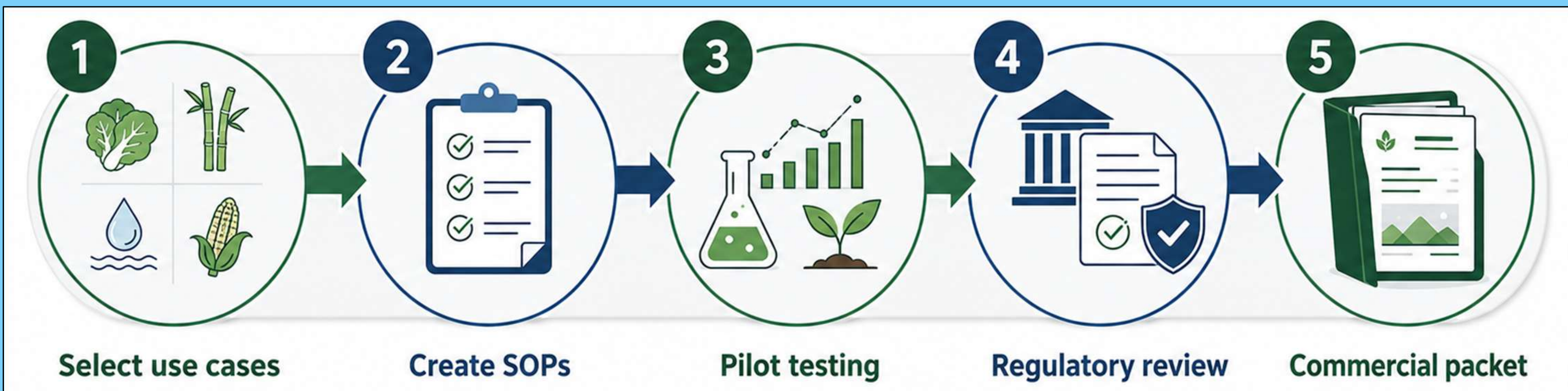
Confirm label language

no pesticidal/disinfectant/sanitizer claims unless product and use are properly registered/labeled

Suggested Next Steps

Use the presentation to move from historical support to a validated commercial program.

1	2	3	4	5
Pick 2–3 near-term markets: produce wash, sugarcane fogging, greenhouse water or corn processing.	Write pH/ORP/FAC targets, dwell time, pretreatment and QA records.	Run controlled pilot trials with microbial, quality and yield/recovery metrics.	Map each claim to label, FCN, NOP, FSIS or EPA pathway.	Produce customer deck, one-page spec sheets and pilot proposal.

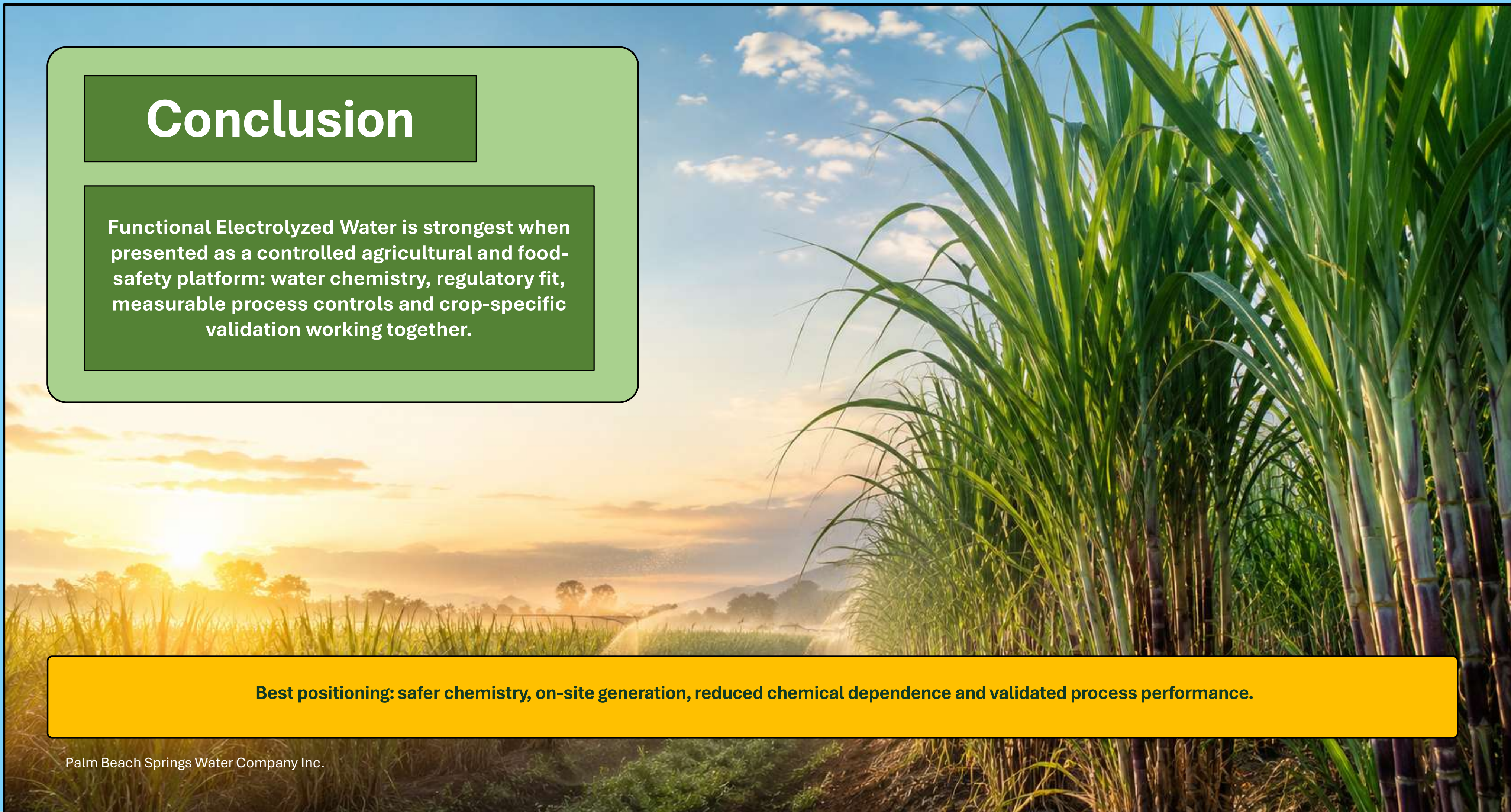


Priority recommendation

Start with process-water and post-harvest applications because they are measurable, controllable and easier to align with food-safety programs.

Secondary recommendation

Use field crop claims carefully until crop-specific performance and phytotoxicity data are created for each crop and application rate.



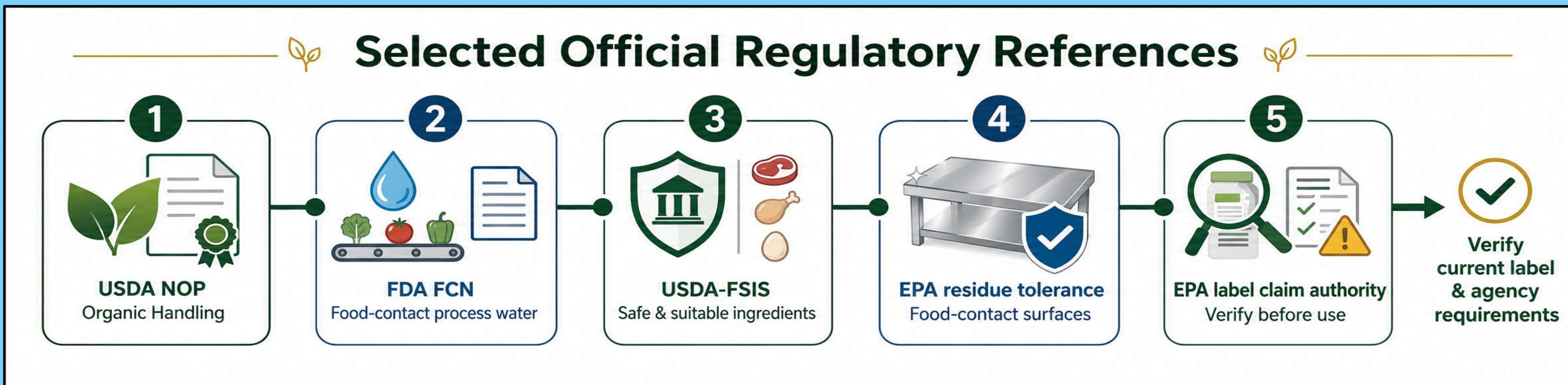
Conclusion

Functional Electrolyzed Water is strongest when presented as a controlled agricultural and food-safety platform: water chemistry, regulatory fit, measurable process controls and crop-specific validation working together.

Best positioning: safer chemistry, on-site generation, reduced chemical dependence and validated process performance.

Selected Official Regulatory References

Use these in backup or appendix when a buyer asks about approval status.



USDA AMS National Organic Program, NOP 5026 Rev03: The Use of Chlorine Materials in Organic Production and Handling.

FDA Environmental Assessment for Food Contact Notification No. 1811: electrolytically generated hypochlorous acid for process water/ice uses.

USDA-FSIS Directive 7120.1: Safe and Suitable Ingredients Used in the Production of Meat, Poultry and Egg Products.

EPA 40 CFR 180.940 and 2022 final rule: tolerance exemption for residues of hypochlorous acid in antimicrobial formulations on food-contact surfaces under specified conditions.

EPA pesticide registration resources: antimicrobial pesticide products and label-claim authority.

Reference note: always verify current agency text, product labels and state requirements before commercial use or claims.

Selected Scientific and Technical References

These are built from the user-provided supporting documents.

Agricultural Booklet II

Crops; Grape Growing Project

Sulfuric Acid vs Acetic Acid

Abridged Esperer.H2O Introduction

Park et al.: Efficacy of electrolyzed water for reduction of foodborne pathogens on lettuce/spinach and green onion/tomato

Park et al. 2008: Effects of organic matter on acidic electrolysed water for reduction of pathogens on lettuce and spinach

Abadias et al. 2008: Efficacy of neutral electrolyzed water for reducing microbial contamination on minimally processed vegetables

Ayebah 2006: Efficacy of electrolyzed water as a sanitizer and cleaning agent and its effect on food contact surfaces

Wang 2011: Evaluation of hypochlorous acid, lactic acid and peroxyacetic acid as sanitizers for fresh vegetables

Solomon 2009; Singh et al. 2015; Sugar Tech abstracts: post-harvest deterioration of sugarcane and EW fogging

Prudente & King: ozonation to degrade aflatoxin in corn; Li & Xiong: NEW/AcEW against Aspergillus flavus and AFB1

Appendix: Regulatory Language for Speaker Use

Suggested phrases to keep the presentation accurate and defensible.

Topic	Suggested wording
Organic	HOCl generated from electrolyzed water is listed by USDA NOP as a chlorine material for specific crop, livestock and handling uses, subject to NOP annotations and OSP monitoring.
Food processing	FDA FCN 1811 provides a food-contact pathway for electrolytically generated HOCl in process water/ice under the conditions stated in the notification.
Meat/poultry	USDA-FSIS safe and suitable ingredient guidance supports defined uses of electrolytically generated HOCl in meat/poultry/egg product processing.
EPA	Disinfectant/sanitizer/pesticidal claims require EPA registration and label compliance; residues on food-contact surfaces may be exempt from tolerance when 40 CFR 180.940 conditions are met.
Research	Laboratory and field studies support feasibility, but each commercial use case should be validated under actual operating conditions.

Thank You

Palm Beach Springs Water Company Inc.
Functional Electrolyzed Water Agriculture Platform

Next review: confirm preferred emphasis

- Agriculture sales deck
- Regulatory-focused deck
- Corn/sugarcane specialty deck

From the farm to processing and cold storage, from the trucks that deliver to the stores that provide, every step supports the fresh food our families consume. Advanced Electrochemistry introduces a new water-based process platform designed to support crop yield, crop safety, storage stability, shelf life, and overall crop quality — from field to table.