

QUANTUM AGROTECHNOLOGY

SSF Quantum Technology

A Strategic Solution for Global Food Security

Addressing the Fertilizer Crisis in Europe, Middle East & Africa
Through Non-Contact Field Activation Technology

Executive Overview

01 The Global Fertilizer Crisis

Understanding the unprecedented disruption to global fertilizer supply chains and the converging factors creating a perfect storm

 Market Analysis · Regional Impact

02 Regional Impact Analysis

Examining how the crisis affects Europe, Middle East, and Africa with data-driven insights on supply disruptions

 Europe · Middle East · Africa

03 SSF Technology Solution

Quantum signals activation of agricultural soils and crops without chemical inputs—scientific foundation and operational principles

 Quantum Physics · AI Integration

04 Proven Results & Validation

Documented outcomes from global field applications across multiple crops, climates, and agricultural systems

 Field Data · Scientific Publications



Strategic Implementation Roadmap

Partnership opportunities and global deployment strategy

25+ Years Development
Patented Technology

01

The Global Fertilizer Crisis

Understanding the unprecedented disruption to global fertilizer supply chains



Supply Chain Collapse



Price Volatility



Global Impact

The Perfect Storm: Multiple Converging Factors



Strait of Hormuz Blockade

45% of globally traded urea passes through this critical chokepoint, now effectively closed since March 1, 2026. **200+ merchant vessels stranded.**



Qatar Production Halt

QatarEnergy halted world's largest single urea facility (5.6M tonnes annual capacity, **14% of global supply**) following attacks on energy infrastructure.



Iran Export Disruption

Iran's urea exports (5M tonnes annually, **10-12% of global exports**) paralyzed due to military conflict and infrastructure damage.



European Import Collapse

EU nitrogen fertilizer imports dropped **80%** in January 2026 (from 1.18M to 179K tonnes) due to CBAM (Carbon Border Adjustment Mechanism) implementation and supply disruptions.

Crisis Timeline

- Feb 28** Military escalation begins; first strikes on Iranian infrastructure
- Mar 1** Iran closes Strait of Hormuz; shipping traffic collapses 90%
- Mar 2** QatarEnergy halts LNG and urea production
- Mar 3-5** Global fertilizer prices surge 20-35% within 48 hours
- Mar 6-9** EU gas prices spike 70%; production costs become unsustainable

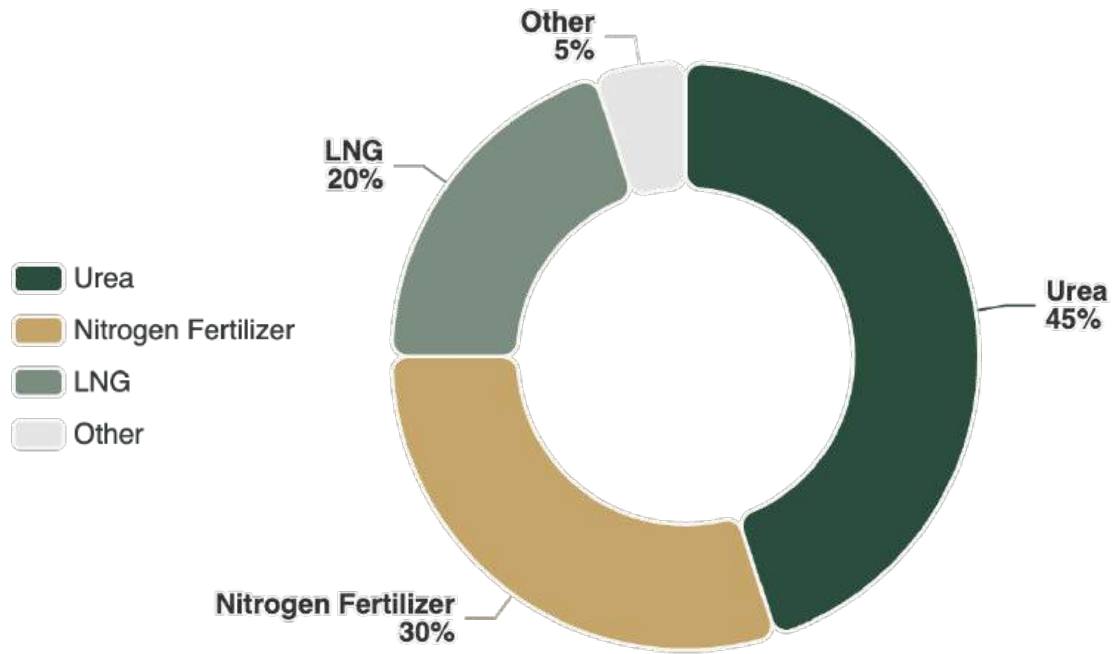
Energy Price Impact

EU Natural Gas	+70%
Brent Crude	+15%
Production Cost	\$550-600/m³

Source: TASS, Rabobank, Argus Media

Strait of Hormuz: The Critical Chokepoint

Global Trade Flows Through Hormuz



Why Hormuz Matters

Global Urea Trade **45%**
of internationally traded urea passes through this strait

Nitrogen Fertilizer **25-30%**
of world's nitrogen fertilizer exports

Global LNG **20%**
of liquefied natural gas exports

Current Status

90%

Traffic Reduction

200+

Vessels Stranded

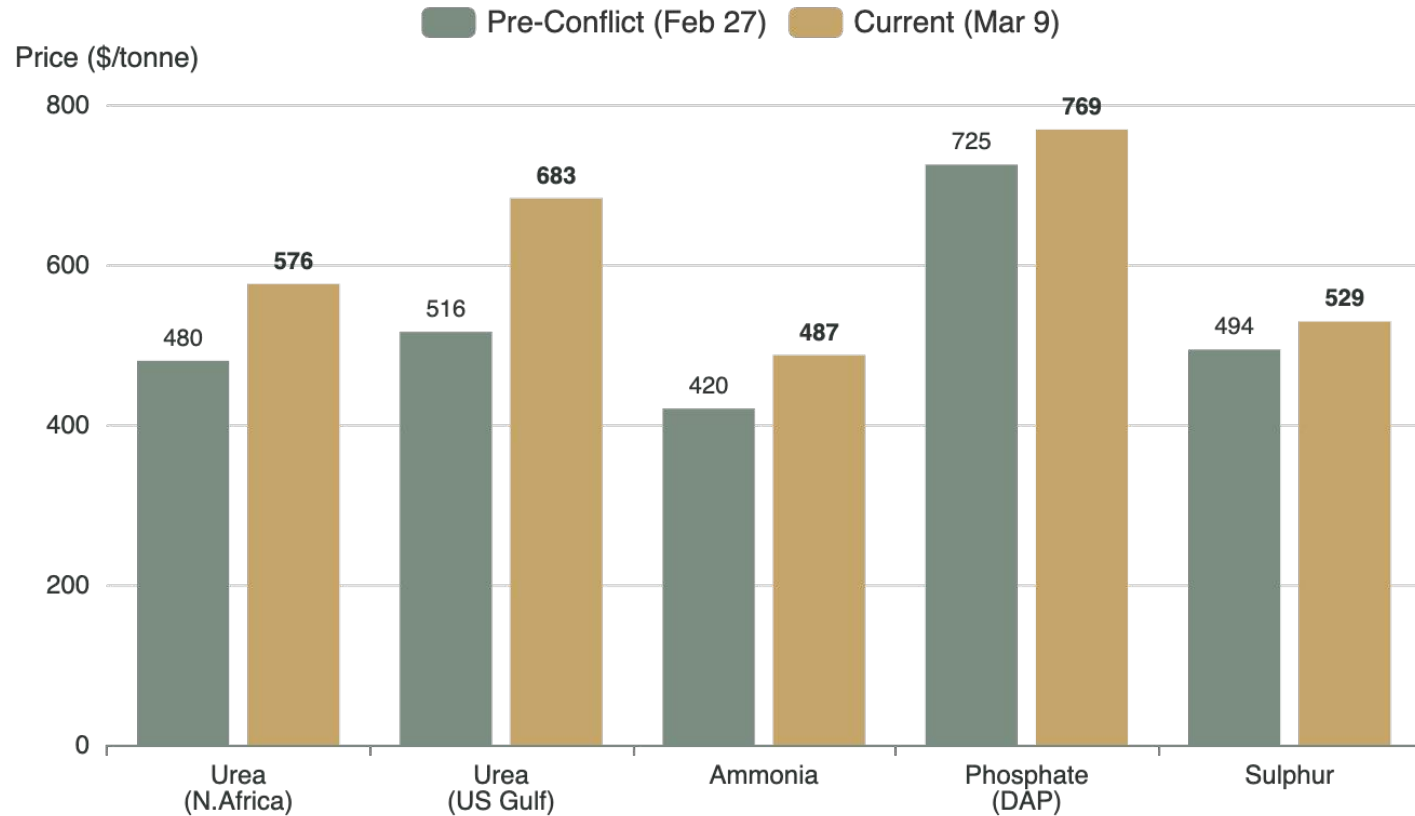
! Commercial tanker passage effectively ceased since March 1

i Sources: Rabobank, Kpler, Navy Lookout, Independent

Price Shock: Global Fertilizer Market Response

Within 48 hours of conflict escalation, fertilizer markets experienced unprecedented price volatility

Fertilizer Price Surge (Pre-Conflict vs Current)



Key Price Movements

Urea (North Africa) +20%
\$480 → \$576/t

Urea (US Gulf) +27%
\$516 → \$683/t

Ammonia +16%
Global benchmark

Phosphate +6%
DAP/TSP

Sulphur +7%
Key input

European Energy Crisis

Natural Gas Price **\$550-600/m³**
Making EU fertilizer production economically unviable

Sources: Bloomberg, Argus Media, Scotiabank, Rabobank (March 2026)

02

Regional Impact Analysis

Examining how the crisis affects Europe, Middle East, and Africa



Europe



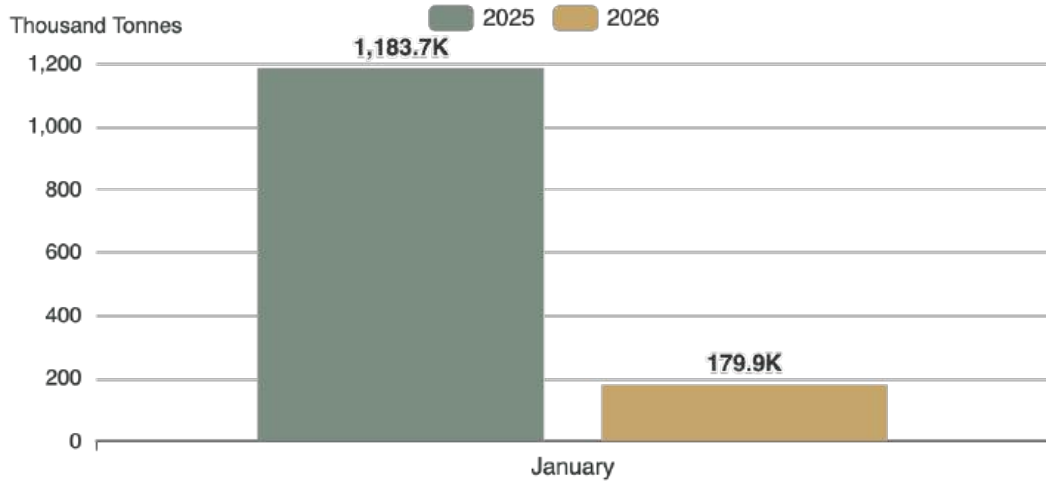
Middle East



Africa

Europe: Import Dependency Crisis

EU Nitrogen Fertilizer Imports Collapse



80%

Import Decline
Jan 2026 vs Jan 2025

25%

Price Increase
Above 2024 average

45-50%

Stock Coverage
Of 2026 harvest needs

CBAM Impact on Costs

Carbon Border Adjustment Mechanism adding €16-42 per tonne of urea:

€16.19/t

With actual data

€41.96/t

With default values

Most Affected EU Member States

Germany

Energy-intensive industries most vulnerable; gas-dependent fertilizer production

Critical

Italy

Significantly lower stock levels; high import dependency

Critical

Ireland

Lowest stock coverage; grass-based agriculture vulnerable

High Risk

France

Major agricultural producer; rising input costs squeezing margins

High Risk

Poland

Suspended new nitrogen orders; fulfilling existing contracts

Moderate

Middle East: Production Shutdowns & Supply Disruption

Major Production Facilities Status

Country/Company	Capacity	Status	Global Share
QatarEnergy Qatar	5.6M t/year	HALTED	14%
Iran (National) Iran	5.0M t/year	PARALYZED	10-12%
Bapco Energies Bahrain	-	FORCE MAJEURE	-
Saudi Aramco Ras Tanura	-	PARTIAL	-
Egypt (Mopco/Alexfert) Egypt	~10% global	AT RISK	~10%

Key Disruption Factors



Military Attacks

Direct strikes on Ras Laffan and Mesaieed industrial cities



Strait Closure

Complete maritime blockade since March 1



Gas Supply

Israel's Leviathan field shutdown affecting Egypt



Insurance

Prohibitive premiums making shipping uneconomical

Total Impact

24-26%

of Global Urea Supply

Directly affected by production halts

45%

of Global Urea Trade

Blocked at Strait of Hormuz

Recent Market Transactions

Mopco (Egypt)

\$505/t FOB

Alexfert (Egypt)

\$495/t FOB

Premium vs Feb 27

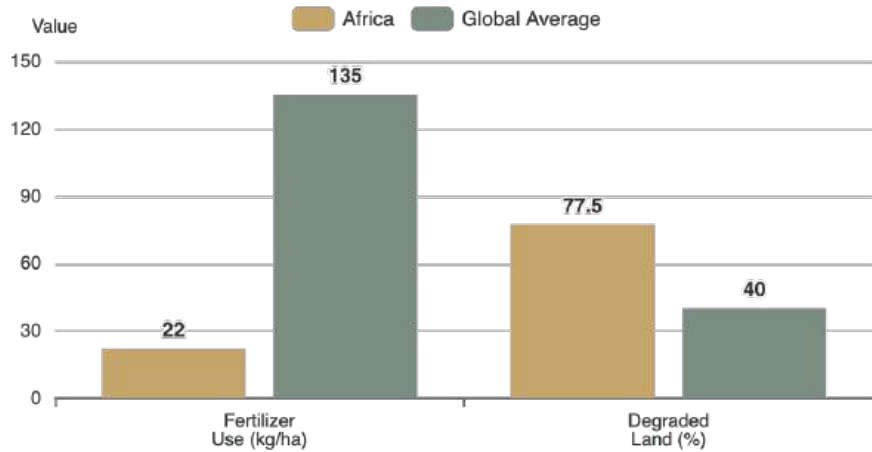
+\$20-25/t

6,000 tonnes each, March loading

Sources: QatarEnergy, C&EN, WSJ, Argus Media (March 2026)

Africa: Food Security at Risk

Africa's Pre-Existing Vulnerability



Crisis Compounding Factors

- Land Degradation**
75–80% of cultivated land already degraded; losing 30–60 kg nutrients/ha annually
- Low Fertilizer Use**
Only 22 kg/ha vs 135 kg/ha global average; 485M people dependent on affected systems
- Climate Shocks**
Failure of seasonal rains in Kenya, Ethiopia; drought conditions expanding
- Price Spike Impact**
North Africa saw 20% price increase within 48 hours; sub-Saharan most vulnerable

Critical Statistics

75–80%
Land Degraded

22 kg/ha
Fertilizer Use

485M
People at Risk

\$4B+
Annual Loss

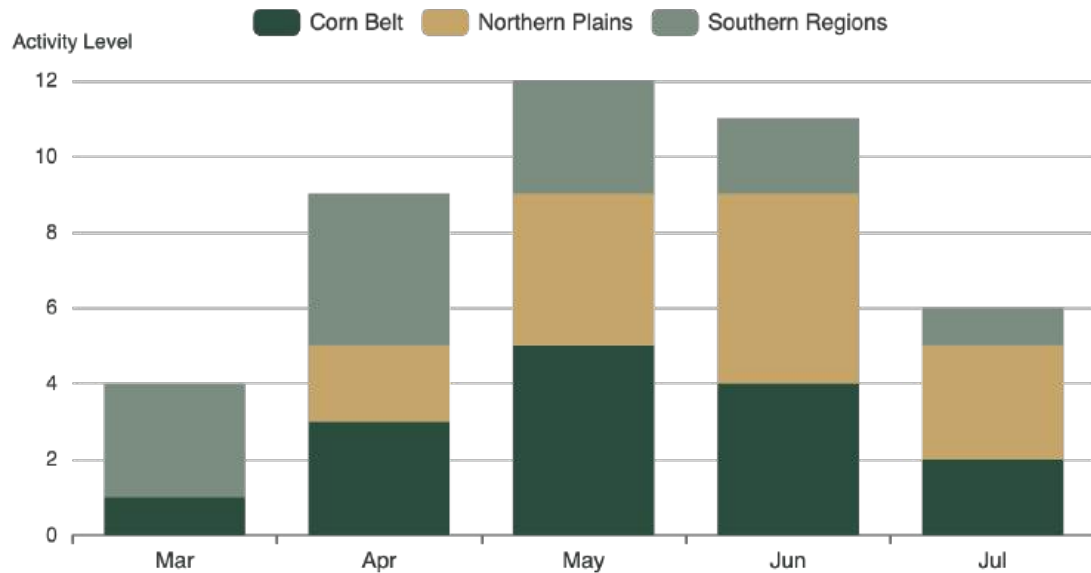
Most Affected Regions

- North Africa** CRITICAL
Egypt, Algeria: 20% price spike; energy supply risks; major exporters facing production constraints
- East Africa** HIGH RISK
Kenya, Ethiopia: Crop failure reports; failed rainy season; 1,700 deaths from flooding in region (Nov 2025)
- Sub-Saharan** VULNERABLE
Most sensitive to input cost increases; already low fertilizer adoption; food insecurity deepening
- West Africa** EMERGING
Nigeria, Ghana: Subsidy program inefficiencies; input diversion issues; ECOWAS reserve activated 19 times (2017–2024)

2026 Planting Season: Critical Timing

Why the current crisis timing makes it especially severe for global agriculture

Northern Hemisphere Planting Calendar



Spring Application Critical

Corn nitrogen	50%
Cotton nitrogen	28%
Spring wheat	42%

Applied during spring season

Limited Flexibility

- ✘ Farmers finalizing purchases now
- ✘ Cannot easily switch crops mid-season
- ✘ Field prep already underway
- ✘ Short window for adjustments

Major Importing Countries at Risk

India

Critical

Urea imports from ME: **40%+**
 Domestic production already reduced on 3 plants due to gas supply disruption

Brazil

High Risk

Urea import dependency: **90%+**
 7.5-8.5M tonnes annually; soybean and corn production at risk

United States

Moderate

Price impact: **\$516→\$683/t**
 Corn Belt planting begins April-May; considering acreage shifts to soybeans

Expert Warning

"Literally, this could not happen at a worse time of the year."

— Josh Linville, StoneX Analyst

Sources: Farm Bureau, Reuters, USDA, Farm Policy News (March 2026)

Projected Impact: Yield Reductions & Food Security

Expert Projections for 2026-2027

Nitrogen Deficit (Q2 2026) **5-7M tonnes**

Expected shortage if Hormuz blockade persists through summer

Ammonia Price Impact **+30%**

Projected rise pushing phosphate producers into severe margin pressure

Urea Premium **20-30%**

Persistent premium over Chinese prices could delay Chinese exports

Crop Yield Implications



Corn

High risk with reduced N



Wheat

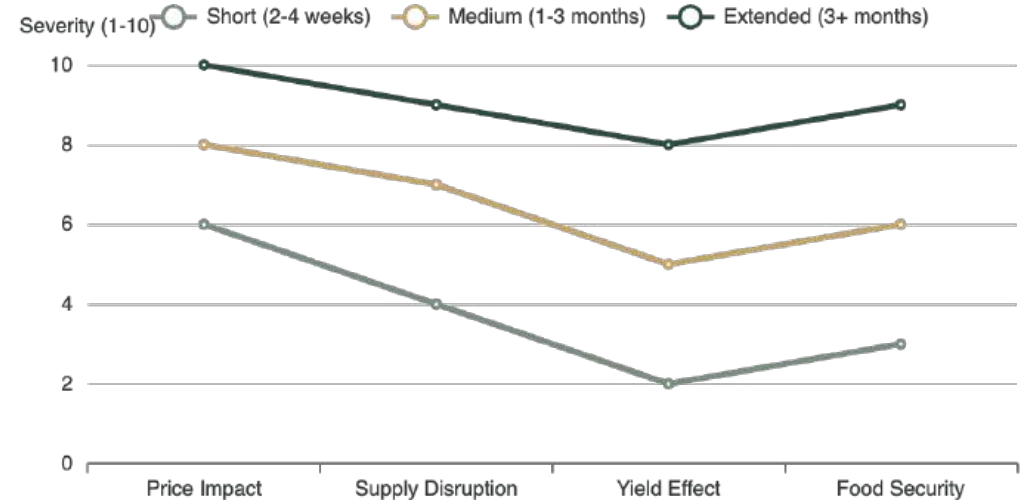
Global production at risk



Rice

Asia staples threatened

Scenario Analysis by Conflict Duration



Food Security Risks

- ⚠️ Food Price Inflation:** Historically correlated with social unrest
- 👥 Global South Impact:** Developing nations most vulnerable to input cost increases
- 🕒 Delayed Impact:** Yield effects appear months after price spikes
- 🌐 Systemic Risk:** Without synthetic nitrogen, world could feed only fraction of current population

03

SSF Technology Solution

Quantum field-based agricultural activation without chemical inputs



Quantum Physics



Remote Delivery



Zero Chemicals

What is the SSF Technology?

A fundamentally new class of innovation unifying quantum-optical systems and AI-driven signal preparation

Core Technology Definition

Special Signal Form (SSF)

An oscillating system of quantum fields operating on quantum resonance principles. Unlike conventional mono-frequency signals, SSF combines multiple harmonics with defined amplitudes and phases.

Non-Contact Field Modulation

NOT a chemical treatment or mechanical intervention. A field-based system rooted in quantum physics that works remotely without physical presence on the field.

AI-Driven Signal Preparation

Artificial intelligence processes satellite imagery, identifies patterns and correlations, and optimizes specific SSF signal preparation for each target application.

SSF Signal Characteristics

Multi-Harmonic Complexity

Carries spectral, phase, and temporal relational information simultaneously—not a simple single-frequency transmission

Frequency Pattern Signature

Each SSF carries the characteristic frequency pattern of a specific substance, prepared from an existing signal library

Self-Sustaining Oscillation

Implements a self-sustaining oscillating emission mechanism—a novel type of collective quantum behavior

Key Differentiators



No Chemicals

Zero environmental risk



Scalable

Unlimited hectares



Remote

No field presence



25+ Years

Commercial validation

Intellectual Property Status



Patented in CIS

Media-SSF platform registered



Patented in USA

Core technology protected



Commercial Ready

IPQS platform operational

Scientific Foundation: Quantum Effects in Biology

Peer-reviewed research confirms quantum mechanics underlies SSF technology principles

Key Scientific Publications

Nature Physics (2026)

Peer-Reviewed

"Quantum Coherence Without External Pumping"

Dense, disordered quantum systems capable of self-organizing into stable, coherent macroscopic states without continuous external energy input.

- ✓ Validates SSF's self-sustaining oscillation mechanism

PRX Quantum (2025)

Peer-Reviewed

"Quantum Photosynthesis Research"

Rice University physicists confirmed plants use quantum effects for near-instantaneous energy transfer during photosynthesis.

- ✓ Energy losses only 2-3% vs 25% in artificial cells

Nature Quantum (2025)

Peer-Reviewed

"Floquet Engineering with Excitons"

International team confirmed Floquet engineering creating new quantum materials via controlled quantum interactions using excitons.

- ✓ Quasiparticles as viable quantum "drivers"

Quantum Efficiency Comparison



SSF Alignment with Natural Systems

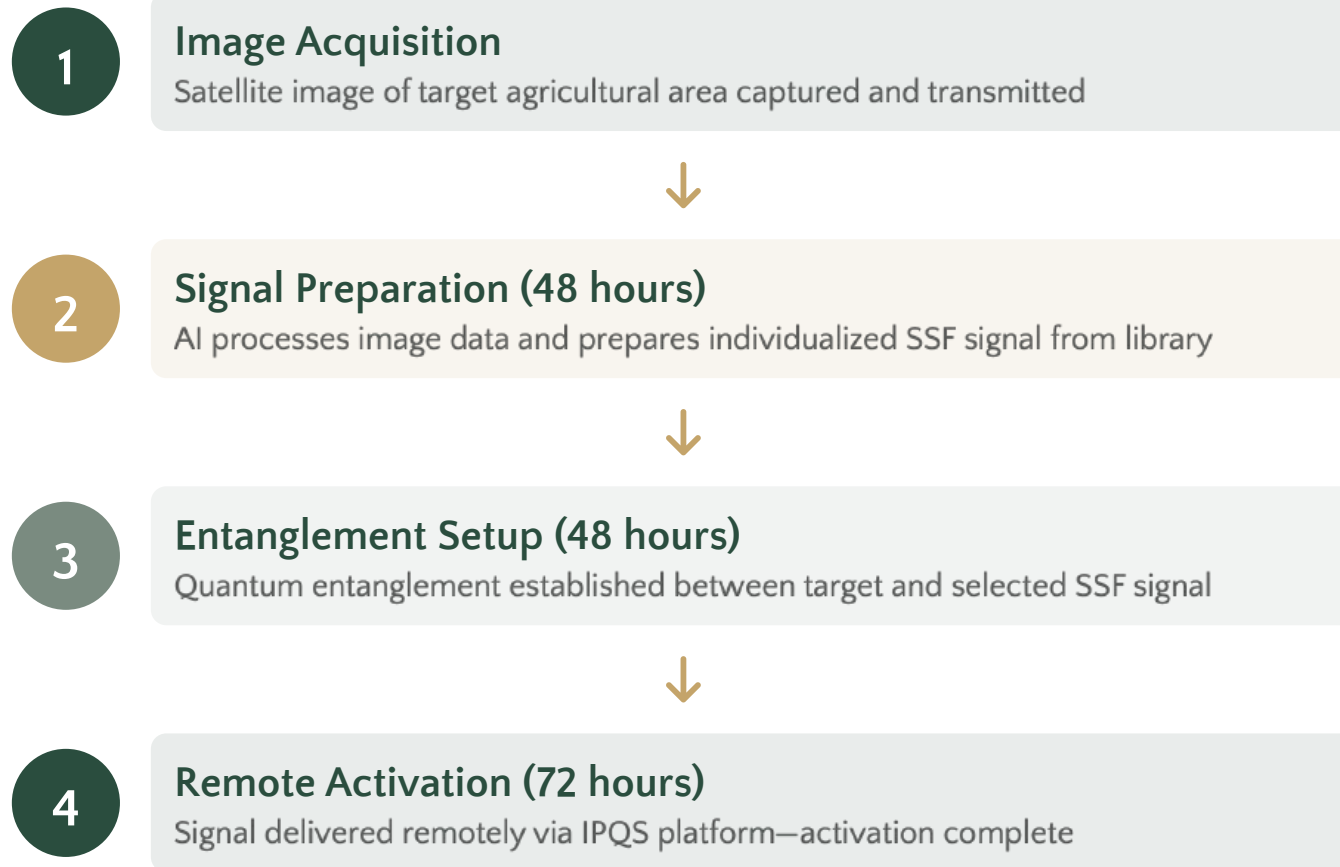
- 🌱 **Natural Quantum Behavior:** Plants already exploit quantum mechanics at fundamental level
- ⚡ **Amplification Principle:** SSF amplifies natural quantum processes rather than introducing foreign mechanisms
- 🔄 **Coherence Mechanism:** Decoherence actively contributes to forming stable coherent states in SSF
- 🎯 **Selective Resonance:** Only target systems with aligned oscillatory modes respond

"SSF technology aligns with natural operating principles that living systems already exploit at a fundamental level."

How SSF Technology Works

Remote activation process requiring no physical presence on the field

SSF Remote Activation Process Flow (7-10 days)



IPQS-SSF Platform Features

- Address-Remote Control**
Precisely directed to target field regardless of geographic location
- Scale Independence**
From single plot to thousands of hectares—no proportional cost increase
- Swarm Intelligence**
SSF adapts dynamically using swarm intelligence for enhanced precision
- Task Specificity**
Accounts for individual characteristics and natural oscillation modes

Critical Advantage

No Physical Logistics Required

- ✓ No shipping through Hormuz
- ✓ No supply chain dependencies
- ✓ No storage requirements
- ✓ Immediate deployment possible

SSF vs Traditional Fertilizers: The Critical Difference

Fundamental Approach Comparison

Aspect	SSF Technology	Chemical Fertilizers
Mechanism	Activates plant's genetic potential through quantum field modulation	Adds external nutrients to soil
Supply Chain	INDEPENDENT - No physical logistics required	VULNERABLE - Dependent on global supply chains
Delivery Method	Remote via satellite and quantum entanglement	Physical transport and application
Environmental Impact	ZERO RISK - No chemicals, no contamination	SIGNIFICANT - Soil acidification, runoff, emissions
Cost Stability	STABLE - Not affected by energy prices	VOLATILE - Tied to natural gas prices
Scalability	UNLIMITED — no proportional cost increase	Logistics and cost constraints
Speed of Deployment	IMMEDIATE - Can activate within days	DELAYED - Shipping, customs, distribution
Compatibility	Organic and conventional systems	Limited in organic production



Crisis-Proof

Immune to Hormuz blockade and supply chain disruptions



Ready Now

All systems operational for immediate 2026 season deployment



Unlimited Scale

Can process unlimited hectares simultaneously

Why SSF Eliminates Fertilizer Dependency

SSF modulates plant's internal processes to maximize efficiency of existing resources

Key Biological Mechanisms

⌘ Phytohormone Modulation

SSF modulates concentration of phytohormones—plant's primary internal signaling molecules. This regulatory capacity is highly specific and **cannot be replicated by fertilizers**.

10⁻¹² M minimum

10⁻⁷ M active range

⚡ Lipoxygenase Cascade

The lipoxygenase metabolic cascade plays a central role in SSF activation pathway, acting as a significant amplifier of the original signal—magnifying biological impact well beyond initial quantum interaction.

🌱 Nutrient Uptake Enhancement

SSF increases nutrient uptake from existing soil reserves and improves efficacy of any applied fertilizers, reducing required volumes by up to 50% while maintaining yields.

⚙️ Photosynthetic Efficiency

Enhances photosynthetic processes by amplifying natural quantum effects. Plants use water, nutrients, and light more effectively through optimized energy transfer.

The Plant as a System

Open Thermodynamic System

Plant continuously exchanges energy, matter, and information with environment. SSF optimizes this exchange without adding external chemical load.

Bioelectromagnetic Sensitivity

Plant regulatory systems (genes, hormones, membranes) exhibit high sensitivity to external influences. Potential differences exist between plant parts (0.1–0.4 μA currents).

Soil Microflora Management

SSF actively manages soil microbial communities, stimulating beneficial microbes critical to organic matter decomposition and humus formation.

Critical Insight

Plants use only their **own genetics and existing resources** more effectively. No external nutrient input required.

×1000s

Signal Speed Advantage

SSF processes orders of magnitude faster than chemical pathways

📌 SSF technology does not change agronomic practices—farmers continue standard operations

04

Proven Results & Validation

Documented outcomes from global field applications



Laboratory Validated



Field Proven

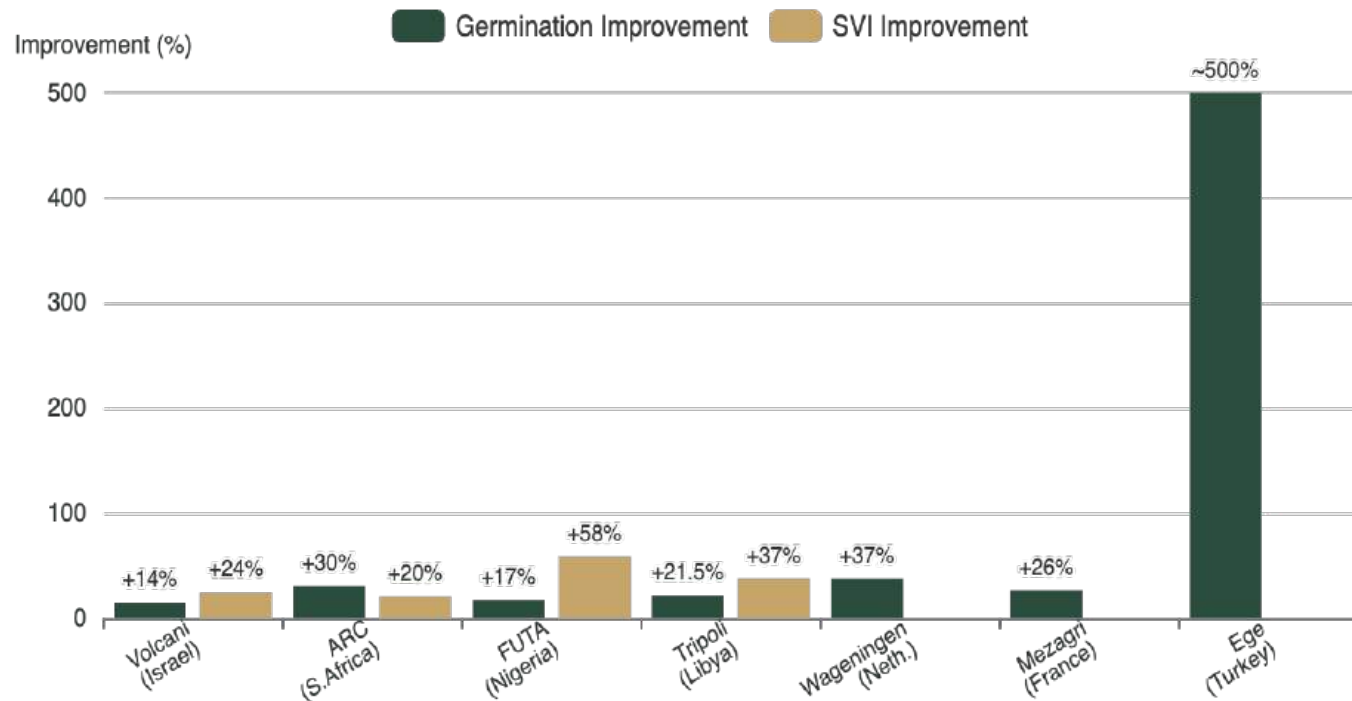


Global Deployment

SSF Results: Seed Germination Enhancement

Verified by leading agricultural research institutions worldwide

Seed Germination Improvements by Institution



Key Results Summary

Volcani Institute (Israel) +14%

Sunflower germination; -24% dead seeds

ARC (South Africa) +30%

Germination; +20% SVI

FUTA (Nigeria) +17%

Germination; +58% SVI

Wageningen (Netherlands) 92%

vs 55% baseline

Notable Achievement

-500%

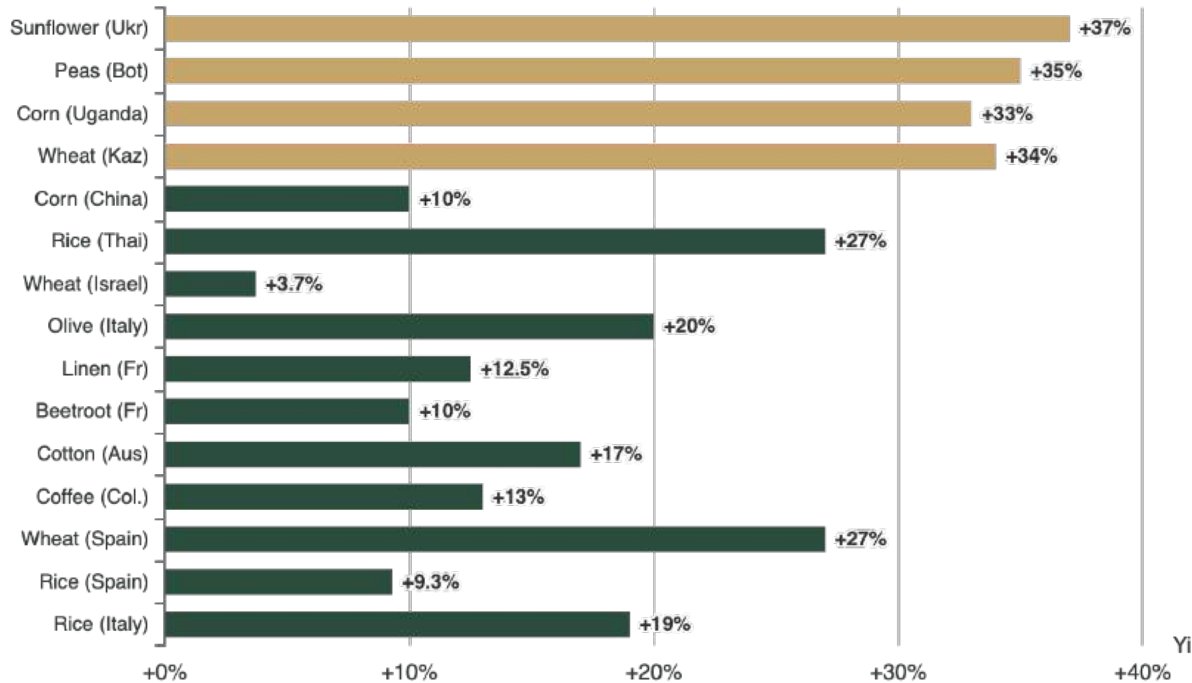
Ege University (Turkey)

Eggplant germination from low baseline

SSF Results: Field Production Yields

Commercial deployments across diverse crops, climates, and geographic regions

Yield Improvements by Crop and Region



Top Yield Improvements

- Sunflower (Ukraine)** +37%
Field production
- Black-eyed Peas (Botswana)** +35%
Field production
- Corn (Uganda)** +33%
Full-season application
- Winter Wheat (Kazakhstan)** +34%
Field production
- Linen Fiber (Russia)** +75%
Fiber yield assessment

Geographic Coverage

25+
Countries

15+
Crop Types

5
Continents

All
Climates

SSF Results: Fertilizer Reduction & Quality Enhancement

Demonstrating fertilizer independence while maintaining or improving yields

Fertilizer Reduction Achievements

Corn (Italy)

Field production

50%
Fertilizer reduction

Result: Same harvest achieved with half the fertilizer input

Rice (Colombia)

Field production

25%
NPK reduction

Result: +13% yield increase with reduced NPK use

Discovery Seed Labs (Canada)

Zero-fertilizer trial

Result: Yield only -22% vs 100% fertilizer control—demonstrating near-complete fertilizer independence is achievable

SGS North America Validation

Controlled soil nutrient uptake analysis

United States

Increase in phosphorus uptake

-60%

Quality Enhancement Results

Wheat (Canada)

Protein content increase (Discovery Seed Labs)

+4%

Olive (Italy)

Fruit weight and size increase; record polyphenol levels achieved

+20%

Potato (Sweden)

Larger, healthier potatoes with activated fertilizer application

Enhanced

Onion (Niger)

Significantly larger onions in field production

Larger

Key Insight: Fertilizer Independence

SSF technology enables agricultural productivity with **significantly reduced or zero chemical fertilizer inputs:**

- ✓ Same yields with 50% less fertilizer
- ✓ Improved yields with reduced NPK
- ✓ Near-baseline yields with zero fertilizer
- ✓ Enhanced nutrient uptake efficiency

Scientific Publications & IP Protection

Continuous record of scientific and commercial validation since 1998

Peer-Reviewed & Industry Publications

Publication	Year	Focus Area
Izvestiya TSKHA	1998, 2006	Information technologies; flax cultivation
Theory of Harvest (book)	2003	Technologies of the future; low-energy factors
International Agricultural Journal	2004	Cotton yield enhancement
Forestry Journal	1998	Energy-information field in forestry
Australian Cotton Magazine	2004, 2005	"Unique electronic bio-growth regulator"
INDIA BioSpectrum	2004	"SSF Technologies"—international overview
Nature Physics	2026	Quantum coherence validation
PRX Quantum	2025	Quantum photosynthesis research

Key Authors & Credentials

V.M. Kovalev
D.Sc., Professor

E.A. Kalashnikova
D.Sc., Professor

D.V. Belov
Chairman, SSF-Technologies

Intellectual Property Portfolio



Russian Federation

Media-SSF Platform Patent

Core quantum information processing technology protected



United States

Media-SSF Platform Patent

International patent protection ensuring commercial exclusivity



IPQS Platform

Operational System

Intelligent Platform of Quantum Systems managing all activations

Development Timeline

1998–2005 Early research and publications

2005–2015 Commercial deployment begins

2015–2025 Global field validation

2025–2026 Scientific peer-review validation

05

Strategic Implementation

Roadmap for deploying SSF technology at scale



Partnership



Global Centers



Ready Now

SSF: The Solution for Current Crisis

Why SSF technology is uniquely positioned to address the 2026 fertilizer emergency

Why SSF is Crisis-Proof

Zero Supply Chain Dependency

Completely eliminates need for physical fertilizer logistics—no Hormuz, no shipping, no storage

Remote Deployment Capability

Can activate unlimited agricultural areas from control center—no field presence required

Immediate Activation Possible

Can deploy for 2026 planting season—no lead time for manufacturing or shipping

Proven Across All Conditions

Validated in Europe, Middle East, Africa, Asia, Americas—diverse climates and crops

Zero Risk Profile

Compatible with organic and conventional systems; no agronomic or ecological risks

The Critical Difference

Traditional Fertilizers

BLOCKED

- ✗ 45% of global supply blocked at Hormuz
- ✗ Qatar production halted (14% global)
- ✗ Prices surged 20-35% in 48 hours
- ✗ EU stocks cover only 45-50% of needs

SSF Technology

AVAILABLE NOW

- ✓ No physical logistics required
- ✓ Remote activation from anywhere
- ✓ Cost stability—no energy price ties
- ✓ Can deploy for 2026 season immediately



2026 Season

Ready for immediate deployment



Unlimited

Hectare processing capacity

Global Competence Center Network Vision

Building distributed expertise and blockchain-enabled collaboration platform

Proposed Regional Hubs

Saudi Arabia

Middle East hub for regional expertise, government partnerships, desert agriculture research



Mongolia

Central Asia hub for extreme climate research, pasture management, nomadic agriculture



Latin America

Regional hub for tropical crops, soybean/corn research, Brazil-Argentina corridor



Africa

Continental hub for diverse agro-ecologies, food security programs, smallholder support



Center Functions



Expertise Hub



Certification



Testing & R&D



Local Partnerships

Blockchain-Enabled Distributed Platform

Network Architecture

Distributed platform connecting all competence centers for knowledge sharing and collaboration

Cross-Sector Applications

- **Agriculture:** Soil activation, crop enhancement, pasture management
- **Medicine:** Digital Pharmacy with SSF wellness video signals
- **Pharmaceuticals:** Traditional drug digitization, quantum drug certification

Knowledge Repository

Centralized database of SSF applications across climates, soils, and crop types

Research Priorities by Region

- 🔥 **Climate Conditions:** Arid, tropical, temperate, continental adaptations
- 📚 **Soil Types:** Sandy, clay, loam, acidic, alkaline optimization
- 🌱 **Crop Diversity:** Cereals, legumes, oilseeds, vegetables, fruits
- 🐄 **Pasture Biomass:** Green mass increase for livestock grazing

Partnership Opportunity: Ready for Deployment

Seeking strategic financial partnership for global SSF technology deployment

Our Readiness Status

- ✓ **All Technical Systems Operational**
IPQS platform, Media-SSF software, satellite integration ready
- ✓ **Patent Protection in Place**
Russia and USA patents secured; commercial exclusivity ensured
- ✓ **25+ Years Validation Complete**
Commercial deployments across 25+ countries, multiple crops
- ✓ **Scientific Peer-Review Achieved**
Nature Physics 2026, PRX Quantum 2025 publications

Partnership Objectives

- 🏢 **Competence Centers:** Establish regional hubs in Saudi Arabia, Mongolia, Latin America, Africa
- 🔬 **Laboratory Research:** Climate-specific studies, soil analysis, crop optimization
- 📄 **Government Contracts:** National food security programs, agricultural ministries
- 🐄 **Pasture Management:** Green biomass increase for livestock grazing systems

Strategic Value Proposition

- 🛡️ **Food Security Solution**
Address critical fertilizer crisis affecting 485M+ people; provide immediate alternative to blocked supply chains
- 📈 **Market Timing**
Unprecedented market conditions create immediate demand; first-mover advantage in quantum agriculture
- 🔗 **Scalable Impact**
Technology applicable to unlimited hectares; no proportional cost increase with scale
- 🌱 **ESG Alignment**
Zero chemical inputs, carbon sequestration enhancement, sustainable agriculture support

Immediate Start

2026 season deployment possible

Global Reach

Multi-continental competence network



Securing Food Security Through Quantum Innovation

SSF technology offers a **scientifically-grounded, commercially-validated** pathway to agricultural resilience. In a world of increasing supply chain vulnerability, quantum field activation provides independence from chemical input dependencies.

25+

Years Development

25+


Countries Validated

Ready

For Deployment

We are ready to partner in deploying this technology at scale

 Contact for Strategic Discussion

 Partnership Opportunities