# CROPS GUARD

## THE ABSOLUTE BEST SOLUTION FOR AN INSECTICIDE FREE ENVIRONMENT IMAGINE... AN INSECTICIDE FREE WORLD

## THERE IS A BUG IN THE PROCESS

Greenhouse-grown crops is especially vulnerable to insects, who rapidly multiply and carry deadly plant diseases **affecting the final product** 

#### Aphids

Can birth **7-10 young per day**, maturing within a week

Transmit over 300 viruses



Thrips

Can lay **100** eggs within 35 lifecycle

> Transmit serious diseases



White flies

Can lay **400** eggs within 21-36 lifecycle

Transmit several deleterious plant viruses



Weevels, Mites and more

Eat and infect crops

Unusable buds and products

WHAT IF THERE WAS A SAFE, PROVEN AND COST-EFFECTIVE WAY TO ELIMINATE COMMON GREENHOUSE PESTS AND THEIR EGGS WITHOUT DAMAGING THE CROP'S YIELD OR EFFECTIVENESS?



## MEET CROPS GUARD

Fully customizable to any insect type and level of infestation

Protecting crops with the power of physics. Cutting Edge - RF insect control for greenhouse crops

## BENEFITING GROWERS FROM DAY ONE



Increased predictability



Higher % usable yield



Meets all health and regulatory requirements



Material and labor costs Drop dramatically GREENHOUSES ARE THE MOST CONTROLLED ENVIRONMENTS IN THE WORLD. THE ONLY THING THEY CANNOT CONTROL, UNTIL NOW, IS INSECT INFESTATIONS.

## - DANGEROUS AND FLAWED

## **MARKET INFORMATION**

The global value for insecticides is expected to grow at a CAGR of 11.5% to nearly \$130.7 billion by 2023

Though most growth will be from developing countries, the US and EU will continue to attract high sales.

#### \$286 MILLION <sup>11.3</sup> YEARS

THERE HAVE BEEN NO NEW INSECTICIDES IN RECENT YEARS.



## MAJOR ISSUES WITH INSECTICIDES

#### **IMPACT ON ENVIRONMENT**

95% of pesticides reach a destination other than the target; runoff carries the chemicals to the water table.

#### NO ONE-STOP SOLUTION

No pesticide is suitable for all insects. Multiple pesticides needed. Different pesticides may be needed for the SAME SPECIES of insect, depending on growth stage.

#### SPRAY OFTEN AND LIBERALLY

- Pesticides may need to be applied frequently, e.g. 3x every 3 days.
- In various cases the whole plant and each side of the leaf must be **drenched in pesticide** to ensure all insects are reached.

#### RESISTANCE

Insects **grow resistant** to pesticides making pests difficult to control. Growers would need to use different and more powerful pesticides.

#### **GLOBAL DISPARITY AND REGULATION**

- HEAVILY REGULATED Use of pesticides depends on geographic location certain pesticides may be allowed in one country, but banned in others.
- EUROPE is more sensitive to using pesticides than the US.



## GREENHOUSE PEST CONTROL

- Pesticides are **TOXIC** even in greenhouses, they impact the environment negatively, and are harmful to humans.
- Pests develop **RESISTANCE** due to the high use of pesticides.
- Pesticides must be **SPRAYED LIBERALLY**. In comparisons with field-grown crops, greenhouse crops showed higher levels of pesticides.
- Use of some pesticides to a crop can CAUSE STRESSES that reduce the productive life of the crop.
- Use of pesticides is **HIGHLY REGULATED**.
- Eliminates beneficial insects as well
- Pesticides can become BANNED even after decades of use.
- A CLEANER, HEALTHIER ALTERNATIVE IS NEEDED

#### **CROPS GUARD IS THE SOLUTION**

## **CROPS GUARD** - THE PHYSICAL SOLUTION

**Crops Guard** - a regulatory compliant hardware ("**HW**") and proprietary software RF-as-a-Service ("**RFaaS**") cloud system based eliminates the full life cycle of an insect.

## **CROPS GUARD OFFERS A SOLUTION TO VIRTUAL EVERY GREENHOUSE ENVIRONMENT**

#### **CROPS GUARD BASE SYSTEM**

Can be connected to a series of antennas or to a "leaky feeder" system similar to irrigation systems







#### CROPS GUARD MOBILE SYSTEM

Crops Guard can offer clients a mobile system for emergency outbreaks for programmed treatments





CROPS GUARD DESIGNED AN EMERGENCY CART AND PROGRAMMABLE ROBOT



## A PHYSICAL WAVE THAT DISARMS THE INSECT LIFECYCLE THE RIGHT MODULATION, AT THE RIGHT FREQUENCY

100% safe RF (radio frequency) technology, transmitting various sound wave modules to effectively deter and terminate greenhouse pests



## **OUR SECRET SAUCE – SHAKING THE CELL**

### Physically hindering insects at the cellular level

Crops Guard's vibrations "shake" the insect cells, severely impairing the function of adult insects and rendering eggs unviable





#### AFTER

The egg has completely lost its organization and will not develop, preventing the emergence of a new generation of whiteflies.

SINCE THE VIBRATIONS OCCUR ON THE CELLULAR LEVEL, IT DOES NOT IMPACT ORGANISMS LARGER THAN 3MM



## TRIED, TESTED, REPLICABLE





Complex proprietary algorithm 8 years of company R&D



Decades of multidisciplinary expertise



Military grade equipment, Encrypted software



Independently tested and proven



THE HEBREW UNIVERSITY OF JERUSALEM





## **MANAGEMENT TEAM**



#### **DR. HANOKH CZOSNEK - CSO**

Hanokh has been a research scientist and teacher for the last 40 years, specializing in molecular genetics of plant-insect-virus interactions. Hanokh has edited three books and numerous research papers during his professional career and continues to mentor Masters and Doctoral students.



#### DR. IDO SCHECHTER - CEO

Ido has over 20 years of hands-on managerial experience, and is currently CEO of Agrinnovation, a premier venture capital fund. Prior to co-founding Crops Guard and Agrinnovation, Ido served as CEO and Board Member of Top Image Systems, a NASDAQ and TLV Stock Exchange company.



#### NADAV BITTON - CTO

Nadav has 20 years of experience as a technologist, first in the Israeli Air Force, and then in software and hardware companies. He was the CTO of BIT Technology Company, and prior to that served in various roles as product owner and product manager.

#### JOSHUA KARSH – VP OF MARKETING AND BD

Joshua has 15 years of senior level management in the US and Israel. His experience includes creating winning campaigns, crafting and launching new multi million dollar brands and developing brand penetration strategies for North America and the Middle East.



## MULTIDISCIPLINARY DEVELOPMENT & ADVISORY BOARD



#### Dr. Rena Gorovits

Institute of Plant Sciences Hebrew University



#### Dr. Murad Ghanim

Department of Entomology Volcani Institute



#### Dr. Haim Rabinowitch

Institute of Plant Sciences Hebrew University

#### **Dr. Lorne Levinson**

Faculty of Physics Weizmann Institute





**Crops Guard was** formed In the prestigious Hebrew University, and developed through decades worth of expertise in physics, biology, electronic engineering, industrial design, agriculture, and computer science

## **A TRUE ENVIRONMENTALLY SMART SOLUTION**



## **CURRENT INSECTS TREATMENT LANDSCAPE**





## Case Study Southern R&D Station (MOP Darom)

## **GLOBAL GREENHOUSE PRODUCTION**



## WHY CROPS GUARD

#### Decade of RD

01

Multidisciplinary leaders

Built for years of use

World's only physical insecticide solution

03

Infrastructure Investment

04

Safest and most effective solution

05



Crops Guard was born after ten years of extensive research and development.

Crops Guard has been proven to be as effective, if not better than current available chemical and biological treatments

Crops Guard has been independently verified by leading agricultural research laboratories and **institutions** in Israel

Crops Guard has been deployed in greenhouses in Israel and Australia.

## EFFECTIVE TECHNOLOGY

## CHALLENGES TO INTEGRATED PEST MANAGEMENT (IPM)

#### CHEMICAL CONTROL

Spray crops with pesticides that kill the pests.

#### Issues

- Leeches into groundwater.
- Has a destructive impact on the environment and public health.
- Strict regulations throughout supply chain.
- The global value market for pesticides is projected to reach \$130 billion by 2023

#### BIOLOGICAL CONTROL

Introduce pests' predators (such as red mites) into the ecosystem.

#### Issues

- Needs to be finely balanced if the predators consume all the natural enemies, they then start to attack the plants themselves.
- It is **expensive**; only added once the insect pathogen is known, and takes time to establish themselves in the system; at which point it may be too late.

#### BREEDING PLANTS FOR RESISTANCE

Breed plants for to make them stronger against pests.

#### Issues

- Requires heavy spending on research, and on a crop-by-crop bases.
- Requires a high degree of specialist knowledge that very few people have.
- Time intensive and results may be hazardous.

## THE MARKET SOLUTIONS LANDSCAPE



## **COMPETING SOLUTIONS**

#### **COMPETITIVE PRODUCTS**

<b>PLANT BREEDING</b>	PREDATORS	PESTICIDES	CROPS GUARD	
Manipulate genes of plants and flowers to make them stronger against pests	Predators introduced into ecosystem to control and maintain a low population of pests	Chemicals sprayed on crops in greenhouses and fields	Patented RF HW and SW. RF waves cause lethal damage to pests and kill whole lifecycle	In a Nutshell
High-tech	Low-tech	Low-tech	High-tech	Technology
Very high - must be done on a crop by crop basis	High	Very low cost but need very large quantities and to spray very often	Medium installation Minimal running costs	Cost to implement and run
Dependent on crop	Medium	High	Very High	Effectiveness
None	None	Extremely high	None	Toxicity
×	x	×	$\checkmark$	Cloud monitoring system
High	Very high	High	Very low	Level of monitoring needed
High	High	Very high and throughout the entire supply chain	None	Level of regulation needed

## **CROPS GUARD VS OTHER TECHNOLOGIES**

#### **TECHNOLOGIES**

GAMMA- AND X-RAYS	SOUND WAVES	<b>RF HEATING</b>	CROPS GUARD	
Primarily tested as a post- harvest control	Ultrasound waves configured to target insects (less than 20 Hz)	RF generator 27 MHz for several minutes. Mortality 60- 75C. For post- harvest control	Patented RF HW and SW. RF waves cause lethal damage to pests and kill whole lifecycle	In a Nutshell
Effective	Not effective against agricultural insect pests. Some success with mosquitoes and birds.	Some insects are resistant. Mainly effective against mature insects.	99-100% insect mortality. Eliminates eggs, young, and mature insects.	Performance
Dangerous source of radiation, so if it being radioactive.	Minimal, may deter birds and natural enemies	None - operates in closed environment	None	Impact on environment
Not commercialized - too costly and too dangerous	Not commercialized	Not commercialized	Initial sales and costs is decreasing rapidly	Commercialization