

Modern solutions for a sustainable agriculture

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Future Agriculture, Future Fertilizers Choices of Today

Green Deal

The 2030 Agenda for Sustainable Development Goals

Making the European Union (EU) climate neutral by 2050

“Farm to Fork” By 2030

- **Make 25% of EU agriculture organic**
- **Reduce pesticide use by 50%**
- **Reduce fertilizer use by 20%**
- **Reduce nutrient loss by at least 50%**

Green Deal

The 2030 Agenda for Sustainable Development Goals

Introduce new legislation on:

- **Circular economy**
- **Building renovation**
- **Biodiversity**
- **Farming**
- **Innovation**

Future Fertilizers

Evidence-based policies should focus on:

- Creating and supporting nutrient roadmaps: nutrient recovery and recycling, climate-smart fertilizers, etc.
- Including realistic national targets
- Progressive regulation
- Incentives that support technology and business innovation.

A new paradigm for
responsible plant nutrition



Source: Dobermann et al. (IFA)

Future Fertilizers

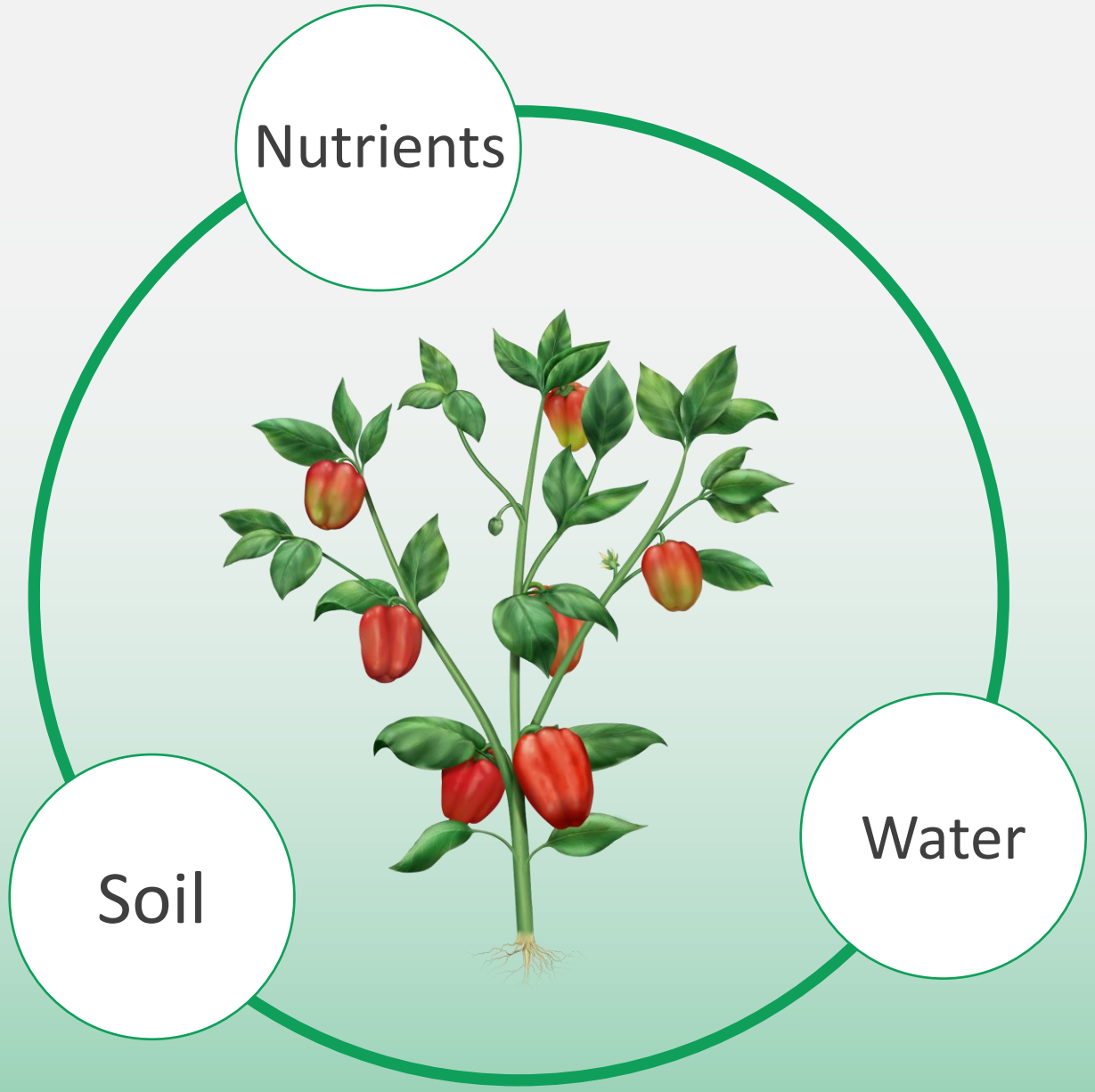
The coming 10-20 years will be critical for making the transition to a global food system in which **mineral nutrients** in agriculture must be managed in a more **holistic** manner.



- **Mineral** Fertilizers produced and used in a highly **efficient** way
- **Bio-Fertilizers**
- **Organics**
- **Upcycled** Fertilizers (using byproducts from industry)
- Complemented with **Biostimulants**

Source: Dobermann et al. (IFA)

Efficacy of Biostimulants: Exploring the influence factors



Is it about the crop?

or about the crop system?

Why apply Biostimulants?



Enhance productivity



Alleviate physiological disorders



Improve quality and increase yield



Facilitate nutrient uptake and improve **NUE**



Increase systemic resistance to biotic & abiotic stresses

Application of biostimulants: **the right timing**

During / before severe stress?

When applied before severe stress, the efficacy of the BS depends on:

- Duration of the stress
- Magnitude of the stress

Could result in less damage if the stress is not persisting

OR

Throughout the season?

The plants are subject to mild abiotic & biotic stress throughout the growth cycle!



Biostimulants: **the right choice of products**

Single product
suitable for all types of stresses, crops & application methods

OR

Various products suited to:

- Function
- Crop
- Nature of stress
- Phenological stage
- Application method
- Miscibility with other Agrochemicals



Biostimulants: **choose the right application method**

Soil application / Nutrigation

The roots absorb large & small molecules

Foliar Application

The leaf cuticle can't absorb large molecules

Size matters, so for maximum efficacy we should choose the right molecular size for the application method



Trial study about different strategies with Haifa products on Open Field Tomato 2022

Haifa holistic approach

VICENZA – ITALY
Open Field Tomato
Pivot irrigation system
May 23rd – Sept 15th 2022

Products summary

#	Name of thesis	Product Technology	Notes
1	Farmer Practice - FP	Water Soluble and Granular	
2	FP + Multi K	Water Soluble and Granular	
3	Multicote Agri™	Controlled Release Fertilizer	
4	Multicote Agri™ + Multi K	Controlled Release Fertilizer + WSF	
5	Multicote Agri™ + PF Stim Enduro	Controlled Release Fertilizer + WSF*	WSF + Seaweed
6	Multicote Agri™ + PF + HaifaStim Force	Controlled Release Fertilizer + WSF + Biostimulant**	** Vegetal AA

Haifa holistic approach

VICENZA – ITALY
Open Field Tomato
Pivot irrigation system
May 23rd – Sept 15th 2022

Treatments summary

#	Name of thesis	Application method	Total nutrients N/P/K (Kg/ha)
1	Farmer Practice - FP	Base dressing + Top dressing	200/100/220
2	FP + Multi K	Base dressing + Nutrigation®	200/100/220
3	Multicote Agri™	Base dressing	150/75/268
4	Multicote Agri™ + Multi K	Base dressing + Nutrigation®	136/58/298
5	Multicote Agri™ + PF Stim Enduro	Base dressing + Foliar Spray	151/76/270
6	Multicote Agri™ + PF + HaifaStim Force	Base dressing + Foliar Spray	151/76/270

Haifa holistic approach

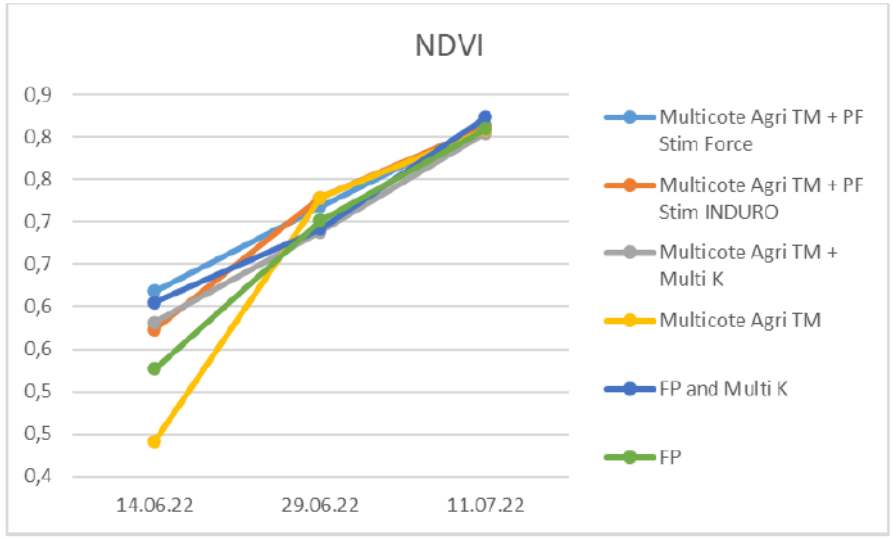
NDVI - Normalised Difference Vegetation Index

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Treatment	NDVI 14.06.22	NDVI 29.06.22	NDVI 11.07.22
Multicote Agri TM + Multi K	0,58 ab	0,69	0,81 b
Multicote Agri TM	0,44 b	0,73	0,81 ab
FP	0,53 ab	0,70	0,81 ab
Multicote Agri TM + PF Stim ENDURO	0,57 ab	0,73	0,81 ab
Multicote Agri TM + PF Stim Force	0,62 a	0,72	0,82 ab
FP and Multi K	0,61 ab	0,69	0,82 a



Initially some differences are evident (14.06.22): Multicote agri TM had the lowest value, while Multicote agri TM + PF Stim Force the highest.

After two weeks (29.06) the differences became less pronounced and the vegetative status of the plants appeared similar.

On 11.07 the value of NDVI are almost identical.

NDVI: the method
NDVI was measured by means of Greenseeker device (by TRIMBLE). The sensor emits short beams of red and infrared light and thus measures the type of light reflected by the plant, respectively. The readings range from 0.00 to 0.99. The strength of the light detected is a direct indicator of the health of the crop, the higher the value of the reading, the better the health of the plant. The collected values are the average of all the plants in the plot.

Haifa holistic approach

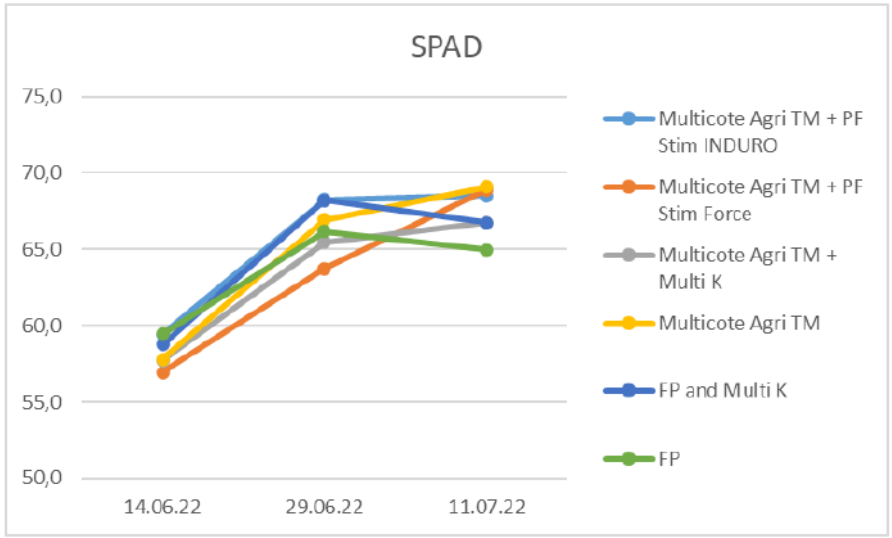
SPAD – single-photon avalanche diode

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Treatment	SPAD 14.06.22	SPAD 29.06.22	SPAD 11.07.22
FP	59,4 a	66,1 ab	65,0 b
Multicote Agri TM + Multi K	57,7 ab	65,5 ab	66,7 ab
FP and Multi K	58,7 ab	68,2 a	66,7 ab
Multicote Agri TM + PF Stim ENDURO	59,4 a	68,3 a	68,5 ab
Multicote Agri TM + PF Stim Force	56,9 b	63,7 b	68,9 ab
Multicote Agri TM	57,8 ab	66,9 ab	69,1 a



On the 14.06 the Farmer Practice plants recorded the highest SPAD values. This fertilisation program consists in ready available mineral fertilisers, so immediately the plants benefited of all the nutrients, but quickly these plants loss the intensity in green and on 11.07 were the lightest one.

The other treatments were initially paler in SPAD but in few weeks were able to recover and on the 11.07 Multicote Agri TM based treatments were the darker ones.

SPAD: the method
SPAD was measured by means of 502 Plus Chlorophyll Meter. The SPAD-502 meter is a hand-held device that is widely used for the rapid, accurate and non-destructive measurement of leaf chlorophyll concentrations. Measurements with the SPAD-502 meter produce relative SPAD meter values that are proportional to the amount of chlorophyll present in the leaf.

Haifa holistic approach

Production: Fruit weight (g) per plot

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Production: Weight of the fruits (g) per plot

Treatment	ripen Weight fruits (g) 18.08.22	ripen Weight fruits (g) 01.09.22	ripen Weight fruits (g) 15.09.22	green Weight fruits (g) green 15.09.22
Multicote Agri TM + PF Stim Force	6414,1	3859,6	8663,0	10796,1
Multicote Agri TM + Multi K	6506,5	3844,7	7888,0	10149,5
Multicote Agri TM + PF Stim ENDURO	7185,2	3344,7	7666,2	9891,8
Multicote Agri TM	6073,8	3396,7	7292,0	9768,8
FP and Multi K	5844,9	2612,5	7350,1	9742,3
FP	5753,4	2939,2	6423,8	9000,5

As a trend, the average production per each harvest for the treatment based on Multicote and HaifaStim is higher

...while the production for the Farmer Practice based treatments is generally lower

Production: Cumulated Weight of the fruits (g) per plot

Treatment	ripen Cumulated Weight fruits (g) 18.08.22	ripen Cumulated Weight fruits (g) 01.09.22	ripen Cumulated Weight fruits (g) 15.09.22	%	green Cumulated Weight fruits (g) green 15.09.22	%
Multicote Agri TM + PF Stim Force	6414,1	10273,7	18936,7	125,3	29732,8	123,29
Multicote Agri TM + Multi K	6506,5	10351,2	18239,2	120,7	28388,7	117,71
Multicote Agri TM + PF Stim ENDURO	7185,2	10529,8	18196,0	120,4	28087,8	116,46
Multicote Agri TM	6073,8	9470,5	16762,5	110,9	26531,3	110,01
FP and Multi K	5844,9	8457,4	15807,5	104,6	25549,8	105,94
FP	5753,4	8692,6	15116,4	100,0	24116,9	100,00

ALL the fertilisation programs tested improved the productivity in comparison to the Farmer Practice.

Haifa holistic approach

Production: Fruit weight (g) per plot

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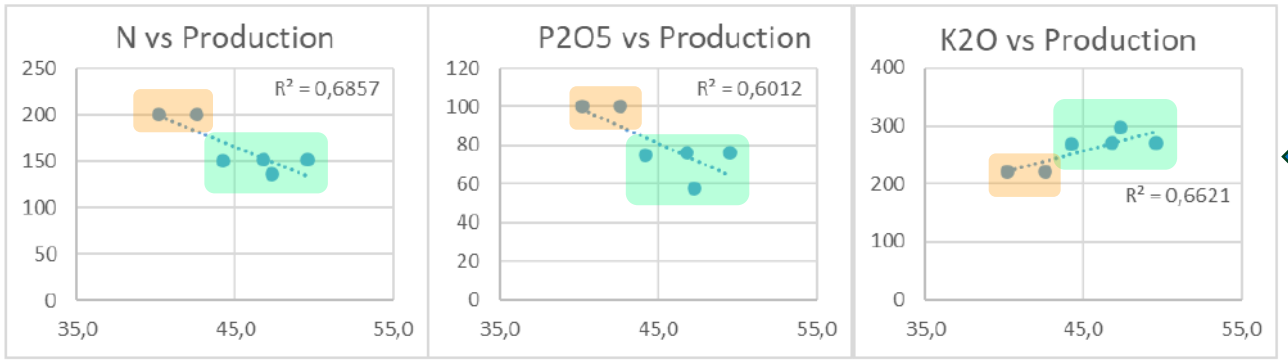
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Production: Cumulated Weight of the fruits (g) per plot

Treatment	ton/ha	%	N	P2O5	K2O
Multicote Agri TM + PF Stim Force	49,6	123,3	151	76	270
Multicote Agri TM + Multi K	47,3	117,7	136	58	298
Multicote Agri TM + PF Stim INDURO	46,8	116,5	151	76	270
Multicote Agri TM	44,2	110,0	150	75	268
FP and Multi K	42,6	105,9	200	100	220
FP	40,2	100,0	200	100	220

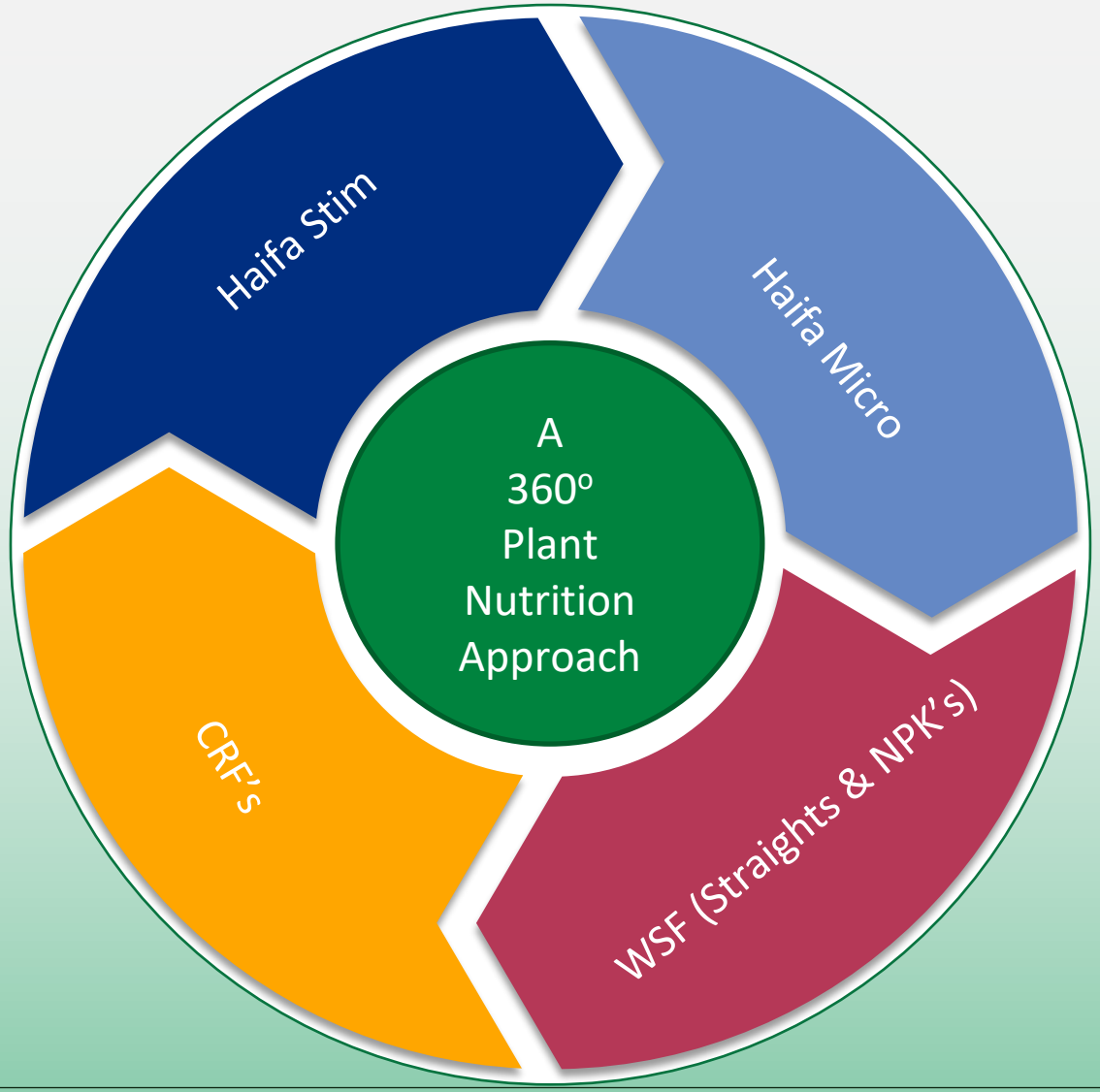
Multicote Agri TM based product produced a lot more then FP, eventhough the units of Nitrogen were lower. The synergy with Biostimulant or MultiK is even more valuable in terms of production

FP+Multi K registered 5,9%. Also in this case the synergy with MultiK improved the fertilisation plan (being similar the N-P-K offered).



Real NUE assessment

Answer the 4WD questions about biostimulants



ONE HAIFA vision towards

- Sustainability
- Integrated solutions
- Dedicated formulations
- Better efficiency
- Environmentally friendly Agriculture

Biostimulants are already the present and in Haifa we believe in their efficacy and support the spread of their technology and usage.



Thank You