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FruitFlyNet

A Location–aware System for Fruit Fly Monitoring and Pest Management Control

MedFlyNet Prototype in Lazio, Italy

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CRA
CONSIGLIO PER LA RICERCA E LA SPERIMENTAZIONE IN AGRICOLTURA

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The 2007-2013 ENPI CBC Mediterranean Sea Basin Programme is a multilateral Cross-Border Cooperation initiative funded by the European Neighbourhood and Partnership Instrument (ENPI). The Programme objective is to promote the sustainable and harmonious cooperation process at the Mediterranean Basin level by dealing with the common challenges and enhancing its endogenous potential. It finances cooperation projects as a contribution to the economic, social, environmental and cultural development of the Mediterranean region. The following 14 countries participate in the Programme: Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Malta, Palestine, Portugal, Spain, Syria (participation currently suspended), Tunisia. The Joint Managing Authority (JMA) is the Autonomous Region of Sardinia (Italy). Official Programme languages are Arabic, English and French (www.enpicbcmed.eu).

The European Union is made up of 28 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

The project FruitFlyNet total budget is 1.662.872,32€ and it is financed, on an amount of 1.496.585,09€ (90 %), by the European Union (ENPI CBC Mediterranean Sea Basin Programme) through the European Neighbourhood and Partnership Instrument.

Editor(s): Name, Email

Verbesi old
Flat area 70-90 m
Peach 28 ha – Kiwi 2 ha
12yr old, new cv 3yr
15 cultivars

Verbesi new
Flat area 80-90 m
Peach 13.5ha – Kiwi 1.5ha
10yr old, new cv 2-4yr
8 cultivars

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Peach orchard

Planting system: *Linear (Espalier)*
Distance between the trees:
4x4 m;
1.5x4 m for new planted cultivars

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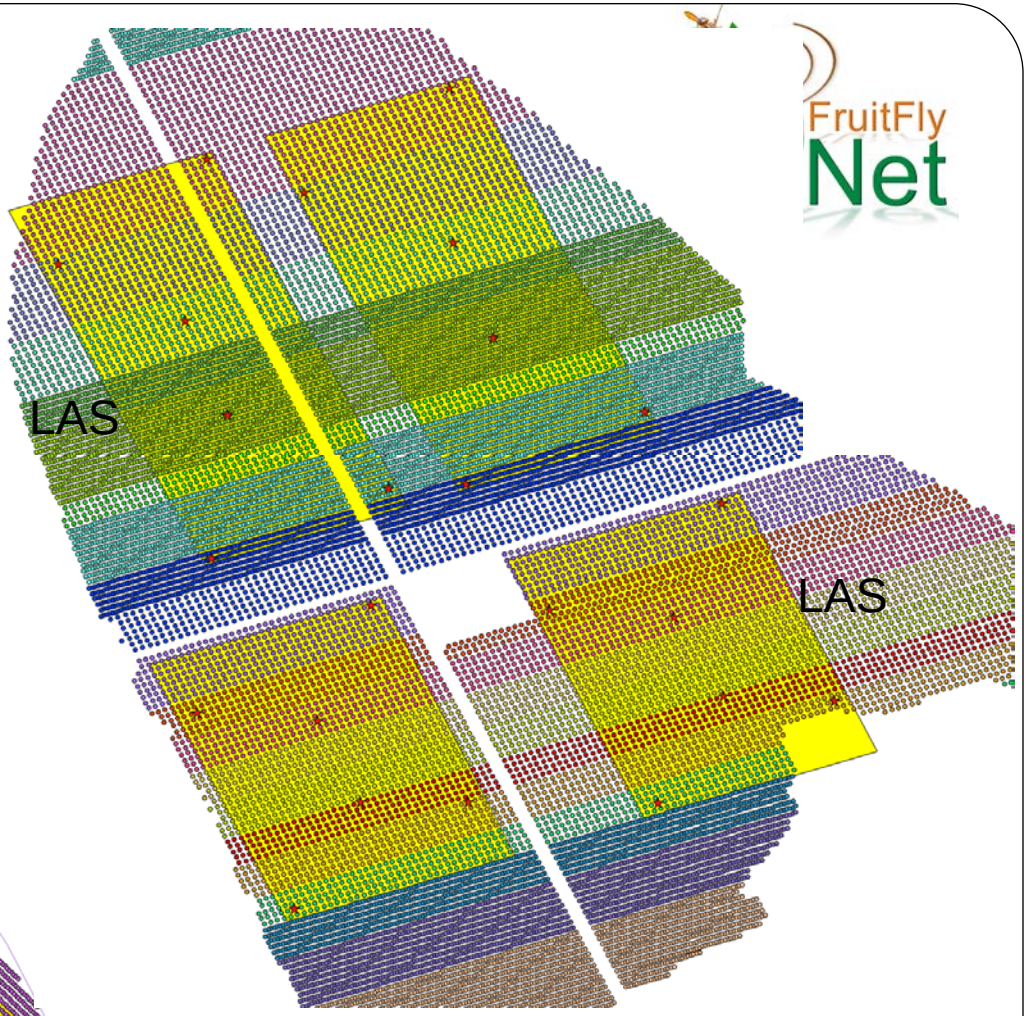
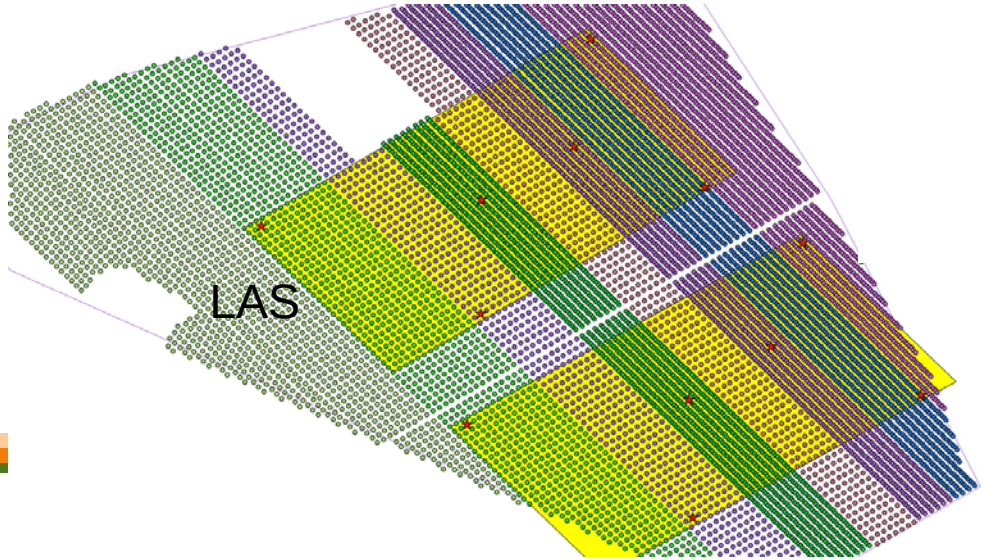
3 LAS versus 3 no-LAS plots
+ 1 control
6 traps in each plot.
Total: 18 e-traps;
18 standard traps





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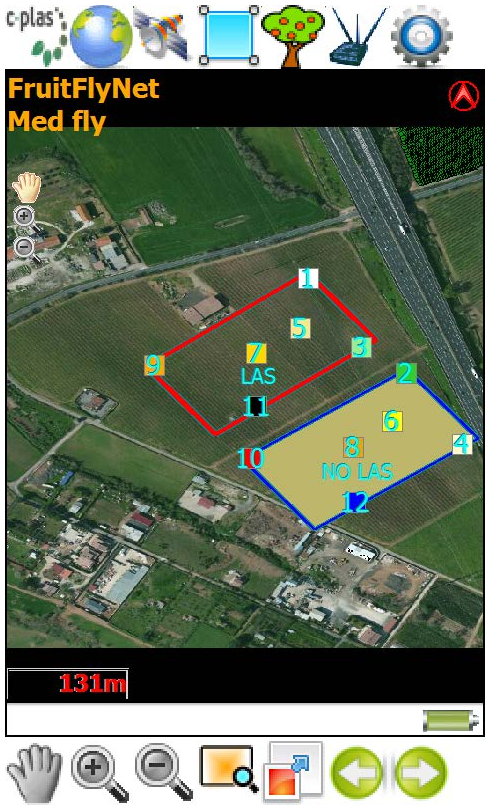
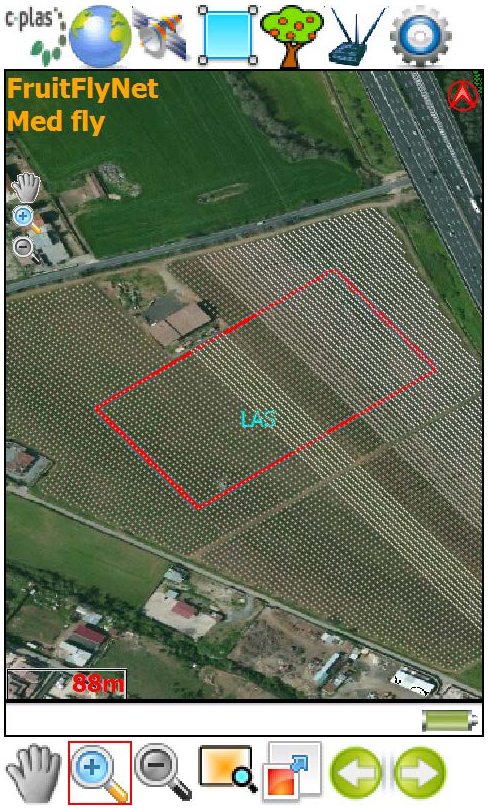
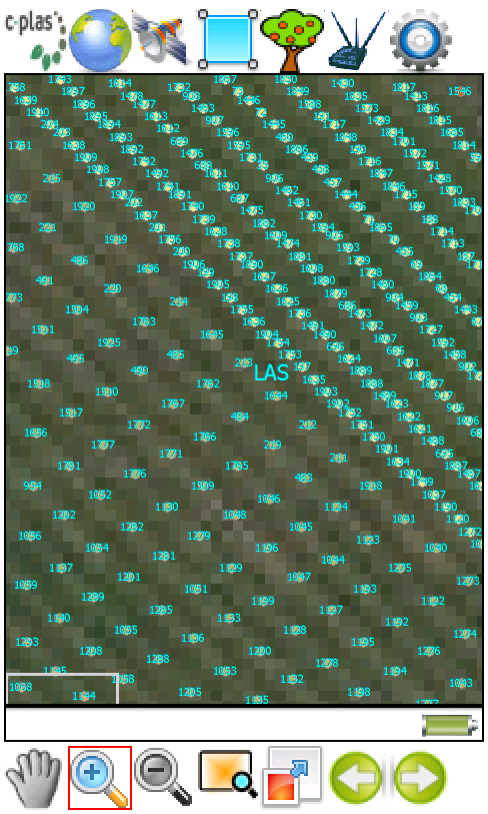
GRAPHICAL USER INTERFACE







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E-trap with electronics and solar panel

Traps baited with biolure

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Stevenson screen

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Gateway with electronics and solar panel

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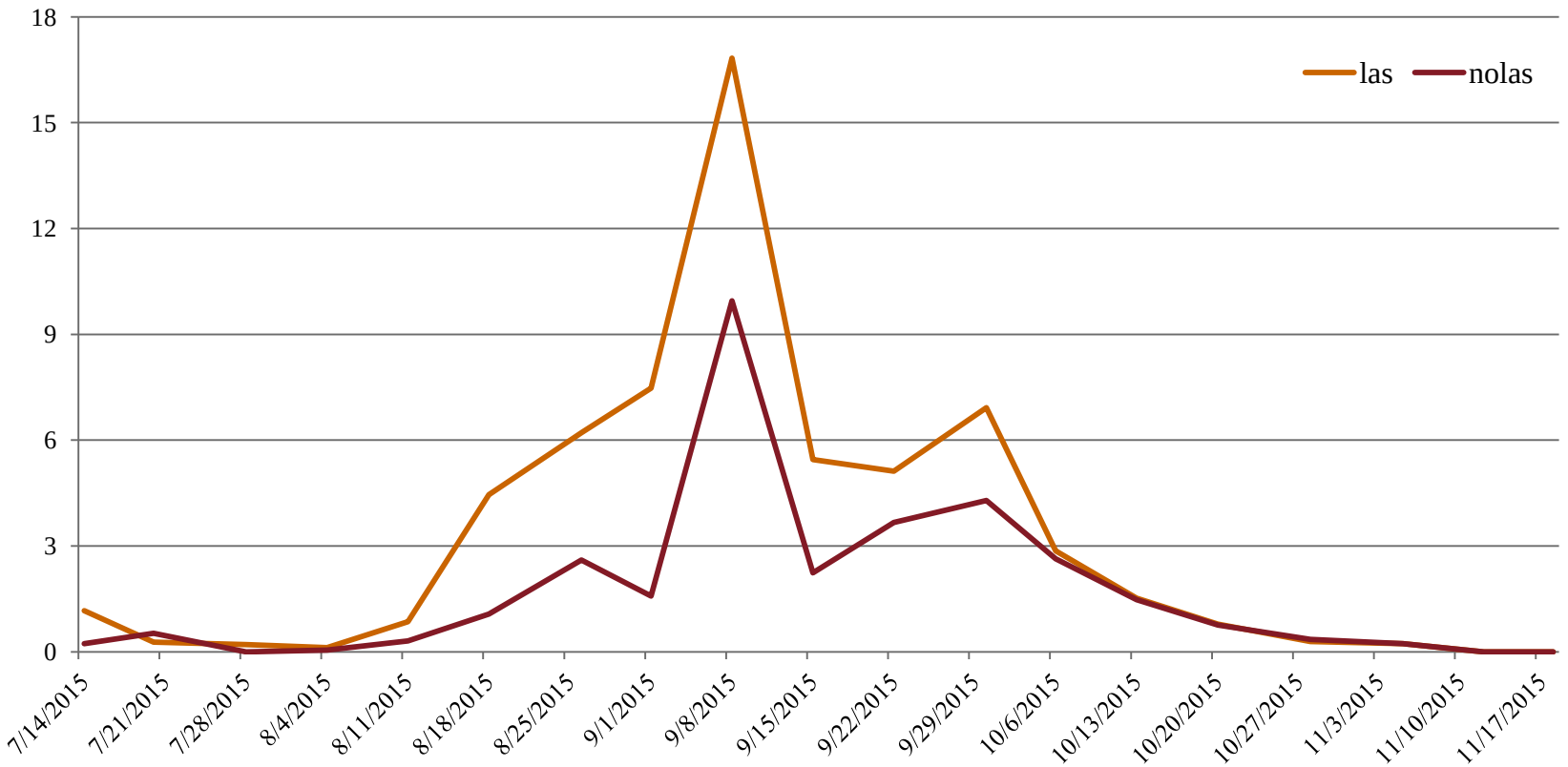
Photo transmitted from the e-trap to the internet ftp site

Results Block A

Medfly adult flights (mean flies/trap/day)



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Results Block B

Medfly adult flights (mean flies/trap/day)

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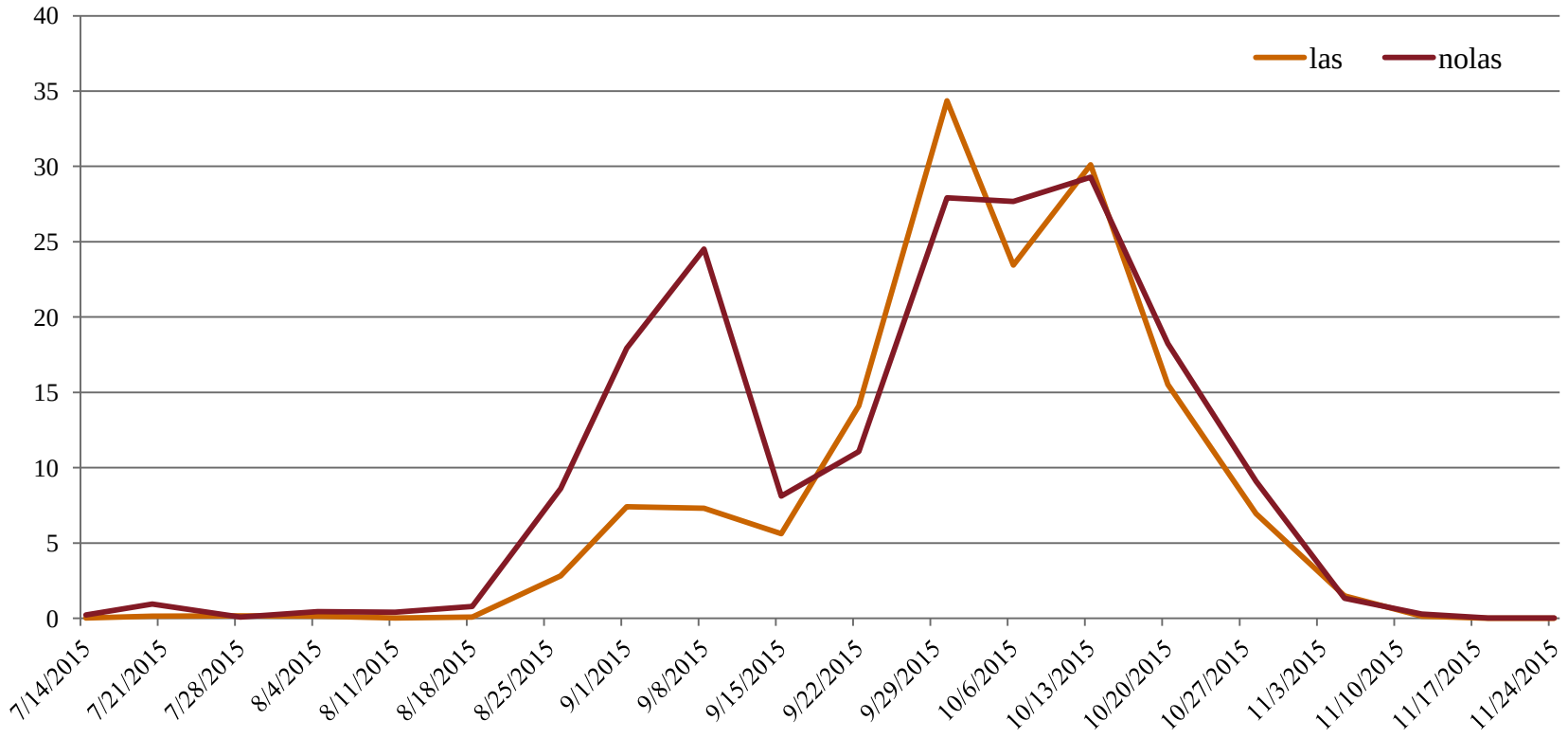
Results Block C

Medfly adult flights (mean flies/trap/day)



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Results: semiautomatic traps

- **Total Amount of Images** Analyzed:

  Block A: 64
  Block B: 40
  Block C: 21
  Tot:125

- **No. of Days** of Scout Visit: 13

- **No. of Target Flies** captured by ReTIC

  Block A: 2029
  Block B: 1432
  Block C: 1564
  Tot: 5025

- **Reliability of ReTIC** Image Analysis (% of concordance between Image Analysis and Scouts Report) (%):

  fly *versus* no fly: 88%

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Decision Support System

- DSS1:TRAP DEPLOYMENT START

It is based on the Degree Days (DD) calculation: $\frac{T_{max}+T_{min}}{2} - 10$

DD: 620. In 2015 was reached on 3 July. The first Medfly catch was on 30th June.

- DSS2: WHEN AND WHERE TO SPRAY

define the trees to be treated and the treatment to use: BAIT Spray or COVER Spray

- DSS3: SPRAYING

define the spraying procedure: the algorithm check for each tree to be treated if the treatment is necessary or there is a cover of the previous treatment or the weather conditions are unfavorable

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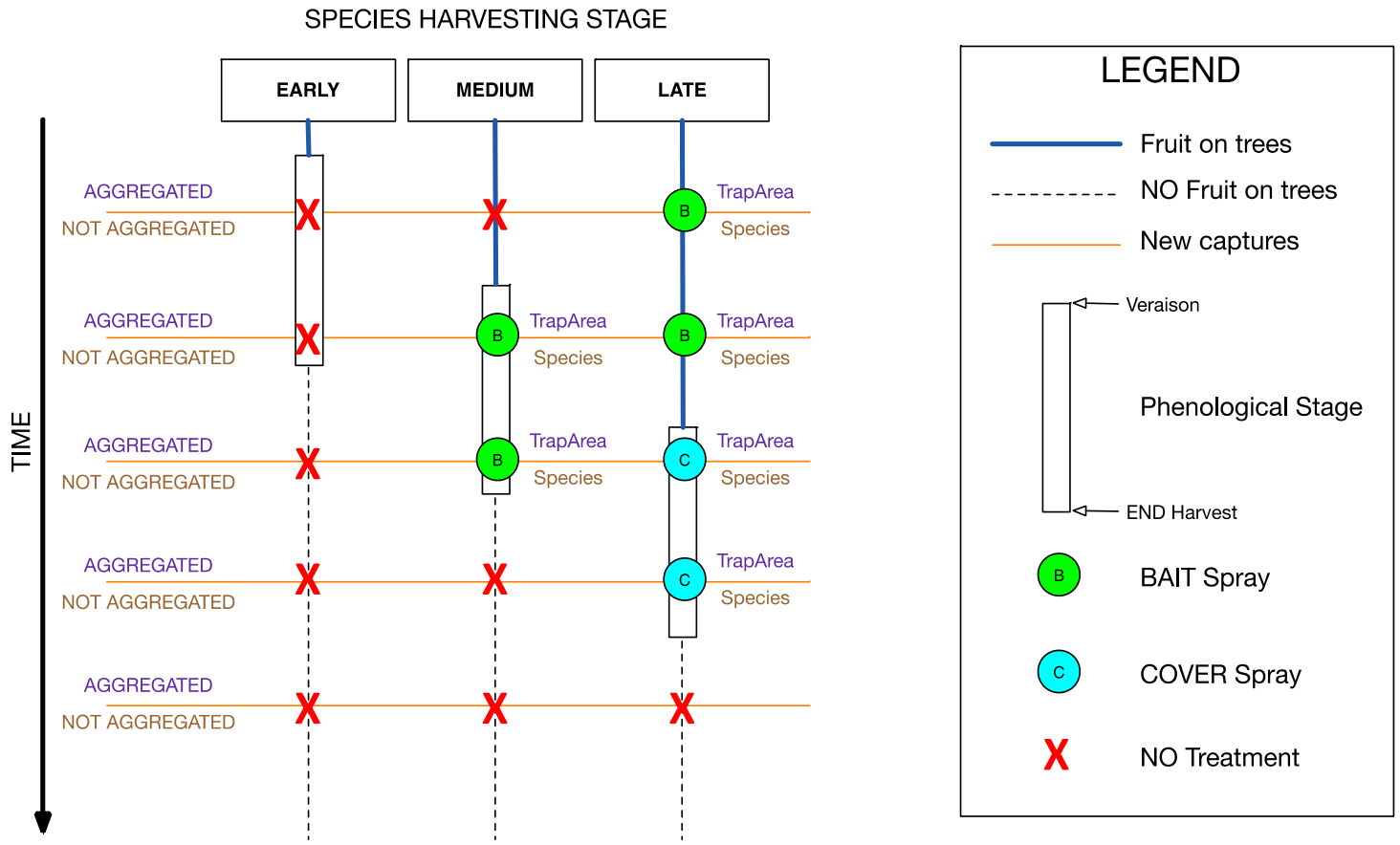
For each variety is defined the Harvest End that characterizes the species harvesting:

- **EARLY**: Harvest End before 15th of July
- **MEDIUM**: Harvest End between the 16th of July and the 15th of August
- **LATE**: Harvest End after the 16th of August



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SPECIE		BLOCK	HARVEST PERIOD
AUGUST FLAME	1,5X4	A	MEDIUM
ROJO D'ALBESA	1,5X4	A	LATE
ORION	1,5X4	A	MEDIUM
RICH MAY	4X4	A	Early
BIG BANG	1,5X4	A	Early
CRIMSON LADY	4X4	A	Early
SELEZIONE 25	3,5X4	A	MEDIUM
SELEZIONE DS/93	3,5X4	A	MEDIUM
SAGITTARIA	1,5X4	B	Early
FAIRTIME	4X4	B	LATE
CALIFORNIA	4X4	B	LATE
FAIRLANE	4X4	B	LATE
ROYAL SUMMER	1,5X4	B	EARLY
SWEET DREAM	1,5X4	B	MEDIUM
SELEZIONE 25	3,5X4	B	MEDIUM
SAGITTARIA	1,5X4	B	Earl
TARDY RED	1,5X4	B	LATE
RUBY RICH	4X4	B	Early
CRIMSON LADY	3,5X4	C	Early
DIAMOND BRIGHT	3,5X4	C	Early
SPRING BRIGHT	3,5X4	C	EARLY
DIAMOND RAY	3,5X4	C	EARLY
STAR RED GOLD	3,5X4	C	MEDIUM
VENUS	3,5X4	C	MEDIUM
KEWEA	3,5X4	C	MEDIUM
MESSA PIA	3,5X4	C	LATE

Early: 11
Medium: 9
Late: 6






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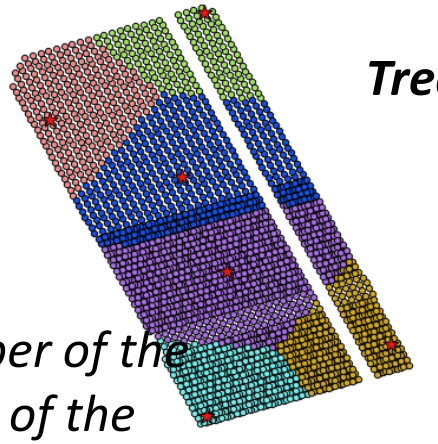
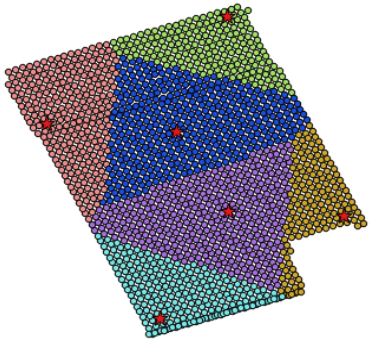
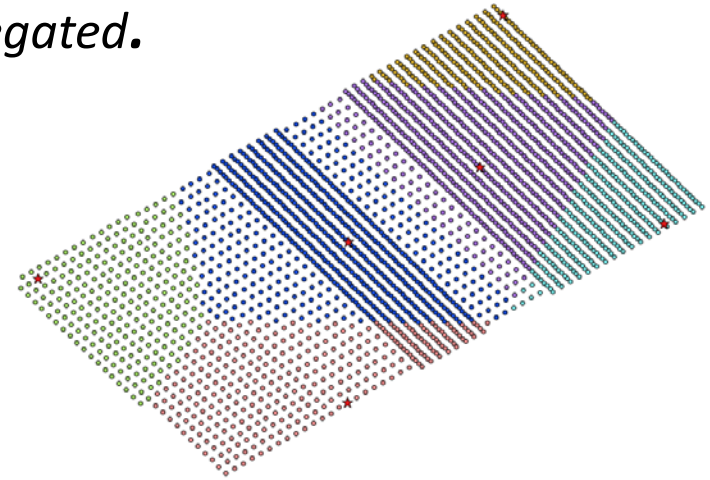


***Treatment Unit**: single variety*

***Capture Aggregation:** if the number of the traps with new captures are < 1/3 of the number of the traps of the LAS, the captures are aggregated, otherwise not aggregated.*





***Trap Area:** area around a trap defined by the following rule: a tree belong to the TrapArea(X) if the tree is closer to the trap X than to other traps*

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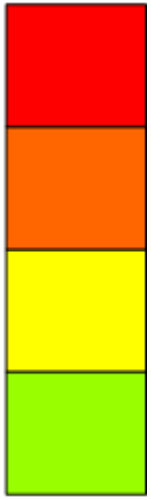
DSS output

	Treatment	Action	Risk
Spray	Spray with cover	Requested	High
	Spray with bait	Recommended	Medium
	Spray aggregated	Suggested	Low
Do not spray	Do not spray	Do not spray	Absent



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Experimental period

The prototype worked from the first catch until the end of the fruit harvest:

- Block A: 3 July – 9 August
- Block B: 3 July – 20 September
- Block C: 3 July – 1 September

DSS was executed on a weekly base

- Block A: 7 times
- Block B: 13 times
- Block C: 9 times

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DSS decision: 14 July

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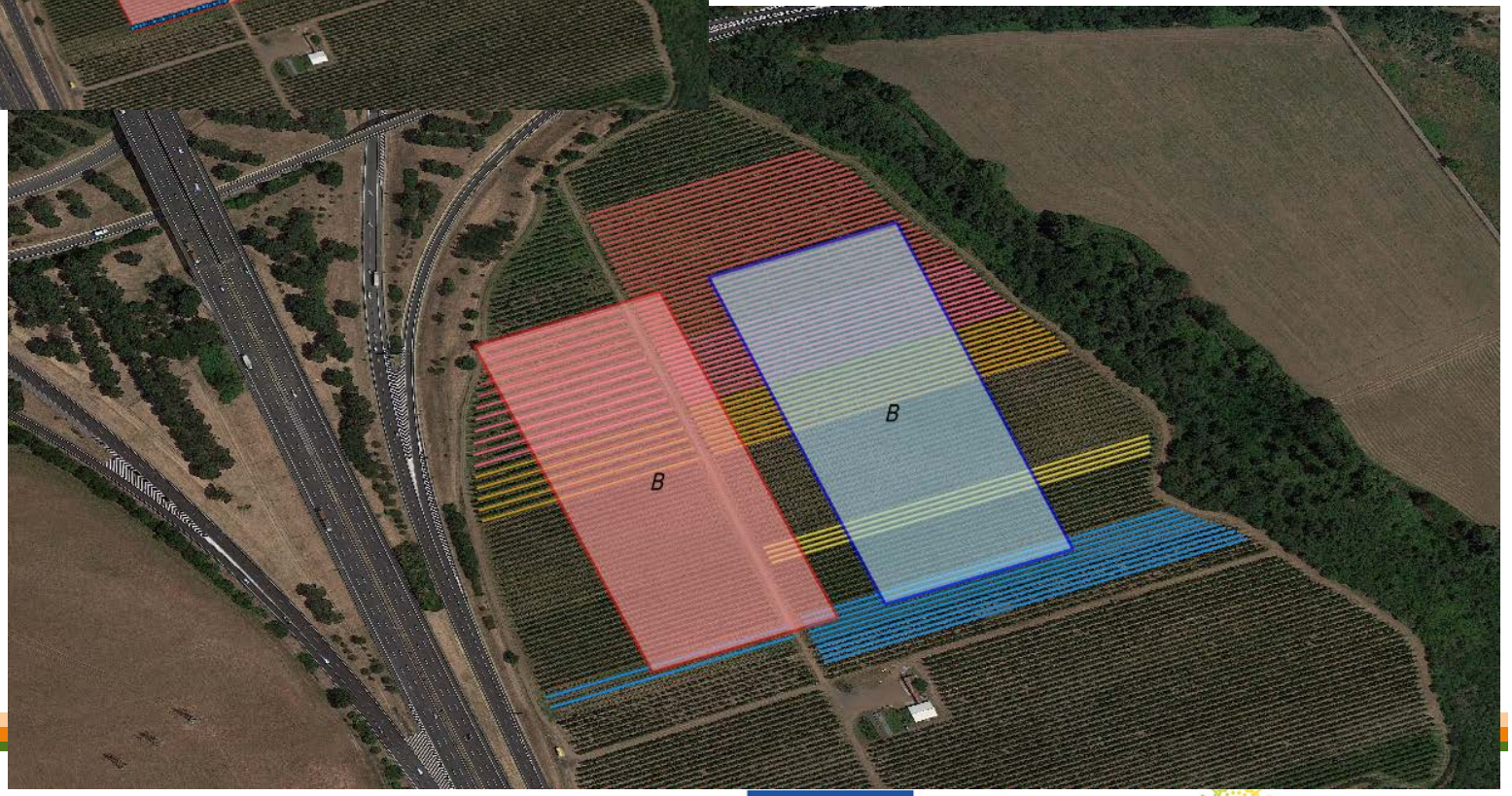
DSS decision: 13 August



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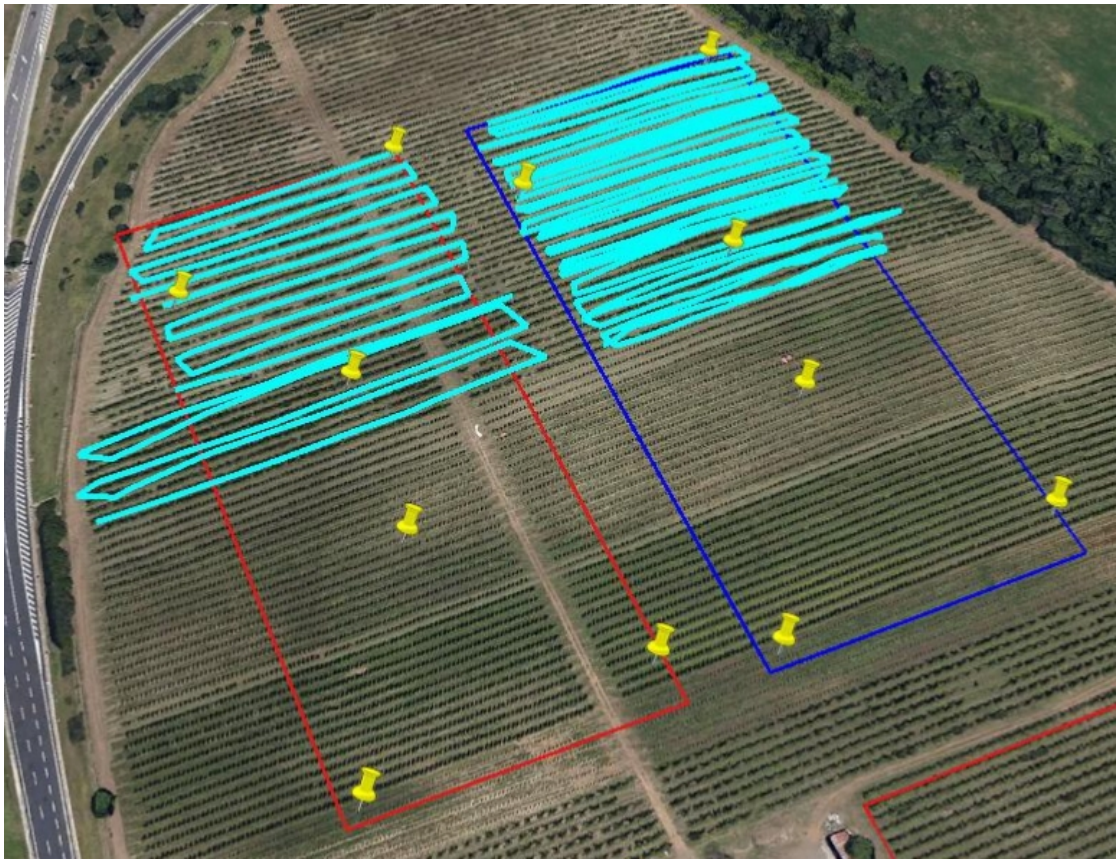
Treatment tractor paths



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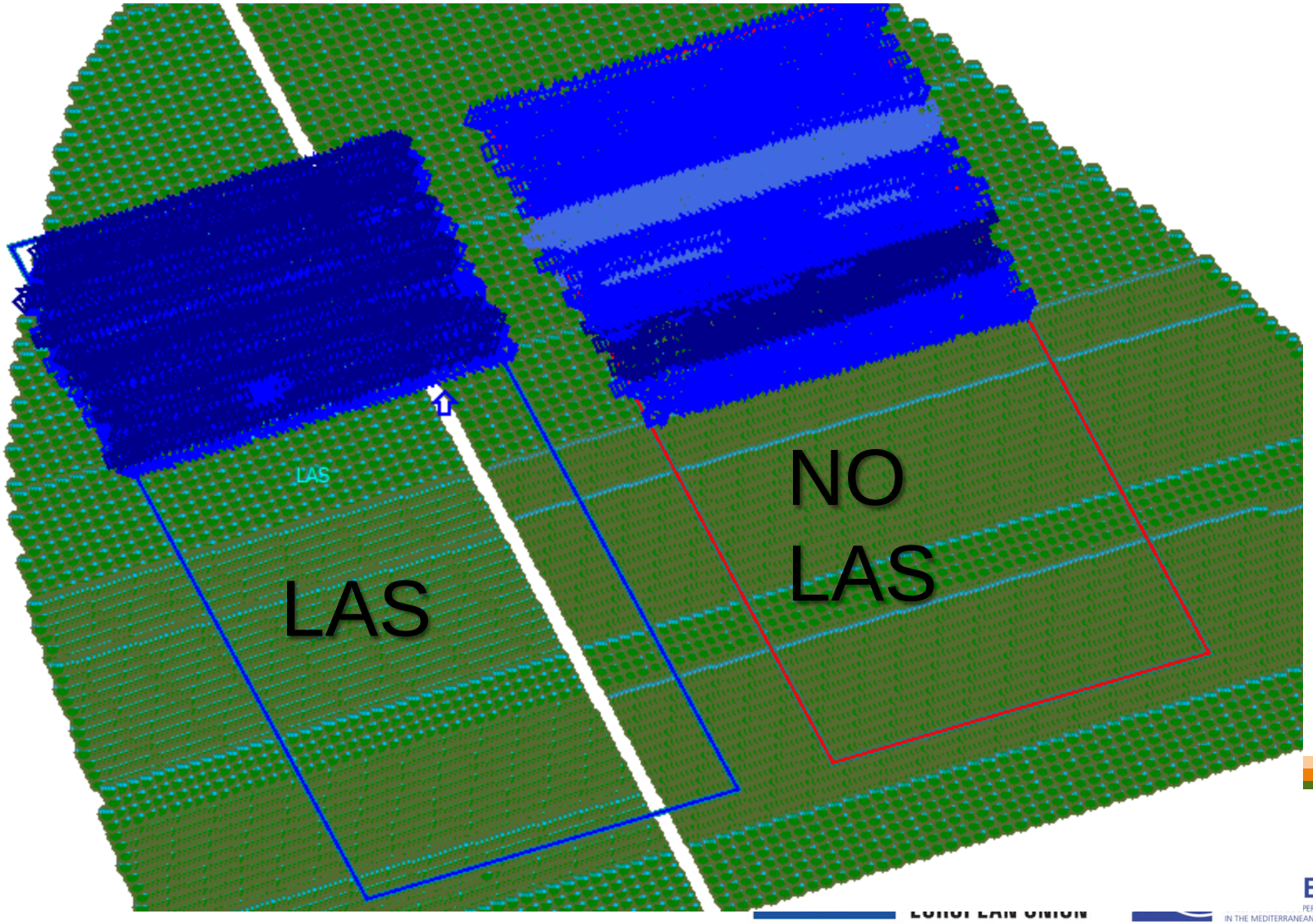
Tracking path of spraying –Block B



Results: treatments

Indicator	NO-LAS	LAS	Difference
Area Affected by Application(s) (Ha)	Plot A: 2.82 Plot B: 9.69 Plot C: 1.3	Plot A: 2.91 Plot B: 5.28 Plot C: 0.22	**Plot A: 3.2%** **Plot B: -45.5%** **Plot C: -83%**
No. of Pesticide Applications per single cultivar	Plot A: 7 cover Plot B: 27 cover Plot C: 6 cover	Plot A:7 baits Plot B: 10 baits; 4 cover Plot C: 1 bait	**Plot A: 0%** **Plot B: -67%** **Plot C: -95%**
Volume of Pesticide applied (ml of a.i./ha)	Plot A: 256.1 Plot B: 963.6 Plot C: 108.9	Plot A: 26.1 Plot B: 254.8 Plot C: 2.1	**Plot A: -89.8%** **Plot B: -73.6%** **Plot C: -98.1%**
Total volume applied (hl/ha)	Plot A: 28.2 Plot B: 98.6 Plot C: 13.0	Plot A: 13.4 Plot B: 33.7 Plot C: 2.2	**Plot A: -52.5%** **Plot B: -65.9%** **Plot C: -83.1%**

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Validation: the level of acceptance of the FruitFlyNet prototype recommendations by the farmer

	N. treatments suggested by DSS	N. treatments in agreement with DSS	N. treatments not executed	N. treatments not requested	Total agreement %
blockA	7	6 (86%)	1	1	75%
blockB	11	11 (100%)	0	1	92%
blockC	3	1 (33%)	2	0	33%
Total	**21**	**18 (86%)**	**3**	**2**	**78%**

N. aggregated treatments recommended: 5 (plot A and B)
N. aggregated treatments realized: 2 (plot A and B)

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Fruit damage block A

Harvest time	Variety	NO LAS	LAS
E	Rich May	0%	0%
E	Big Bang	0%	0%
E	Crimson Lady	0%	0%
M	DS93-Selezione 25	0%	6.4%
M	Orion	0%	0%
M	August Flame	0%	1.2%
	Total	**0%**	**1.4%**

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Fruit damage block B

Harvest time	Variety	NO LAS	LAS
E	Sagittaria	0%	0%
E	Royal Summer	0%	0%
M	Sweet Dream	0.5%	0%
L	California	1.8%	1.2%
L	Fairlane	4.4%	3.7%
L	Fairtime*	3.7%	1.9%
L	TardiRed	21.8%	25.7%
	Total	**5.3%**	**5.5%**

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Fruit damage block C

Harvest time	Variety	NO LAS	LAS
E	Crimson Lady	0%	0%
E	Flame rouge	0%	0%
E	Diamond Bright	0%	0%
E	Spring Bright	0%	1.2%
E	Rich Lady	0%	0%
E	Diamond Ray	0%	0%
M	Stark Red Gold	0%	0%
M	Venus	0%	0%
M	Kewea	1.5%	1.5%
	Total	**0.2%**	**0.4%**

ANOVA analysis: damage Not Sign, plot Sign. at P=0.05 (df= 43, F= 0.188)

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Achievements

- Reliability of image analysis
- DSS recommendations agreement (78%)
- Reductions achieved for: N. of pesticide applications, area affected by applications, volumes of pesticides applied
- Fruit damages between LAS and no-LAS not significantly different

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Drawbacks

- Improve e-trap design-efficiency
- Difficult to treat aggregated areas
- Improve real time decisions using mobile GIS
- GUI not intuitive
- Interpolating maps output not useful with few traps

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Thank you!!!

FruitFly Net

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Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria

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