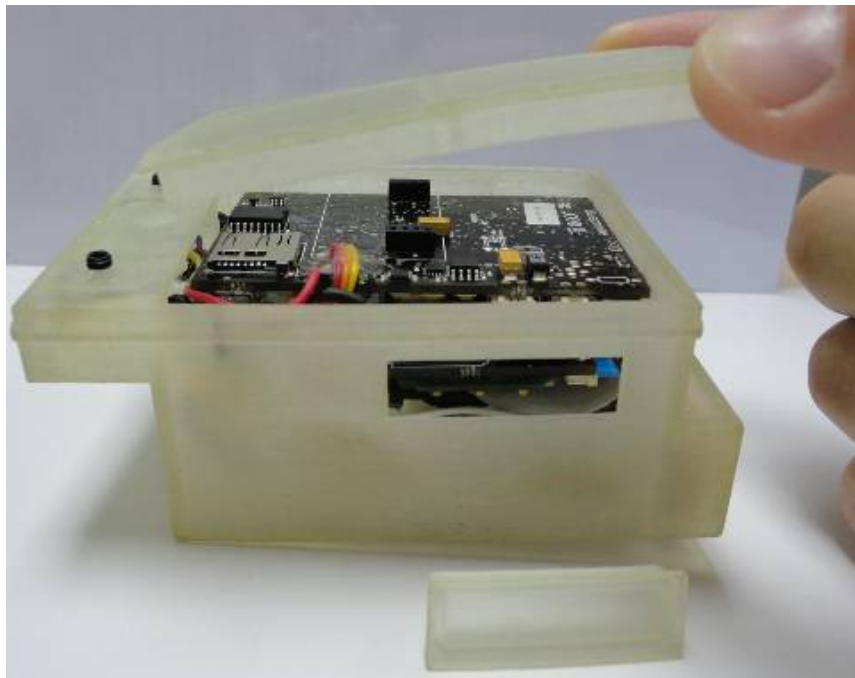



**ANNEX – FIGURES, FINAL REPORT: Description of the main S&T results/foregrounds**



**Fig. 1: The experimental trap in the field**



**Fig. 2: e-FlyWatch version 2 electronic components**


 HOST FTP: 19.28.213.25    User: cnetrial    Password: \*\*\*\*\*   

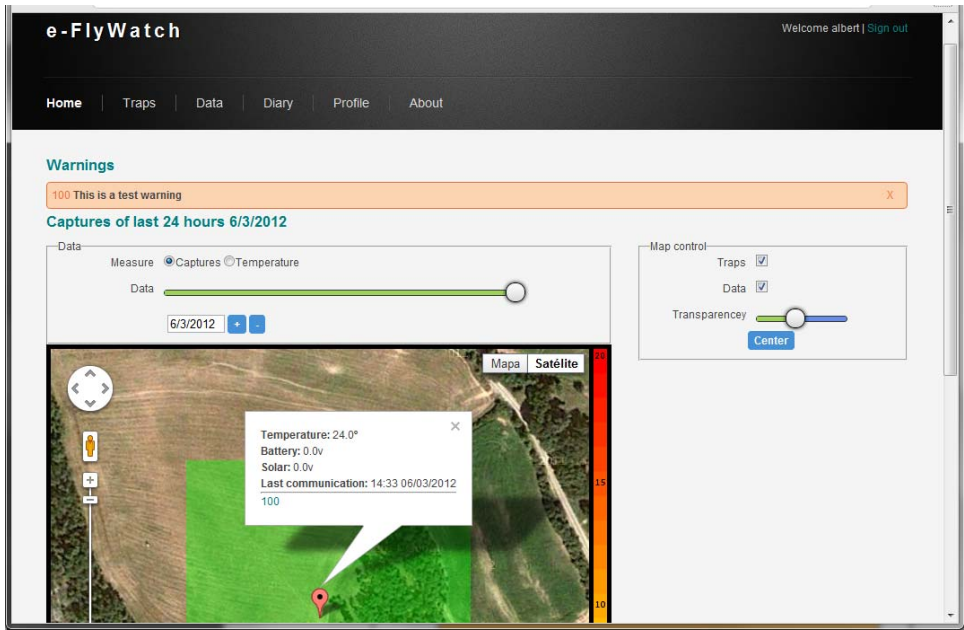
   Status: Receiving / Trap 58225    File Name: T\_58224\_IMG01.JPG    ASCII IMG:

Template Algorithm	OK
Particle Area Meas.	OK
Overall Geom. Algorithm	OK
Feature 1 Algorithm	OK
Feature 2 Algorithm	OK

S/N	DATE	NO TRIGGERS	NO INSECTS	Tmax	Tmin	RH	Cord.N	Cord.E	SEND
58223	01/09/2013	1	1	31.9	22.2	63	34°38'46.73"N	32°55'56.05"E	OK
58223	02/09/2013	0	0	30.8	21.5	35	34°38'46.73"N	32°55'56.05"E	OK
58222	10/09/2013	0	0	28.3	19.9	36	34°44'31.75"N	33°19'48.01"E	OK
58224	10/09/2013	1	1	28.6	19.7	42	34°39'9.63"N	32°55'56.67"E	OK
58221	10/09/2013	1	1	28.6	19.8	39	34°44'26.05"N	33°19'37.15"E	OK
58225	10/09/2013	3	2	28.1	21.3	34	34°41'19.24"N	32°47'32.64"E	OK
58222	11/09/2013	2	2	31.2	23.2	41	34°44'31.75"N	33°19'48.01"E	OK
58224	11/09/2013	0	0	31.8	23.3	45	34°39'9.63"N	32°55'56.67"E	OK
58221	11/09/2013	1	1	31.9	23.3	44	34°44'26.05"N	33°19'37.15"E	OK
58225	11/09/2013	4	4	29.7	20.9	39	34°41'19.24"N	32°47'32.64"E	WAIT

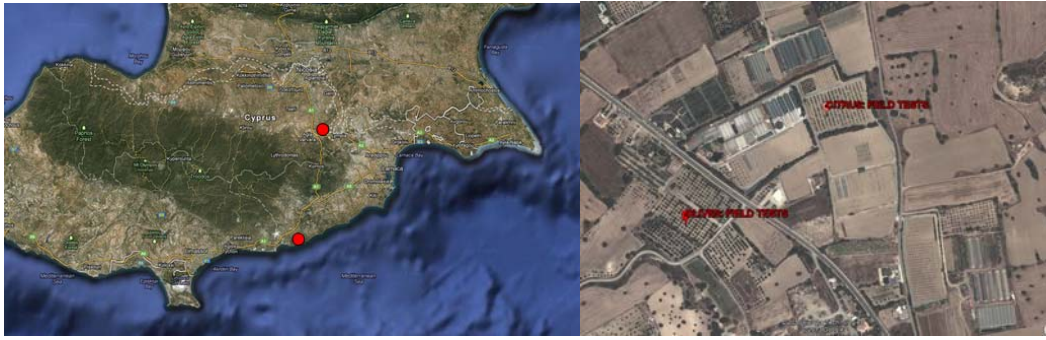
**Fig. 3: Optical recognition Software**



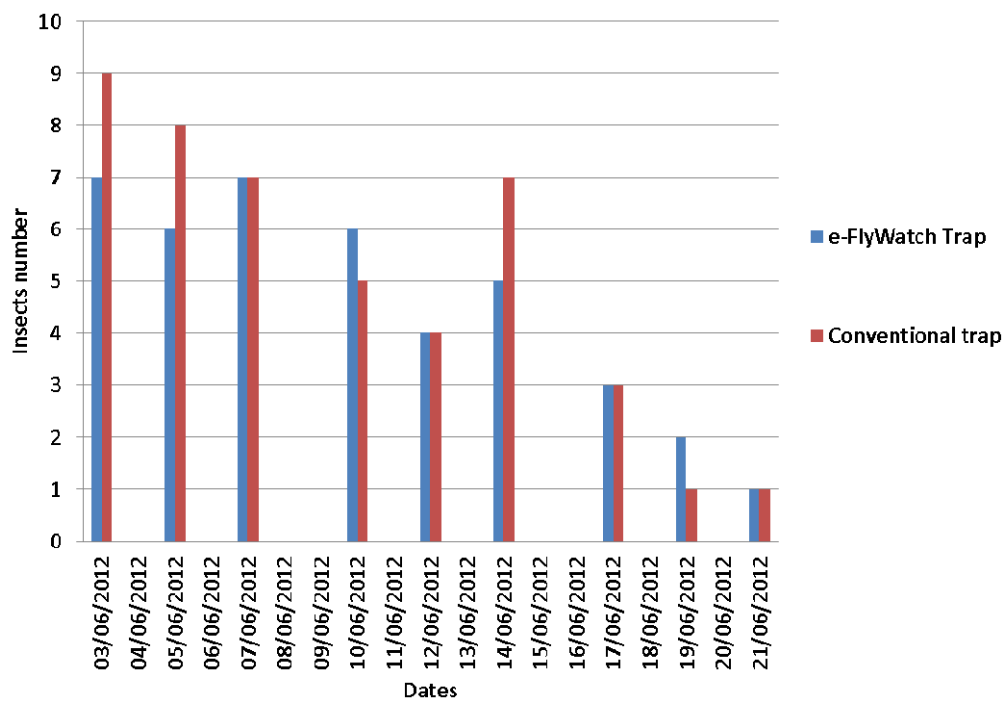
**Fig. 4: e-FlyWatch Central Station Graphical User Interface**



**Fig. 5: One of the e-FlyWatch trap prototypes version 2**

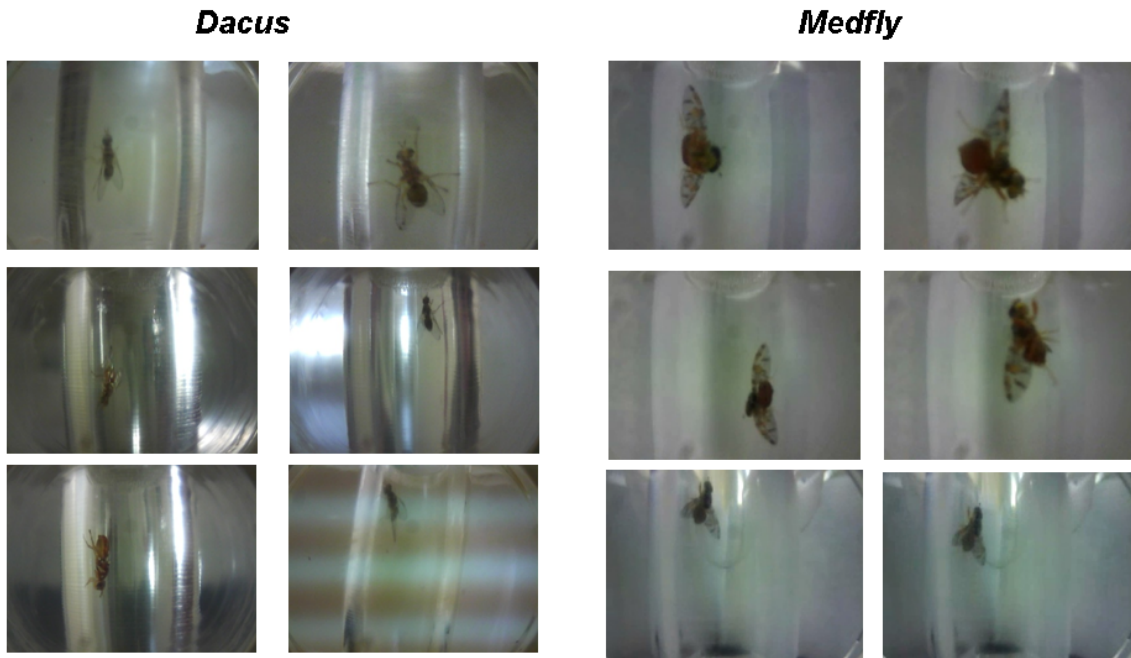


**Fig.6:** The selected locations for the field validation of the traps. The left figure shows the experimental fields for the attraction of insects (Zygi and Dali villages) while the right picture shows the fields in Zygi for the validation of the complete trap functionalities.



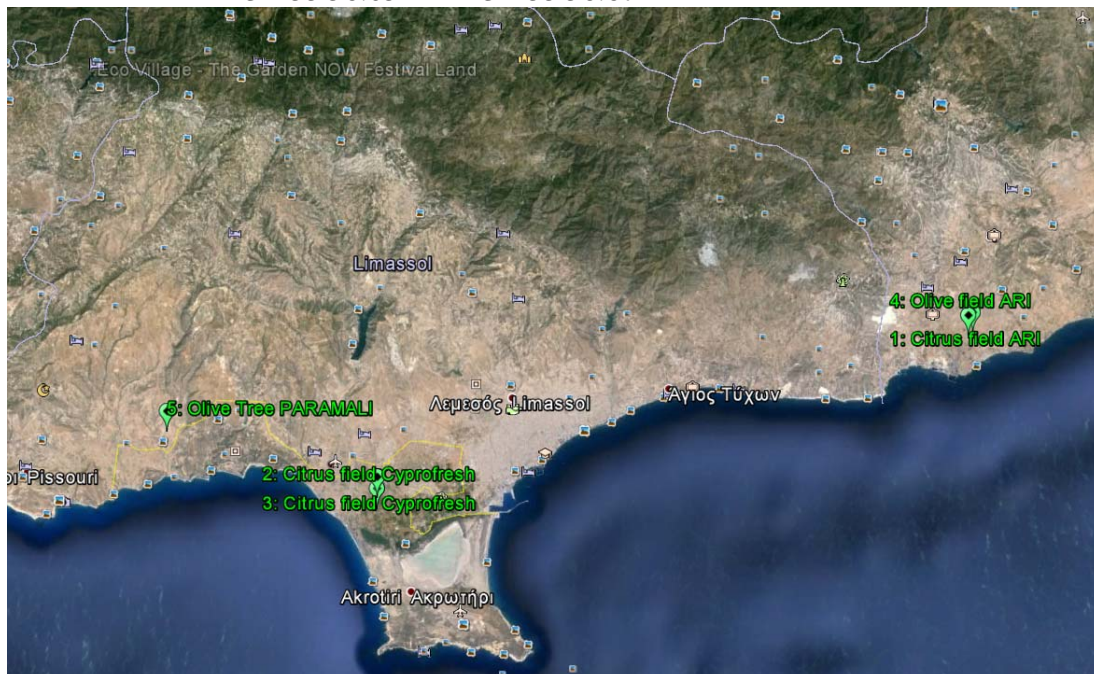
**Fig.7:** Field Test results for comparing the attraction of insects in a Conventional McPail Trap and the e-FlyWatch Trap



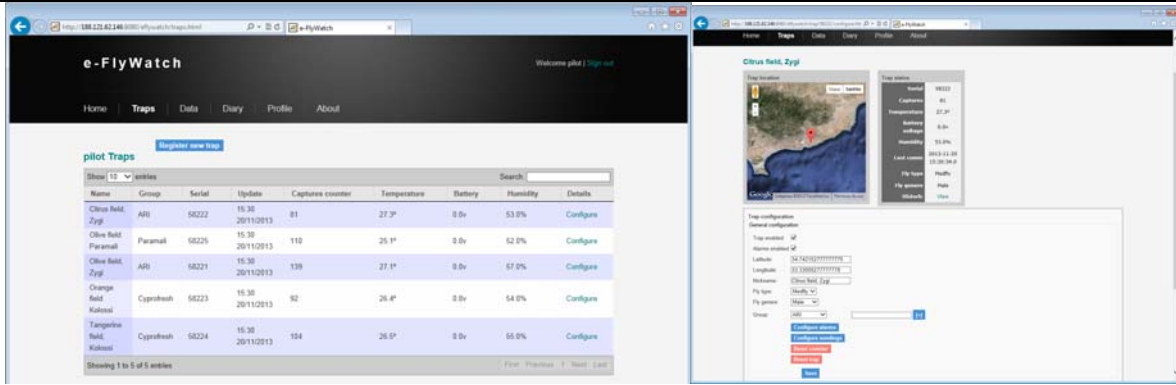


**Fig.8: Captured images from various traps using e-FlyWatch System Trap version 2**

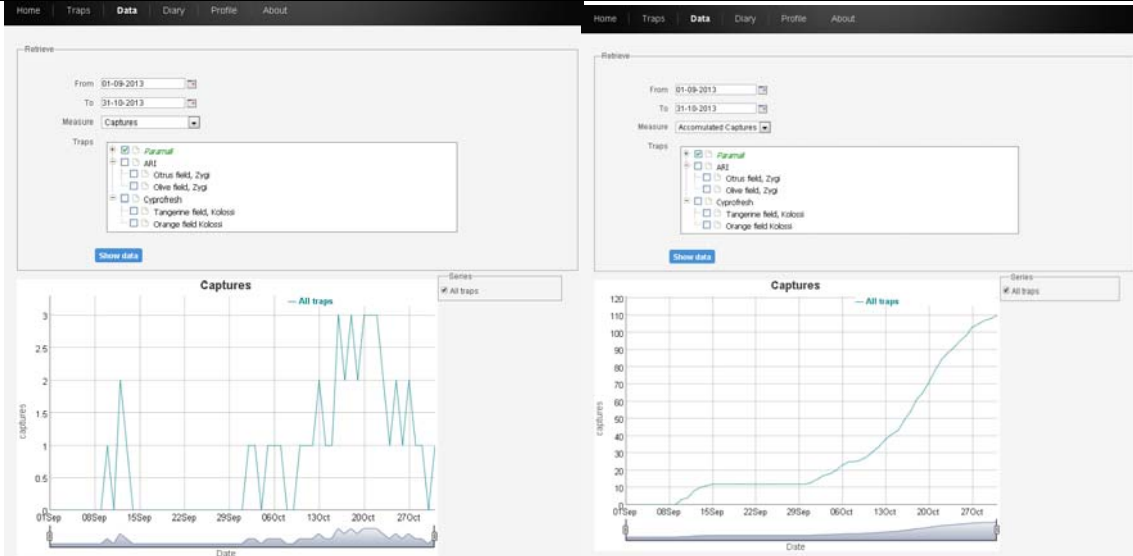
1: Citrus field ARI-Zygi 34°44'31.75"N 33°19'48.01"E	2: Citrus field Cyprofresh- Kolossi 34°38'46.73"N 32°55'56.05"E	3: Citrus field Cyprofresh- Kolossi 34°39'9.63"N 32°55'56.67"E	4: Olive field ARI-Zygi 34°44'26.05"N 33°19'37.15"E	5: Olive Field Paramali 34°41'19.24"N 32°47'32.64"E
---	---	--	--	--



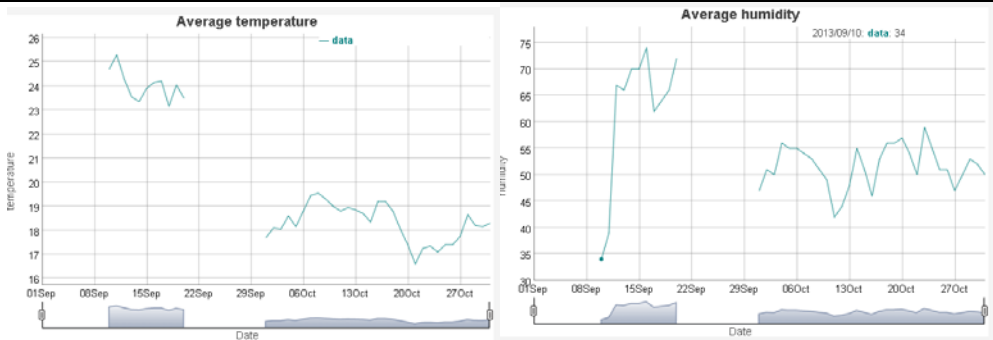
**Fig.9: The selected locations for the second phase of field validation**



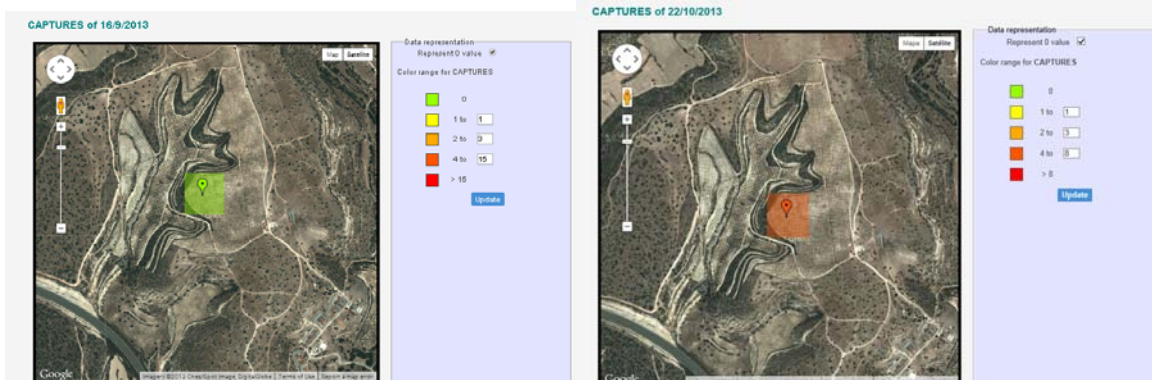
Information of all pilot traps and example of configuration for trap 1



Graphical results with the number of Captured-Recognised dacus insects and corresponding results with the accumulated number



Avg Temperature and humidity for September and October



Example of e-Flywatch GUI Density Map (Trap in Paramali for 2 different dates)

Fig.10: e-Flywatch GUI





**Fig.11: Demonstration of e-FLyWatch trap in orange fields**



**Fig.12: Video demonstration from CNE**





# e-Fly Watch

Development of an innovative automated & wireless trap with warning and monitoring modules for integrated management of the Mediterranean (Ceratitis capitata) & Olive (Dacus oleae) fruit flies



Health & Quality

Production Revenue



## The Problem

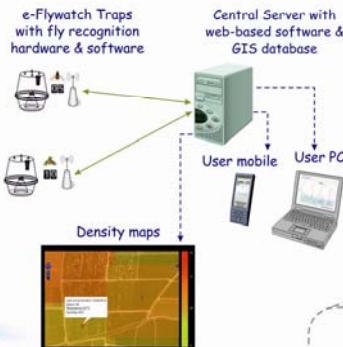
Fruit, vegetable and olive growers throughout Europe face major problems from the damages caused by two of the world's most destructive fruit pests, the Mediterranean fruit fly and the Olive fruit fly.

The importance of early detection through monitoring techniques has always been a top priority in detection, delimitation and control programmes. The costs of intervention and eventual eradication increase dramatically if the population becomes established and spread.

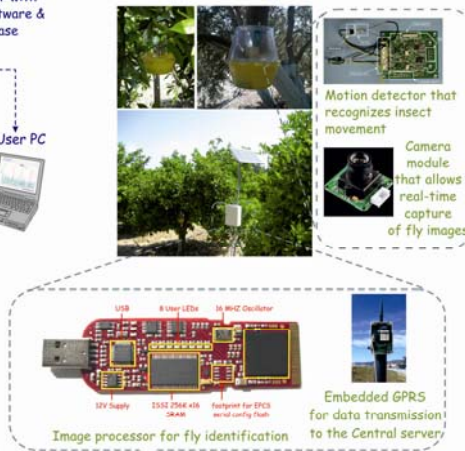
## The Innovative e-FlyWatch System

e-FlyWatch is a unique fully autonomous trap with integrated insect recognition, communication modules connected to a centralised data collection system which includes analysis and prediction models, end-user warning module via SMS, web etc. and historical analysis of infested areas through a web-application

### General Concept

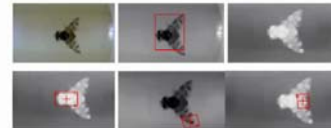


### e-FlyWatch trap



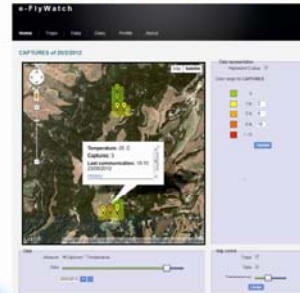
### Recognition software

Recognition software with intelligent algorithms for real-time identification of medfly and/or dacus



### Web-based software with GIS database

The software incorporates monitoring, statistical analysis and prediction models for eradication. Also, it includes data recording, user interactive communication and recording actions for pesticides usage.



### Features

- A trap module based on proven concepts that are successfully used by fruit and olive producers
- An embedded camera module inside the trap that allows real-time analysis of insect images
- A Software recognition module with intelligent algorithms for real-time identification of medfly and/or dacus insects
- A complete system which consist of the trap, power and communication (via 3G/GPRS) modules for field use and transmission of real-time data
- A Web-based software with GIS database for field, regional or national level insect monitoring. The system incorporates monitoring, statistical analysis and prediction models for eradication
- Advanced management system to be used by end-users and authorities, which includes field information (through GIS database) such as daily temperature, number of flies captured, type of pesticide used and when it was used, fruit and olive production records, as well as other climate parameters.

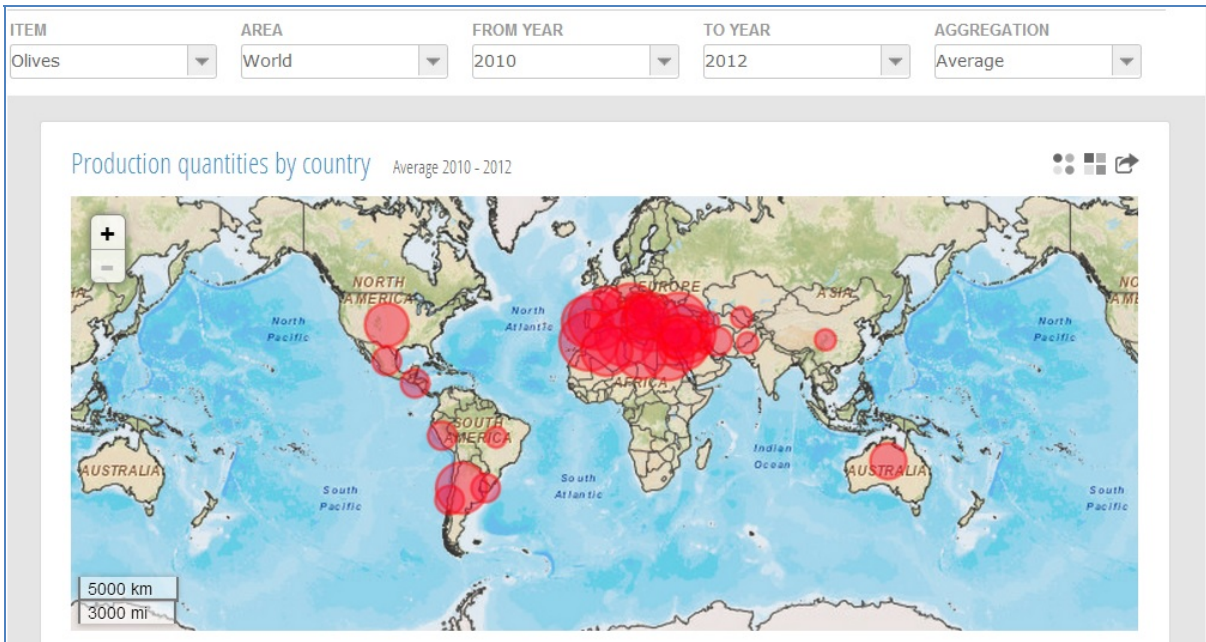
### Benefits

- The trap maintains the proven McPhail functionality, while being able to automatically identify and count the insects
- The insects are identified in real-time, allowing for immediate action
- For the first time, a trap is able to automatically identify the medfly and dacus insects
- The interested users/ authorities can be notified via internet or SMS for increased numbers captured or for any possible problem
- The powerful GIS platform allows for the application of national level insect monitoring programs
- Statistical analysis tools facilitate the monitoring procedures
- Possibility to use the e-FlyWatch traps and platform as the main part of a complete IPM system

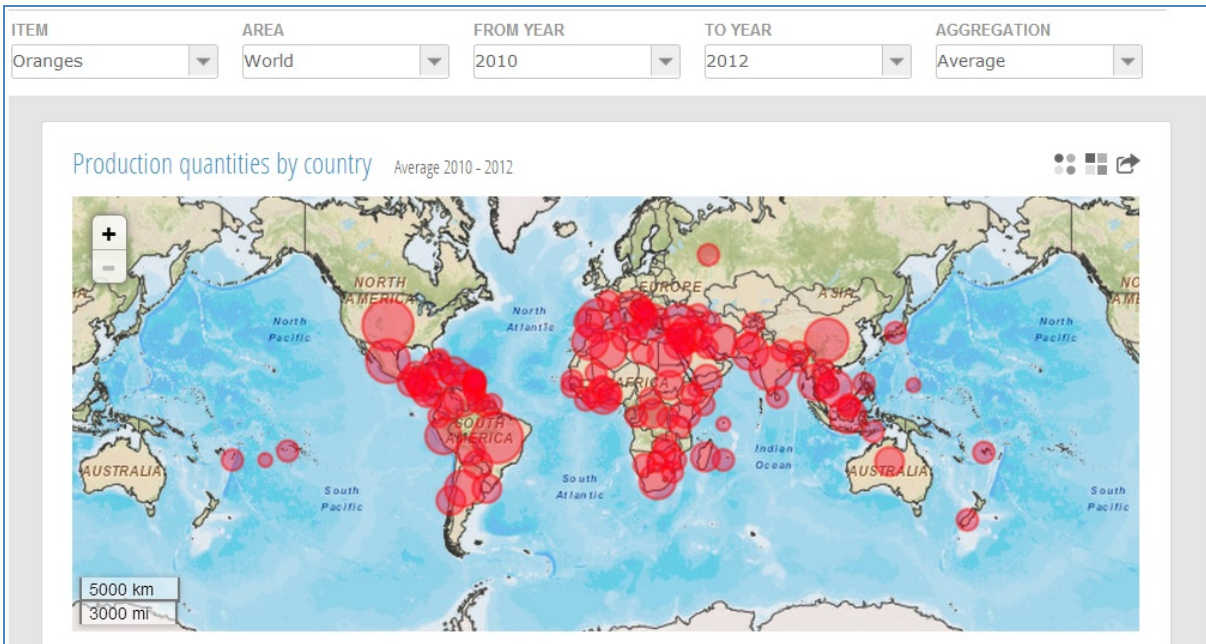


Coordinator: Dr Panayiotis Phyllis, p.phyllis@cnetechology.com

Fig. 13: The e-FlyWatch poster prepared for the 2<sup>nd</sup> International Symposium of TEAM



**Fig. 14: Main world olive production (FAO statistics)**



**Fig. 15: Main world citrus production (FAO statistics)**



**Table 1: 2006 EU Production of medfly susceptible fruits and vegetables**

	Total EU27 production [M tons]	Susceptible To medfly EU27 [M tons]	Susceptible To medfly MED-8 [M tons]	Est. Value For MED-8 Producers M €	MED-8 1000 ha
Fruit & Vegetables	129.8	79.4	64.6	20193	4523
FRUIT	68.6	60.1	49.7	19319	4265
VEGETABLES	61.2	19.3	14.9	874	258

**Table 2: Main EU citrus and olive production fields in Spain, Greece, Italy, Portugal, Cyprus and France**

CITRUS							
	#holdings	Area	Produce	Average Yield	Average Area/ Plantation	Value	Value
		x 1000 ha	x 1000 ton	t / ha	ha	M €	€/ ha
Totals2005	345 770	566	10 471	18.5	1.6	2093	3698
OLIVES							
Totals2007	1 873 200	4376	12 660	2.9	2.3	6315	1443
Total number of citrus fruit and olive orchard holdings:					>2.2 million		
Total area of citrus fruit and olive orchards:					>4.9 million ha		
Annual value of EU citrus fruit and olive market:					€8.4 billion		
Total market for e-FlyWatch based on 5 traps per ha:					>24 million units		
Total value of the market for e-FlyWatch units at €90/units					> €2.2 billion		

**Table 3: world olive production (FAO statistics)**

World Olive Production (FAO)					
Area Code	Area Name	Value (Tonnes)	Area Code	Area Name	Value (Tonnes)
2	Afghanistan	1,533.33	121	Lebanon	87,204.67
3	Albania	86,800.00	124	Libya	152,727.33
4	Algeria	438,622.67	134	Malta	7.67
9	Argentina	170,000.00	138	Mexico	17,745.67
10	Australia	82,022.33	143	Morocco	1,412,723.00
21	Brazil	64.00	154	FYROM	15,528.67
40	Chile	66,000.00	170	Peru	80,218.00
50	Cyprus	15,002.67	174	Portugal	426,333.67
52	Azerbaijan	1,619.00	198	Slovenia	1,866.33
59	Egypt	438,527.33	203	Spain	6,042,889.67
60	El Salvador	9,314.67	212	Syrian Arab Republic	1,050,163.00
68	France	27,665.00	214	China, Taiwan	2,571.67
80	Bosnia Herzegovina	145.33	222	Tunisia	799,333.33
84	Greece	1,969,933.33	223	Turkey	1,661,666.67
98	Croatia	40,108.00	231	USA	132,207.33
102	Iran	38,376.33	234	Uruguay	6,071.33
103	Iraq	17,011.33	235	Uzbekistan	111.33
105	Israel	67,500.00	273	Montenegro	2,262.67
106	Italy	3,115,078.00	299	Palestinian Territory	80,353.33
112	Jordan	153,053.00	351	China	2,571.67
118	Kuwait	58.00			

**Table 4: World orange production (FAO statistics)**

World Orange Production (FAO)					
Area Code	Area Name	Value (Tonnes)	Area Code	Area Name	Value (Tonnes)
2	Afghanistan	8338.00	120	Laos	42506.00
3	Albania	6865.50	121	Lebanon	120000.00
4	Algeria	698618.00	123	Liberia	7900.00
9	Argentina	855168.50	124	Libya	47414.00
10	Australia	341283.00	129	Madagascar	78201.50
12	Bahamas	3656.50	131	Malaysia	52974.00
16	Bangladesh	20254.50	133	Mali	18750.00
18	Bhutan	56807.00	134	Malta	1374.00
19	Bolivia	171696.50	135	Martinique	356.00
20	Botswana	560.00	138	Mexico	4065654.50
21	Brazil	19157102.00	143	Morocco	849598.50
23	Belize	175601.50	144	Mozambique	34074.00
26	Brunei Darussalam	434.50	147	Namibia	1234.50
37	C. African Republic	26900.00	149	Nepal	50598.50
38	Sri Lanka	7190.00	156	New Zealand	8394.50
40	Chile	137486.00	157	Nicaragua	89744.00
41	China, mainland	5626500.00	165	Pakistan	1446270.00
44	Colombia	244081.50	166	Panama	51538.50
46	Congo	2475.00	169	Paraguay	229898.00
47	Cook Islands	72.50	170	Peru	406603.50
48	Costa Rica	205703.00	171	Philippines	4160.50
49	Cuba	150581.50	174	Portugal	211000.50
50	Cyprus	35641.50	175	Guinea-Bissau	6326.50
52	Azerbaijan	8210.00	176	Timor-Leste	1694.50
53	Benin	13450.00	177	Puerto Rico	14122.00
55	Dominica	6676.50	181	Zimbabwe	88256.00
56	Dominican Republic	138692.20	182	Réunion	2567.00
58	Ecuador	42050.50	184	Rwanda	5261.00
59	Egypt	2489368.00	185	Russian Federation	120.00
60	El Salvador	44072.41	189	Saint Lucia	535.00
66	Fiji	410.00	191	Saint Vincent	1150.00
68	France	602.95	195	Senegal	45000.00
69	French Guiana	649.50	196	Seychelles	28.95
70	French Polynesia	435.00	201	Somalia	9496.00
72	Djibouti	3.50	202	South Africa	1455373.50
73	Georgia	1000.00	203	Spain	2966844.00
80	Bosnia Herzegovina	122.00	206	Sudan (former)	133825.00
81	Ghana	590000.00	207	Suriname	15057.00
84	Greece	755000.00	208	Tajikistan	1200.00
86	Grenada	595.50	209	Swaziland	42750.00
87	Guadeloupe	1489.00	212	Syrian Arab Republic	701430.00
88	Guam	64.50	214	China, Taiwan	182059.00
89	Guatemala	149878.00	215	Tanzania	2345.00
91	Guyana	4457.00	216	Thailand	398850.00
93	Haiti	28358.00	217	Togo	13900.00
95	Honduras	273146.50	219	Tonga	834.50
98	Croatia	274.50	220	Trinidad and Tobago	4755.50
100	India	5268700	222	Tunisia	138200.00
101	Indonesia	1923927	223	Turkey	1720323.00
102	Iran	1351858	231	United States of America	7778202.00
103	Iraq	94415	233	Burkina Faso	580.00
105	Israel	112677.2	234	Uruguay	144695.50
106	Italy	2431801	236	Venezuela	400249.50
107	Côte d'Ivoire	40219.5	237	Viet Nam	630367.10
109	Jamaica	104234.5	238	Ethiopia	43903.50
110	Japan	53381.5	249	Yemen	121735.00
112	Jordan	40860	250	Congo	203273.00
114	Kenya	120357.5	251	Zambia	3910.00
115	Cambodia	60173.5	273	Montenegro	8201.50
118	Kuwait	122.35	299	Palestinian Territory	21500.00
			351	China	5808559.00



**Table 5: Cost of Pesticides for the MED-8 countries.**

	Spending on PPP [€/ ha]	Arable and permanent crops [x1000 ha]	Spending Total [M€]	Insecticides Consumption on citrus fruit [tons]
Greece	79	3 207	253	50
Spain	44	17 536	772	583
France	138	22 242	3069	2
Italy	65	9 913	644	51
Portugal	71	1 957	139	15
Cyprus, Malta	90	400	36	10
Total MED-8	89	55 255	4913	711

**Table 6: Annual Production losses for Citrus fruits and olives**

	Present value	Production loss	Annual loss due to medfly and olive fly	Area x 1000 hectares	Annual loss per 1 ha
Citrus fruits	€2.1 B	15%	€0.3 B	566	€555
Olives	€6.3 B	30%	€1.9 B	4376	€432