New strategy for agriculture without usage of neonicotinoids and protection of the growers by a mutual insurance against pitfalls
IS IT POSSIBLE TO PRODUCE GOOD AGRICULTURAL PRODUCTS KEEPING/IMPROVING FARMERS’ NET INCOME WITHOUT USING NEONICOTINOIDS?
TWO WAYS

1) USING INSECTICIDES ONLY WHERE/WHEN IS NEEDED = IPM (Integrated Pest Management)

2) USING OTHER EFFECTIVE STRATEGIES (=IPM) OR OTHER CHEMICALS WHEN/WHERE A ECONOMIC POPULATION OCCURS
IPM THE KEY TOOL
1. Before any decision on pest control is taken, harmful organisms must be monitored with adequate methods and tools, where available; tools should include observations in the field as well as scientifically sound warning, forecasting and early diagnosis systems.

2. Crops may only be treated when and where the assessment has found that levels exceed set economic thresholds.

3. When economic thresholds are exceeded, agronomic solutions, mainly rotation, should be considered to prevent crop damage, as tillage timing, choice and changing of sowing dates, and crop rotation interfere with newly established pest populations.
4. When economic thresholds are exceeded and no agronomic solutions are available, biological control, physical treatment or another non-chemical pest control method should be considered as a replacement for chemical treatment.

5. When economic thresholds are exceeded and no agronomic solutions, biological controls, physical treatments or other non-chemical pest control methods are available, chemical treatments should be selected from options that pose the lowest risk to the environment and human health. It should be used so that the risk of pest resistance is minimised.
CONDITIONS NEEDED

A) LOW COST STRATEGIES

B) NON TIME CONSUMING TOOLS

C) SUSTAINABLE TECHNICAL TOOLS
ESSENTIAL FOR ARABLE CROPS

A) LOW INCOME CROPS

B) LOW MANPOWER AVAILABILITY

C) GENERAL LOW TECHNICAL KNOWLEDGE

D) DIFFERENTLY FROM ORCHARDS/VINEYARDS (LONG TRADITION) LITTLE TRADITION/EXPERIENCE ABOUT MONITORING AND IPM
IPM IMPLEMENTATION FIRST STRATEGY BECAUSE:

a) high potential as stressed by case studies

b) IPM principles include all the alternatives

c) can provide greater benefits than the simple replacement of neonicotinoids with other insecticides as it may reduce the total application of chemicals

d) IPM is compulsory in Europe since January 2014 – with strong support for IPM implementation by EU Commission

IPM INCLUDES ALL THE ALTERNATIVES TO NEONICOTINOIDS
WHICH CROPS OR OTHER TARGETS?
1) ARABLE CROPS INCLUDING RICE (mainly against soil pests) AND VEGETABLES

2) ORCHARDS/VINEYARDS

3) FORESTRY

4) ORNAMENTAL GOLF COURSES

5) LIVESTOCK
IS IT ACTUALLY FEASIBLE IPM?
CRITERIA TO ASSESS IPM FEASIBILITY

1) WHAT IS THE RISK LEVEL? ARE POPULATIONS LEVELS ABOVE THRESHOLDS EVERYWHERE AND THEN TREATMENTS NEEDED ON ALL FIELDS OR ON FEW OF THEM?

2) ARE IPM STRATEGIES (MONITORING METHODS, RISK ASSESSMENT, TRESHOLDS FOR KEY PESTS, AGRONOMIC AND/OR BIOLOGICAL ALTERNATIVES) AVAILABLE?
MAIZE CASE STUDY
Neonics effective but diseases have low incidence, hybrids are usually resistant – resistant hybrids as effective as neonicotinoids


INSECTS AND OTHER ARTHROPODS
BLACKCUTWORMS

Agrotis epsilon – migrante, più importante
Agrotis segetum

6 (7) stadi
3-4 generazioni
• OCCASIONAL ATTACKS  (last significant outbreaks 1971, 1983)
• LOW ECONOMIC DAMAGE
• ATTACKS NOT PREDICTABLE at sowing
• NEGLIGIBLE CONTROL BY SOIL INSECTICIDES (ALSO AS SEED COATING) WHEN NEEDED
• ALERT PROGRAMME PREDICTS WHERE AND WHEN POST-EMERGENCE TREATMENTS ARE NEEDED

UNJUSTIFIED AT SOWING TREATMENTS
1) WHAT IS THE RISK LEVEL? LOW, < 1%

2) ARE IPM STRATEGIES (MONITORING METHODS, RISK ASSESSMENT, TRESHOLDS FOR KEY PESTS) AVAILABLE? Yes, black cutworm alert programme producing accurate results in Italy since 1991.
1. What is the risk level? Low, < 1%

2. Are IPM strategies available (e.g. monitoring methods, risk assessment, key-pest thresholds, agronomic [and/or biological alternatives])? Yes, black cutworm alert programme producing accurate results in Italy since 1991.
WCR - DIABROTICA

• POPULATIONS BELOW ECONOMIC THRESHOLD IN MOST OF THE EUROPEAN MAIZE FIELDS
• ROTATION THE ONLY FULL EFFECTIVE STRATEGY (provisions of directive 128/2009/CE give solution)
• ROTATION CAN BE EFFECTIVE EVEN AS “SOFT” MODALITY (1 YEAR OUT OF 3 OR MORE YEARS)
• AVAILABLE SOLUTIONS FOR ROTATION THAT DO NOT REDUCE GROSS MARGIN OF LIVESTOCK/BIOGAS FARMS
• TREATMENTS AT SOWING DO NOT SIGNIFICANTLY AFFECT WCR POPULATION DYNAMICS
• POSSIBILITY OF INSECTICIDE FAILURE WHEN POPULATIONS ARE REALLY HIGH

UNJUSTIFIED AT SOWING TREATMENTS
THRESHOLD  6 beetles/trap/day over a 3 – 6 week period
1) WHAT IS THE RISK LEVEL?  LOW

2) ARE IPM STRATEGIES (MONITORING METHODS, RISK ASSESSMENT, TRESHOLDS FOR KEY PESTS, AGRONOMIC (first of all rotation) – NON CHEMICAL SOLUTIONS,…..) AVAILABLE?

It can be kept below economic threshold by “soft” rotation. Rotation is the first option for IPM based on directive 2009/128/CE IPM OF DIABROTICA ONLY MEANS THE IMPLEMENTATION OF RATIONAL ROTATION WITHOUT ANY CHEMICAL TREATMENTS (AT SOWING OR LATER AGAINST BEETLES)
THE ITALIAN CASE

DAMAGED FIELDS BY WIREWORMS
(over 30 years observations in Italy)

• visible damage (plants with attack symptoms easily found, more than 5% of damaged plants): < 5,0 %

• high damage: < 1,0 %
### ITALIAN REGIONS

<table>
<thead>
<tr>
<th>MONITORED FIELDS</th>
<th>WITH RISK FACTORS (A.brevis, A.sordidus)</th>
<th>WITH RISK FACTORS (A.litigiosus, A.ustulatus)</th>
<th>A. brevis mean (e.s., min-max)</th>
<th>A. sordidus mean (e.s., min-max)</th>
<th>A. litigiosus mean (e.s., min-max)</th>
<th>A. ustulatus mean (e.s., min-max)</th>
<th>STAND pp/m² HEALTHY (mean, min, max)</th>
<th>% of healthy plants out of total sown seeds</th>
<th>% of emerged plants (mean, min, max)</th>
<th>damage on plants – no economic damage (up to 10% of damaged plants) (n°)</th>
<th>Fields with economic damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>VENETO</td>
<td>51</td>
<td>6</td>
<td>6</td>
<td>76 (18,3, 0,0-691)</td>
<td>523 (53,1, 91-2129)</td>
<td>n.r.</td>
<td>548 (88,4, 0,00-2786,00)</td>
<td>6,46 (0,07, 5,30-7,38)</td>
<td>90,3</td>
<td>1,14 (0,024, 0,0-7,0)</td>
<td>2</td>
</tr>
<tr>
<td>EMILIA ROMAGNA</td>
<td>105</td>
<td>7</td>
<td>4</td>
<td>n.r.</td>
<td>245 (26,44, 4,00-2201)</td>
<td>253 (24,3, 6,0-1141)</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
<td>0,17 (0,071, 0,10-0,81)</td>
<td>1</td>
</tr>
<tr>
<td>LOMBARDIA</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>n.r.</td>
<td>983 (244, 189-2349)</td>
<td>629 (202, 63-2087)</td>
<td>n.r.</td>
<td>6,48 (0,06, 4,80-7,3)</td>
<td>93,2</td>
<td>5,8 (0,017, 0,012)</td>
<td>1</td>
</tr>
<tr>
<td>PIEMONTE</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>n.r.</td>
<td>1091 (290, 123-2311)</td>
<td>243 (52, 46-549)</td>
<td>n.r.</td>
<td>7,00 (0,12, 6,40-7,40)</td>
<td>94,6</td>
<td>0,059 (0,01, 0,05-0,1)</td>
<td>0</td>
</tr>
<tr>
<td>FRIULI</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>169 (19,7, 86-323)</td>
<td>335 (66,6, 59-763)</td>
<td>12 (6,41, 0,00-52,0)</td>
<td>n.r.</td>
<td>6,63 (0,05, 6,35-6,90)</td>
<td>90,7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTALE</td>
<td>183</td>
<td>18</td>
<td>11</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
<td>n.r.</td>
</tr>
</tbody>
</table>

**INCIDENZA (%)**

Lorenzo Furlan – Agricultural Research Department
WIREWORMS
WHAT ABOUT THE OTHER MEMBER STATES?

PURE PROJECT (SEVENTH FRAMEWORK PROGRAMME) 2011 - 2014

• 3 on-stations experiments - FRANCE, HUNGARY, ITALY (long-term) to investigate different

• 15 on farm experiments (FRANCE, GERMANY, HUNGARY, ITALY, SLOVENIA)
The experiments were carried out at:
1) Southern climatic conditions – Italy (5 locations) and France (2 locations)
2) Central climatic conditions - Germany (2 locations)
3) Eastern climatic conditions – Hungary (4 locations) and Slovenia (2 locations)
AVAILABLE TOOLS FOR IPM

A) RISK FACTORS
B) PHEROMONE TRAPS
C) BAIT TRAPS
D) AGRONOMIC STRATEGIES
E) BIOCIDAL PLANTS AND MEALS
F) OTHER BIOLOGICAL TREATMENTS

PLANTING CROPS WHERE AND WHEN THERE IS NO SERIOUS ECONOMIC DAMAGE RISK
A) AGRONOMIC RISK FACTORS

1. CONTINUOUS PLANT COVER (meadow, double crops as rye grass-maize, oilseed rape-soybean,…);
2. PEAT SOILS (high organic matter content)
3. PREVIOUS DAMAGE
4. high beetle captures with Yf and/or high incidence of uncultivated zones like grasses, forest,….
5. IRRIGATION (continuous supply of water keeping high soil moisture)

Lorenzo Furlan – Agricultural Research Department
AREA-WIDE LEVEL

B) PHEROMONE TRAPS

- RELIABLE (NON SATURABLE)
- FEW INSPECTIONS
- EASY, QUICK MANAGEMENT
- LOW COSTS
- MULTIBAITED (MORE SPECIES MONITORED AT THE SAME TIME BY ONE TRAP)

Lorenzo Furlan – Agricultural Research Department
B) BAIT TRAPS FOR COMPLEMENTARY LIMITED IN FIELD EVALUATION

a) IF AND WHERE THERE IS A RISK OF ECONOMIC POPULATIONS PLACING BAIT TRAPS

b) EVALUATION OF LARVAL_THRESHOLDS
<table>
<thead>
<tr>
<th>wireworm species</th>
<th>wireworm catches (larvae/trap)</th>
<th>sampled fields</th>
<th>fields with yield reduction (maize)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-1</td>
<td>64</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td></td>
<td>1,01-2</td>
<td>7</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td></td>
<td>2,01-5</td>
<td>9</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td><strong>Agriotes ustulatus</strong></td>
<td><strong>5,01-10</strong></td>
<td><strong>9</strong></td>
<td><strong>1</strong></td>
<td><strong>11,1</strong></td>
</tr>
<tr>
<td></td>
<td>&gt;10,01</td>
<td>5</td>
<td>2</td>
<td>40,0</td>
</tr>
<tr>
<td></td>
<td>0-1</td>
<td>54</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td><strong>Agriotes brevis</strong></td>
<td>1,01-2</td>
<td>6</td>
<td>2</td>
<td>33,3</td>
</tr>
<tr>
<td></td>
<td>2,01-5</td>
<td>7</td>
<td>4</td>
<td>57,1</td>
</tr>
<tr>
<td></td>
<td>&gt;5,01</td>
<td>3</td>
<td>1</td>
<td>33,3</td>
</tr>
<tr>
<td></td>
<td>0-1</td>
<td>113</td>
<td>0</td>
<td>0,0</td>
</tr>
<tr>
<td><strong>Agriotes sordidus</strong></td>
<td>1,01-2</td>
<td>10</td>
<td>0</td>
<td>0,0</td>
</tr>
</tbody>
</table>


...
1. What is the risk level? Low

2. Are IPM strategies available (e.g. monitoring methods, risk assessment, key-pest thresholds, agronomic and/or biological alternatives)? Yes
WHAT THE ACTUAL SOIL PEST RISK FOR MAIZE?

A 30 Ys DATA SET MAKES CLEAR THAT A RISK OF YIELD REDUCTION OCCURS IN LESS THAN 4% OF THE CULTIVATED LAND
MAIZE IPM AGAINST SOIL PESTS IN BRIEF

1. Low risk level

2. Reliable IPM strategies available
WHEN RISK IS LOW THE INSURANCE APPROACH IS CONVENIENT FOR FARMERS AND MUCH SAFER FOR PEOPLE & THE ENVIRONMENT (INCLUDING BEES)

A INSURANCE APPROACH MUCH BETTER THAN INSECTICIDES
### INSURANCE APPROACH vs PESTICIDE APPROACH

**ASSUMPTIONS (prudential) for 100 ha of arable crops:** 1) Mutual fund cost (MF) 5 €/ha; 2) soil insecticides cost 40 €/ha; 3) the highest damage cost 500 €/ha on 4 ha out of 100; 4) soil insecticides efficacy 100%

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>MF (ha)</th>
<th>soil insecticides (ha)</th>
<th>IPM MF COST (€)</th>
<th>MF COST (€)</th>
<th>insecticide cost (€)</th>
<th>damage cost (€)</th>
<th>TOTAL COST (€)</th>
<th>COST DIFFERENCE MF vs insecticides</th>
<th>Effects on humans/environment</th>
<th>compliance with directive 2009/128/CE</th>
<th>Syntetic general evaluation (1 to 5 stars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutual funds only</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>500</td>
<td>0</td>
<td>2000</td>
<td>2500</td>
<td>-1500</td>
<td>no</td>
<td>yes</td>
<td>*****</td>
</tr>
<tr>
<td>IPM with mutual funds based on risk factors</td>
<td>100</td>
<td>20</td>
<td>100</td>
<td>500</td>
<td>800</td>
<td>0</td>
<td>1400</td>
<td>-2600</td>
<td>reduced</td>
<td>partial</td>
<td>***</td>
</tr>
<tr>
<td>IPM with mutual funds based on risk factors + monitoring</td>
<td>100</td>
<td>10</td>
<td>1000</td>
<td>500</td>
<td>400</td>
<td>0</td>
<td>1900</td>
<td>-2100</td>
<td>very reduced</td>
<td>yes</td>
<td>****</td>
</tr>
<tr>
<td>soil insecticides (prophylactic use)</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>4000</td>
<td>0</td>
<td>4000</td>
<td>=</td>
<td>yes</td>
<td>no</td>
<td>*</td>
</tr>
</tbody>
</table>

**Lorenzo Furlan – Agricultural Research Department**
**INSURANCE APPROACH vs PESTICIDE APPROACH**

**ASSUMPTIONS (prudential) for 100 ha of arable crops:** 1) Mutual fund cost (MF) 5 €/ha; 2) soil insecticides cost 40 €/ha; 3) the highest damage cost 500 €/ha on 4 ha out of 100; 4) soil insecticides efficacy 50%

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>MF (ha)</th>
<th>soil insecticides (ha)</th>
<th>IPM COST (€)</th>
<th>MF COST (€)</th>
<th>insecticide cost (€)</th>
<th>damage cost (€)</th>
<th>TOTAL COST (€)</th>
<th>COST DIFFERENCE MF vs insecticides</th>
<th>Effects on humans/environment</th>
<th>compliance with directive 2009/128/CE</th>
<th>Syntetic general evaluation (1 to 5 stars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutual funds only</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>500</td>
<td>0</td>
<td>2000</td>
<td>2500</td>
<td>-1500</td>
<td>no</td>
<td>yes</td>
<td>*****</td>
</tr>
<tr>
<td>IPM with mutual funds based on risk factors</td>
<td>100</td>
<td>20</td>
<td>100</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>2300</td>
<td>-1700</td>
<td>reduced</td>
<td>partial</td>
<td>***</td>
</tr>
<tr>
<td>IPM with mutual funds based on risk factors + monitoring</td>
<td>100</td>
<td>10</td>
<td>1000</td>
<td>500</td>
<td>400</td>
<td>1000</td>
<td>2400</td>
<td>-1600</td>
<td>very reduced</td>
<td>yes</td>
<td>****</td>
</tr>
<tr>
<td>soil insecticides (prophylactic use)</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>4000</td>
<td>0</td>
<td>4000</td>
<td>=</td>
<td>yes</td>
<td>no</td>
<td>*</td>
</tr>
</tbody>
</table>
PRACTICAL IMPLEMENTATION

CONDIFESA VENETO

AGRIFONDO MUTUALISTICO
Associazione Mutualistica Dei Condifesa Del Veneto E Friuli V.G.
(PRIVATE ASSOCIATION OF FARMERS)

MAIZE MUTUAL FUND
SINCE 2014
Instrument managed by farmer consortia aimed to create a compensation and to balance the risk through an interregional distribution of risks

No profit, vehicle of innovation with transparency rules

Compensation commensurate with the financial resources of the Fund
Fund stock increased by savings in forecast costs

Solutions that are not offered by the traditional insurance market
| **RISKS COVERED** | - Insufficient plant density (stand) due to adverse weather conditions (i.e. drought, flooding, freezing cold)
- Insufficient plant density (stand) due to soil pests (e.g. wireworms, black cutworms), or diseases, such as Fusarium spp. (rotten roots, seedlings)
- Diabrotica (WCR) damage |
| **TARGET** | Members of farmer consortia |
| **OBLIGATIONS** | - Contract to be signed before sowing;
- Implementation of good cultivation practices;
- Connection and implementation of suggestions in “Arable Crops Bulletin” |
| **COSTS** | €5/ha all inclusive (including flooding [excessive rain], freezing cold, drought); pest risk alone is covered with less than €5/ha |
| **COMPENSATION** | Up to €500/ha including:
- Resowing (up to €250/ha) if stand below 4 pls/m²
- Yield reduction (up to €250/ha) based on sowing delay, crop change
- up to €1000/ha for WCR damage |
RESULTS 2015

1) 53,000 ha with MF cover

2) COST: 3,5 €/ha (TEN TIME LESS THAN A SOIL INSECTICIDE)

3) DAMAGE PAID < 30,000 €

4) SIGNIFICANT INCREASE OF MF STOCK FOR NEXT YEARS
RESULTS
DETAILED STUDY OF A REPRESENTATIVE AREA (450 HA)
INCLUDING RISK FACTORS WITH MONITORED FIELDS
ENTIRELY UNTREATED OR WITH UNTREATED AND
TREATED STRIPS UNTREATED WHERE PEST SIGNIFICANT
PEST POPULATIONS HAD BEEN FOUND (2014-2015)

Hectars with economic damage: 2014: 0,56% - 2015: 0,00 %

Value of yield reduction: 2014: 700 €/100 ha - 2015: 0,00 %

Value of yield reduction average 2014 – 2015

350 €/100 ha
1. Reduces costs/ha;
2. Covers risks due to mistakes or difficulties in IPM implementation (e.g. delay in black cutworm treatments);
3. Covers other risks, e.g. flooding and drought, not covered by insecticides;
4. Reduces health risk for farmers, as there is no contact with insecticides;
5. No negative impact of insecticides on soil beneficials;
6. No pollution risks for soil and water tables;
ADVANTAGES OF MUTUAL FUNDS

7. No risk to bees and other wild pollinators; more generally, reduces risk to fauna;


Since 2015 “Mutual Insurance” (Regulation EU 73/2009, Art. No. 68) is governed by the National Rural Development Programs.

The measures in the RDP are related to:

1. Risk management
2. Irrigation system
3. Genetic Improvement and Animal Biodiversity
Risk Management

Support under this measure, as established in the article 36 of the **Reg. EU No. 1305/2013**, shall cover:

a) Crop, animal and plant insurance (Art. 37)
b) Mutual Funds (Art. 38)
c) Income stabilization tool (Art. 39)
Art. 38 Mutual Funds

Financial contributions to mutual funds to pay financial compensations to farmers for economic losses caused by:

- Adverse climatic events
- Animal or plant diseases
- Pest infestation
- Measure adopted in accordance with Directive 2000/29/EC to eradicate or contain a plant disease or pest or an environmental incident

Minimum amount for compensation damage is 30%
Maximum amount of rate: 65% of the eligible investments

No contributions by public founds can be made to initial capital stock
WHAT CAN PUBLIC INSTITUTIONS DO TO MAKE EFFECTIVE IPM IMPLEMENTATION?

1) SUPPORT RISK ASSESSMENT STUDIES FOR ALL THE CROPS TO IMPROVE IPM STRATEGIES AND COST EVALUATION FOR MUTUAL FUNDS

2) GIVE FEASIBLE (NO 30% LIMIT!) CONTRIBUTIONS TO MUTUAL FUNDS IN ORDER TO “TURN THE KEY” IMMEDIATELY

3) SUPPORT INDEPENDENT ADVISORY SYSTEM

4) SUPPORT APPLIED RESEARCH FOR PRACTICAL SOLUTIONS AND INNOVATION TRANSFER – A DRAMATIC CHANGE IS IMMEDIATELY POSSIBLE – JUST A QUESTION OF WILLINGNESS

Lorenzo Furlan – Agricultural Research Department
WHICH OTHER CROPS WITH THIS APPROACH IN EUROPE?

- Sunflower
- Rapeseed (canola)

.....
AND WHAT ABOUT OTHER CROPS WITH MEDIUM/HIGH RISK PESTS???

MUTUAL FUNDS TO COVER THE RISK OF IPM IMPLEMENTATION SPECIFIC PROTOCOLS UNDER STUDY