INTERNATIONAL CENTRE FOR PESTICIDES AND HEALTH RISK PREVENTION
CENTRO INTERNAZIONALE PER GLI ANTIPARASSITARI E LA PREVENZIONE SANITARIA

WORLD HEALTH ORGANIZATION
Organizzazione Mondiale della Sanità

LOMBARDIA REGION
Regione Lombardia

UNIVERSITY OF MILAN
Università di Milano

Ospedale Luigi Sacco
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PRELIMINARY IDENTIFICATION OF ITALIAN SCENARIOS FOR PESTICIDE GROUNDWATER EVALUATION

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AIM OF THE WORK

- to identify relevant Italian scenarios to assess potential pollution of pesticides.

- To classified scenarios with a screening index with reference to leaching sensitivity to specific pesticides.

SCENARIO DEFINITION

Unique combination of agronomic and environmental conditions

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areas where conditions are relatively homogeneous.

METHODOLOGY – scenario selection

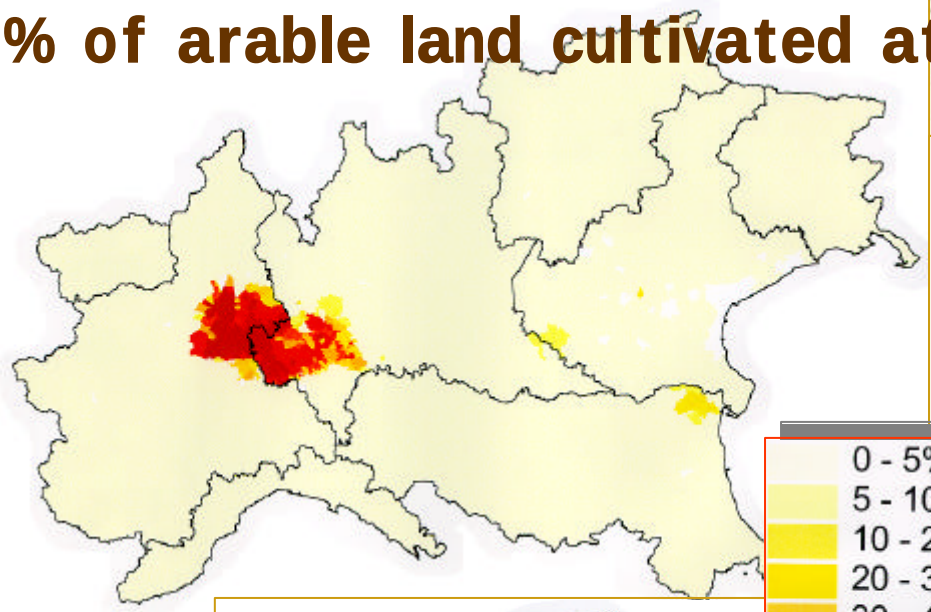
The used methodology for the definition of scenarios can be synthetised as follows:

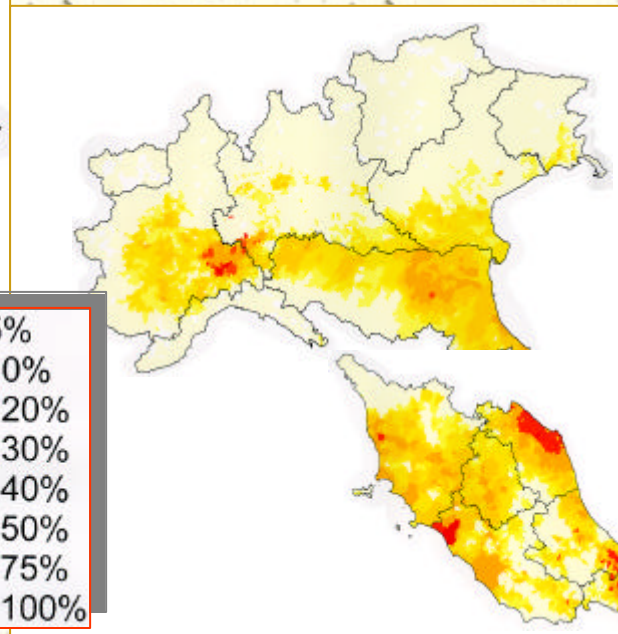
- identification of major agricultural areas;
- identification of major cultures;
- identification and description of soils representative of selected agricultural areas;
- characterisation of climate.

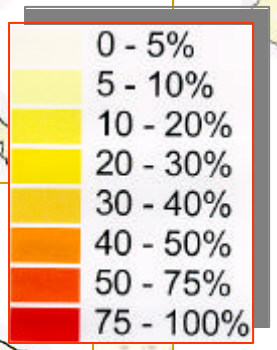
IDENTIFICATION OF MAJOR AGRICULTURAL AREAS/MAJOR CULTURES

Based on the agricultural census data, main crops have been identified and represented as percentage of arable land (ISTAT, 1990).

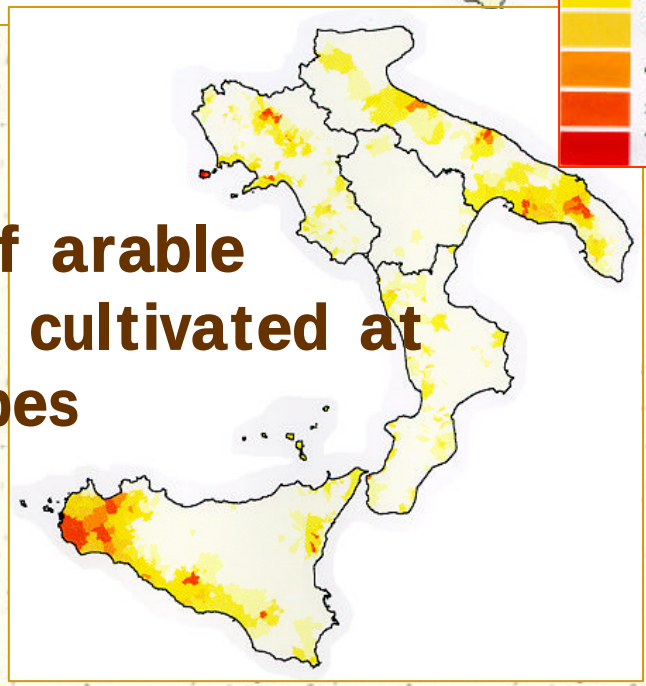
% of arable land cultivated at Rice



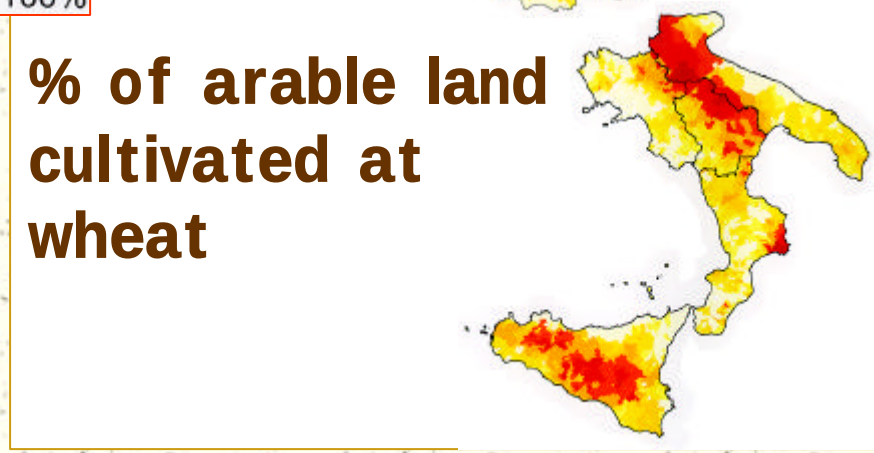




% of arable land cultivated at grapes



% of arable land cultivated at wheat



SOILS REPRESENTATIVE OF SELECTED AGRICULTURAL AREAS/CLIMATE

Information derived from soil surveys at different scale and resolution (Pedological studies provided by Regions, Provinces, and Universities).

Meteorological data used to characterise intensively cultived areas (DB-SAM, Ministry of Agricultural, 1998).

METHODOLOGY – AF/RF

The screening index AF/RF (Rao, 1985) has been applied to the scenarios considering different pesticides (in this paper Alachlor, Terbuthylazine, Molinate, DNOC and Dimetoate).

Five leaching sensitivity classes have been used.

RESULTS

30 scenarios have been identified with a description of the agricultural landscape at scale 1:250.000:

18 in Northern Italy
2 in the Center Italy
10 the South of Italy and the islands.

RESULTS: Scenario description

Land use
(crop, crop development, time of planting, time of harvest, root depth)
Pesticide data
(chemico-physical properties, rate and time of application)
Soil characteristics
(texture, organic carbon, depth, hydraulic conductivity)
climate data
(precipitation,temperature, evapotranspiration).

INDIVIDUAZIONE SCENARI ITALIANI - TABELLA 29

Regione: Sicilia
Zona: Costa Tirrenica
Regione agraria: Colline litoranee di Termini Imerese
Provincia:
Fonte: Carta dei suoli della Sicilia - scala 1:250.000; I vertisuoli dell'agro di Barrafranca

COLTIVAZIONE	**Tipo di coltivazione**	olivo
	Semina	
	Emergenza	
	Maturazione	
	Raccolta	
	Profondità max delle radici (m)	0,7
	max LAI	
	Irrigazione (periodo)	
	Irrigazione (mm)	no

PRINCIPIO ATTIVO	**Tipo di antiparassitario**	ziram, paration, dimetoato
	Calendario delle applicazioni	I/giu. - III/ott.
	Dose (kg/ha)	0,3 - 0,7 (dimetoato)

SUOLO	**Uso del suolo**	olivo
	Suolo/associazioni di suoli	Tipic Chromoxerert
	Unità pedologica/codice	13 - scala 1:250.000 / profilo 25
	Quota (metri s.l.m.)	0 - 400
	Morfologia	ondulata
	Substrato	
	Profondità	100 cm
	Tessitura	argillosa
	Permeabilità/drenaggio	lento
	Carbonio organico (%)	1,3
	AWC (mm)	175
	Pendenza (%)	2 - 10
	Profondità falda freatica (m)	

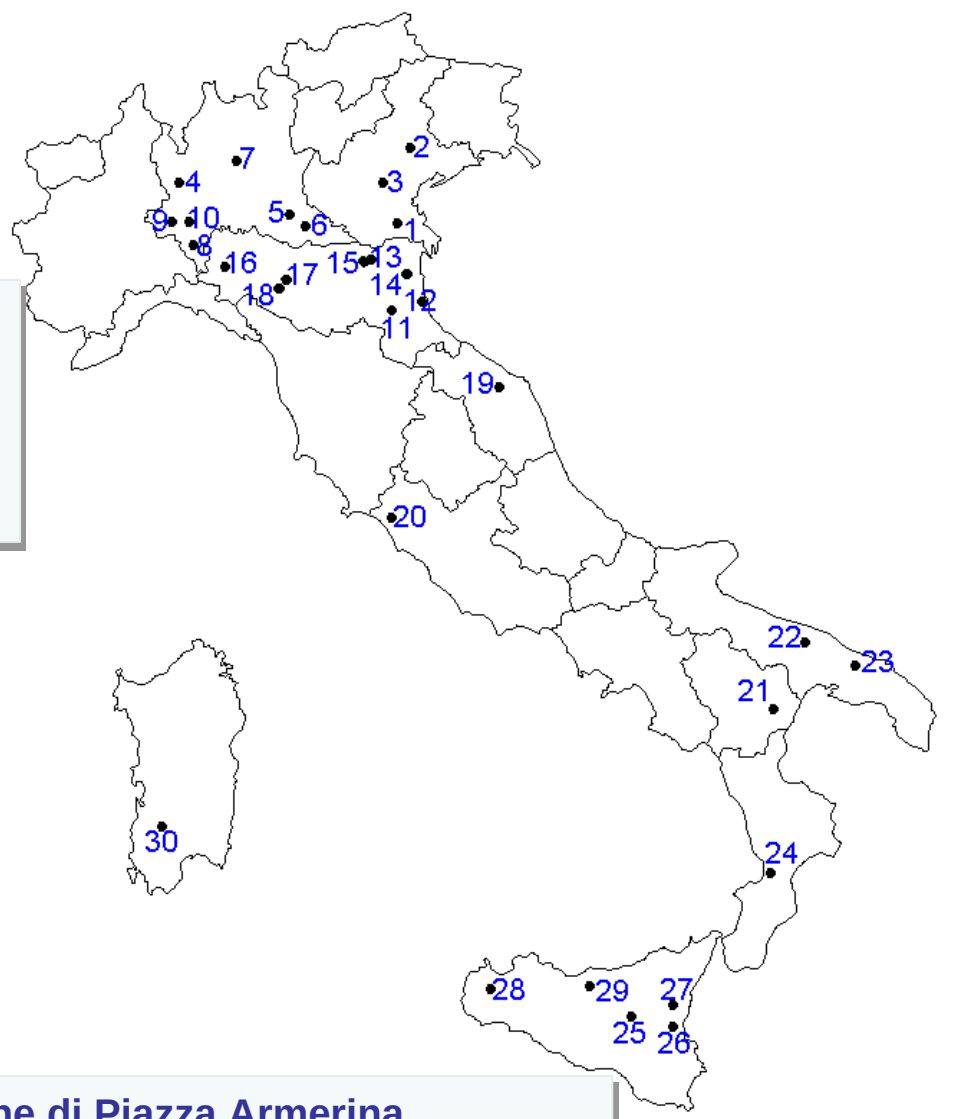
CLIMA	**Precipitazioni** *(media annua - mm)*	608,7
	Precipitazioni *(mese più piovoso - mm)*	ottobre 88,5
	Precipitazioni *(mese meno piovoso - mm)*	luglio 9,5
	Temperatura *(media annua)*	17,1 °C
	Temperatura *(media mese più caldo)*	agosto 25,8 °C
	Temperatura *(media mese più freddo)*	gennaio 10,3 °C
	Evapotraspirazione potenziale *(media annua - mm)*	1377,1
	Ricarica annua (mm)	42,9
	Tipo di clima	subtropicale

1 Polesine di Rovigo
2 Pianure tra Piave e Livenza
3 Colli Euganei
4 Pianura fra Ticino e Lambro
5 Pianura tra Oglio e Po

6 Pianura tra Oglio e Po
7 Pianura bergamasca occidentale
8 Colline settentrionali dell'Oltrepò Pavese
9 Lomellina occidentale
10 Lomellina occidentale

11 Pianura del Senio e del Santerno
12 Pianura di Ravenna
13 Bonifica ferrarese occidentale
14 Pianura di Ferrara
15 Pianura di Ferrara
16 Montagne del Medio Trebbia
17 Pianura di Reggio Emilia

18 Pianura di Reggio Emilia
18 Colline tra Cesano e Musone
20 Tarquinia
21 Colline del Sinni
22 Pianura di Barletta
23 Pianura di Brindisi
24 Pianura di Sant'Eufemia



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25 Colline di Piazza Armerina
26 Pianura di Catania
27 Versante litoraneo dell'Etna
28 Colline del Belice
29 Colline litoranee di Termini Imerese
30 Colline del Trexenta

RESULTS - crops

Most scenarios are settled in plain areas as for the major crops: wheat, maize and rice.

Few scenarios are in hilly areas: grape-vine, olive, citrus fruits, drupaceae and pomaceae are the main cultivated crops.

RESULTS - soil

50% of the identified scenarios is characterised by alluvial and glacio-fluvial deposits; texture of soils is mainly loamy, loamy-sandy and sandy very permeable.

Scenarios of the Center and South of Italy are characterised by the presence of limestone and clay slate and soils with sandy-silt and clay texture.

For all scenarios:

- **Organic carbon** 1-3% in the upper layer (0-50 cm)

  0.3-1.5 in the deepest ones (50-150 cm)

- **Soil Available Water Content** 100-200 mm

RESULTS: climate 1

Rainfall:

Northern Italy 700-1100 mm/year (650-700mm/year in Romagna)

Center and South of Italy 550 e 750 mm/year

Annual average temperature:

North and Center 12-15 °C

South and in the islands 15-18 °C.

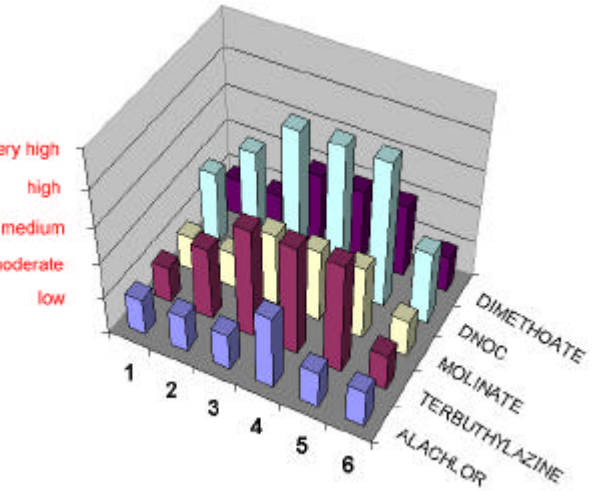
In winter evapotranspiration is higher in southern regions than in northern regions due to the difference in temperature: the coldest month (January) has an average temperature of 8-10 °C in the South and 1-4 °C in the North.

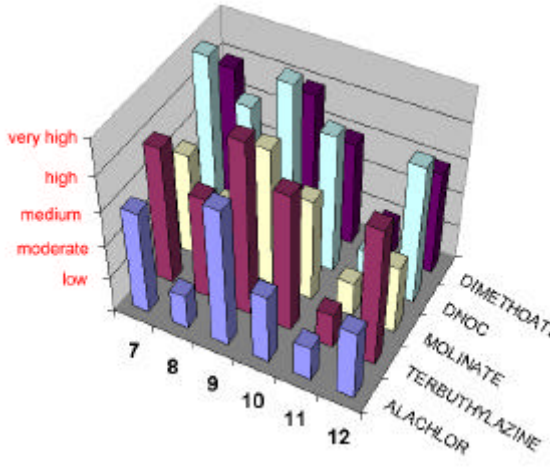
RESULTS : climate 2

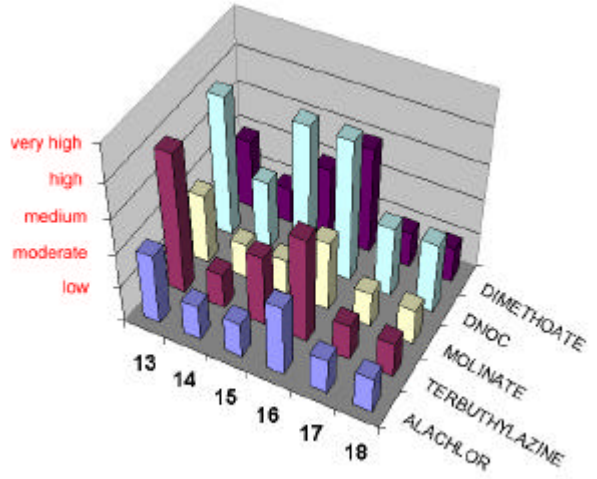
Combination of high evapotranspiration and low rainfall cause difference in groundwater richarge. Southern regions are characterised by 30-70 mm/year richarge while northern regions by 100-200 mm/year.

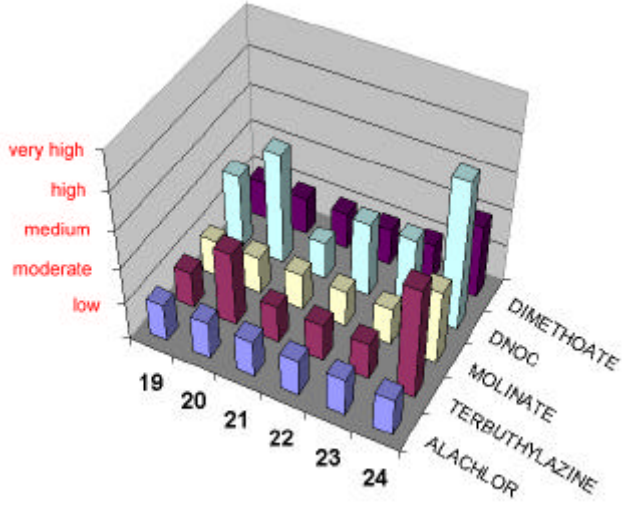
Irrigation practices, typical of northern areas where maize and rice are cultivated, add a further contribution to richarge.

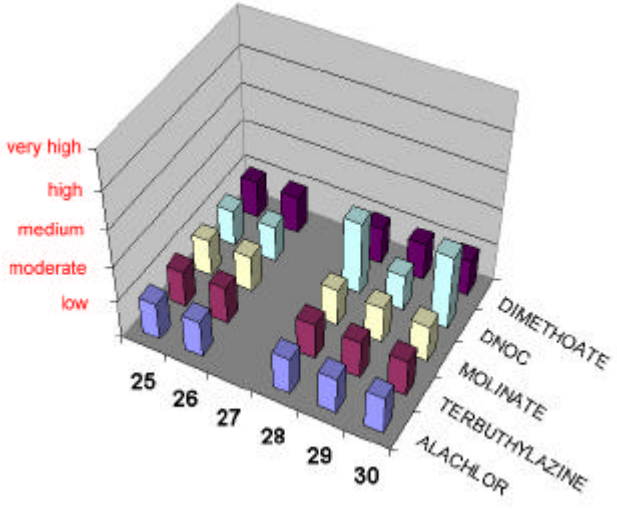
RESULTS - AF/RF











RESULTS - AF/RF
Leaching sensitivity

- South of Italy: low leaching sensitivity for all the considered pesticides;
- North of Italy (scenarios 7, 9, 10, 13): quite high leaching sensitivity for all the pesticides;
- The other scenarios of the North and Center of Italy: leaching sensitivity varying according to the considered pesticides.

CRITICAL ISSUES 1

- ✓ Necessary data for the identification of scenarios are produced by different institutions at national, regional, and sub-regional level.

- ✓ The number of scenarios identified in this work is based on data made available and should not be considered exhaustive.

CRITICAL ISSUES 2

- For a detailed description of the Italian environment it is likely that the availability of further information can increase the number of scenarios.

- For registration purposes at national level it is likely that the number could be reduced.

CONCLUSIONS 1

Preliminary identification of 30 prominent pedo-agro-climatic scenarios.

The application of the screening index AF/RF for Alachlor, Terbuthylazine, Molinate, DNOC and Dimetoate to these scenarios produced a ranking with reference to leaching sensitivity

starting point to classify territory with respect to pesticide leaching risk.

CONCLUSIONS 2

Scenarios identified might be useful for environmental management and the identification of areas at risk of groundwater pollution ("regional authorisations")

Work in progress is addressed to implement the methodology and to carry out national scenarios ("national authorisations")