Higher Tier Rice Modeling for the EU

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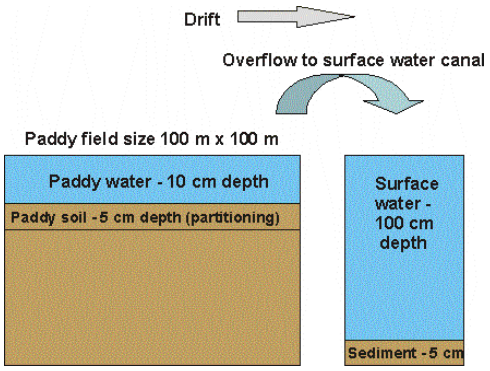
Rationale for higher tier modeling

- **Med-Rice (2003) guidance provides a <u>standardized</u> methodology for the Step 1 assessment of rice pesticides in the EU registration process.**

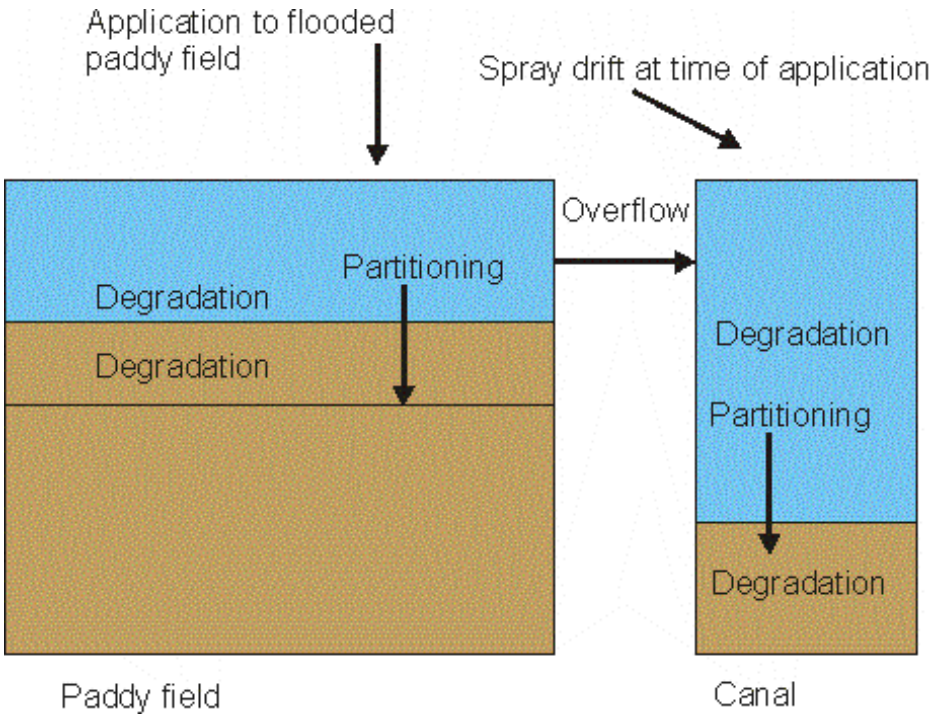
- **Predicted concentrations in paddy water (PEC_{PW}), paddy soil (PEC_{SOIL}), receiving canal water (PEC_{SW}) and canal sediment (PEC_{SED}) are calculated *via* a spreadsheet tool.**

- **A number of simplifying assumptions are made and some processes are omitted.**



MED-RICE

Dissipation processes



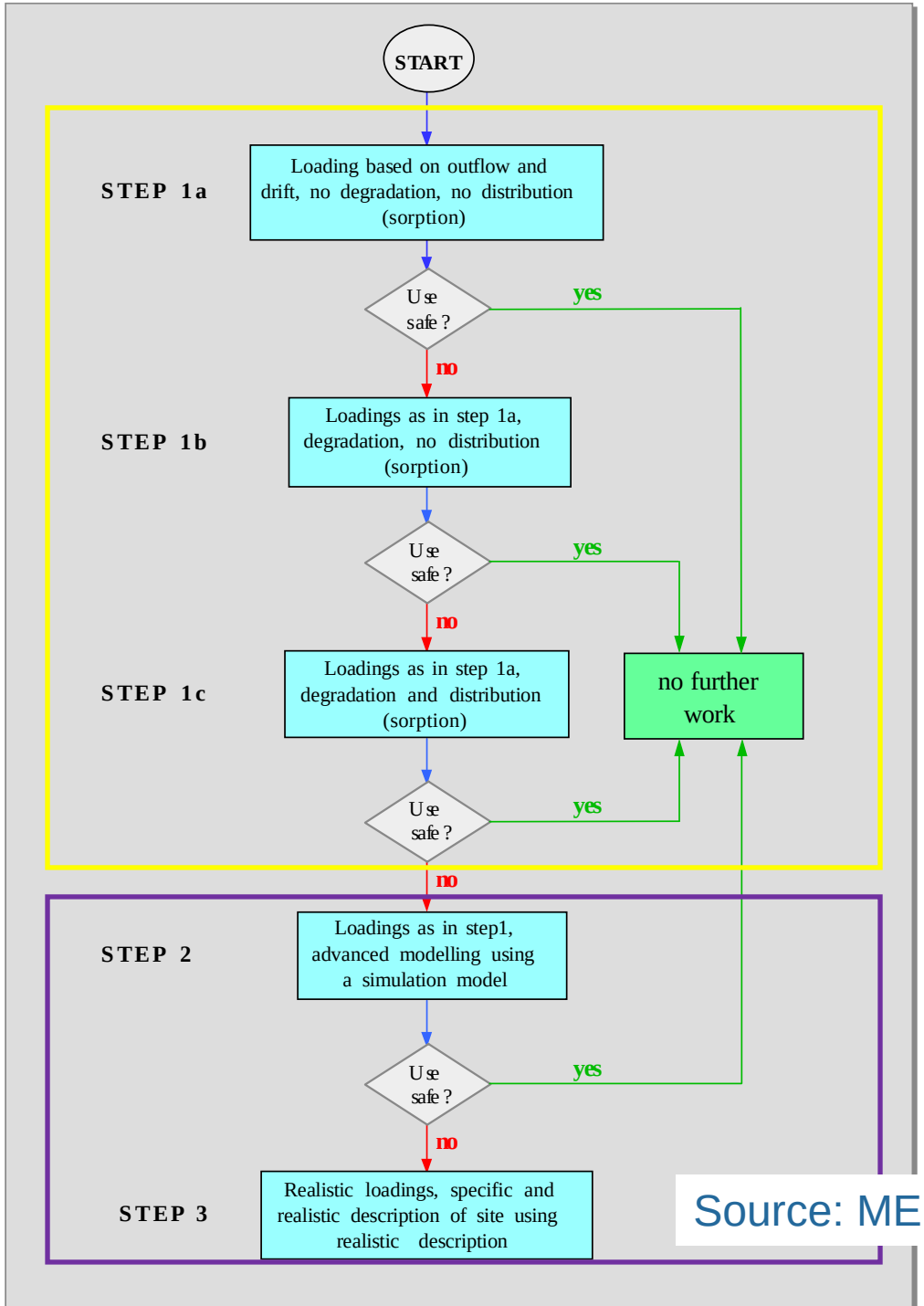
PECsw results

PECsw (t) (mug/L)

	Clay			Sand		
Day	PECsw (t)	TWA sw (t)		PECsw (t)	TWA sw (t)	
0	2.79			4.77		
1	2.74	1 day	2.76	4.68	1 day	4.72
2	2.68	2 day	2.74	4.58	2 day	4.68
4	2.57	4 day	2.68	4.40	4 day	4.58
7	2.42	7 day	2.60	4.14	7 day	4.45
14	2.10	14 day	2.43	3.60	14 day	4.16
21	1.83	21 day	2.27	3.12	21 day	3.89
28	1.59	28 day	2.13	2.71	28 day	3.64
42	1.19	42 day	1.88	2.04	42 day	3.22
50	1.02	50 day	1.76	1.74	50 day	3.00
100	0.37	100 day	1.20	0.63	100 day	2.05

MED-RICE

Higher tier



Source: MED-RICE Manual

Outline

- Present two approaches to higher tier rice modeling
  - Simple
  - Complex
- Discuss potential scenario configurations

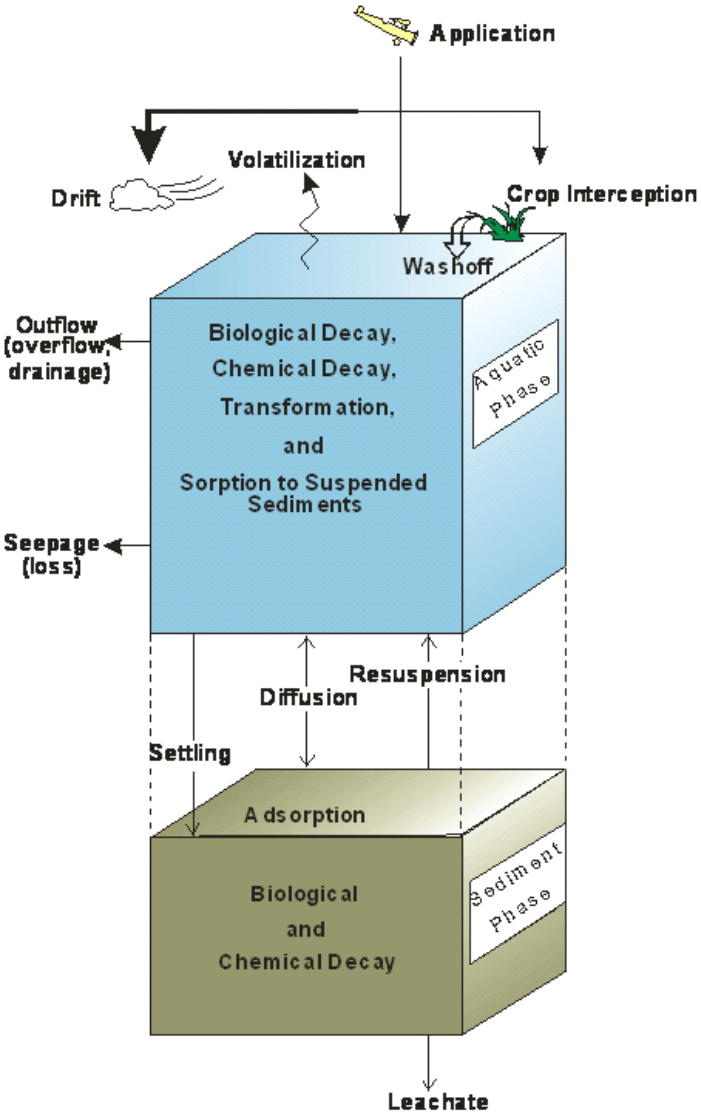
RICEWQ

Recommended by the European Commission for higher tier exposure assessment (Sanco/1090/2000).

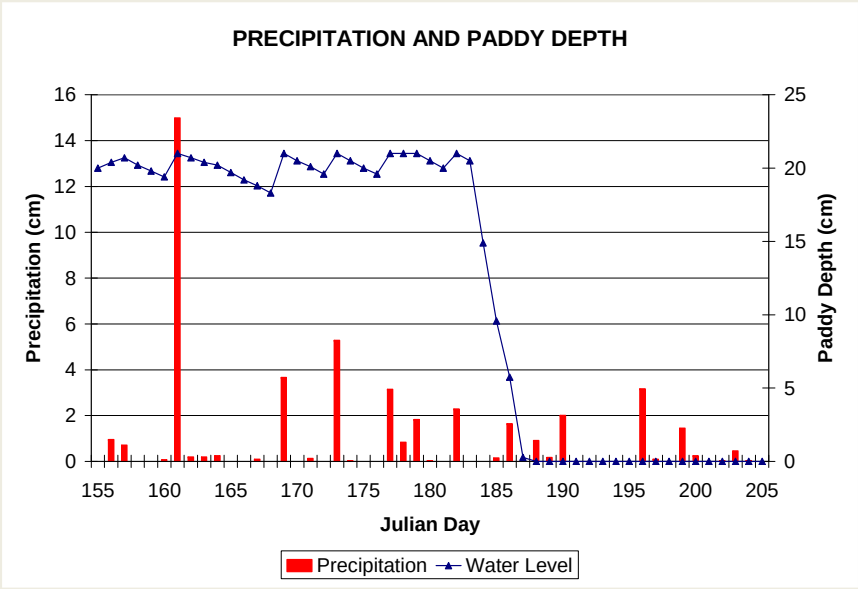
Limitation: Need to link to surface water model (i.e., EXAMS, RIVWQ, TOXSWA)

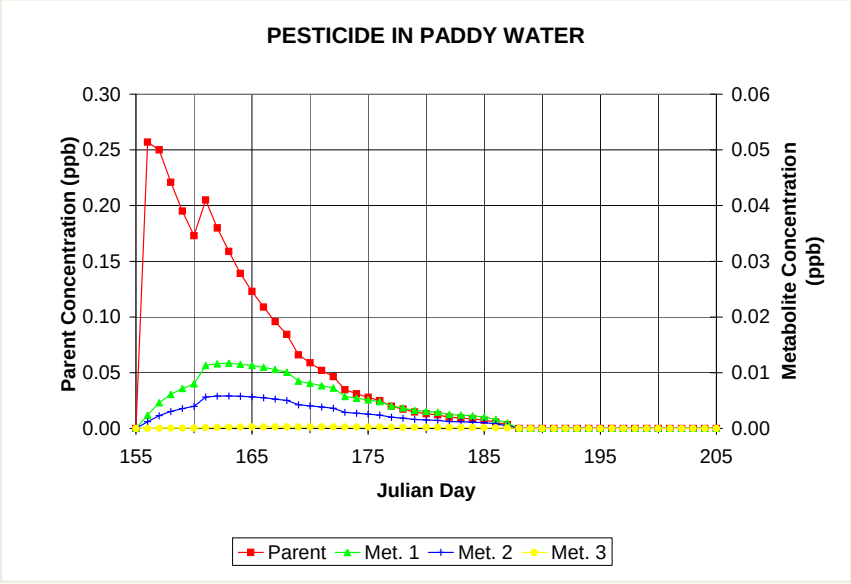
Parameter	MED-RICE	RICEWQ
Drainage Management	No*	Yes
Irrigation	No	Yes
Multiple Applications	No	Yes
Slow Release Application	No	Yes
Incorporated Application	No	Yes
Drift	Yes	Yes
Crop Growth	No	Yes
Foliar Interception	Yes	Yes
Foliar Washoff and Decay	No	Yes
Degradation	Yes	Yes
Adsorption	Yes	Yes
Suspended Sediment	No	Yes
Metabolites	No	Yes
Weather	No	Yes
Probabilistic (multi-years)	No	Yes

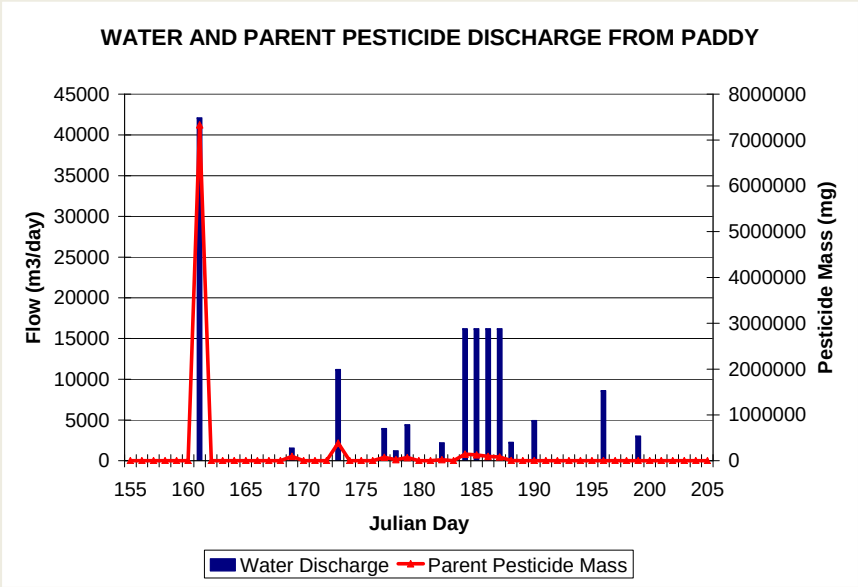
*Able to change holding period

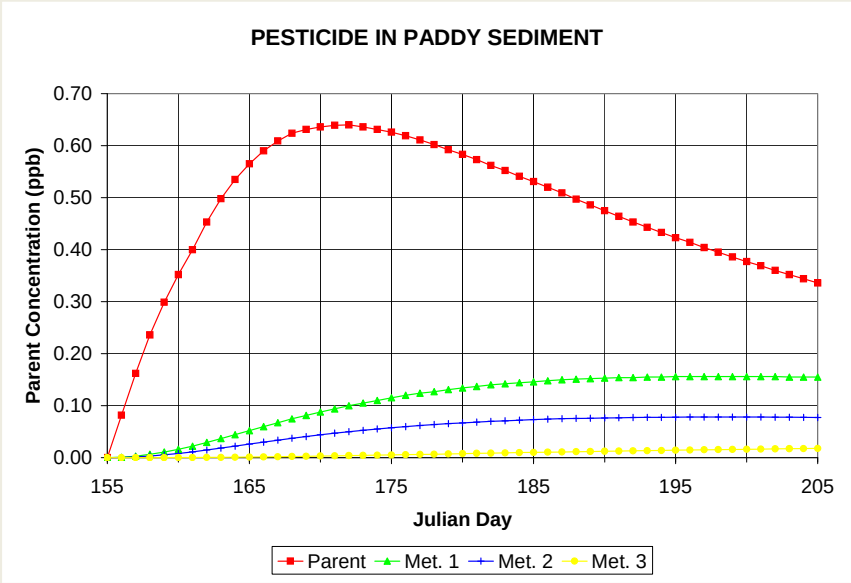


Water and chemical mass balance

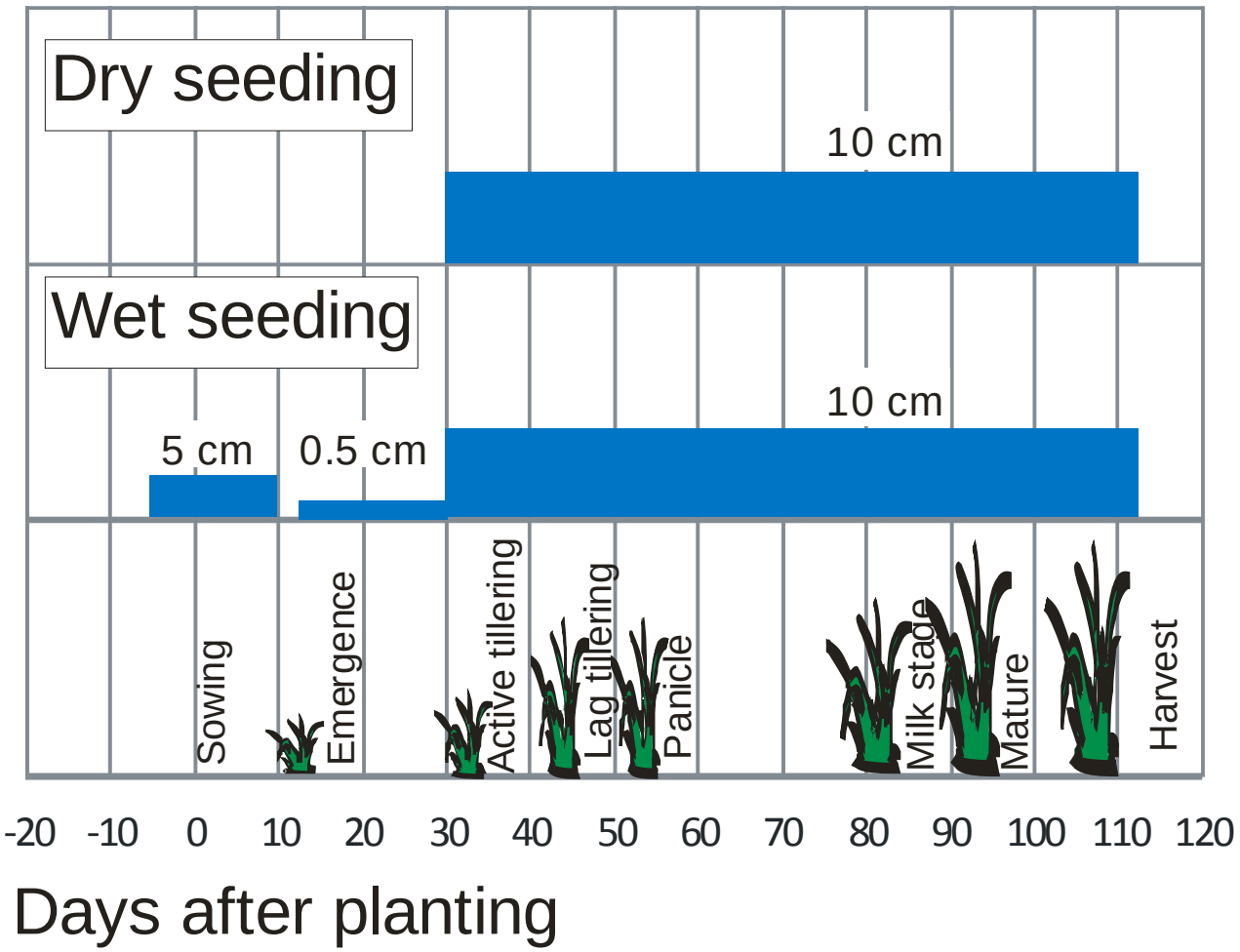


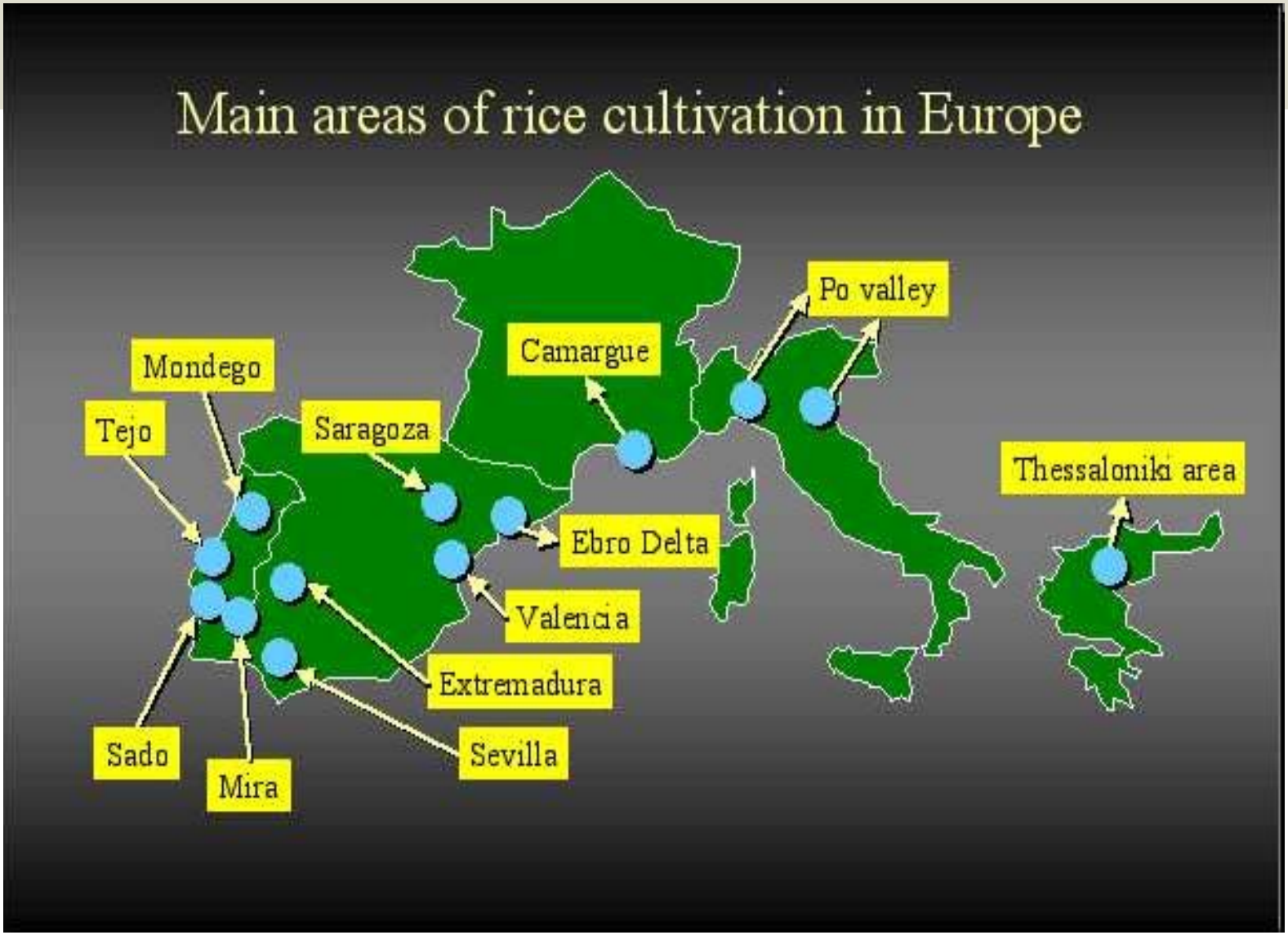






Water management in rice





Source: MED-RICE Manual

Harvested production of rice, 2007

Country	Rice harvested (1000 t)
Italy	1,493
Spain	713
Greece	201
Portugal	155
France	91
Bulgaria	31
Romania	30
Hungary	10

Source: Eurostat – crop production database

Higher tier modeling

Can be simple:

- One rice field
- One water body (canal or stream)
- FOCUS weather (20 years)
- Two soils (clay, sand)

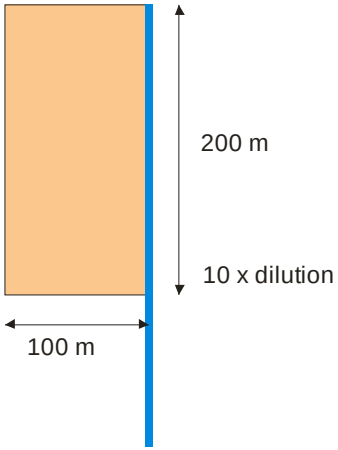
Or complex:

- Watershed scale (1000 fields)
- Three water bodies (ditches, canals, rivers)
- Rice region specific weather
- Representative soils

Simple

Rice field → MED-RICE canal

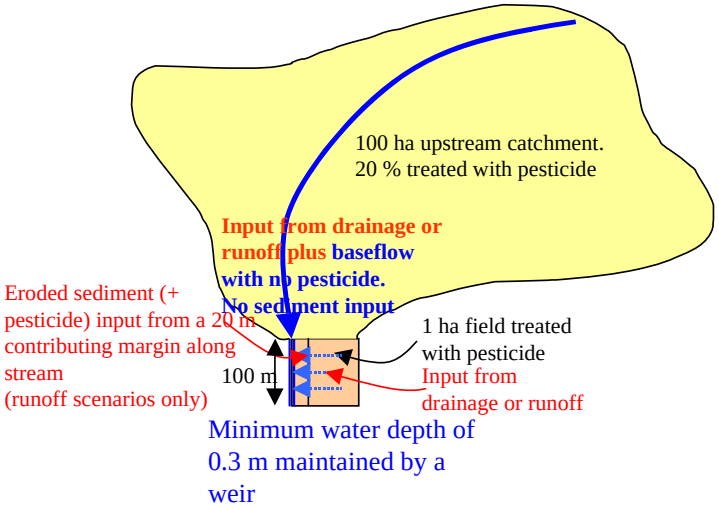
→



Rice field → FOCUS stream

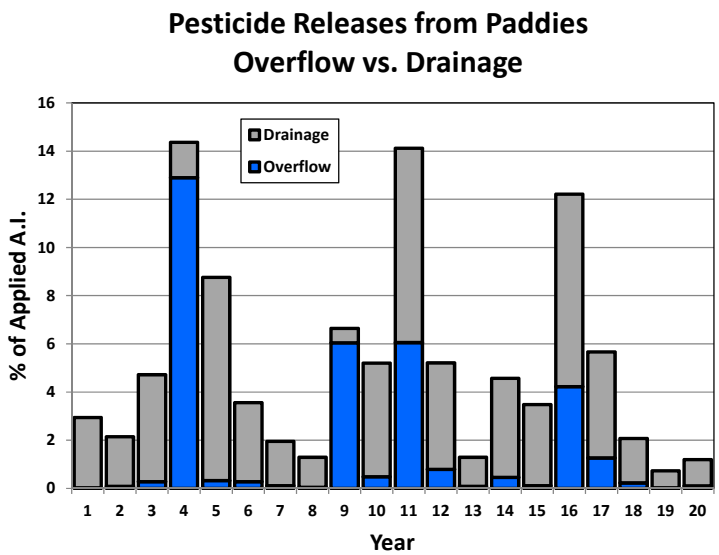
→

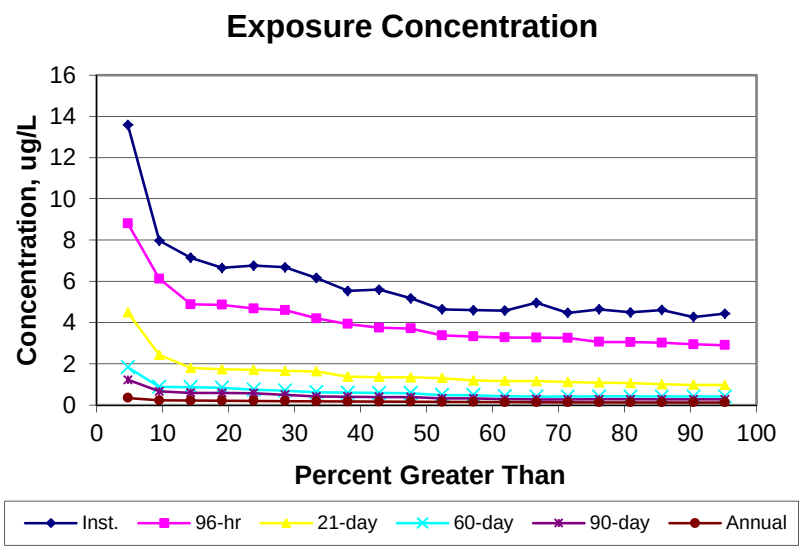
FOCUS Stream Scenario



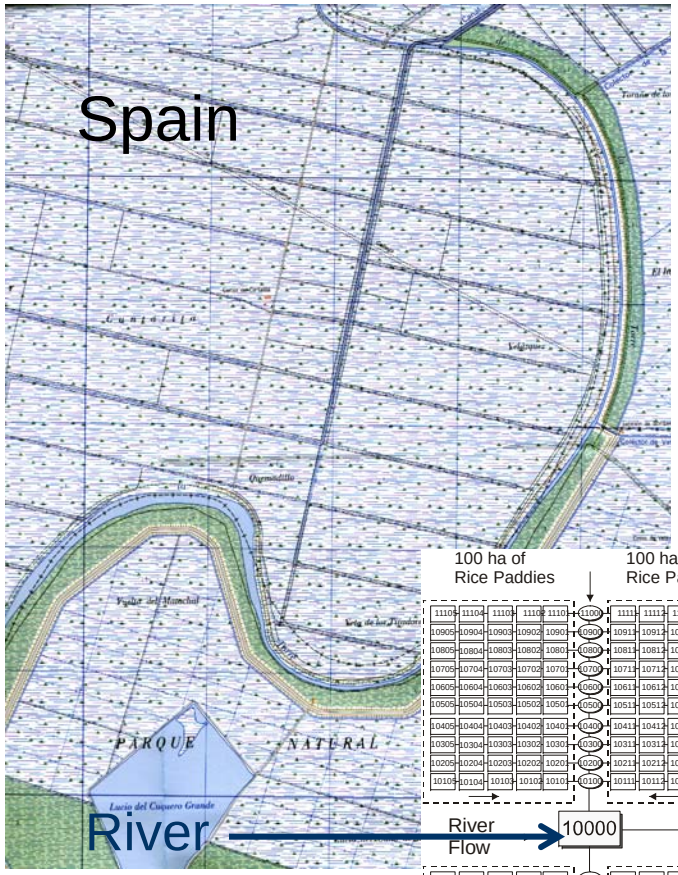
Simple

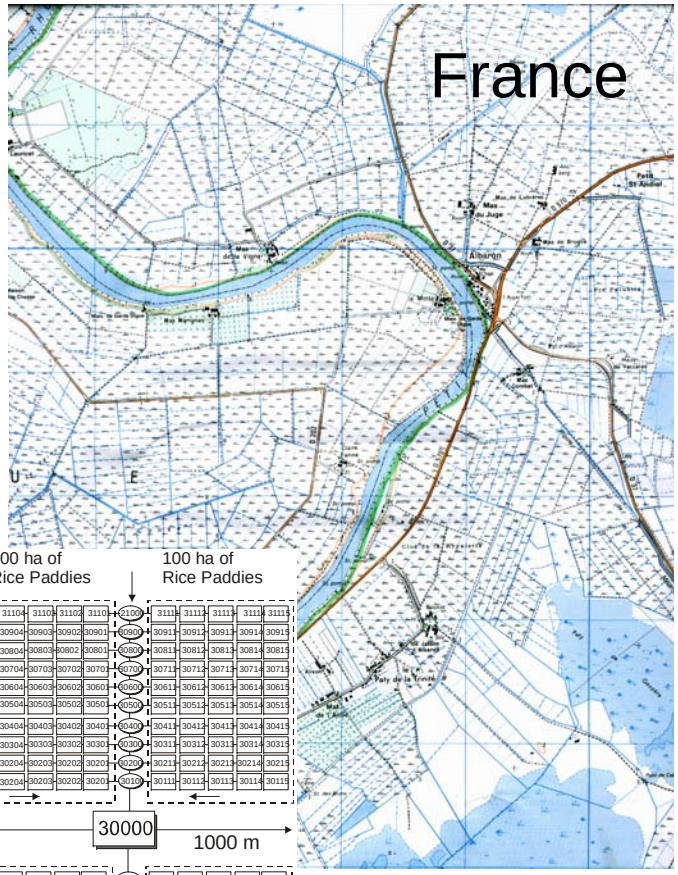
Surface water body	Application Rate (kg/ha)	PECsw (ppb)					
		Peak	96-Hour	21-Day	60-Day	90-Day	Annual Average
Canal	0.1	0.0080	0.0070	0.0028	0.0012	0.0008	0.0002
Stream	0.1	0.0834	0.0702	0.0342	0.0158	0.0108	0.0028



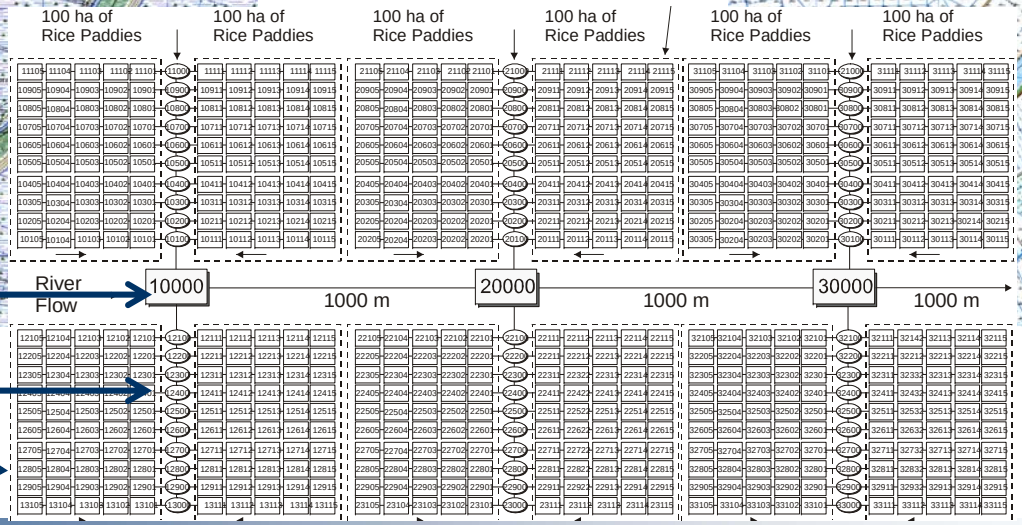


Complex: Watershed scale





Schematic Diagram



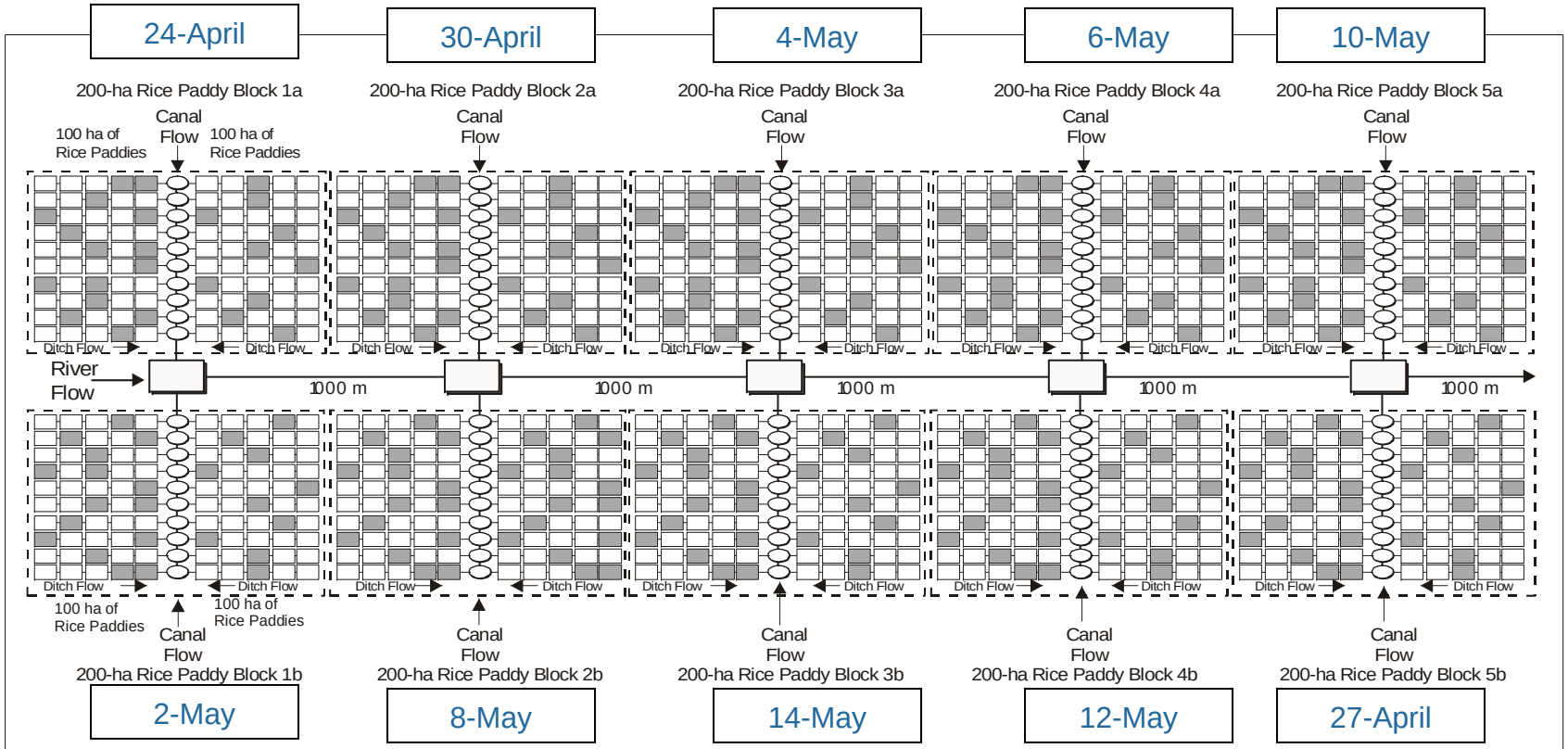
River

Canal

Ditch

2000-ha

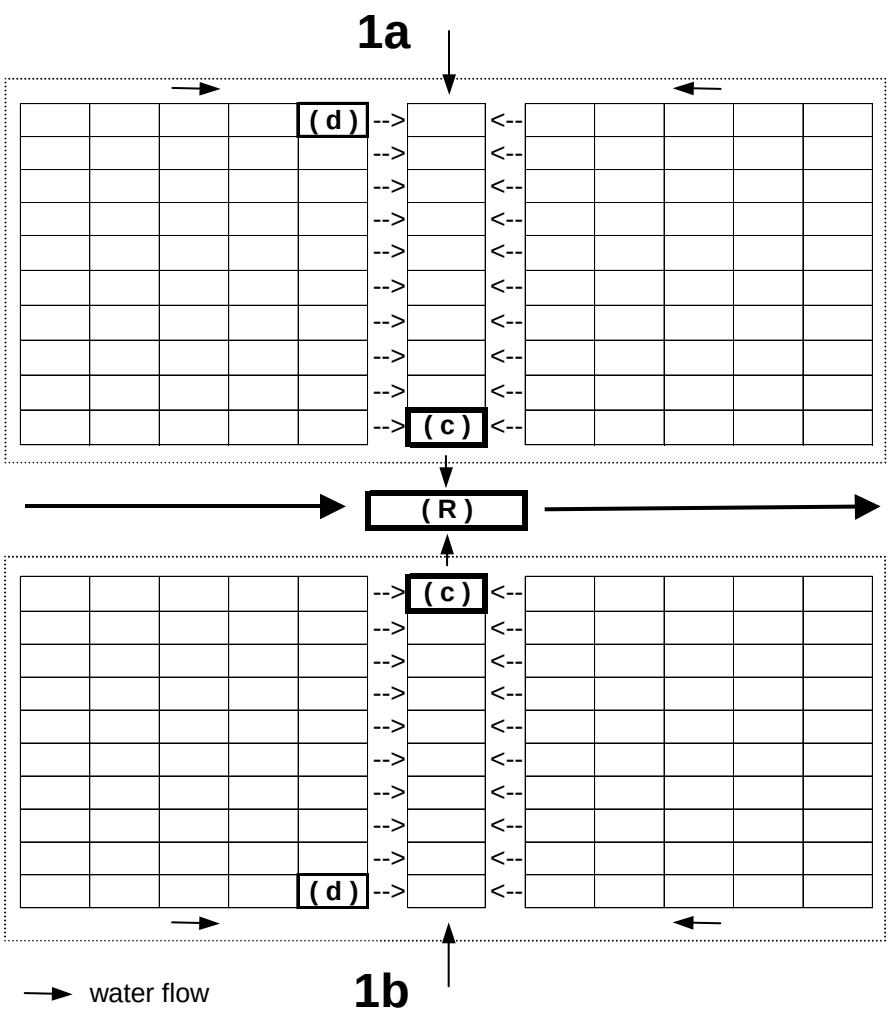
Watershed schematic



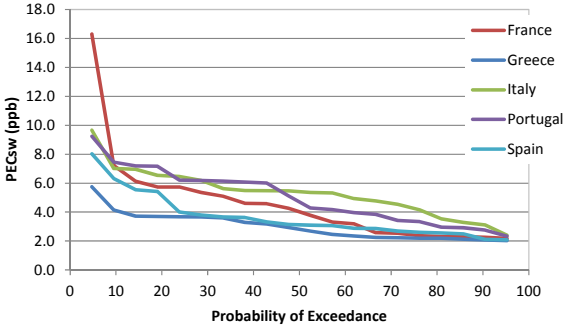
Note:

1. Represents a node on the ditch.
2. Represents a treated node on the ditch.
3. Represents a node on the canal.
4. Represents a node on the river.
5. Total Rice Drainage Area = 2000 ha.

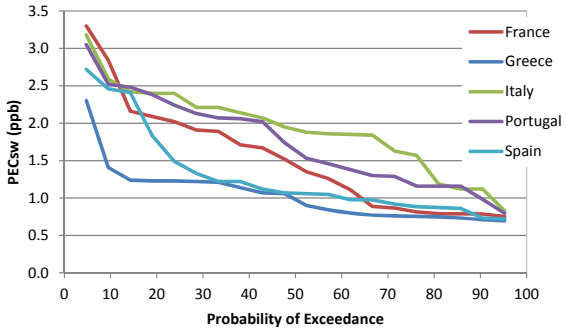
Sampling nodes in watershed



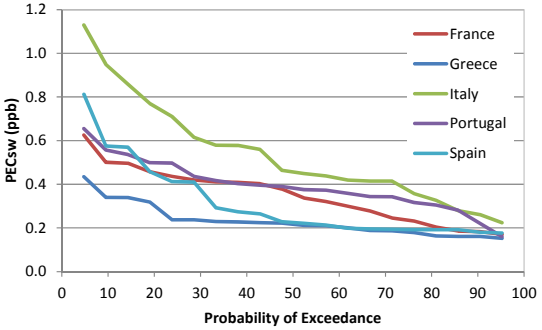
(d) Ditch node sample point



(c) Canal node sample point



(R) River node sample point

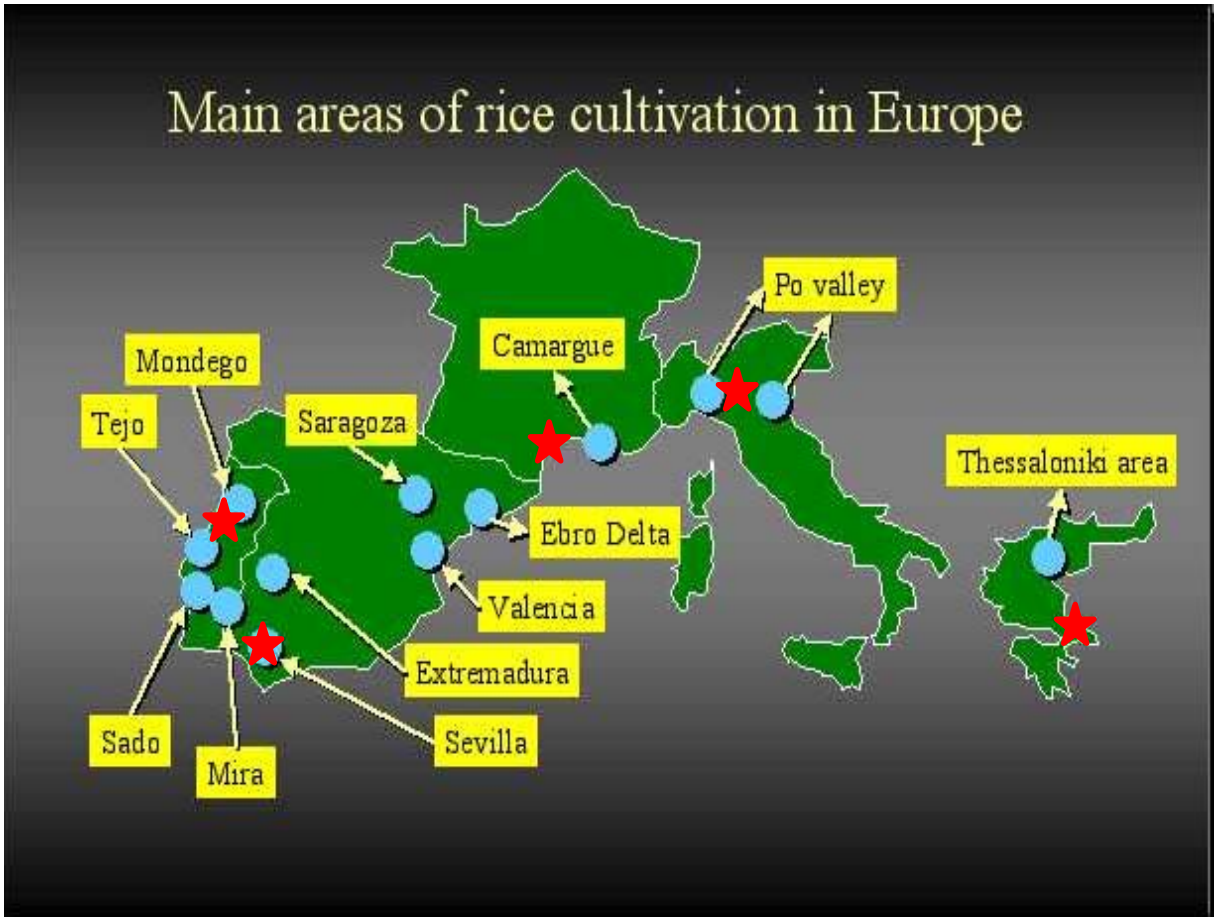


Discussion

- Should there be “standard” scenarios for higher tier rice modeling?
- Simple = Step 2 and Complex = Step 3?
- What ecological endpoint(s) should be used for higher tier? Ditch, Canal, Stream, River?
- Should existing FOCUS weather be used or weather in rice areas (if different from FOCUS scenarios)?
- Probabilistic (i.e. 20 years) versus one year?
- For complex watershed-scale, what variability should be represented (water management, % treated, etc.)
- Country-specific differences (soils, agronomic practices)?
- Higher tier may result in higher PECs

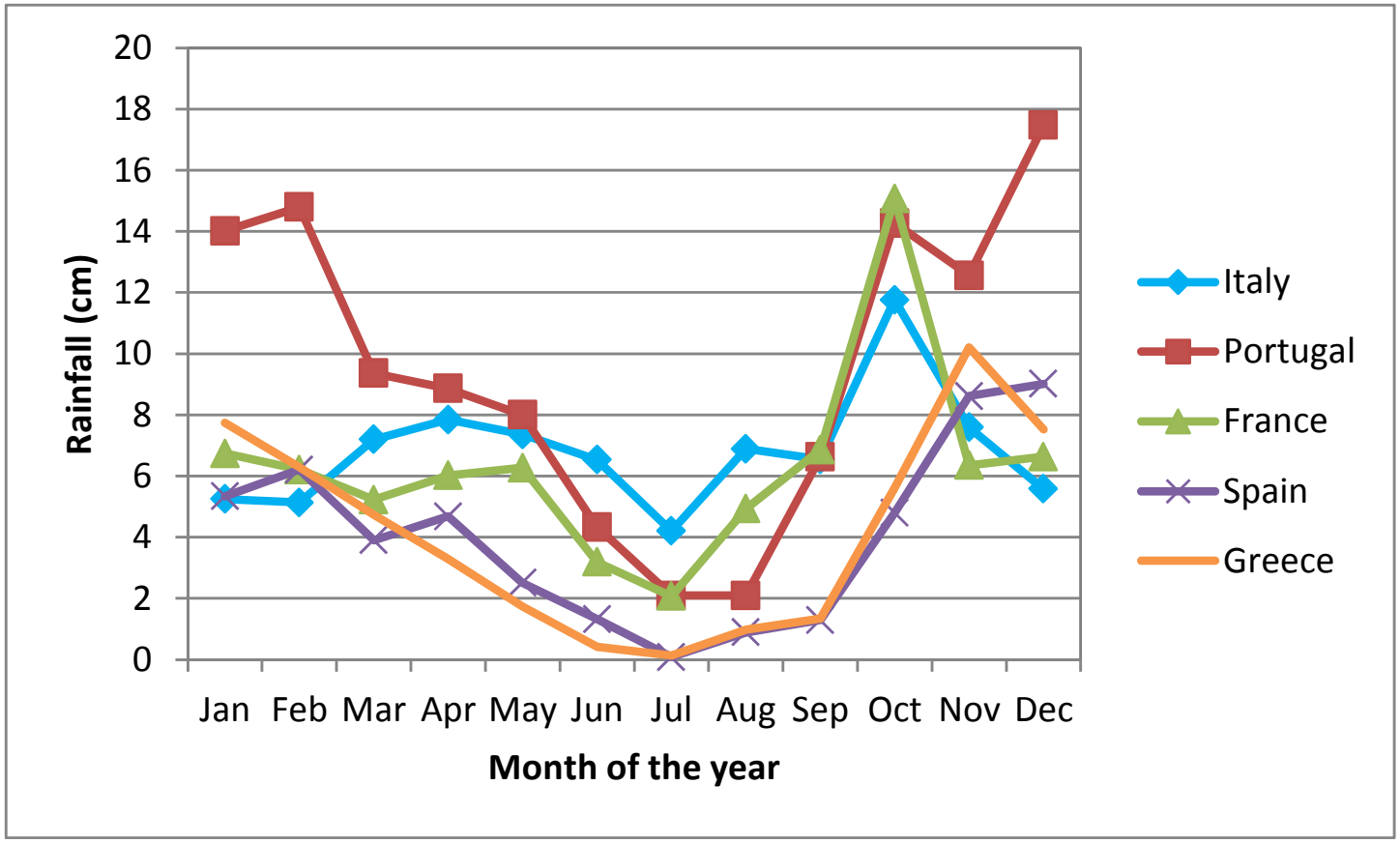
FOCUS weather stations

- **Italy:**
  Piacenza (pzz6.met)
- **Spain:**
  Sevilla (szz6.met)
- **Greece:**
  Thiva (tzz6.met)
- **Portugal:**
  Porto (ozz6.met)
- **France:**
  Roujan (r4noirr.met)

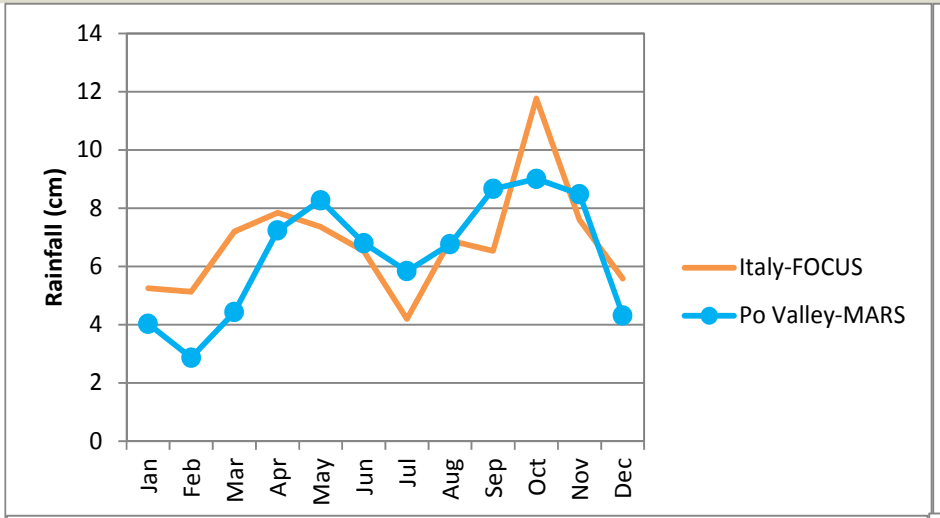


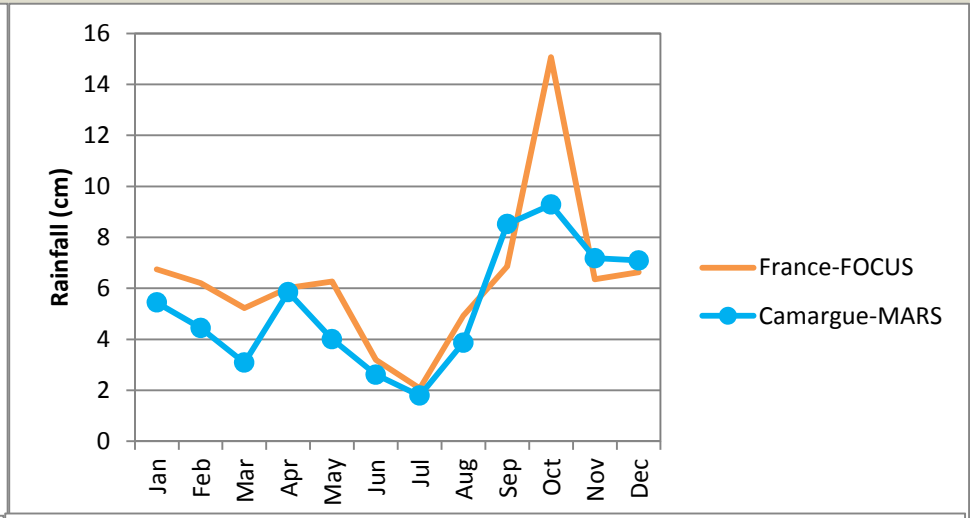
Source: MED-RICE Manual

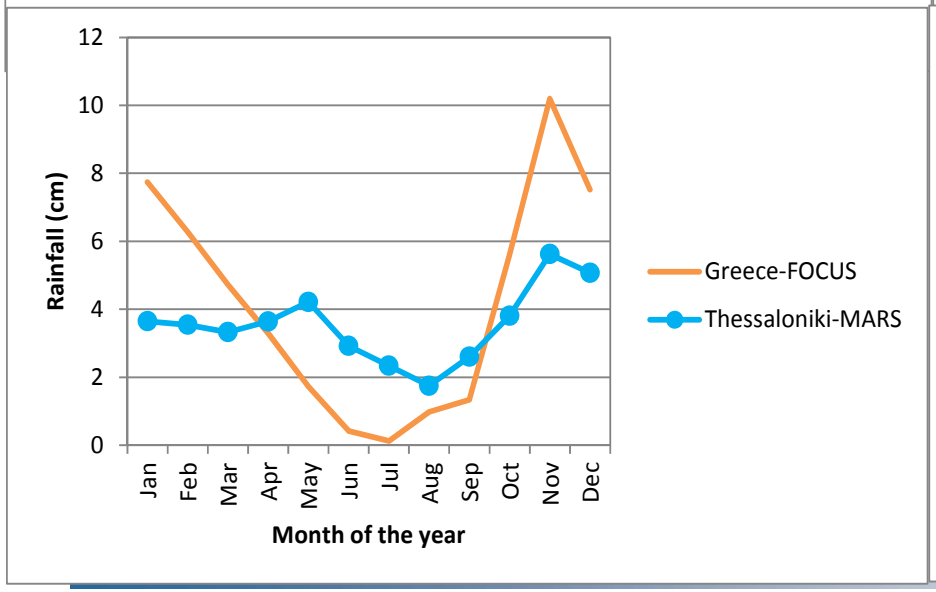
Average monthly rainfall of the weather scenarios (based on 20 years of daily data)

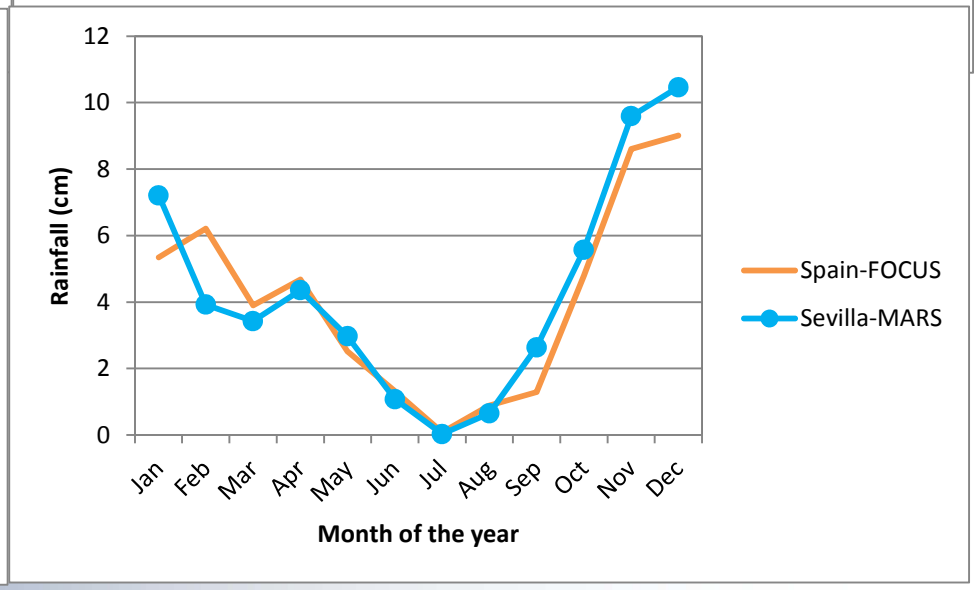


Average monthly rainfall of the weather scenarios



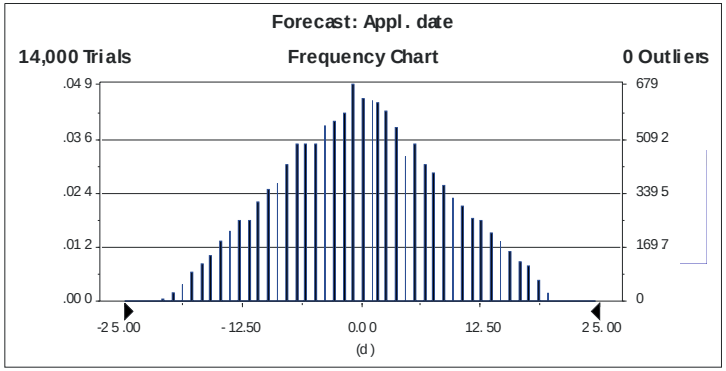


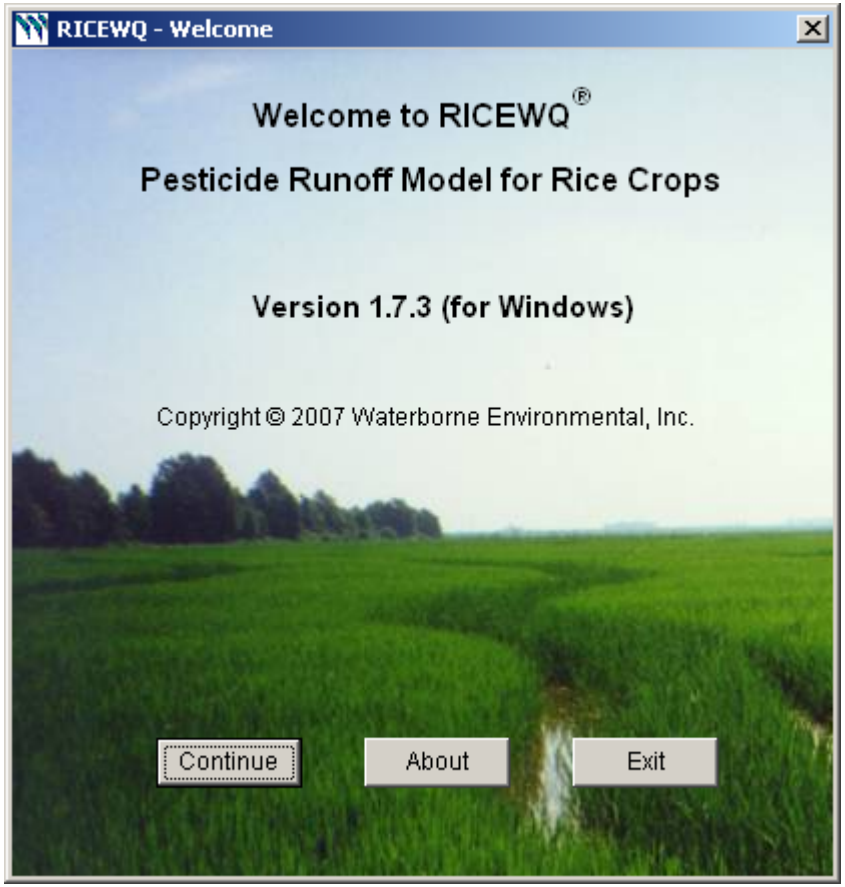
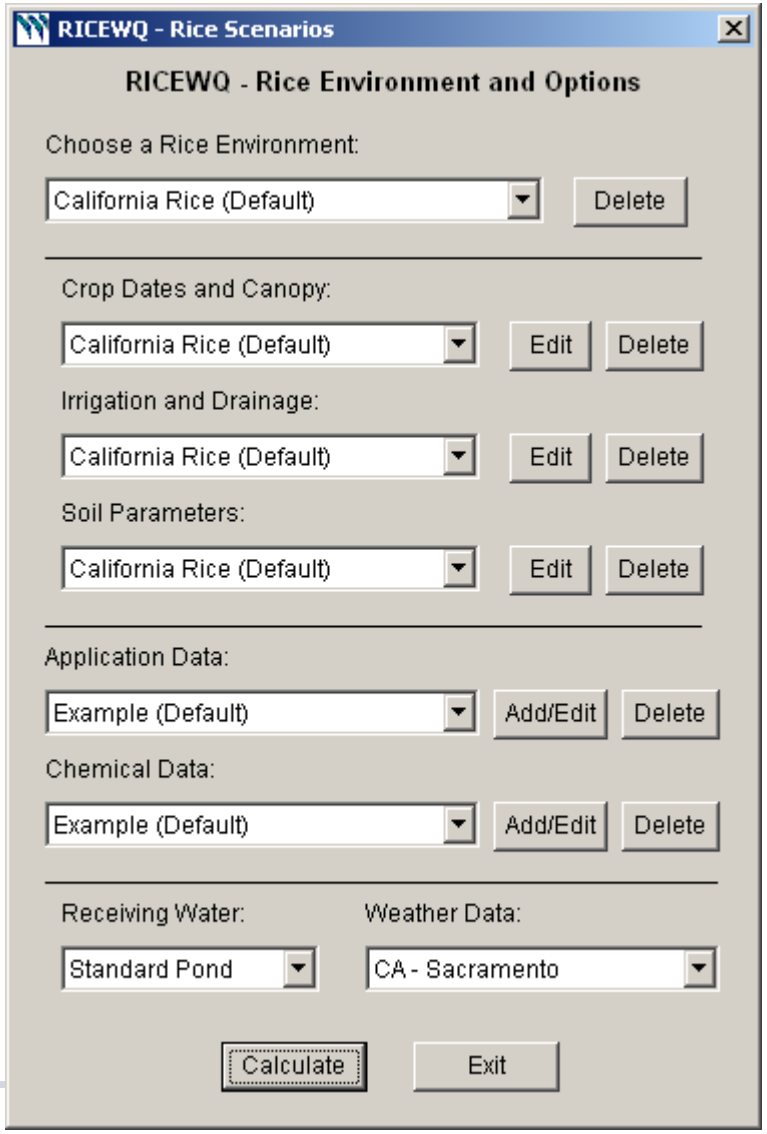




Watershed heterogeneity

- Rice density
- % rice treated
- Planting dates
- Application dates
- Water management
- Drift



x axis: days

RICEWQ-EXAMS Modeling Platform