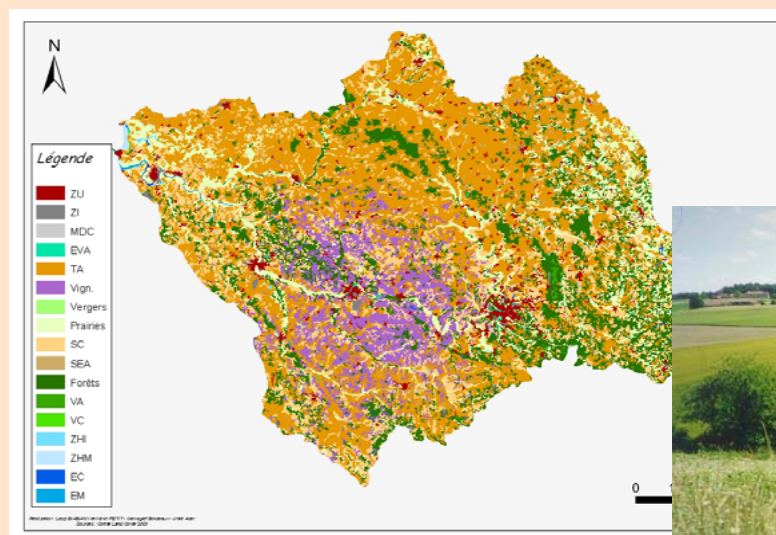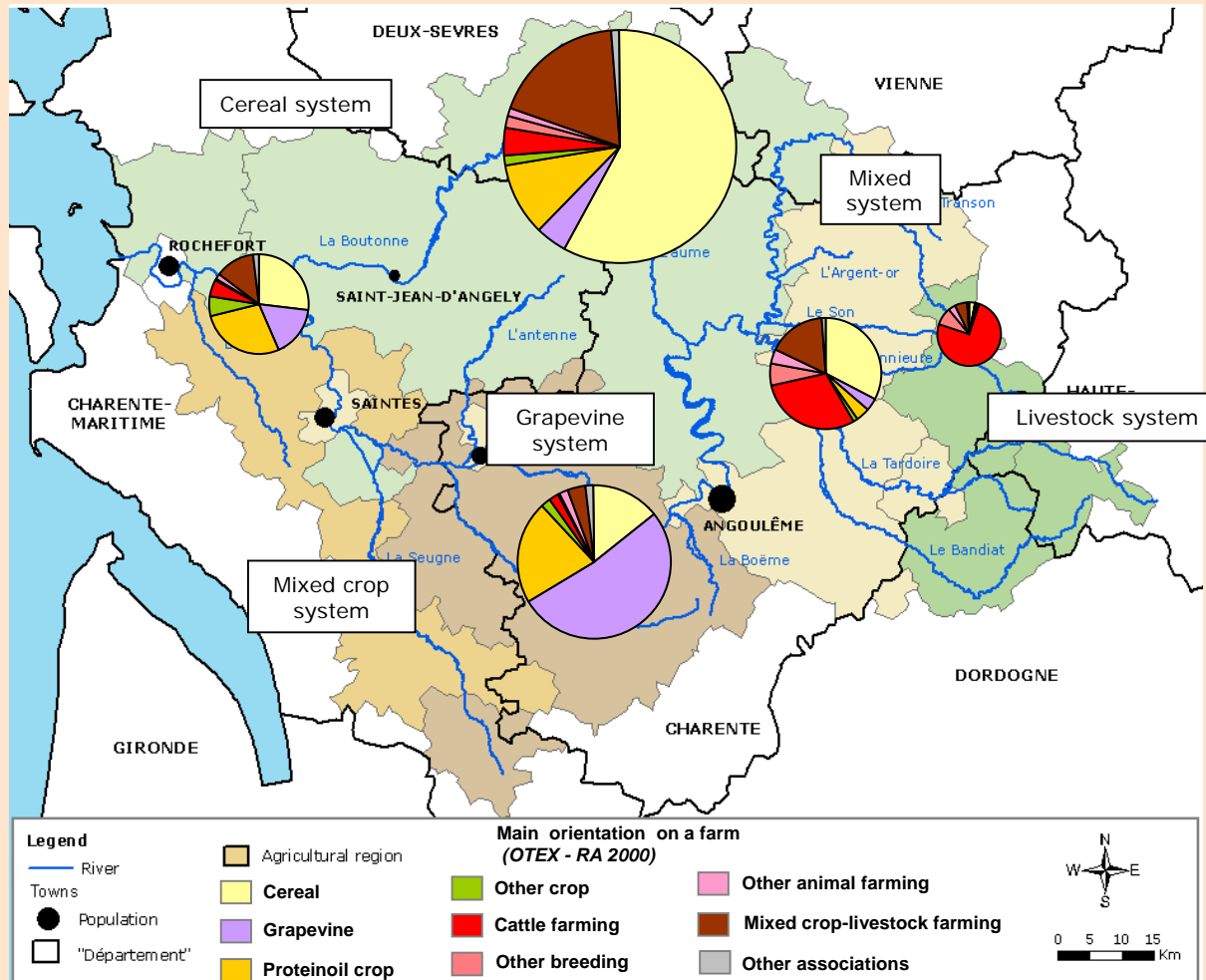# SSA 10 (Pertuis sea and Charente river basin)
Agriculture-Irrigation

Françoise Vernier - Paul Bordenave – Odile Leccia – Kevin Petit

- How to describe the agriculture on the Charente watershed in a simple way ?

- Contribution to the definition of scenarios

- Contribution to the extend model (from the specific agro-hydrological model SWAT)

SIXTH FRAMEWORK PROGRAMME

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Typology of farming systems

Data used : OTEX database, agricultural statistics, at the commune level

5 main types

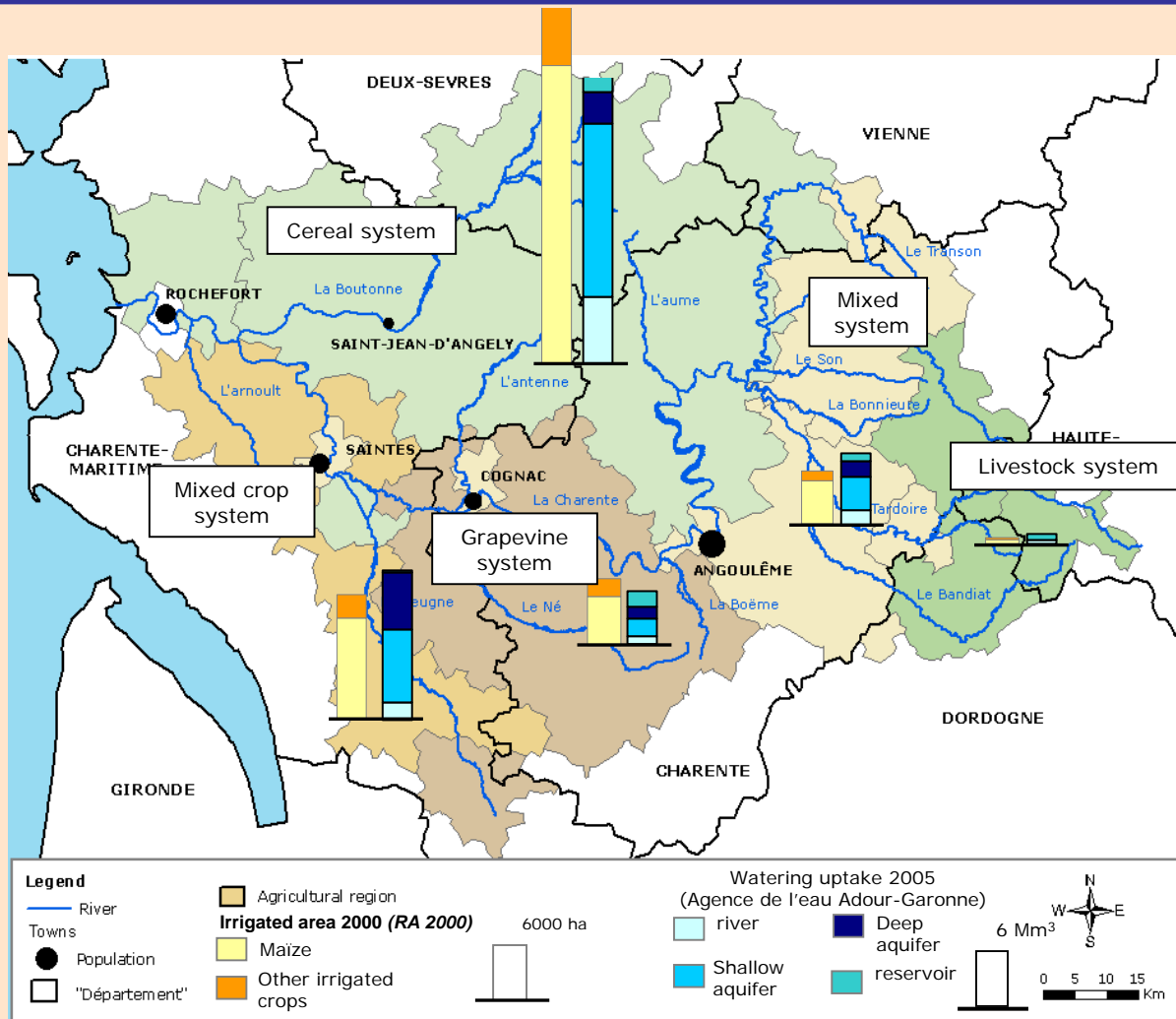**livestock system** : permanent grass and animal fodder.
mixed system : cattle farming, cereal farming and vineyard.
cereal system : cropping plan is essentially cereals (50%) and protein oil crops (25%). 60% of irrigated area and nearly 50% of water uptake.
grapevine system : More than 50 % of the cropping plan is grapevine. It is the Cognac vineyard.
mixed crop system : cereal, protein oil, grapevine. (19% of the irrigated area and 25% of the water uptake).

Legend
- River
- Towns
- Population
- "Département"

Main orientation on a farm (OTEX - RA 2000)

- Agricultural region
- Cereal
- Grapevine
- Proteinoil crop
- Other crop
- Cattle farming
- Other breeding
- Other animal farming
- Mixed crop-livestock farming
- Other associations

0 5 10 15 Km

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Science and Policy Integration for COastal Systems Assessment

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85 000 ha of irrigated area and 3000 irrigated farms,

- Maize is the main irrigated crop and represents 80 % of the irrigated area.

- 60% of the maize area is irrigated.

- Irrigated farms usually have a bigger usable farm area and a higher yield.

- Watering uptake is variable (climate - average close to 90 Mm3 -

- An average 156 mm is brought to the maize

Legend

- River
- Towns
- ● Population
- □ "Département"
- Agricultural region
- **Irrigated area 2000 (RA 2000)**
- Maïze
- Other irrigated crops

6000 ha

Watering uptake 2005
(Agence de l'eau Adour-Garonne)
- river
- Deep aquifer
- Shallow aquifer
- reservoir

6 Mm³

0 5 10 15 Km

Surveys →experts : agricultural advisers, chambers of agriculture

All the river basin area is concerned (samples)

Data collected :

- detailed agricultural practices (N, P ,K , pesticides, irrigation)

-- crop management sequence :

-Dates of sowing, harvest, beginning and end of irrigation, date of treatments or runs on the plot,… → one CMS/crop/system/area

-- crops rotations → main rotations

- Perception about scenarios of evolution of agriculture (2020)

Cartographie des 9 classes

Légende Classes
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
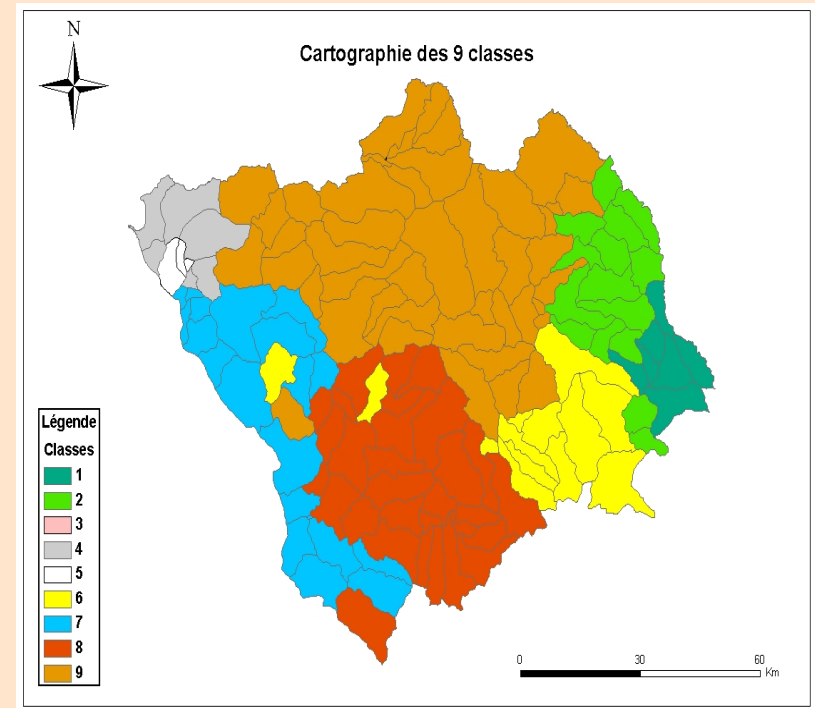
Classification of the hydrological units using 43 variables (soil occupation, types of crops, types of soil, drainage, slopes) = 8 types

Contribution to the definition of scenarios

Some predictable scenarios for agriculture :

-Irrigation measures (Irrig01/Irrig02) applied to a percentage of farmers

    - Substitution of main irrigated crop (corn) by other crops requiring less water (corn → sorghum or winter crops)

    - change in farming system irrigated → non irrigated system

-New reservoirs/hydrographic units → increase in available resources for irrigation → less uptake in the river

-Decrease in irrigated area (more constraints from local policies, limitation of irrigating period)

-New crop rotations on the area

-Increase in the usable farm area (more production)

    One global scenario (example decreasing irrigated corn on the Charente river basin) = different local scenarios for each of the sub-basins in the hydrological model (in this case depending on the irrigated corn area and the agricultural system)

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SIXTH FRAMEWORK PROGRAMME
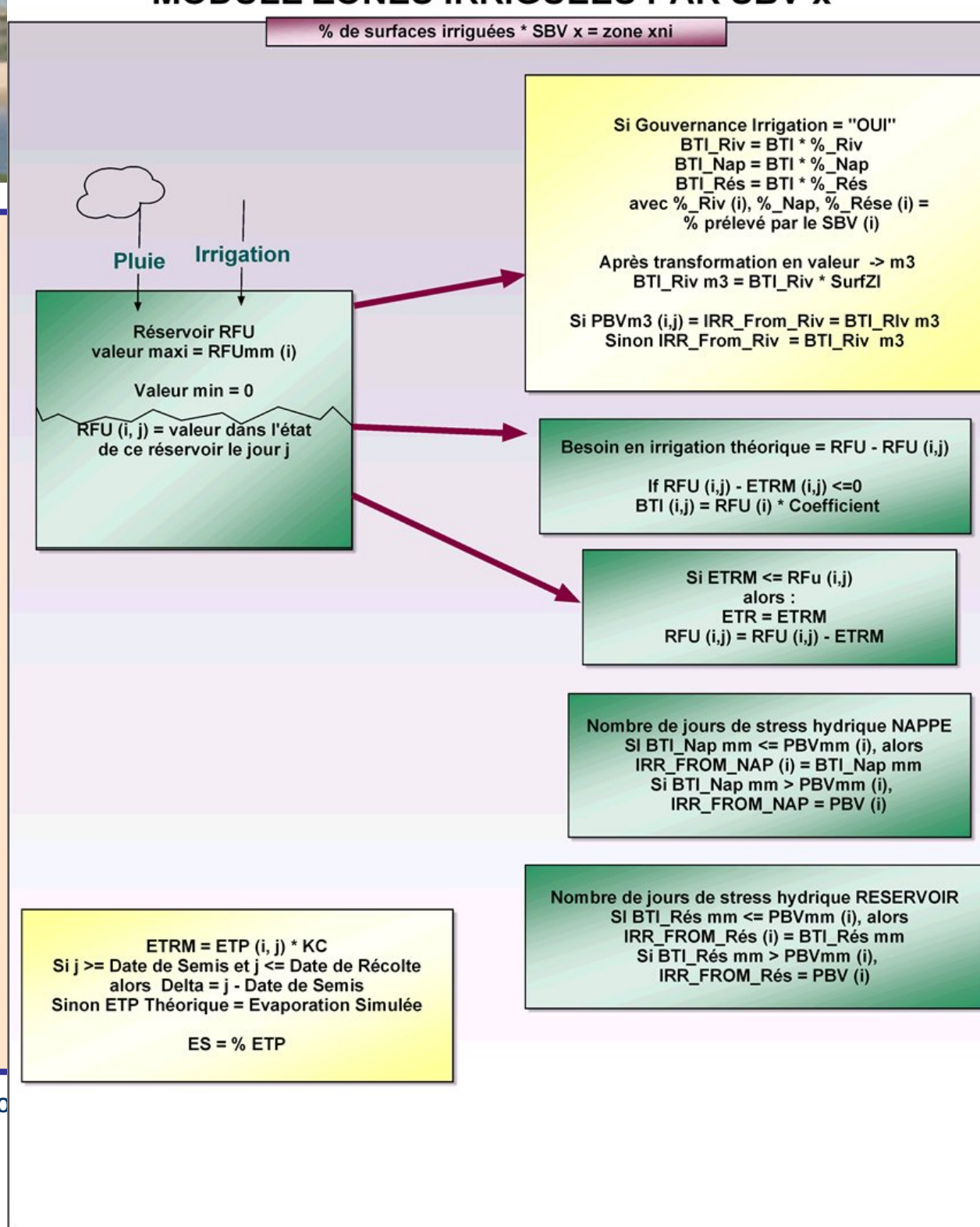
From SWAT model
to Extend model

- Propositions to include in the extend model some main functions :

- calculation of the need in irrigation /crop

- function of production and decrease of production if the need of the crop is not satisfied

- taking in account the different types of uptakes (river, reservoirs, groundwater) for irrigation

- Policy constraints (values of thresholds) limitation of irrigation

MODULE ZONES IRRIGUEES PAR SBV X

% de surfaces irriguées * SBV x = zone xni

Pluie   Irrigation

Réservoir RFU
valeur maxi = RFUmm (i)

Valeur min = 0

RFU (i, j) = valeur dans l'état de ce réservoir le jour j

Si Gouvernance Irrigation = "OUI"
BTI_Riv = BTI * %_Riv
BTI_Nap = BTI * %_Nap
BTI_Rés = BTI * %_Rés
avec %_Riv (i), %_Nap, %_Rése (i) =
% prélevé par le SBV (i)

Après transformation en valeur -> m3
BTI_Riv m3 = BTI_Riv * SurfZI

Si PBVm3 (i,j) = IRR_From_Riv = BTI_Rlv m3
Sinon IRR_From_Riv = BTI_Riv m3

Besoin en irrigation théorique = RFU - RFU (i,j)

If RFU (i,j) - ETRM (i,j) <=0
BTI (i,j) = RFU (i) * Coefficient

Si ETRM <= RFu (i,j)
alors :
ETR = ETRM
RFU (i,j) = RFU (i,j) - ETRM

Nombre de jours de stress hydrique NAPPE
SI BTI_Nap mm <= PBVmm (i), alors
IRR_FROM_NAP (i) = BTI_Nap mm
Si BTI_Nap mm > PBVmm (i),
IRR_FROM_NAP = PBV (i)

Nombre de jours de stress hydrique RESERVOIR
SI BTI_Rés mm <= PBVmm (i), alors
IRR_FROM_Rés (i) = BTI_Rés mm
Si BTI_Rés mm > PBVmm (i),
IRR_FROM_Rés = PBV (i)

ETRM = ETP (i, j) * KC
Si j >= Date de Semis et j <= Date de Récolte
alors Delta = j - Date de Semis
Sinon ETP Théorique = Evaporation Simulée

ES = % ETP

SIXTH FRAMEWORK PROGRAMME

- We provide aggregated data about agriculture on the watershed

  Level : Commune/HU → sub-basin of the hydrological module

- We provide simplified functions to be include in the extend model

- SWAT model is a specific agro-hydrological tool able to run combined agricultural scenarios (substitution of crops, rotation)→ we can provide expertise to improve the extend model