

HOW TO DEAL WITH IRRIGATION DEMAND IN A CONTEXT OF WATER SCARCITY AND WATER UNCERTAINTY:

An example of combining tools in the Charente river Basin in France

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Context

- In France many water conflicts appear in the last 20 years (agricultural demand and environment requirement)
- Minimum base flow of some rivers cannot always be guaranteed
- Consequences:
 - Reduction of the rivers self-epuration capacity
 - Damages to the aquatic flora and fauna
 - Adverse effects on the economy (agricultural production, leisure, tourism)
 - ...

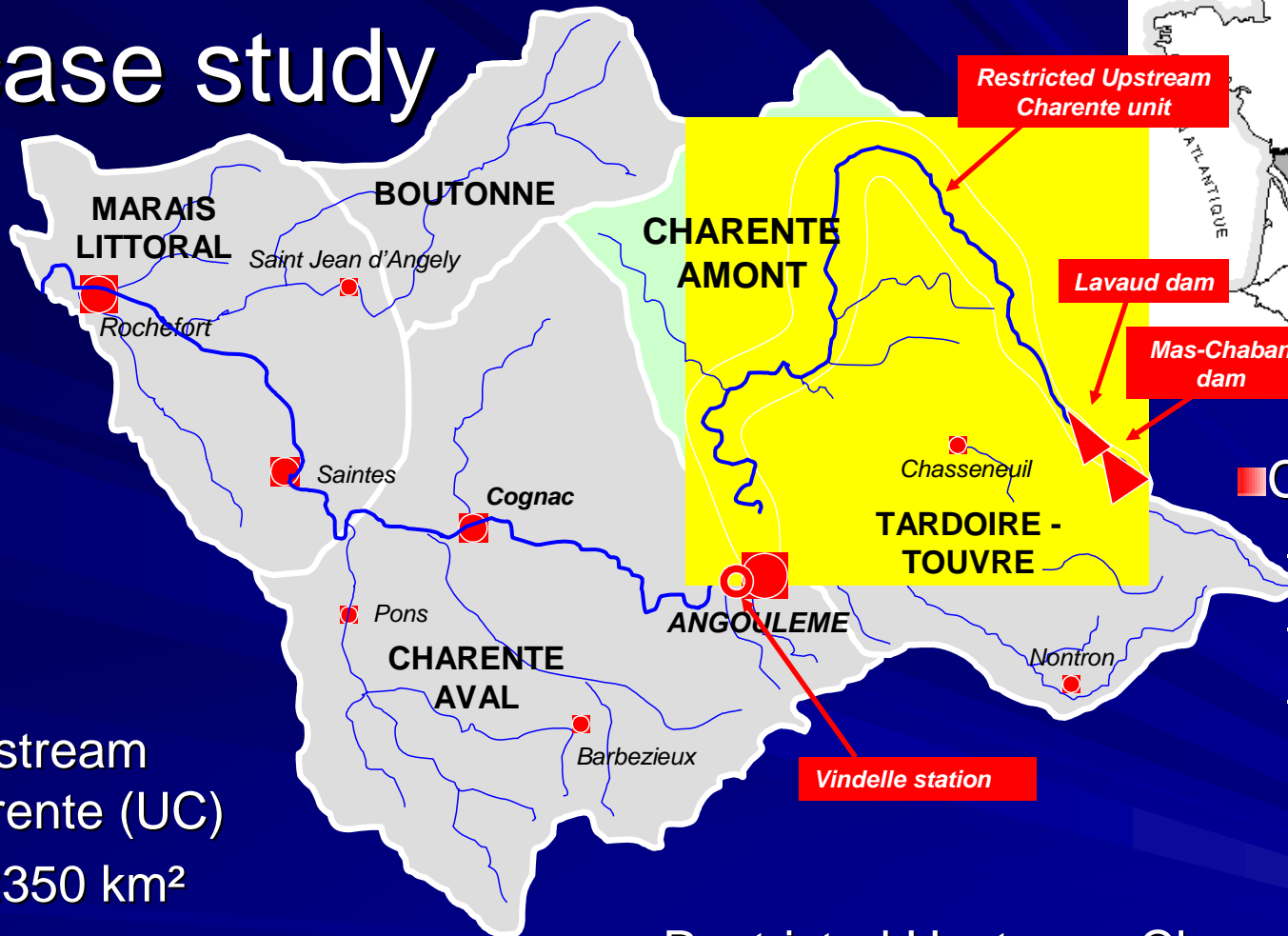
 **Implementation of Volumetric Based Management (VBM) tools**

VBM (Volumetric Based Management)

- VBM supposes knowledge of the volumes which are extracted from a given stock of water resource.
- Main characteristics of a VBM instrument:
 - Water quota for each farming operation,
 - Calendar for the use of the quota during low flow periods,
 - Restriction rules based on the water state,
 - Existence of a monitoring system.

➔ What is the effectiveness of such a system?

Charente case study



Restricted Upstream Charente unit

Lavaud dam

Mas-Chaban dam

Vindelle station

■ Charente RB
 – 9300 km²
 – 380 km river
 – Oceanic climate

■ Upstream Charente (UC)
 – 2350 km²
 – 9000 ha irri.
 – 85% corn
 – Agri=5%PNB
 11% employment

■ Restricted Upstream Charente unit
 – 1640 km² (River + alluvial aquifer)
 – 2 dams (10Mm³ in 1990; 14Mm³ in 2000)
 – Measurement station in Vindelle

Measures for supply / demand adequation (1)

- Despite the Lavaud dam (10Mm³, 1989), chronic imbalances remain common.
- Water stress is measured at Vindelle station (river outflow)

→ 3 solutions implemented

- ✓ Resource creation: Mas Chaban dam (12,4Mm³, 2000)
- ✓ Regulatory tools (irrigation banning)
- ✓ Water scarcity management tools (Water pricing and Volumetric Based Management)

Measures for supply / demand adequation (2)

- The applied pricing mechanism is ineffective, it only allows to ensure a balance budget for the dam manager:
 - Fixed part = 12.2 €/ha/year
 - Variable part = 0.003 or 0.006 €/m³ (only effective over 0.09€/m³)

- Volumetric Based Management in the restricted Upstream Charente:
 - Allocation of a maximal volume of water per year
 - The use of this quota is regulated
 - Possible restrictions or interdictions
 - Monitoring system implemented

Measures for supply / demand adequation (3)

1. Reference volume per year for each farm. Based on:
 - The declared irrigated area in 2000
 - The corn water requirement on 3 types of soil
2. The use of this volume is regulated between mid-June to mid-September (10 periods) according to the corn water requirement per soil types = recommended volume
3. 4 restrictions are defined according to the rate of flow

■ Alert 1	3.3 m ³ /s < flow < 4.0 m ³ /s	1 day interdiction
■ Alert 2	2.8 m ³ /s < flow < 3.3 m ³ /s	2 days interdiction
■ Alert 3	2.5 m ³ /s < flow < 2.8 m ³ /s	50% reduction
■ Alert 4	flow < 2.5 m ³ /s	100% reduction
4. Monitoring system
 - Based on farmer declarations (in cubic meters)
 - Sanctions or penalty are rarely applied (alerts and recommended volume)

Measures for supply / demand adequation (4)

■ Follow-up measures

– Advisory actions:

The weekly “Irrig’info” bulletin includes:

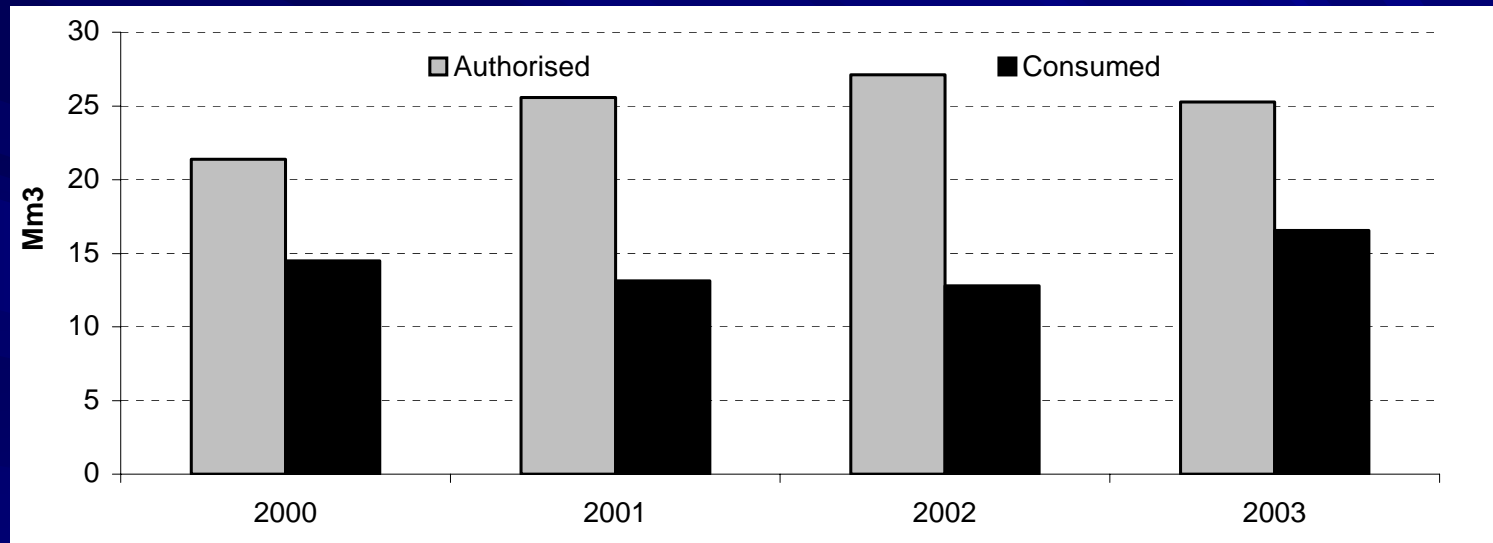
- Crop requirement, climate, evapotranspiration, soils... based on 30 experimental parcels,
- Present conditions for water resource (dams),
- Past and present restrictions

– Actions for equipments

- Equipment diagnostics and improvement of the functioning
- Administrative, technical and financial support to create hillside reservoirs

What effectiveness of the Volumetric Based Management?

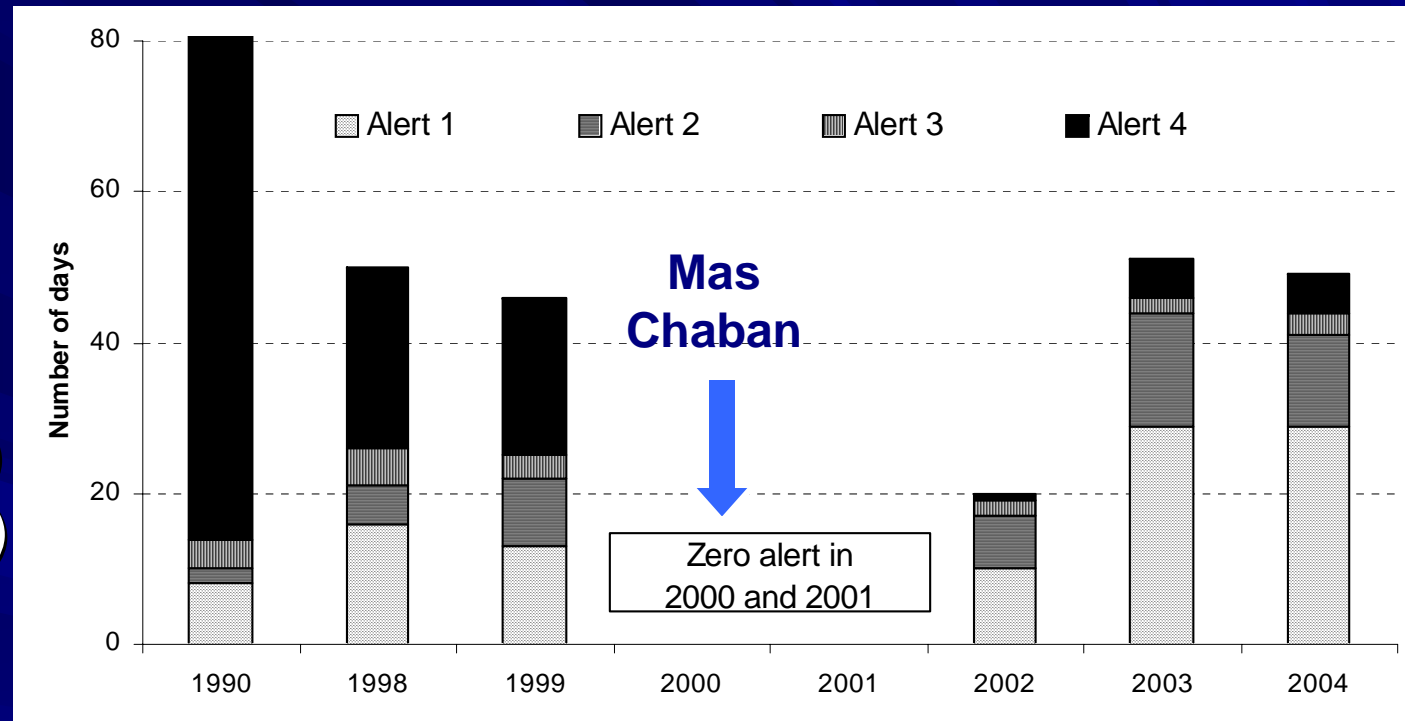
■ Volumes consumed < authorized



- **Reasons:** (i) Restrictions, (ii) Rains and (iii) Overestimation of the irrigated area in 2000 (by 15 to 20%) on which the authorized volume per farm is calculated (which leads to some tensions among water users and managers)

What effectiveness of the VBM ? (2)

→ Relative effectiveness (of the dam):
Comparison:
1990/2003 (dry)
1999/2002 (wet)



- Volumetric Based Management measures are ineffective, especially for alerts 1&2 because of some over-pumping capacities and inequities among farm types
- Changes in 2004: alerts 1&2 become restriction (10 and 30%); advised volumes become authorized ones

Supply and Follow-up measures effectiveness

- Supply characteristics can be improved by:
 - A real time regulatory approach (hydraulics)
 - An increase of the irrigation efficiency by 10% (2.2 Mm³), larger than the deficit recorded in 2003 (1.5 Mm³).
This would allow a better filling of the dam.
(in April 2005, dams are 40% filled)

CONCLUSION

- The dam creation favored the respect of environmental constraints without harming farmers.
- 4 years after, the Volumetric Based Management requires important improvements.
- Too many uncertainties (unknown real irrigated area do not allow to assess water demand and farmer efforts, unknown aquifer/river and rain/outflows relations).
- Need an observatory of agricultural practices to understand the present behaviors and the future agricultural evolutions to adapt policies.
- The VBM in Charente have built the foundations of the first system based on dialogue. However, there remains serious divergences of opinion among agents (farmers, who use the VBM tool to argue for extra resources creation, and pro-environmentalists for which irrigation increase is aberrant and who ask for more severe measures...)

Thank you for your attention