

**Change production systems :
short-rotation conifers, SRC, mix SRC-high forest**

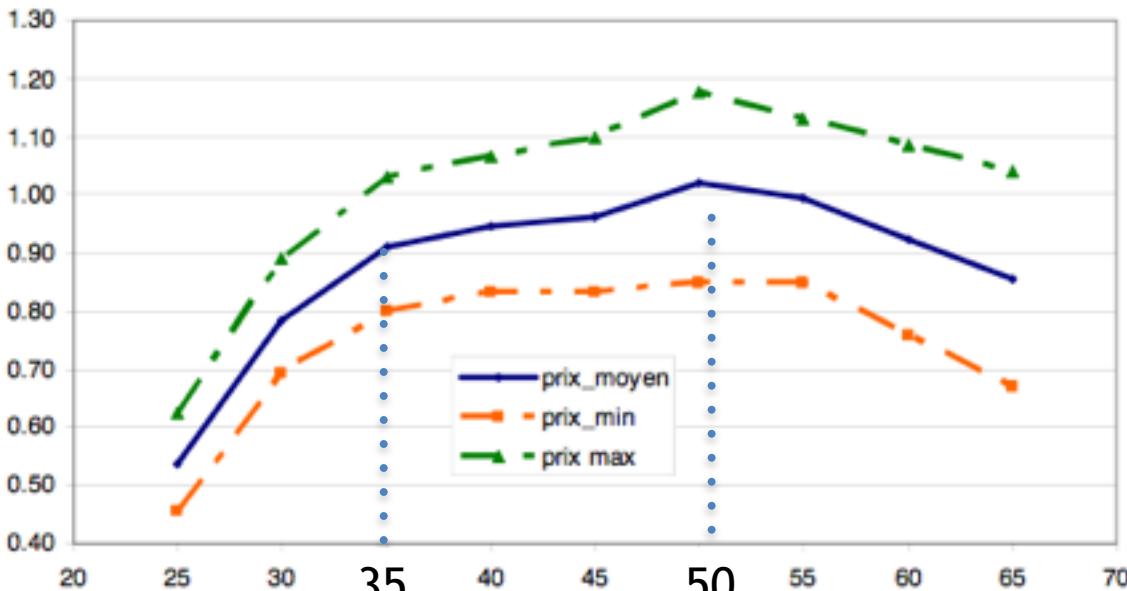
**Increase carbon flux / hectare :
create and use improved genetic material
(productivity is no longer secondary)**

**Test of hybrid poplar clones
for SRC**

**Source : C. Bastien & G. Bodineau
(INRA Orléans)**

Example of forest-industries co-adaptation : shortened rotations in conifers

Selling price/m³ (relative units)



Fir-Spruce - Vosges
mean (sept. 2009-sept. 2010)

Source : ONF
(Gamblin, 21/3/2011)

Max
90%
of Max

Opportunity of shorter rotations :

- ▶ *reduce abiotic risks*
- ▶ *supply closer to industrial demand*
- ▶ *increase fluxes and flexibility*

Need more management planning & integrated multi-scale management

Poplar (high forest)
SRC Poplar
Mix (HF-SRC)

Fast-growing conifers :
Douglas fir, hybrid larch

Multi-purpose,
« mainstream »
management

National parks,
natural reserves,
recreation areas

Specialization
products

Improve resilience
through :

Natural regeneration

Very short
cycle

Standard
rotation

Assisted
migration

Plant other
Oak spec.

Plant exotic
spec.

...genetic
res. mgt

...prevent
abiotic
damages

Land use planning, forest policy : specialize functions in space,
e.g. « Triad » (USA, UK)

Example : diversify regeneration options in Oak management

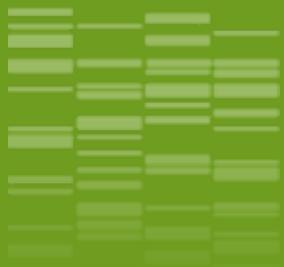
Very short
cycle

Standard
rotation

Delayed
harvesting

Natural
reserve

Example : diversify rotation ages in Beech management



« La bioéconomie suppose une anthropisation réussie de la biosphère »
(Michel Griffon, 5 mai 2015, restitution prospective UE SCAR-4)

≈ « Bioeconomy needs a successful *anthropisation of biosphere* »

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Ecological intensification : coupled cycles of matter/energy/information, acknowledged effort to transform (manage, learn by monitoring and science, improve)

Bioeconomy : circular processes/flows



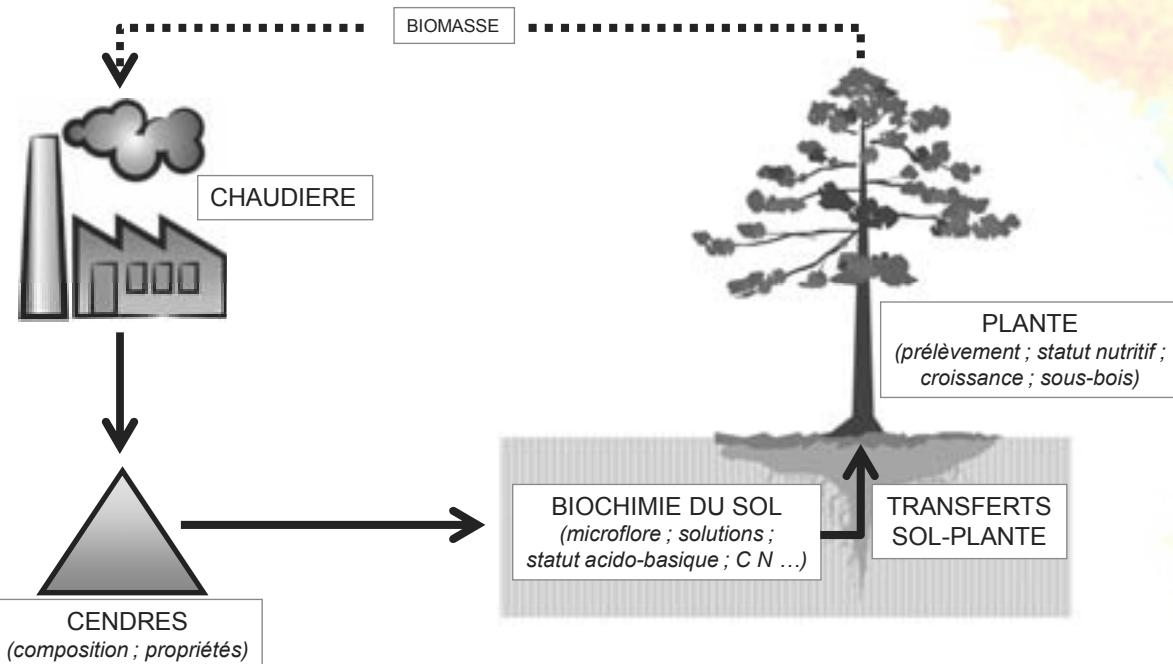
LE PROJET FORÊT-BOIS pour la France

France Bois Forêt (FBF) et France Bois Industries Entreprises (FBIE) sont à l'initiative du

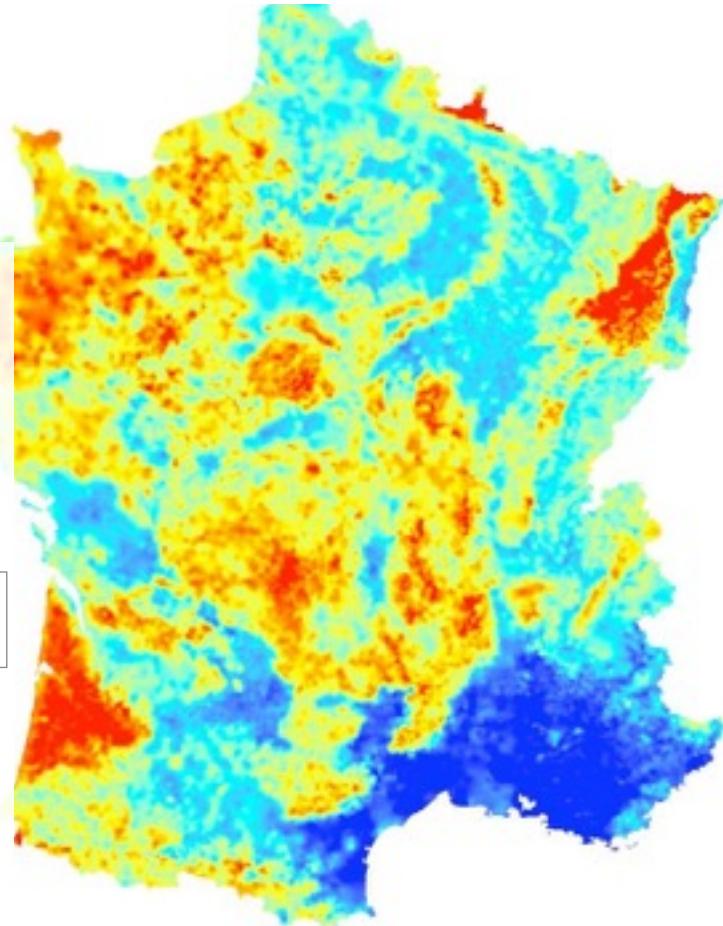


Recycle exported nutrients back to forests, possible strategies of flux limestones → acid soils

*Restitution or recycling
of firewood ashes*

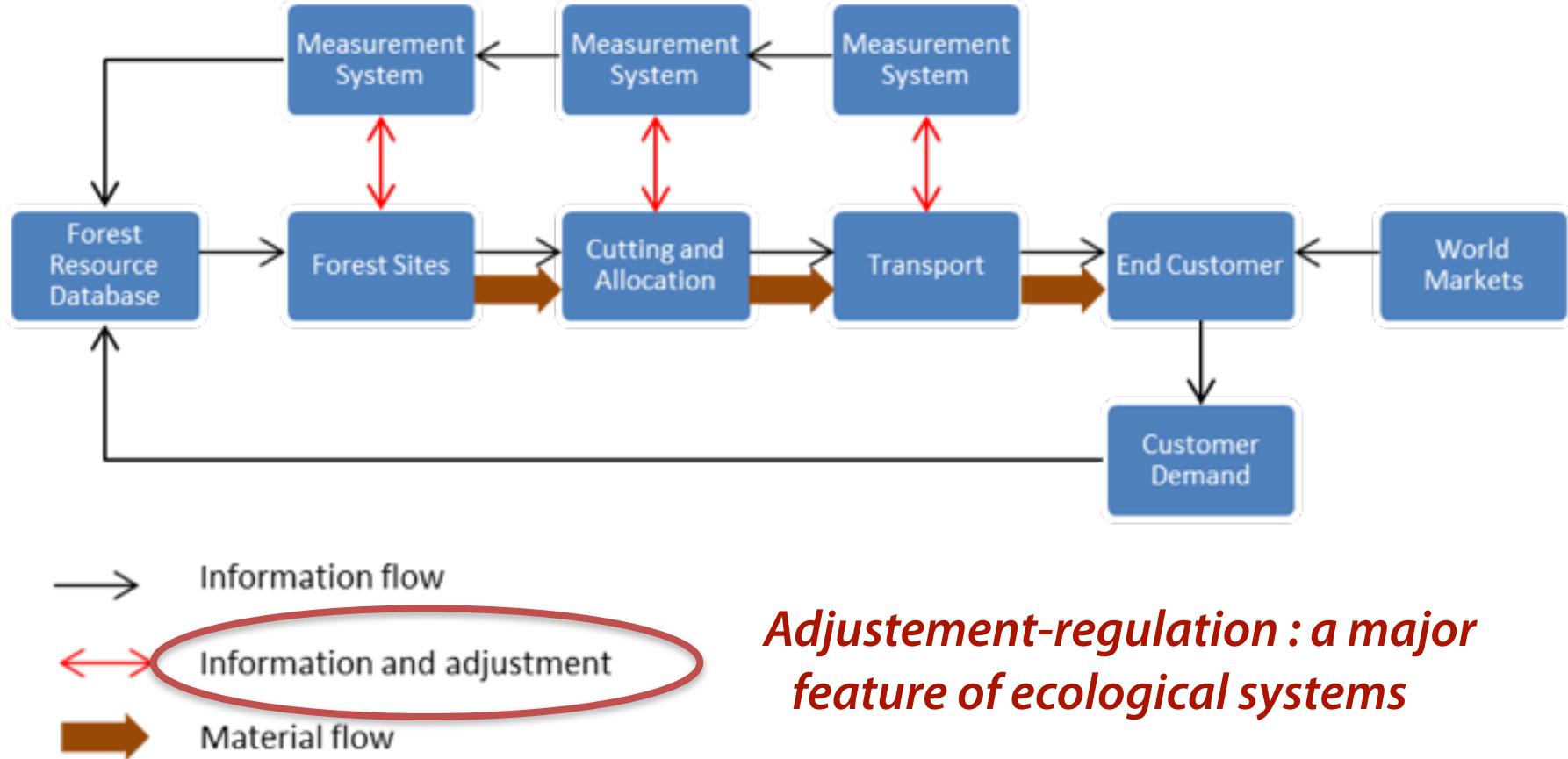


Source : Augusto et al. (2014) - *Les intrants sont-ils nécessaires pour développer durablement la fonction de production ?*



Carte de France du pH des sols forestiers,
échelle 1km, ©IFN, LERFoB

Integrated forest logistics : make a better use of information linked to production process



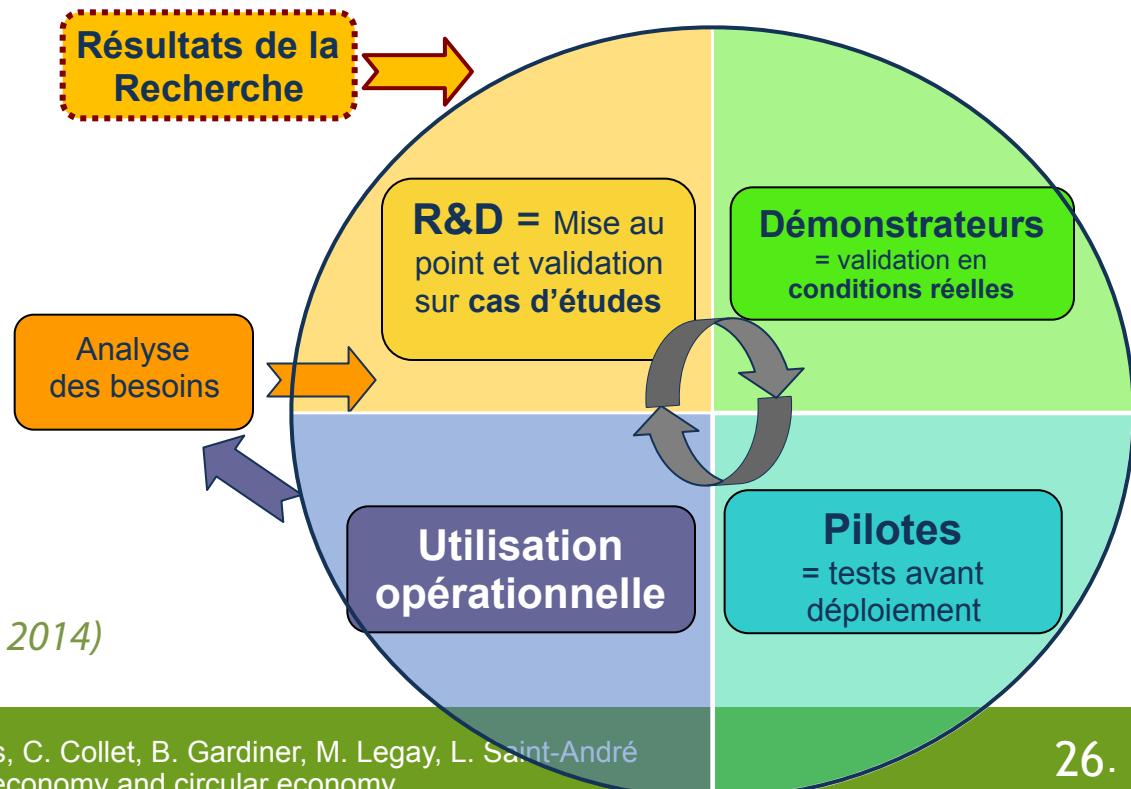
Adjustement-regulation : a major feature of ecological systems

Source : Barry Gardiner (25/1/2015)

Innovation through learning loops

❖ Make a step-forward beyond linear technology-transfer of platform CAPSIS :

- Transfer methods, not only knowledge - case of remote sensing
- Check robustness
- Validate in industrial context
- Handbooks, tools...



Source : ONF (Anne Jolly & Myriam Legay, 2014)



Conclusions

- ❖ Transition of sustainable management & climate challenges :
 - ❖ detect/analyze damages, anticipate large-scale **crises**
 - ❖ **use** existing forests (**more !**) and **plant**
 - ❖ reduce transaction costs (integration, **contracts**)
 - ❖ optimize the world's **use** of fibres and energy
 - ❖ forest soils : **+ targeted & + efficient use**
- ❖ Which questions arises ecological intensification ?
 - ❖ cycles embed ecosystems-human artifacts : **precaution**
 - ❖ **manage together** climate risks & impacts of practices
 - ❖ **information & planning** : monitor, control, correct, diversify, make explicit arbitrages ; optimization and viability
 - ❖ **combine** ecological/social/organisational **resiliences** (multi-scale)



谢谢你的关注

Obrigado

Gracias

Thank you

Merci

**Forêt domaniale de Fontainebleau
nov. 2015**

« *La bioéconomie suppose une anthropisation réussie de la biosphère* »
(Michel Griffon, 5 mai 2015, restitution prospective UE SCAR-4)