

Basis for a sustainable use of the Amazon floodplain forest

Jürgen Kern, Heidi Kreibich & Assad Darwich

Bilateral cooperation (SHIFT)

Financial support

- BMBF
- CNPq

Cooperating institutes

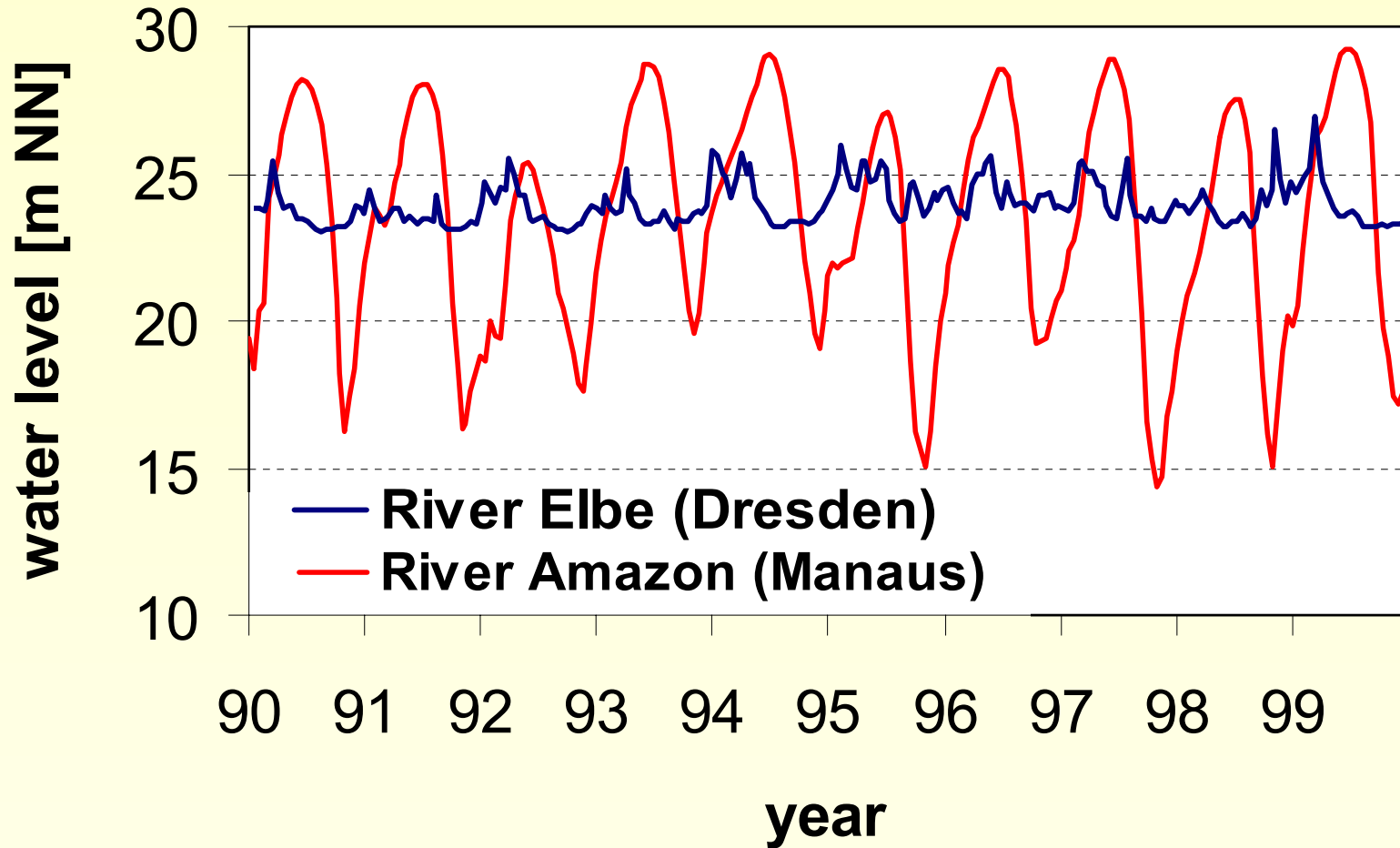
- ATB, Potsdam
- INPA, Manaus
- MPI, Plön



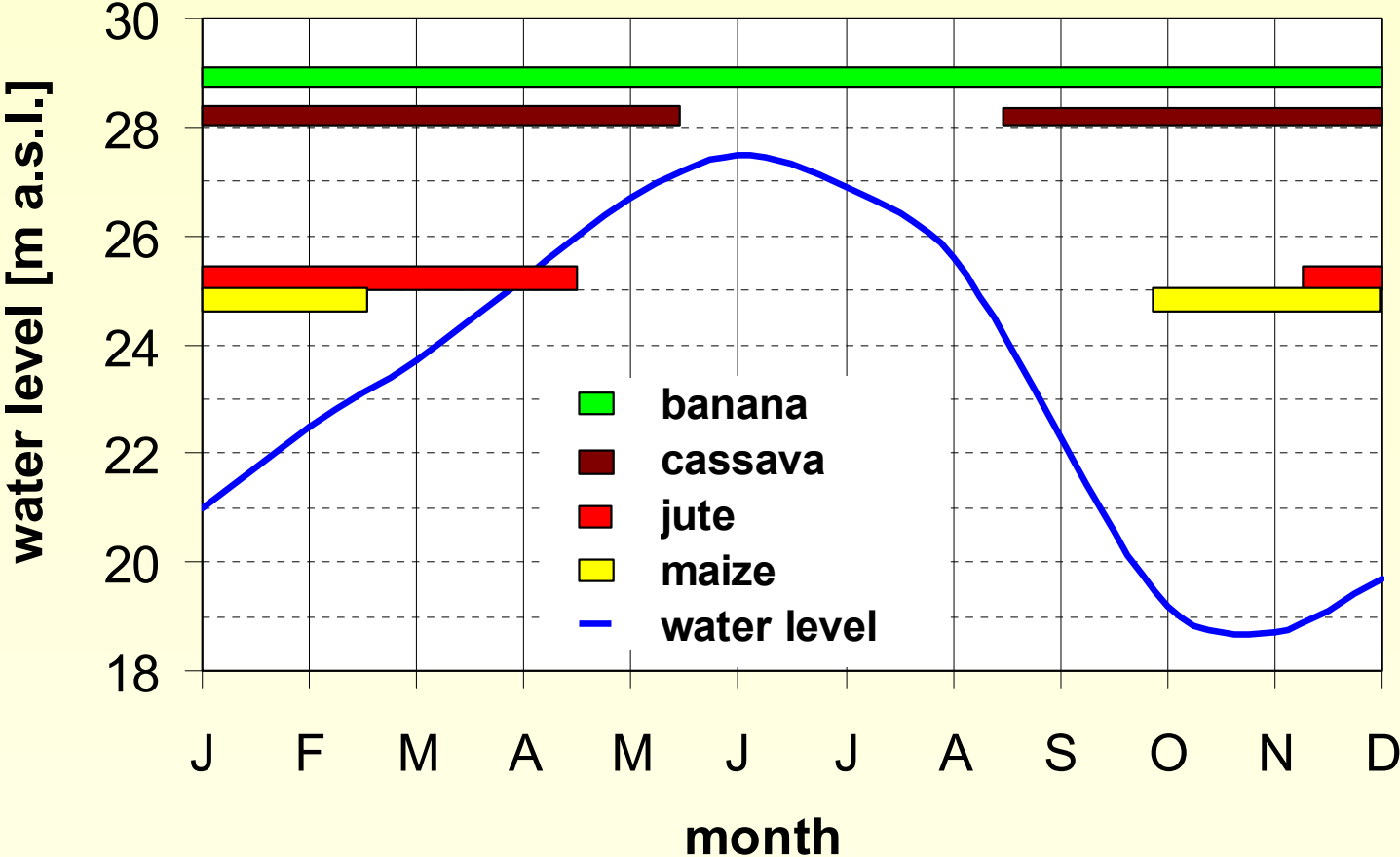
Objectives

- Land use on the Amazon floodplain (várzea)
- Special conditions for crop production
- Results of an interdisciplinary project
 - ⇒ Gaseous nitrogen flux in the floodplain forest
 - ⇒ Importance of legumes for the enrichment of nitrogen in the floodplain forest
- Nitrogen balance in the floodplain forest

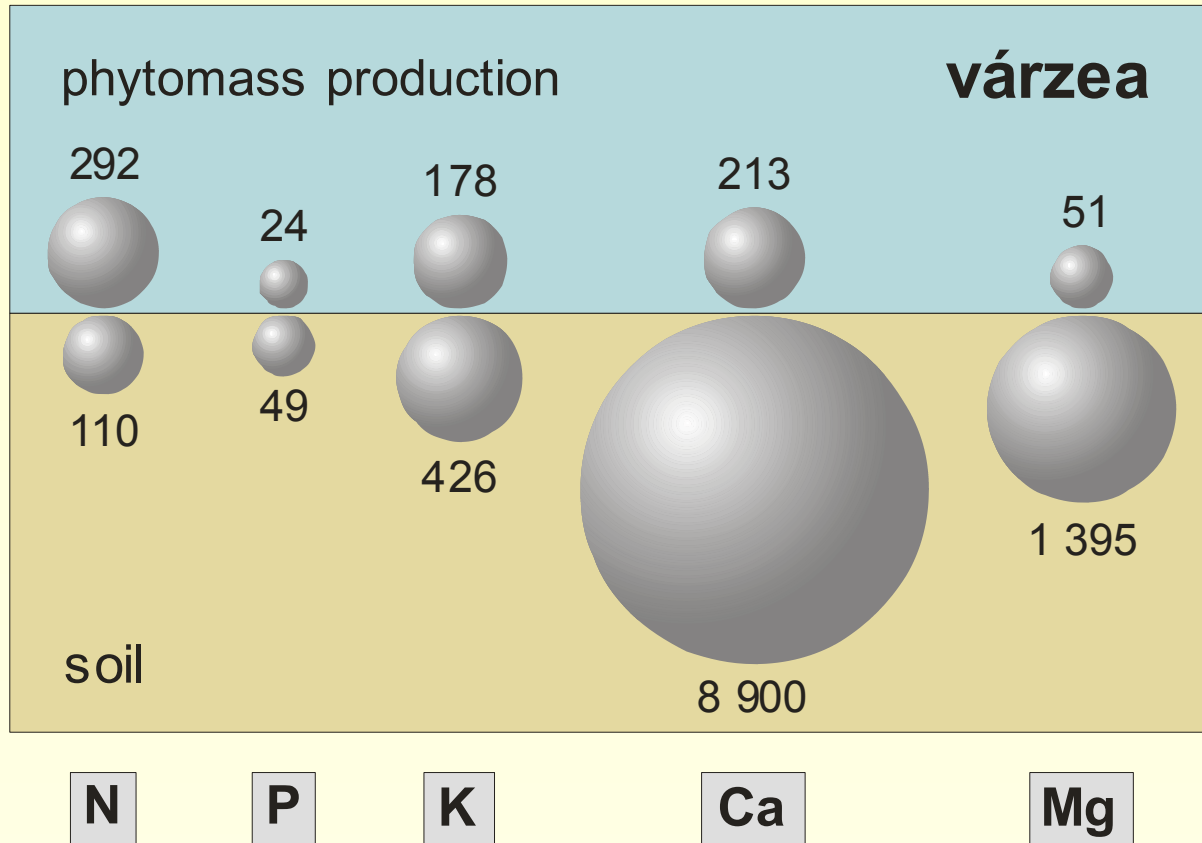
Water level fluctuations (1990-1999)



Crop production in the Várzea

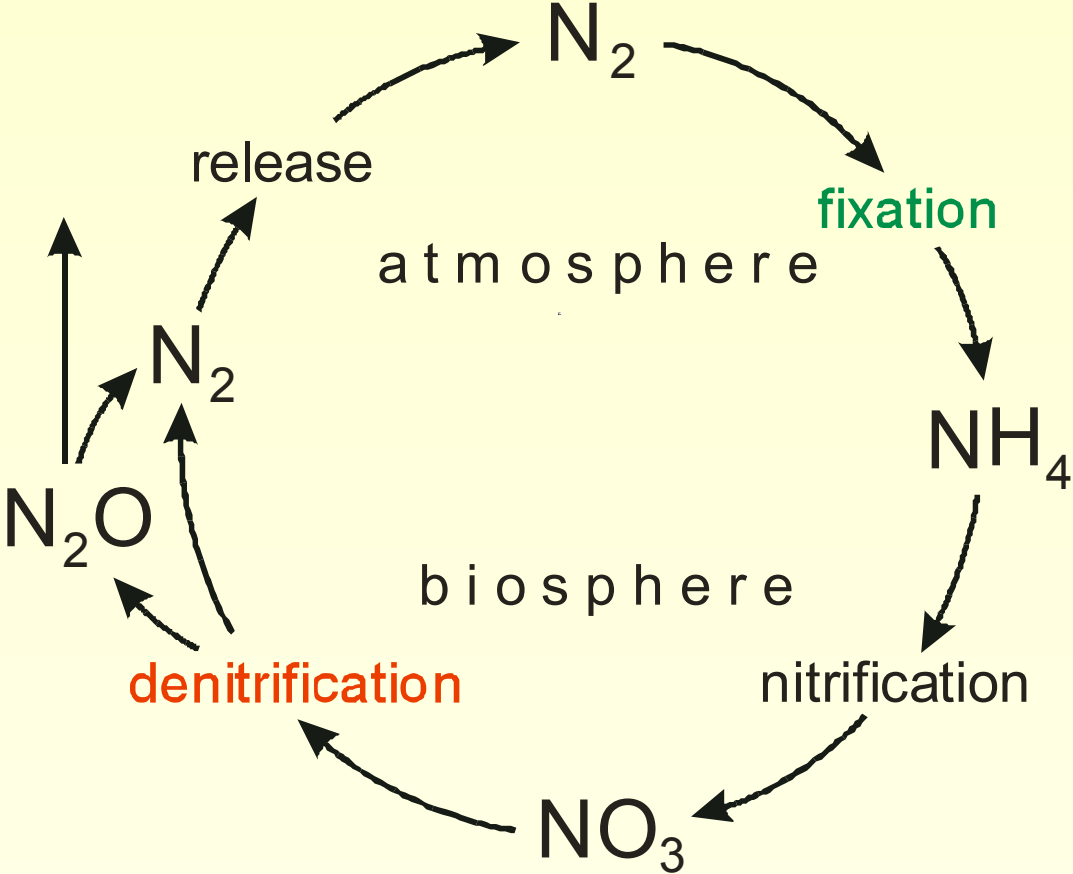


Exchangeable nutrients in forest soils (kg/ha) and annual nutrient requirement (kg/ha a)

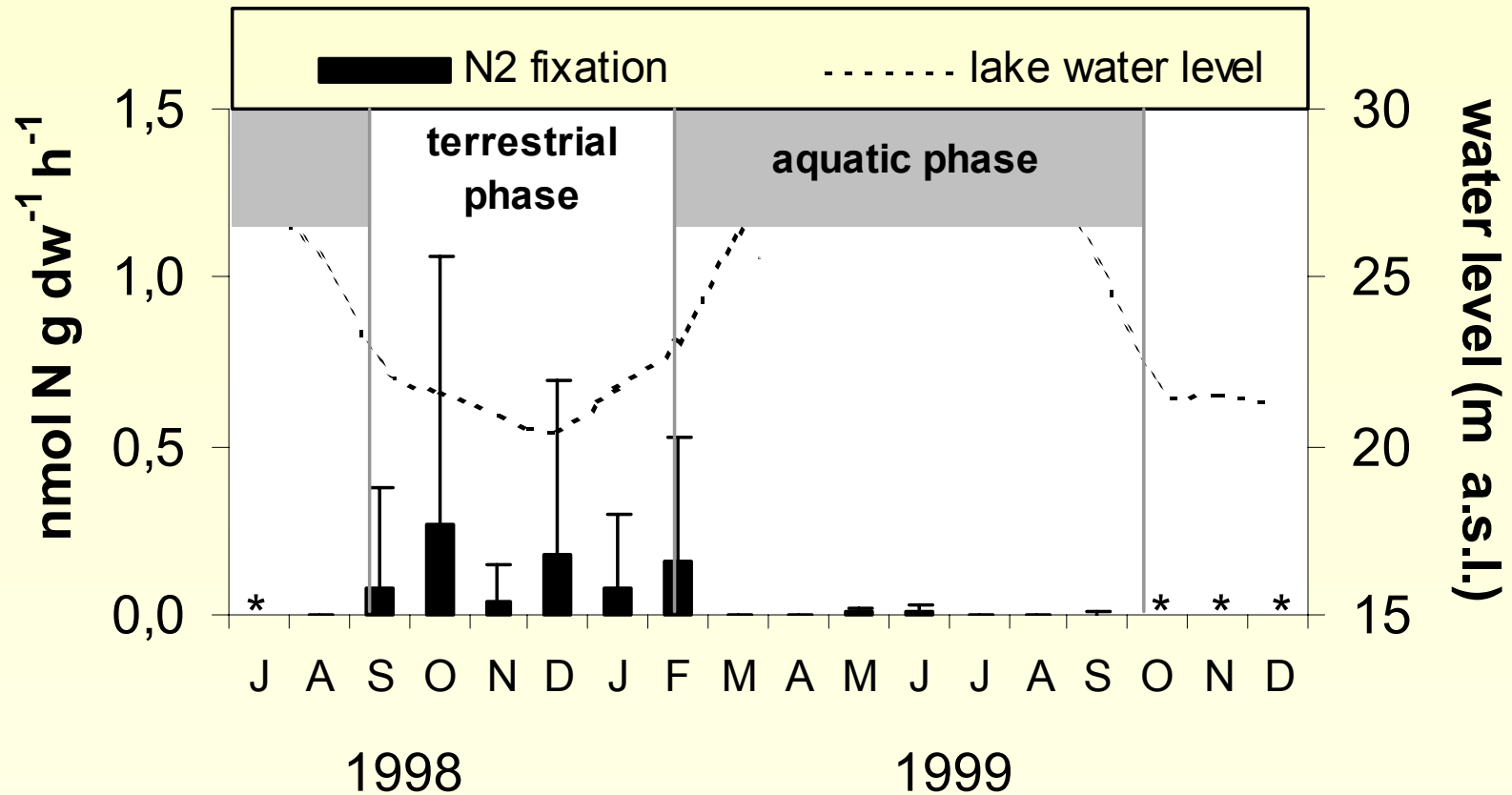


Furch, K. (1999)

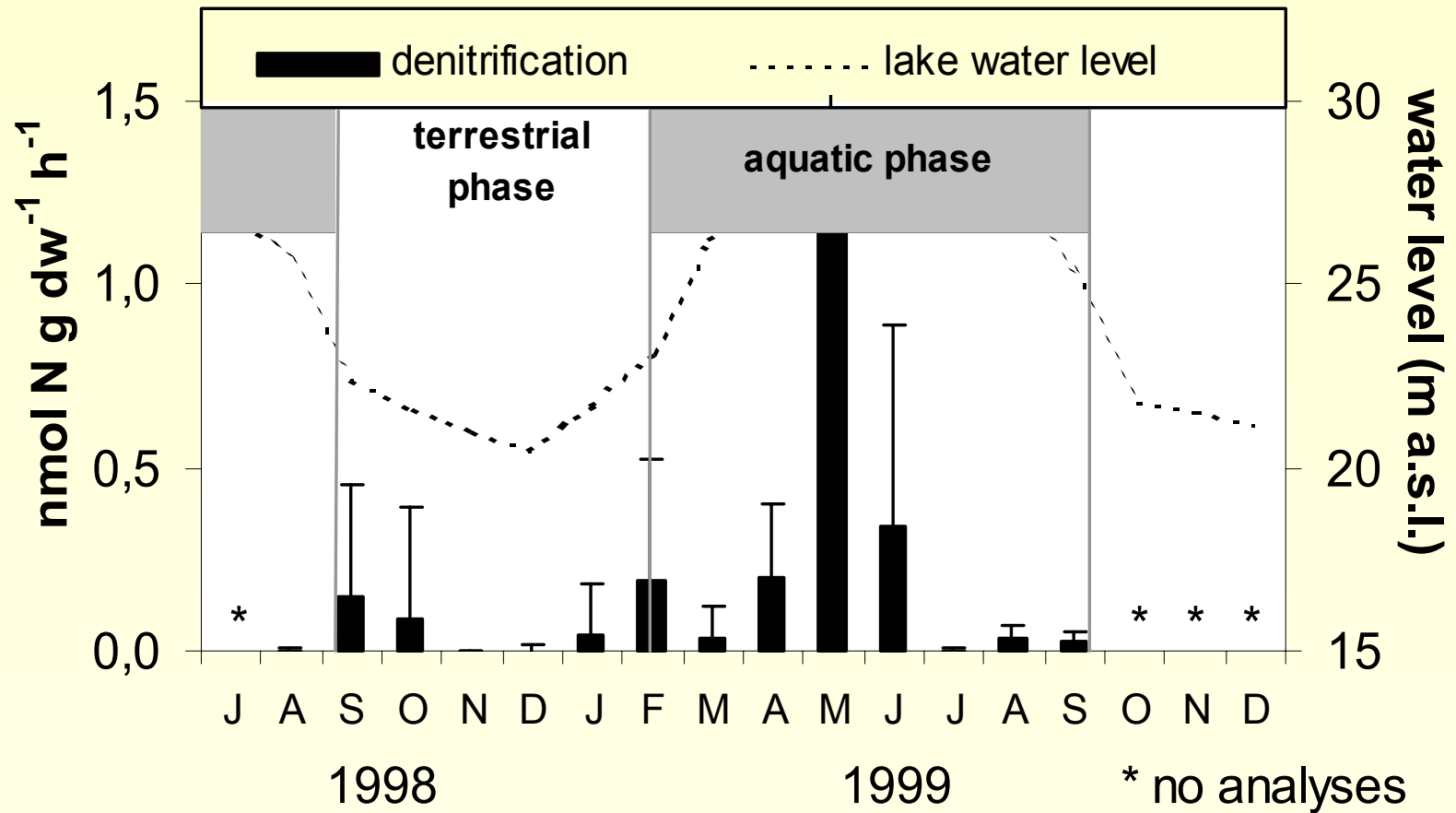
Nitrogen cycle



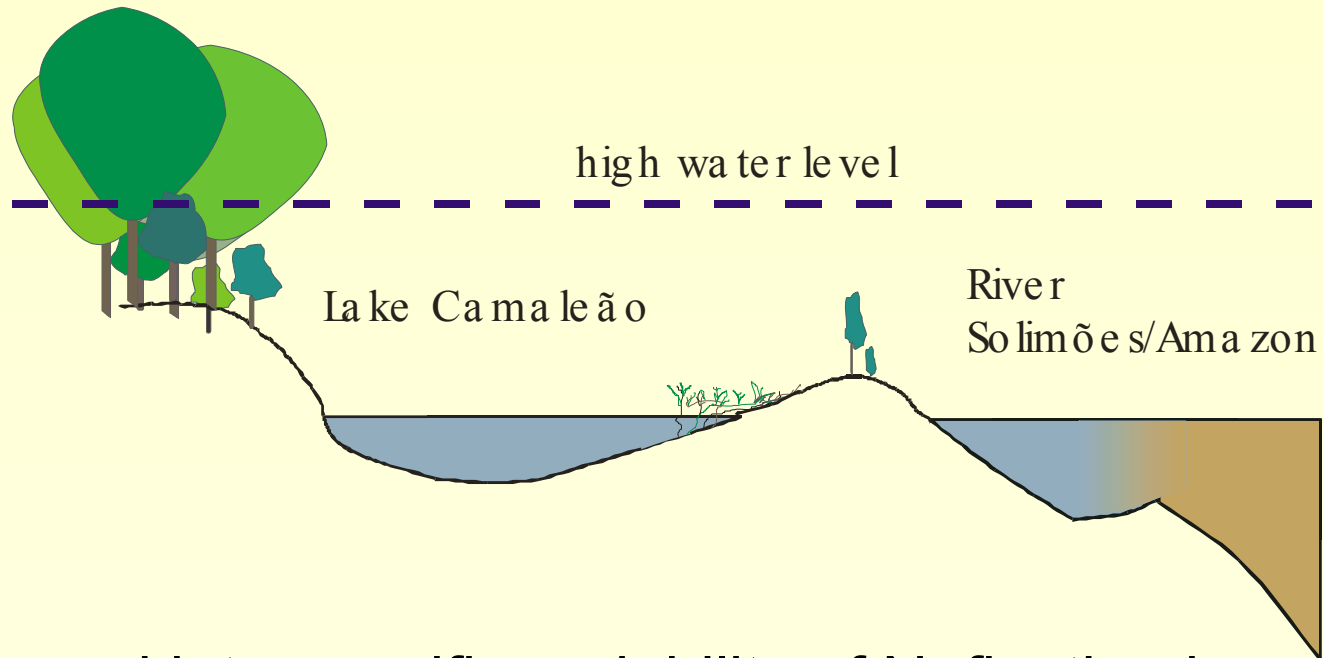
Nitrogen fixation in semiterrestrial sediments of the floodplain forest



Denitrification in semiterrestrial sediments of the floodplain forest



Focal points



- Intra- and interspecific variability of N_2 fixation in various phytocoenoses of the Amazon floodplain forest
- Importance of legumes for the enrichment of nitrogen in the floodplain forest

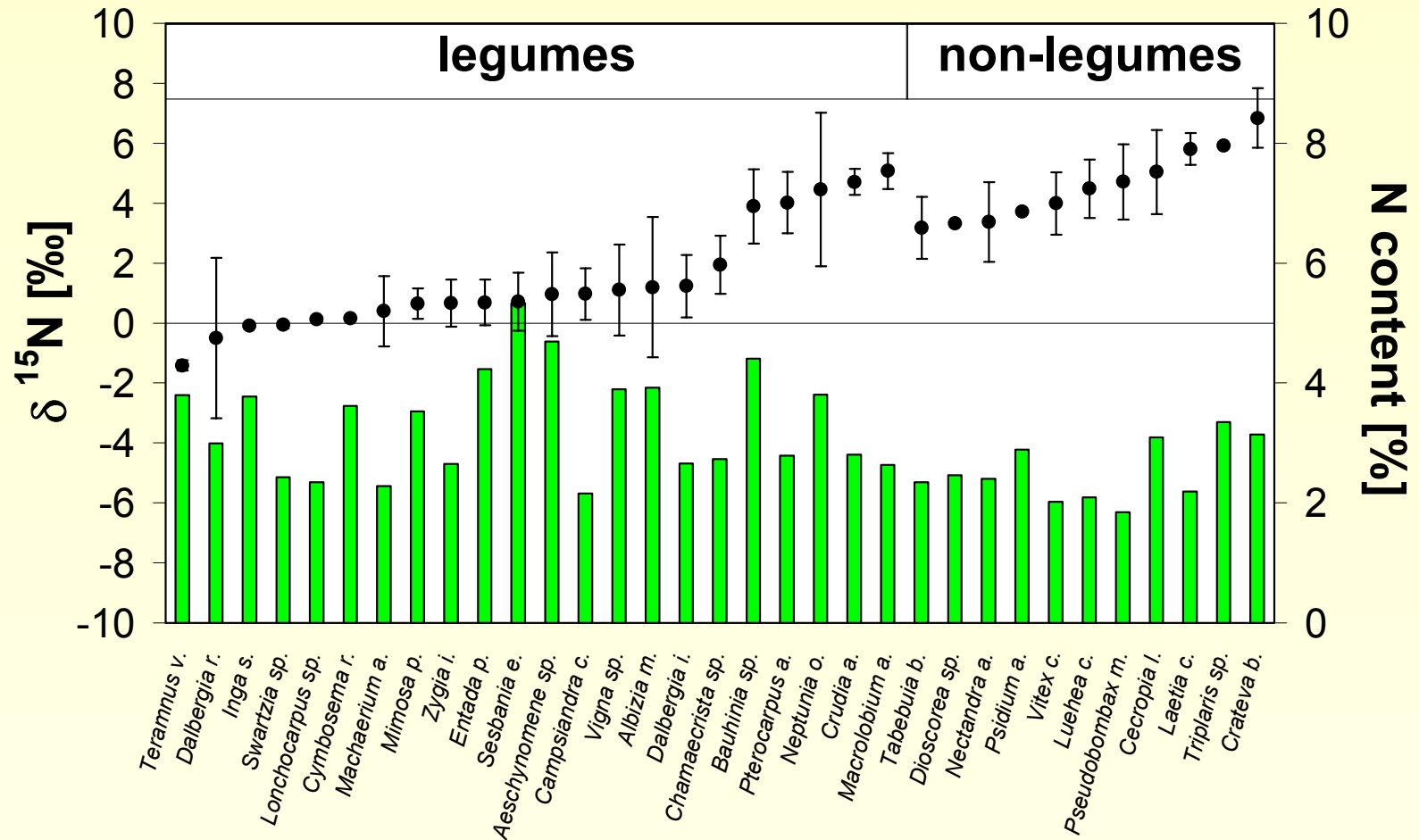
Importance of plant families within the floodplain forest

Family	Relative richness [%]	Relative density [%]	Relative dominance [%]	Family importance value
Capparaceae	2	37	20	59
Verbenaceae	2	23	29	54
Leguminosae	27	10	10	47
Flacourtiaceae	5	7	6	18
Tiliaceae	2	2	12	16
Bombacaceae	2	2	10	14
Myrtaceae	2	7	2	11
Euphorbiaceae	7	3	1	11
remaining 17 families	50	9	10	69

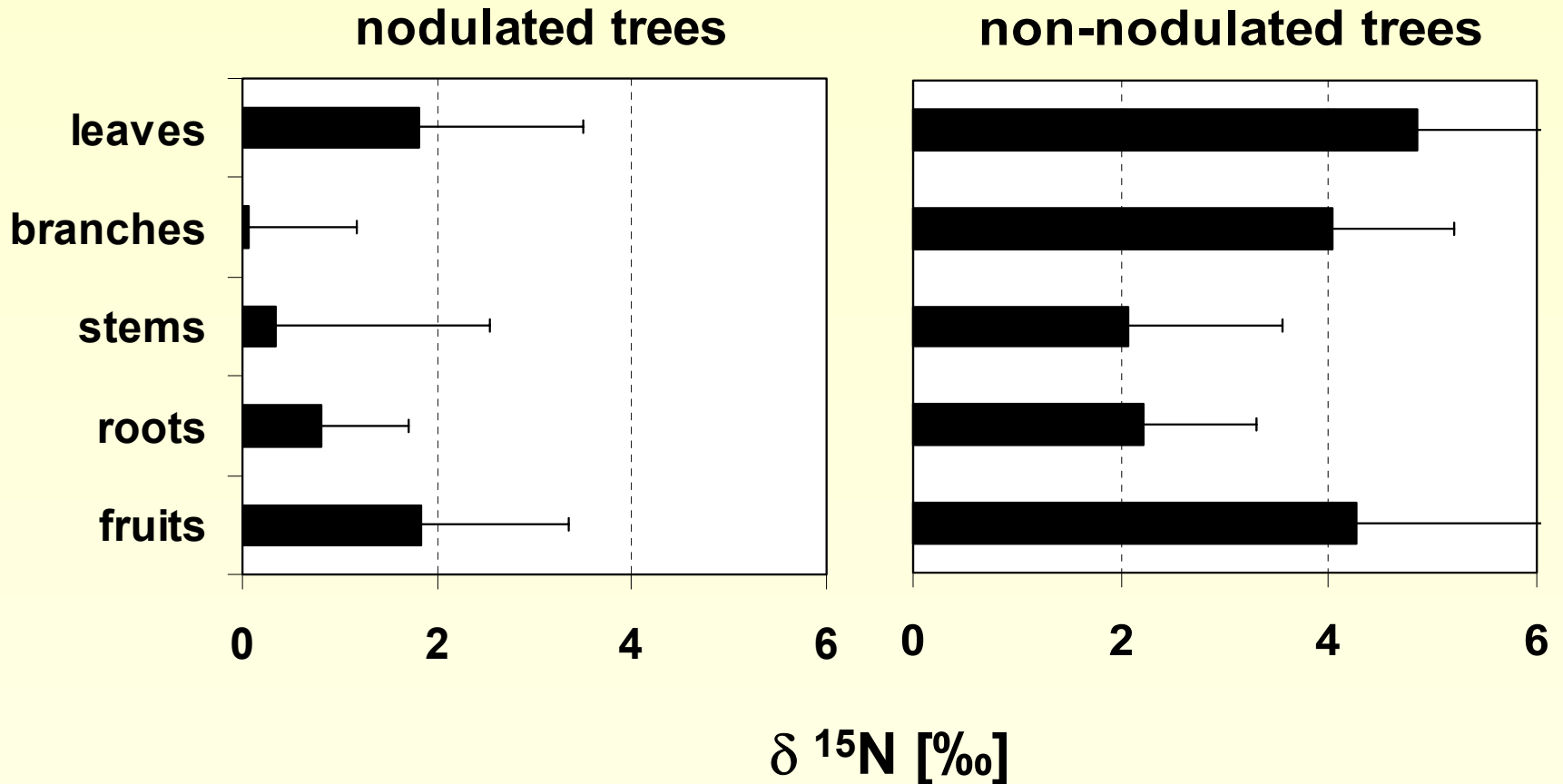
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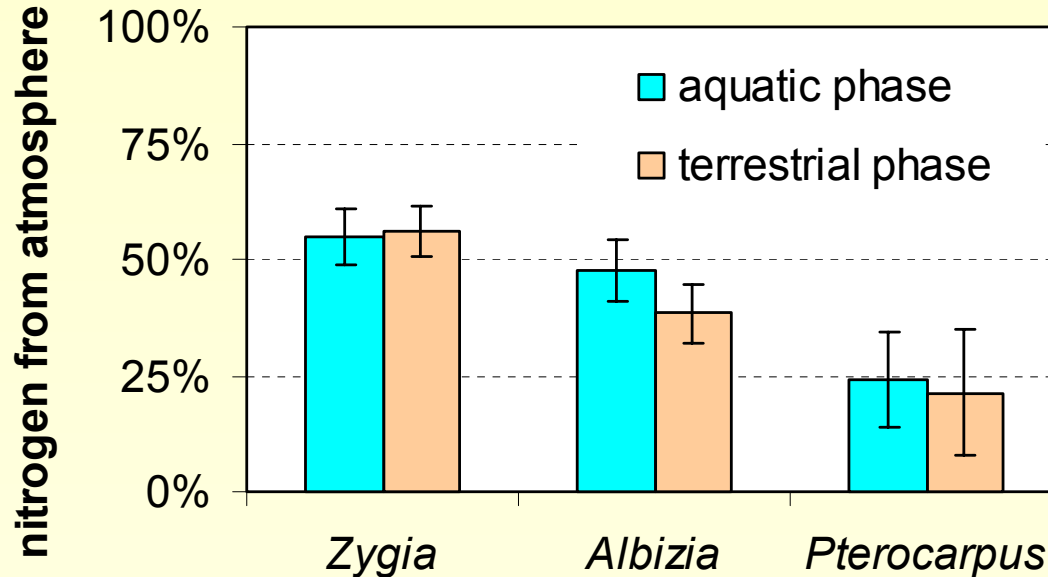
$\delta^{15}\text{N}$ values and mean N contents of woody and non-woody species



$\delta^{15}\text{N}$ in different plant compartments of trees from the floodplain forest



Percentage of nitrogen in legume trees derived from atmosphere



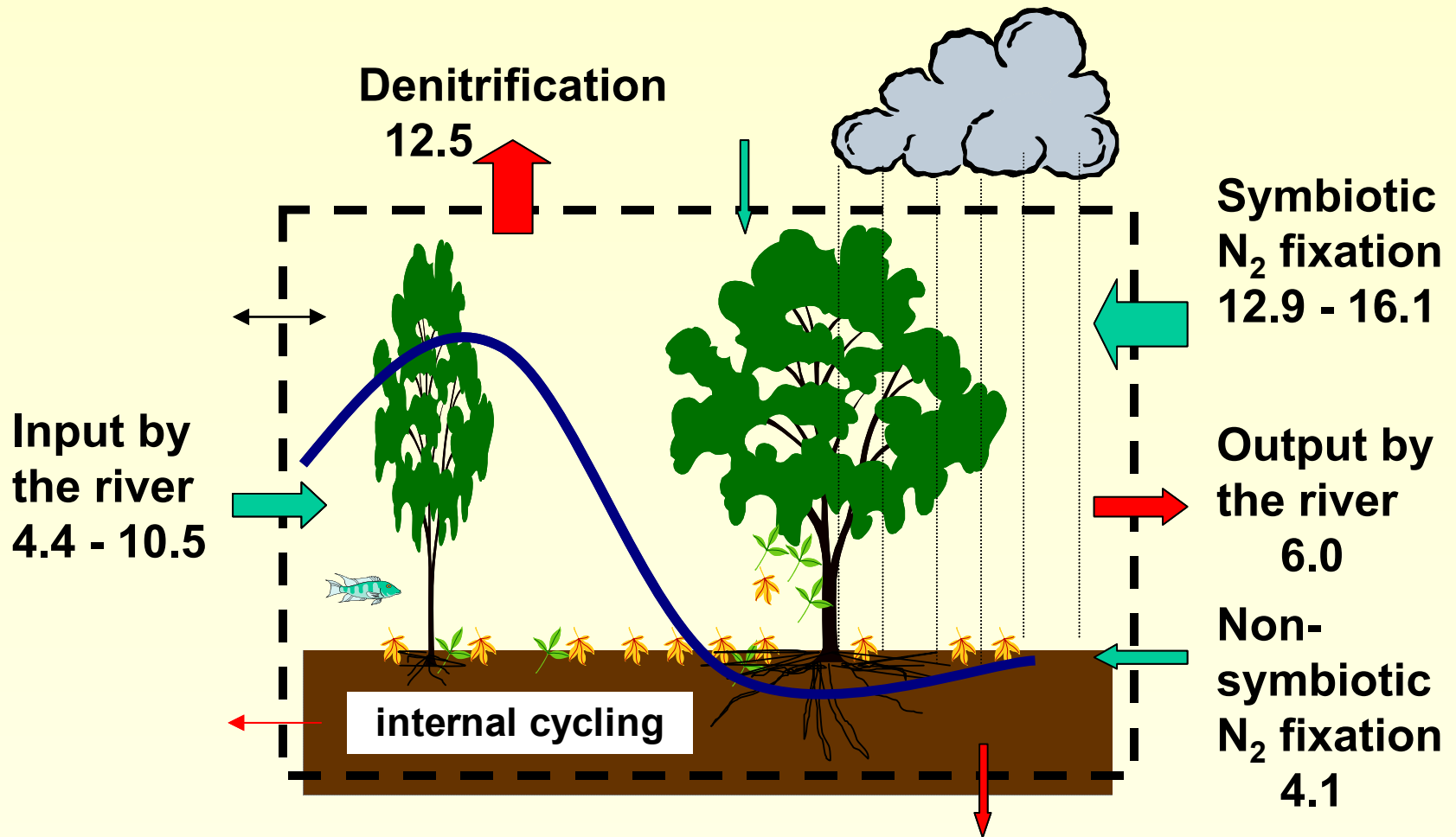
$$\% \text{ Ndfa} = \frac{\delta^{15}\text{N}_R - \delta^{15}\text{N}_F}{\delta^{15}\text{N}_R - \delta^{15}\text{N}_A}$$

$\delta^{15}\text{N}_R$: reference value (no N_2 -Fix.)

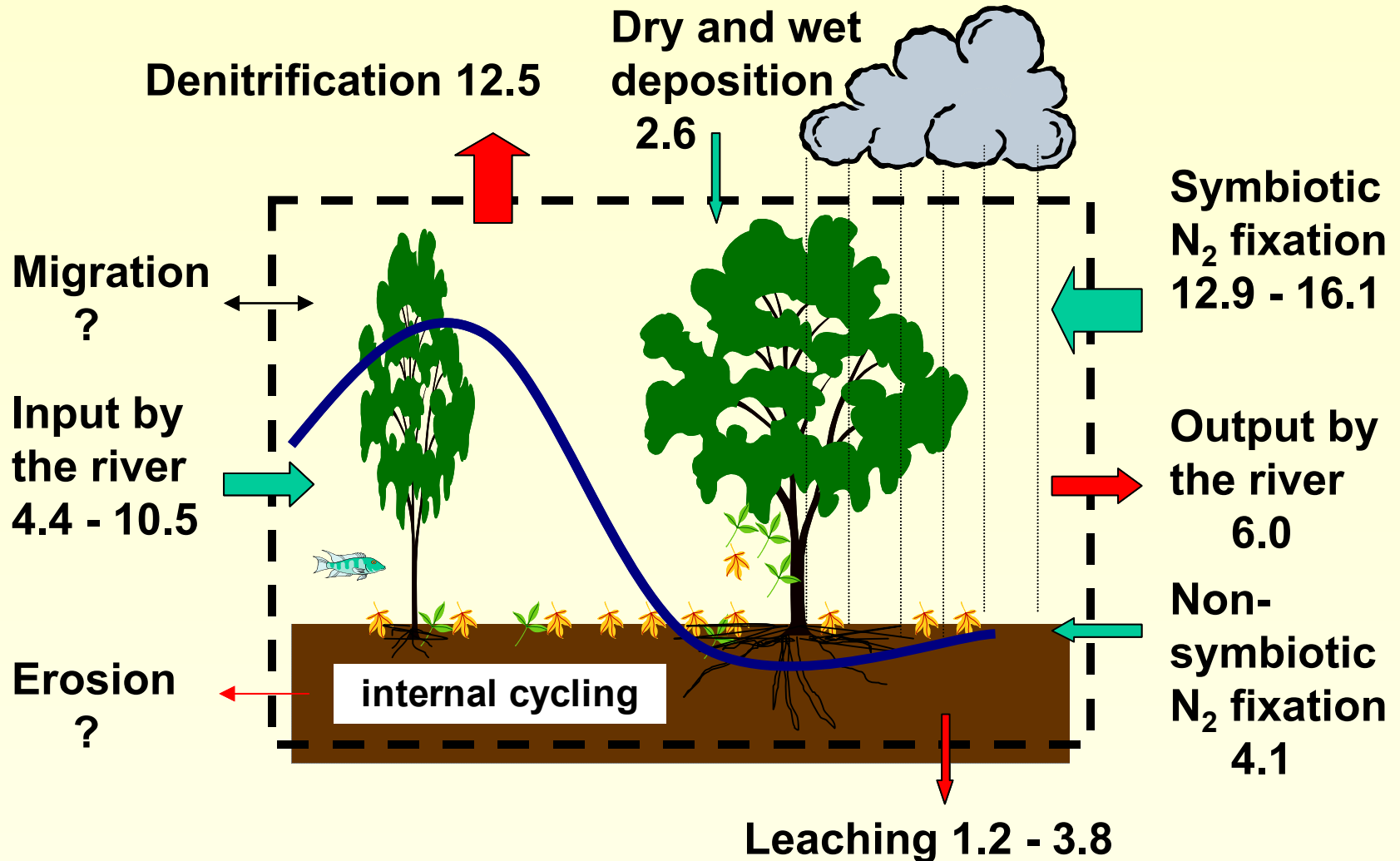
$\delta^{15}\text{N}_A$: value of fixed N (no soil N)

$\delta^{15}\text{N}_F$: value of potentially
 N_2 fixing target plant

Nitrogen balance in the floodplain forest (kg N ha⁻¹ y⁻¹)



Nitrogen balance in the floodplain forest (kg N ha⁻¹ y⁻¹)



Conclusions

- High turnover of nitrogen in the floodplain forest
- Nitrogen loss by denitrification primarily during the aquatic phase
- Greatest nitrogen input by symbiotic N₂ fixation, which is not affected by the floodpulse
- Positive nitrogen balance
(studies between 1992-2000 \Rightarrow 1.7 - 13.6 kg ha⁻¹ y⁻¹)
- Sustainable use of the floodplain forest seems to be possible