

Dynamics of *in situ* diversity of rice in Guinea, elements for the establishment of a monitoring system



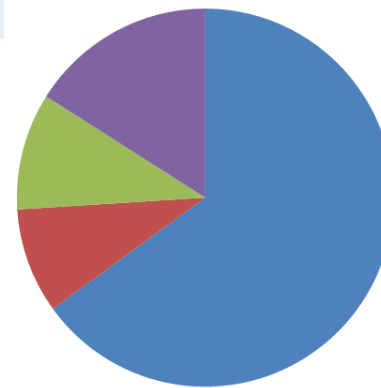
M.B. Barry and N. Ahmadi



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Guinea, the third largest producer of rice in Africa

	Area (ha x 1000)	Production (tx 1000)	Yield (t/ha)
2000	665	1 140	1.71
2004	525	897	1.71
2007	789	1 402	1.78
2012	1 000	1 919	1.92

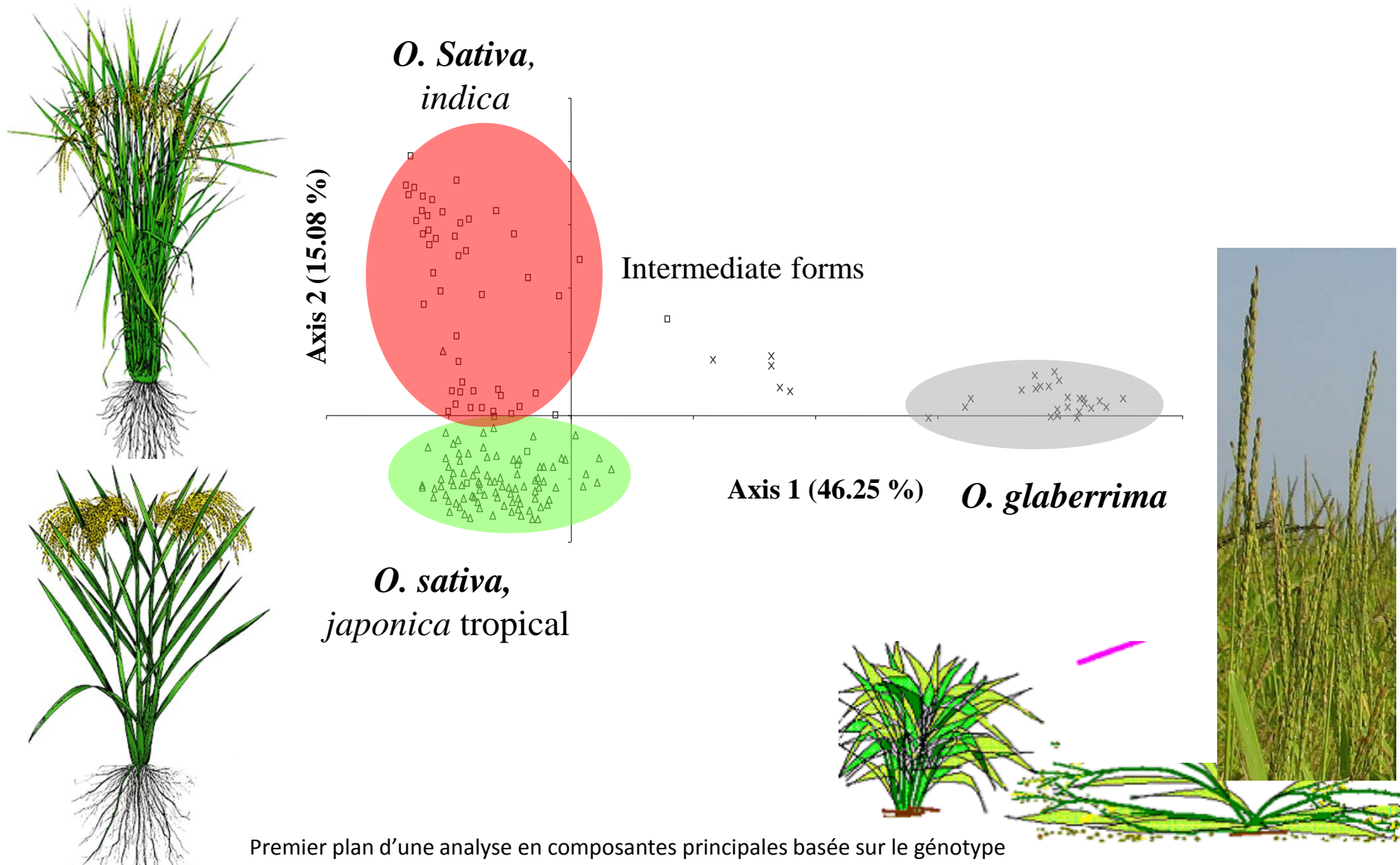


- Pluviale (65%)
- Inondé de plaine (P%)
- Inondé de bas-fond (10%)
- Irriguée (16%)

The rice cultivation remained largely traditional



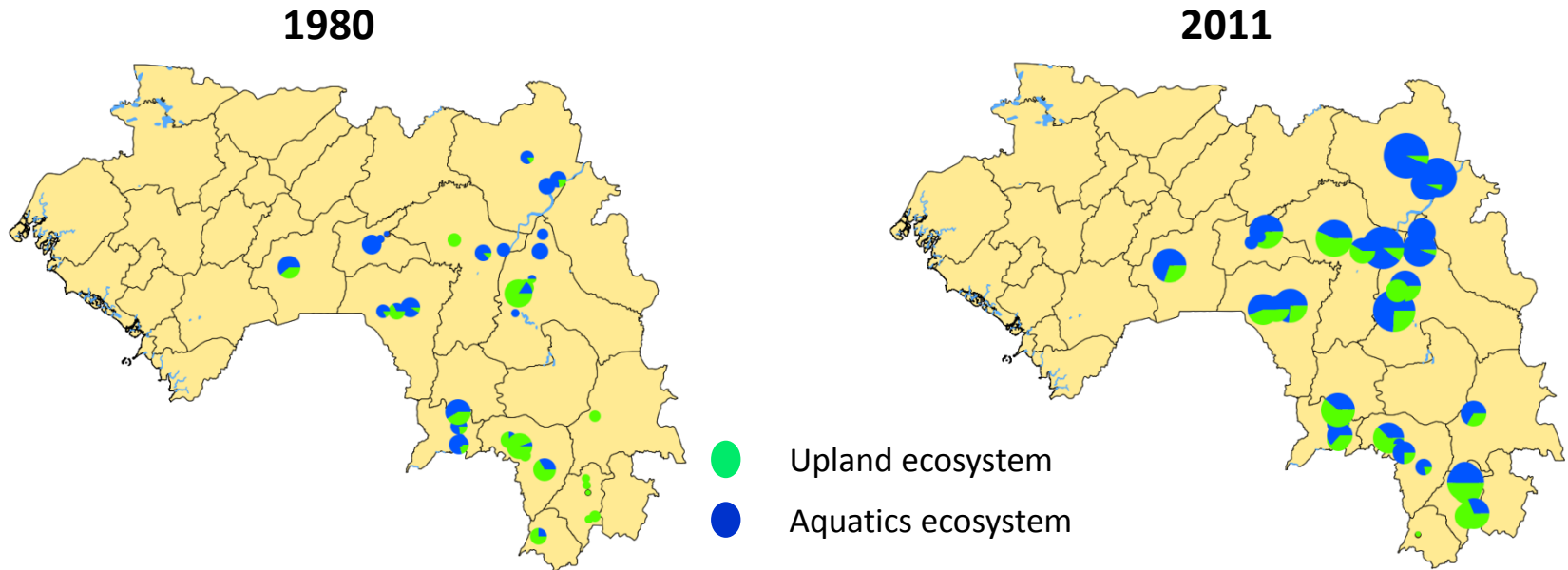
Presence of almost all the diversity of the two compartments cultivated rice species



Premier plan d'une analyse en composantes principales basée sur le génotype à 11 loci SSR de 171 accessions de riz collectées en Guinée maritime

Temporal dynamics in the country

Evolution of varietal richness

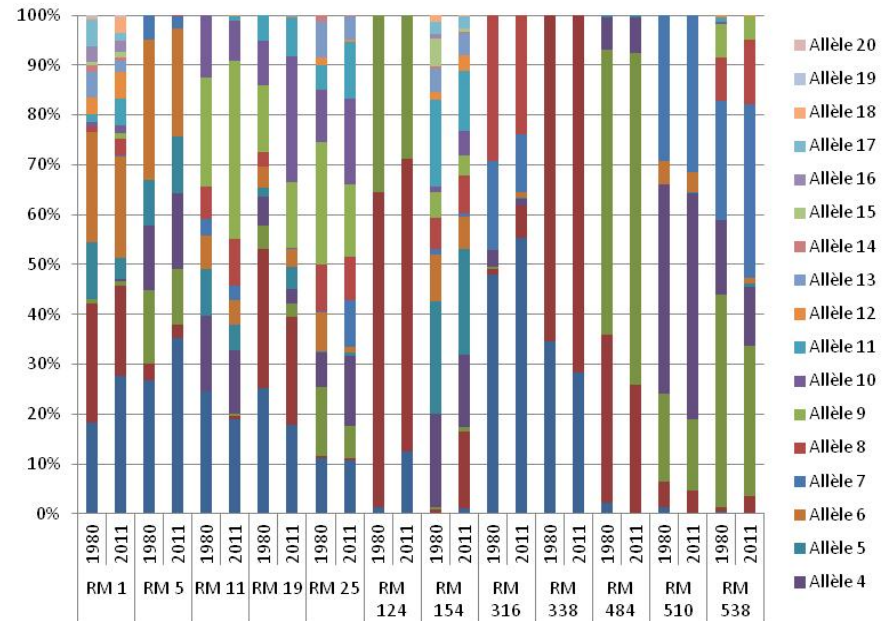


Accessions collected	1980	2011
Number of accessions	415	830
<i>O. glaberrima</i>	23,2 %	19,1 %
<i>O. sativa</i>	76,8 %	80,9 %
- <i>Indica</i>	41,2 %	56,9 %
- <i>japonica</i>	35,6 %	23,1%

- Significant decrease in wealth *glaberrima* varieties despite a 2011 gathering specific effort
- Significant increase in varietal wealth in the aquatic ecosystem and the group associated indica

Evolution of wealth and allele frequencies

Number of allele by locus (12 locus SSR)		
	1980	2011
<i>O. glaberrima</i>	2.25	2.06
<i>O. sativa</i>	8.16	8.55
- <i>Indica</i>	8.17	8.12
- <i>japonica</i>	5.17	7.09*



- Significant increase in allelic richness in the japonica group despite the relative decrease in varietal wealth
- No significant changes in allele frequencies in the SSR loci examined

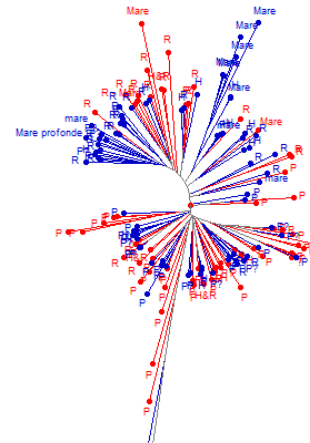
Genetic differentiation of populations over the period 1980 (1) and 2011 (2)

F_{ST} 2-à-2 between populations (6500 SNP)

	OG-1	OG-2	OSi-1	Osi-2	Osj-1	Osj-2
OG-1	-	*	*	*	*	*
OG-2	0.014	-	*	*	*	*
OSi-1	0.847	0.834	-	*	*	*
Osi-2	0.827	0.817	0.015	-	*	*
Osj-1	0.913	0.902	0.703	0.678	-	*
Osj-2	0.916	0.909	0.736	0.702	0.017	-

* Highly significant

- Significant genetic differentiation but limited
- No specific loci under selection



AMOVA (2118 SNP)

Collection date	Accession number	
1980 (OG-1)	80	
2011 (OG-2)	67	

Source of variation	SC	Variance	% variation
Entre-Pop.	461	3.2	1.4
Intra-Pop.	32 775	227.4	98.6
Total	33 236	230.6	

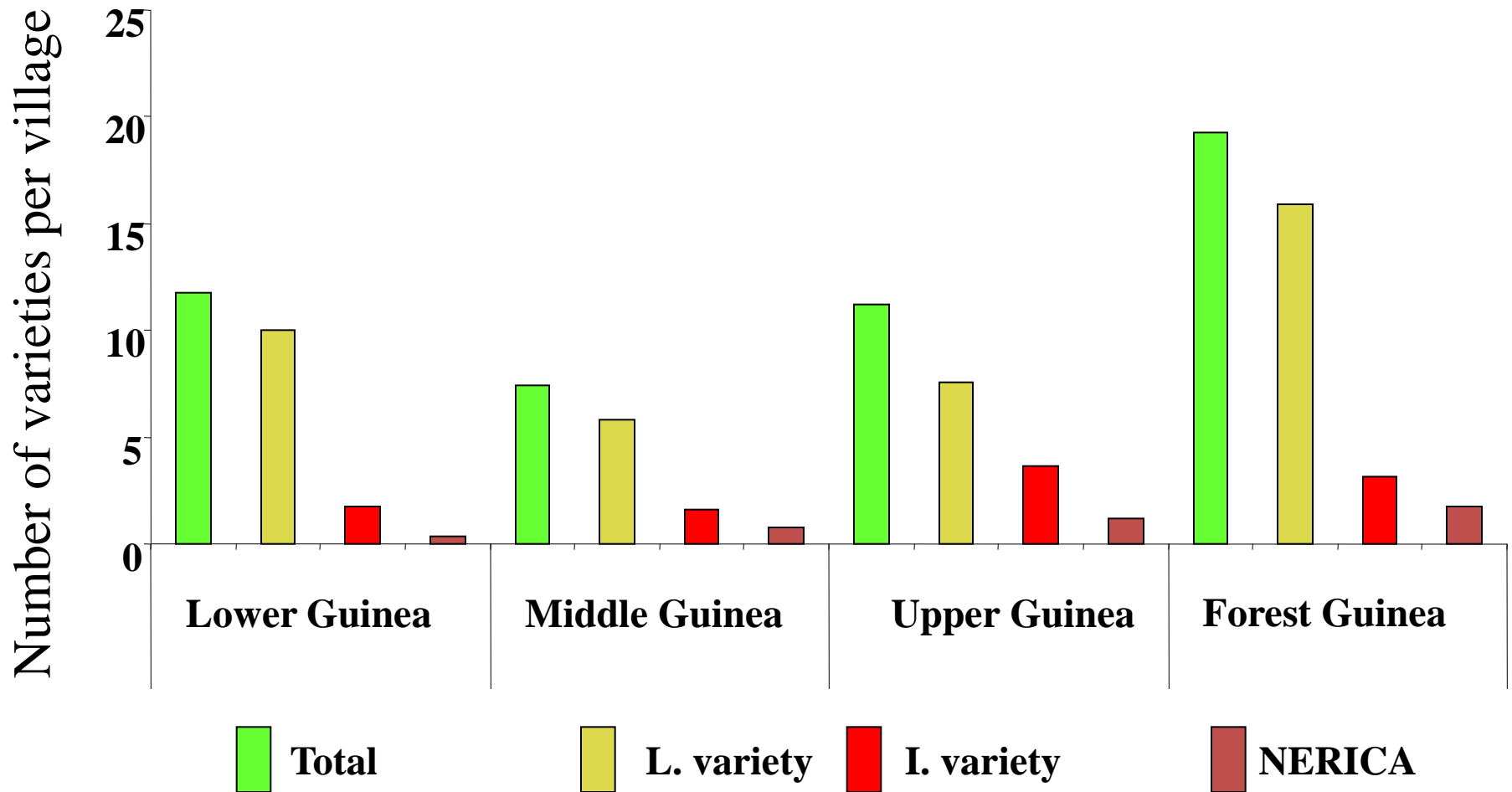
Recent development varietal National diversity survey

Region	Village¹	Exploitation²
Lower Guinea (LG)	32	726
Upper Guinea (UG)	18	361
Forest Guinea (FG)	17	370
Middle Guinea (MG)	12	240
Total	79	1697

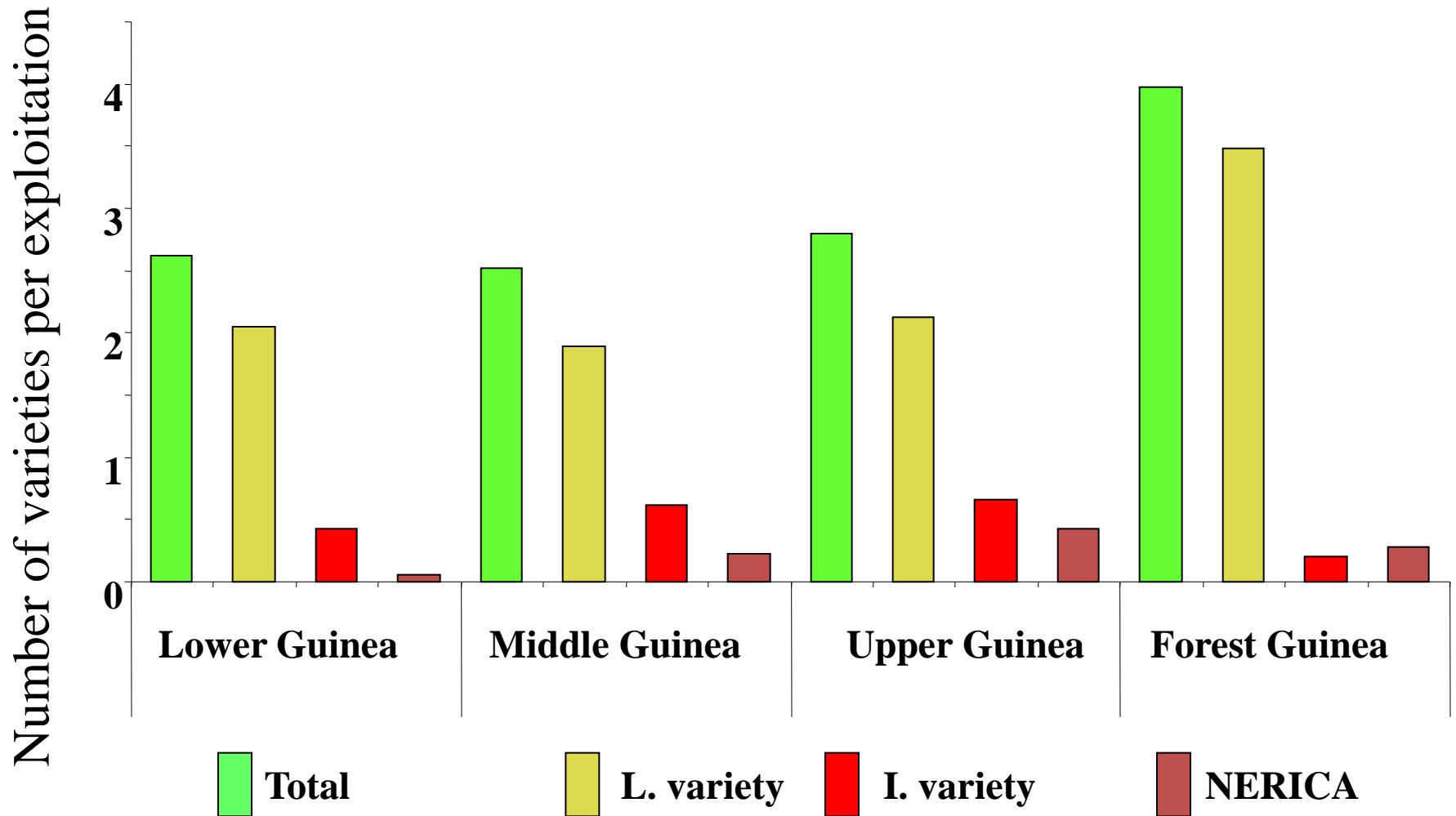
1: about 5% of the villages in each natural region

2: about 10% of the exploitations in each village investigated

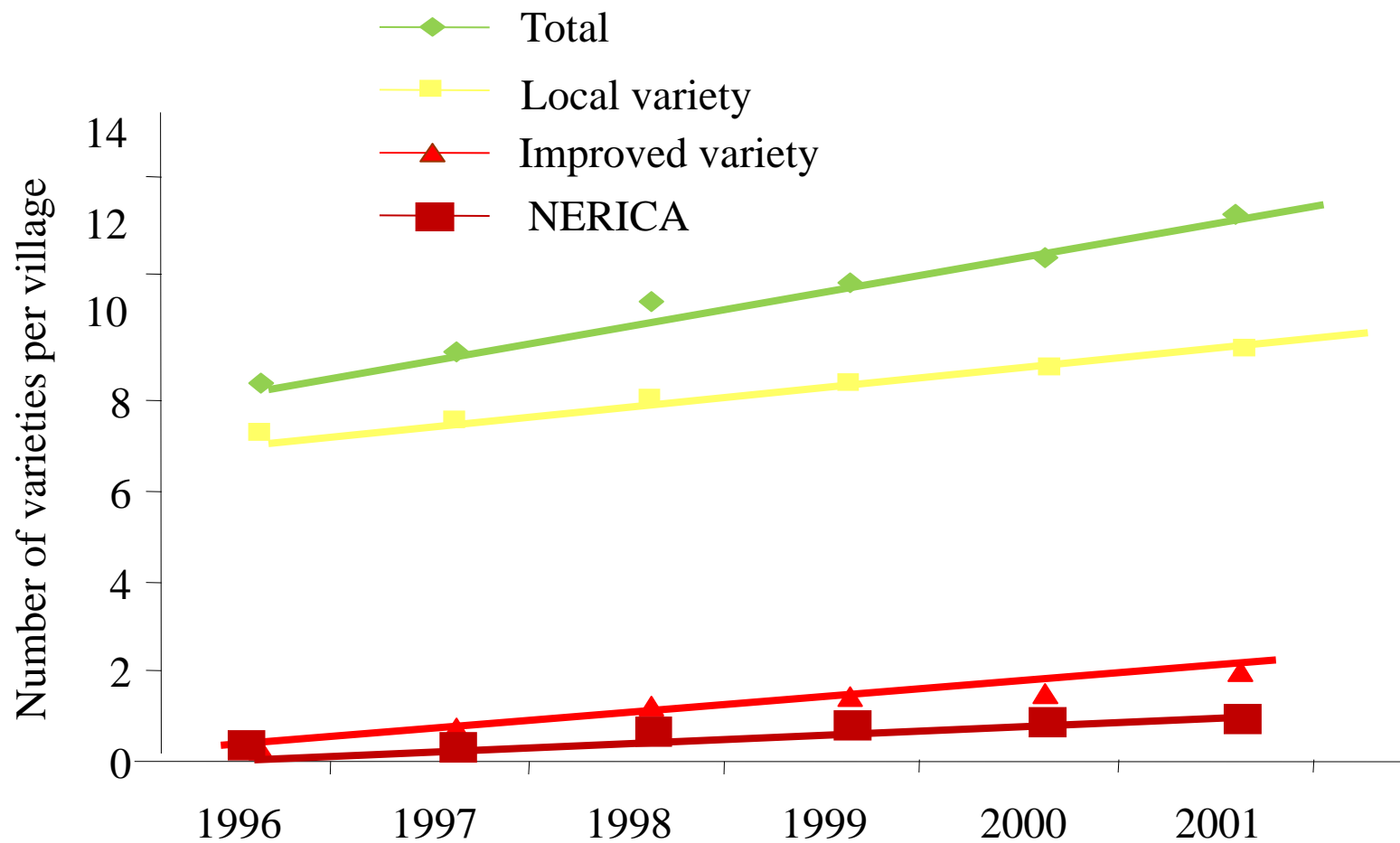
Varietal richness of villages in four natural regions of Guinea



Varietal richness of the exploitations In the 4 natural regions of Guinea

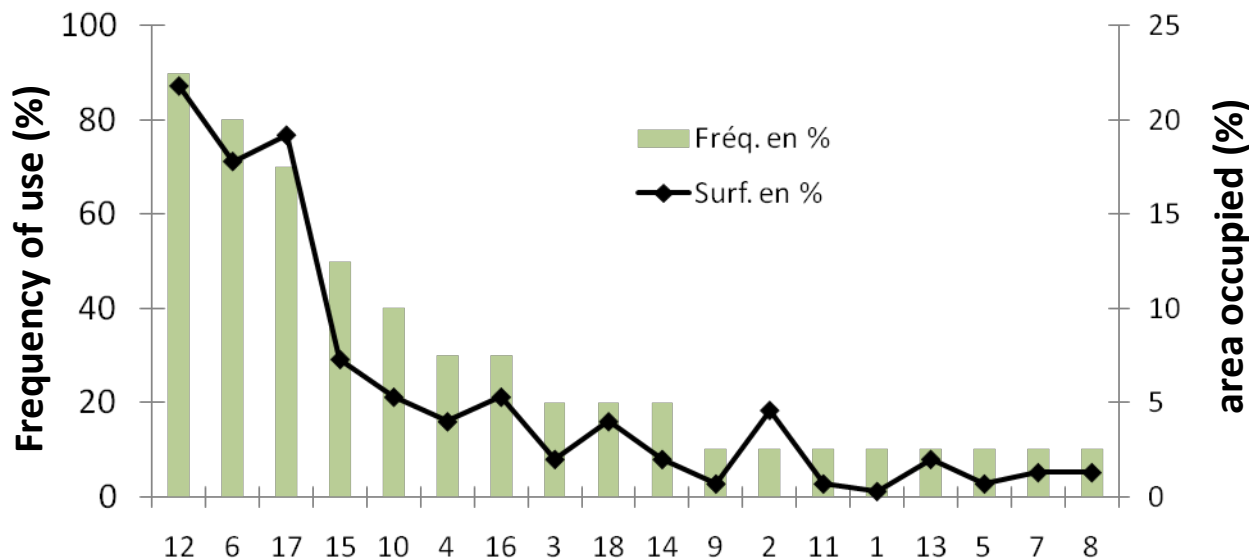


Recent development of rice varietal richness at the village scale



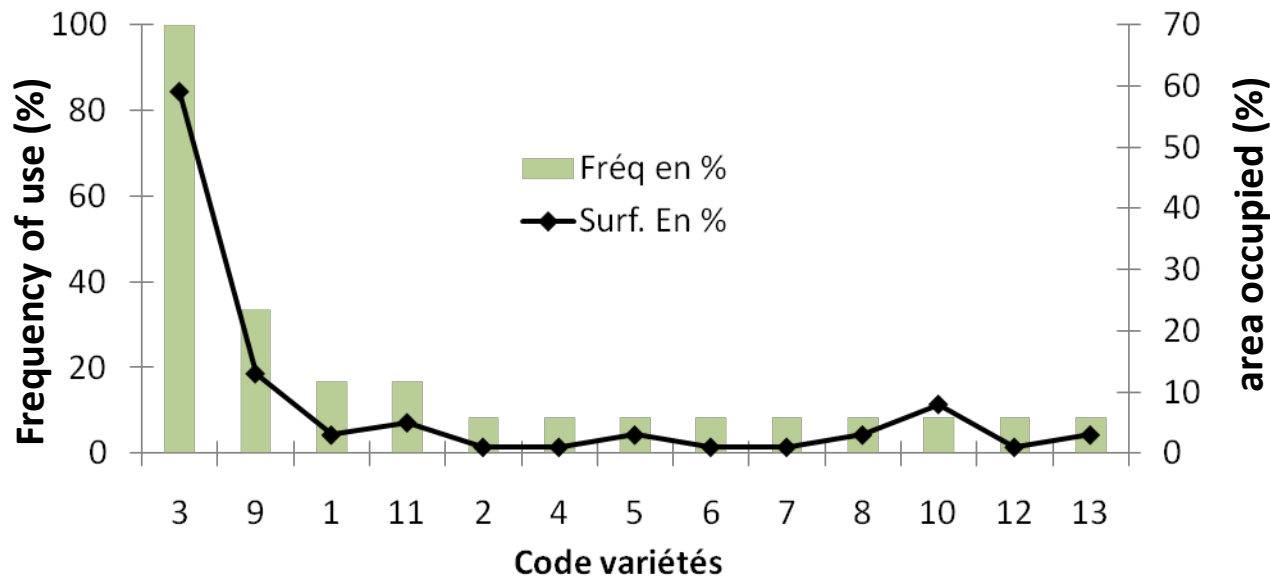
(4 regions, 79 villages, 1700 exploitations)

Rate of varieties utilization in the village



Flooded ecosystem (Village of Kifinda)

- 4 majors varieties
- 14 varieties minors

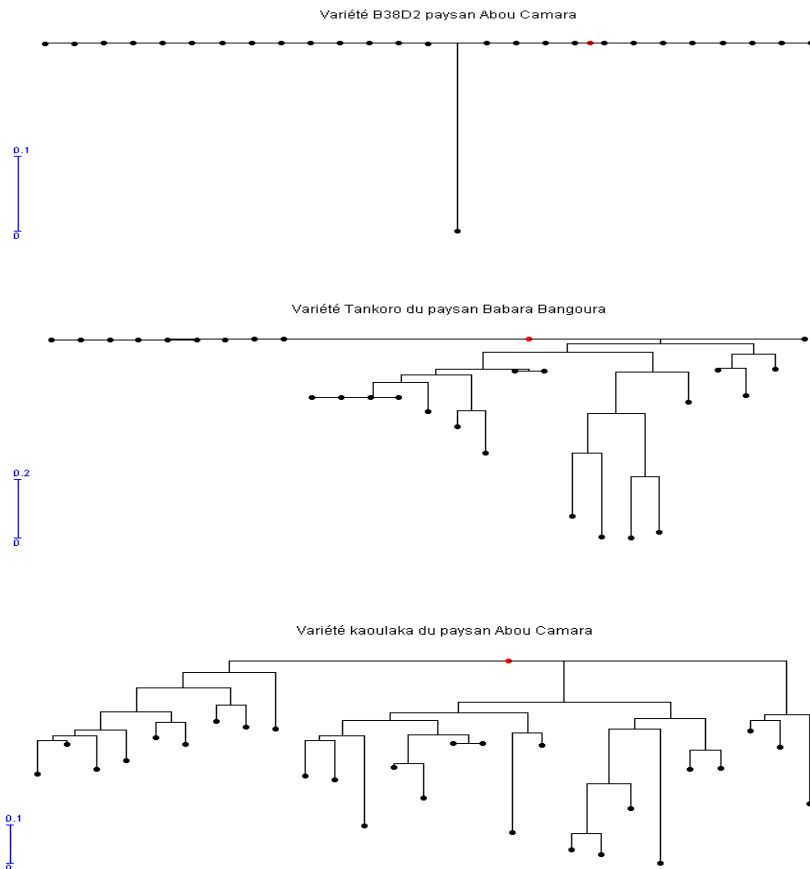


Upland ecosystem (village of Kantchrott)

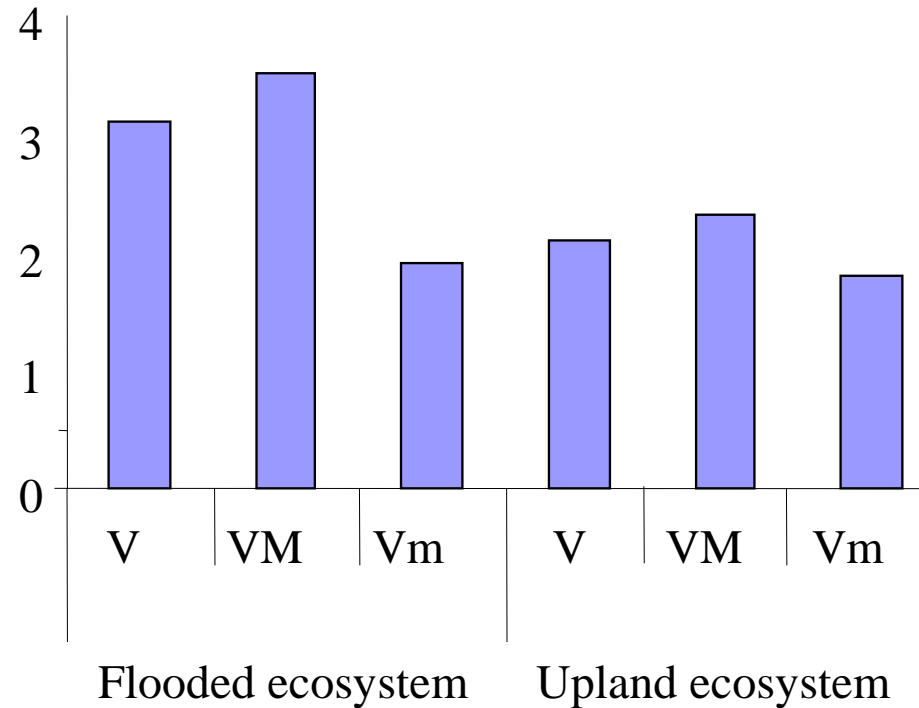
- 1 major variety
- 12 varieties minors

The genetic structure type multi-lines of local varieties

Neighbors – joining tree of 27 individuals of the same accession



Mean number of alleles per locus and per accession



V= All the village accessions
 MV = Majors varieties
 mV = Minors varieties

Conclusions

- Great varietal diversity with a predominance of local varieties, typical of subsistence agriculture;
- Big needs of farmers in varietal innovation;
- Complementary relationship between local and improved varieties, not competition;
- Genetic erosion, a difficult process to evaluate lack of accurate initial references;
- No obvious loss of diversity over the period 1980 – 2003, related to the introduction of improved varieties;
- Some risk situations, related to environmental degradation;
- **We have all the knowledge to set up a monitoring system for diversity in situ.**

Questions about the monitoring of diversity

- Which targets ? ;
- Which spatial scales ?;
- Which temporal scales ?;
- Which indicators for targets, spatial scales, temporal scales ?
- Which actors ? Recherche, Extension, Farmers, others

Others priorities in Guinea

- Preservation *in situ* diversity ;
- Exploitation and of valorization of the local diversity.