

URINE AND FAECES AS FERTILIZERS IN THE CREPA NETWORK

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PRESENTATION OUTLINE

1. INTRODUCTION
2. RESEARCH RESULTS
3. TASTE - TEST
4. QUANTIFYING THE ECOSAN FERTILIZER POTENTIAL

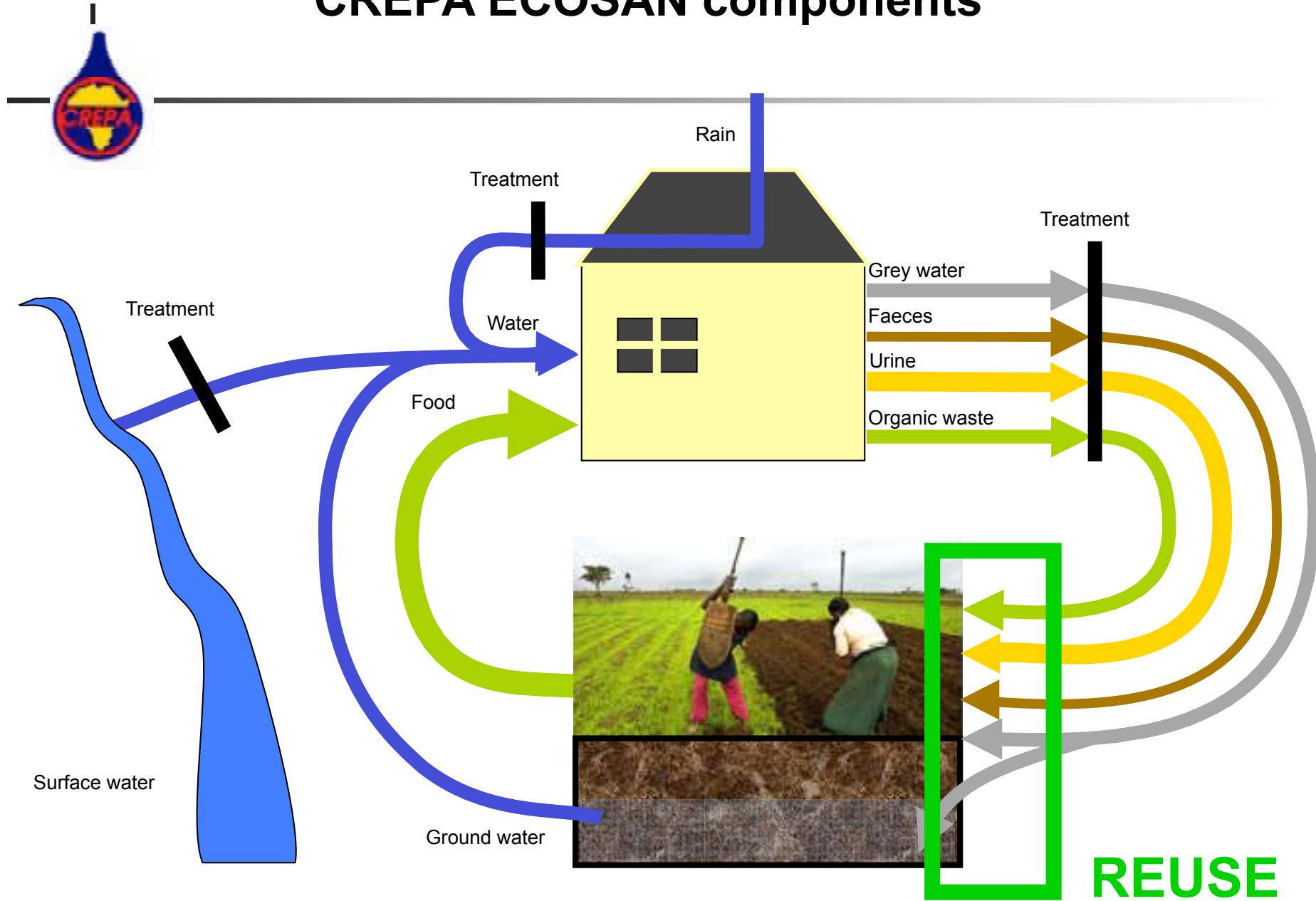


1. INTRODUCTION



**ECO
SAN
CREPA**

CREPA ECOSAN components





2. RESEARCH RESULTS



Research results 2002-2005 (some)



Crop		Egg plant	Gombo	Tomato	Lettuce	Cabbage
Country		Burkina	Burkina	Burkina	Togo	Togo
Control	Tons/ha	2,8	1,7	2,1	6,8	19,1
NPK+urea	Tons/ha	17,1	2,6	5,8	13,3	31,0
Some PK + Urine	Tons/ha	16,0	2,3	5,2	15,7	32,0
[N] urine	g/l	8,0	2,7	8,0	4,4	4,4
L urine/m ²	l/m ²	3,6	3,2	2,4	2,2	3,9

Research results 2002-2005 cont...



Crop		Sorghum	Maize	Manioc	Groundnuts	Cotton	Yams
Country		Burkina	Benin	Côte d'Ivoire	Benin	Mali	Cote d'Ivoire
Control	Tons/ha	2,3	2,4	45	0,44	0,18	4,0
NPK+urea	Tons/ha	4,1	3,5	60	0,78	0,38	6,0
Some PK + Urine	Tons/ha	3,8	3,6	60	0,56	0,35	8,0
[N] urine	g/l	8,0		3,6		3,3	3,6
L urine/m ²	l/m ²		5,4	4,8	7,6	0,5	6,7

3. TASTE TEST



**ECO
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Blind test - Aguié, Niger 2009



	Villages	People testing
Onion	4	40
Pepper	3	30
Cabbage	2	20
Carrot	1	10
Tomato	1	10



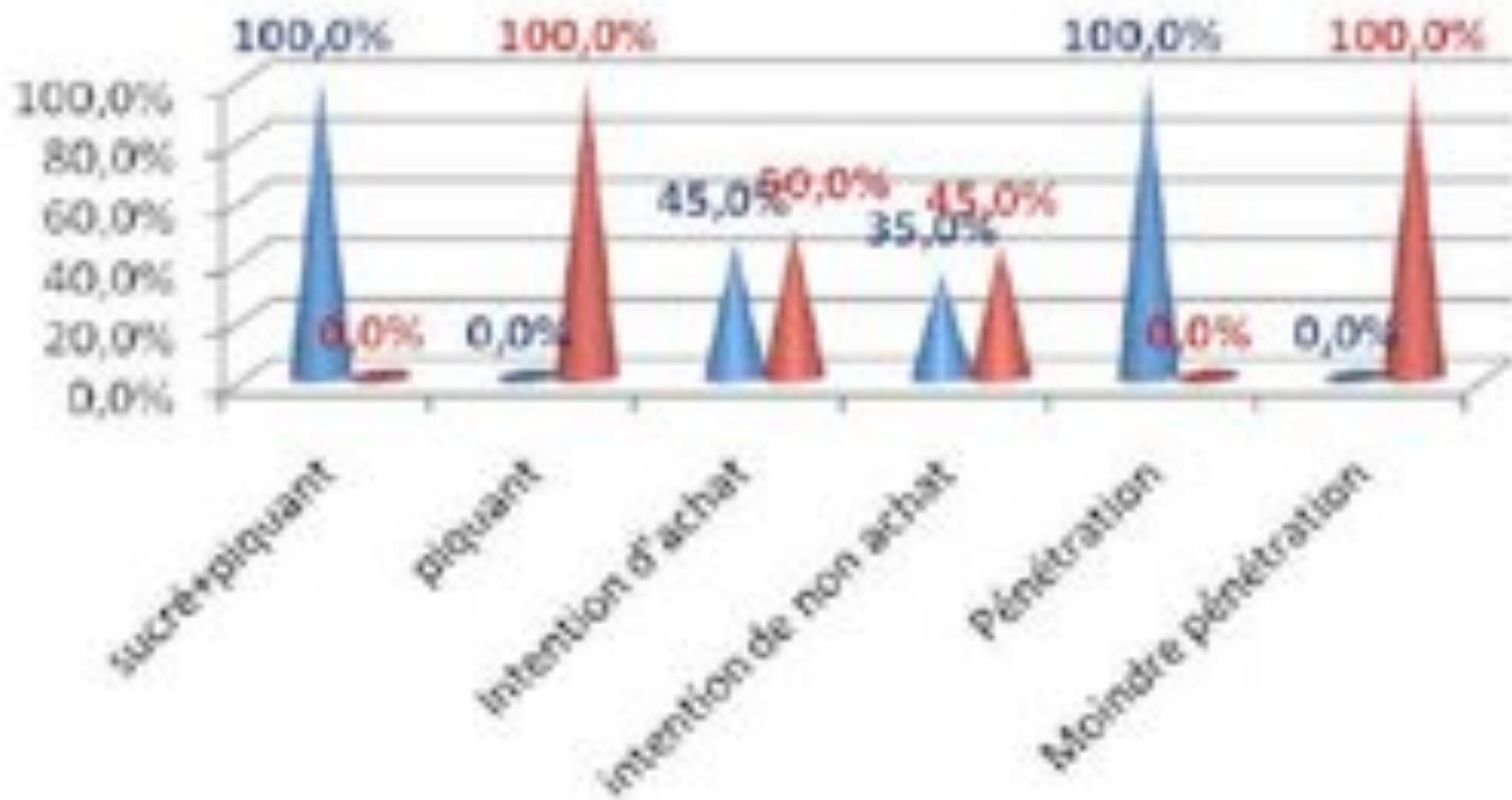


Blind test - Onion



■ Oignon takin nuwa

■ Oignon urée





Blind test - Summary

	Taste		Prefer buying (taste)		Prefer buying (looks)	
	Urine	Urea	Urine	Urea	Urine	Urea
Onion	Sweet/ Spicy	Spicy	45%	55%	100%	
Pepper	Sweet/ spicy	Spicy	50%	50%	93%	7%
Cabbage	Sweet	Aftertaste	100%		95%	5%
Carrot	Sweet	"Thick"	100%		100%	
Tomato	Sweet	Sour	100%		100%	

Urine fertilized = sweeter taste!

4. Quantifying the ECOSAN fertilizer potential

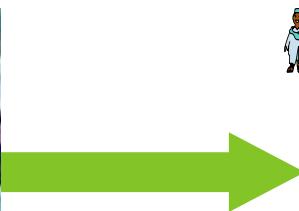


The economic value of ECOSAN fertilizers

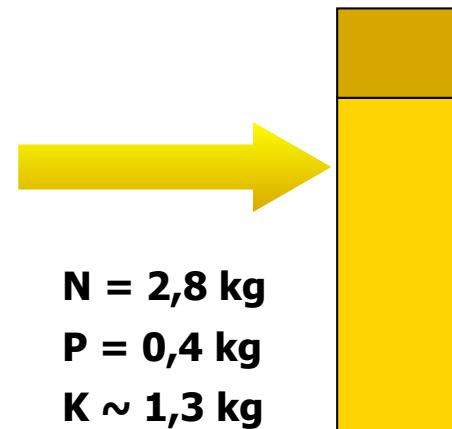


- Value generated: Per person/family/country
- Value of a given quantity: 1 jerry can of urine (20 litres), 1 kg de fèces

Quantity of fertilizers generated



**N = 2,8 kg
P = 0,4 kg
K ~ 1,3 kg
Per person per year**



**N = 2,8 kg
P = 0,4 kg
K ~ 1,3 kg
Per person per year**





Quantity of fertilizers generated

$$N = 0.13^* \text{ total protein}$$

(équation 1)

$$P = 0.011^* (\text{total protein} + \text{vegetal protein})$$

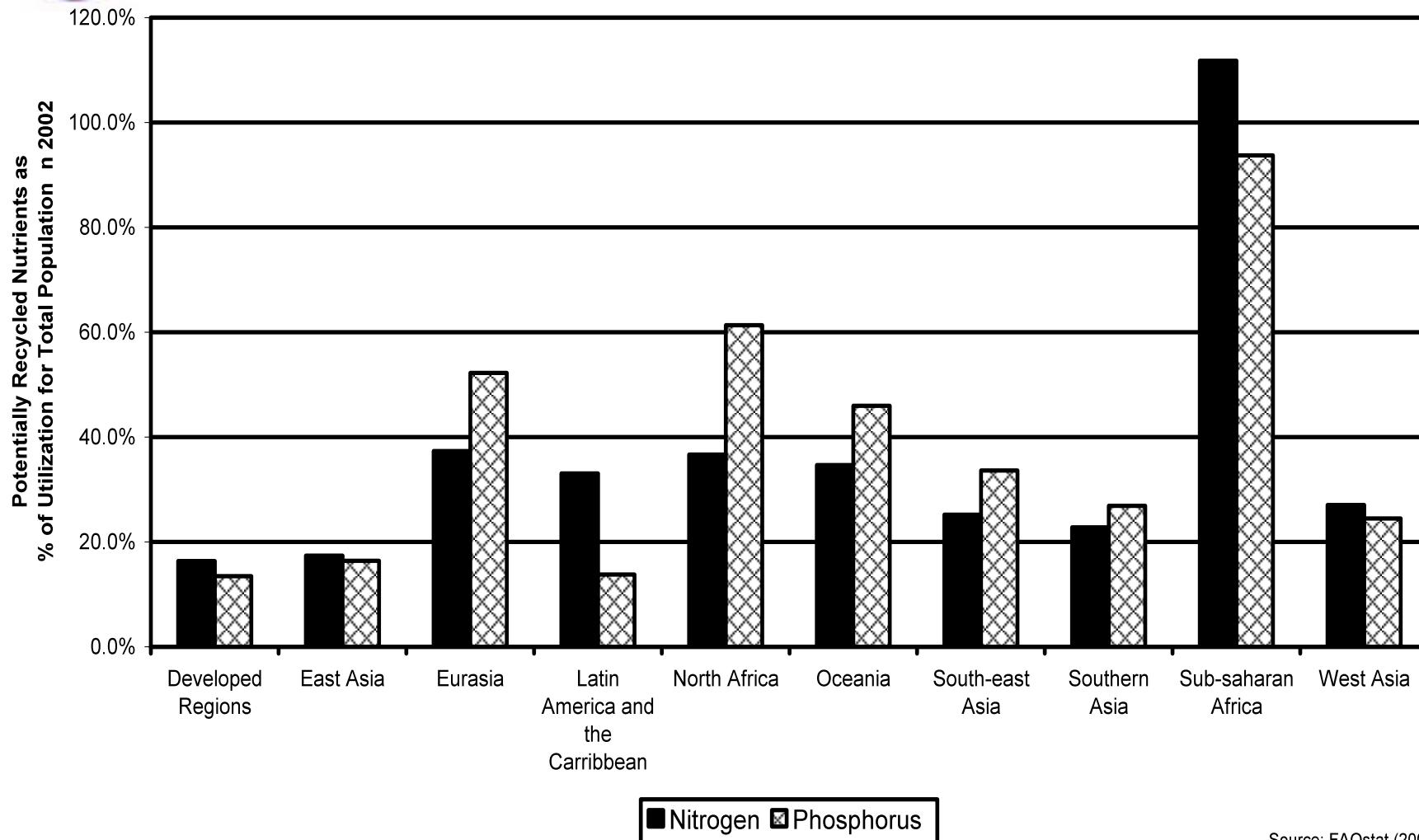
(équation 2)

(Jönsson et al, 2004)

Average nutrient content in excreta based on the protein intake in 10 CREPA countries

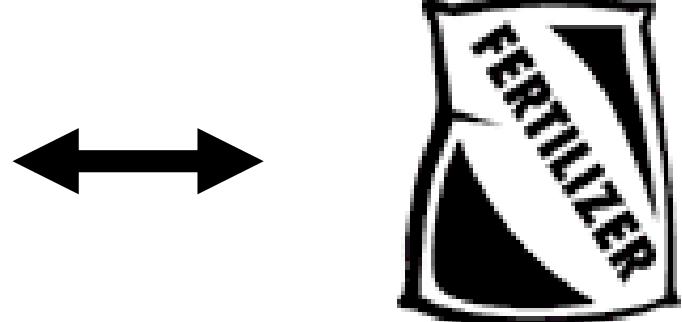
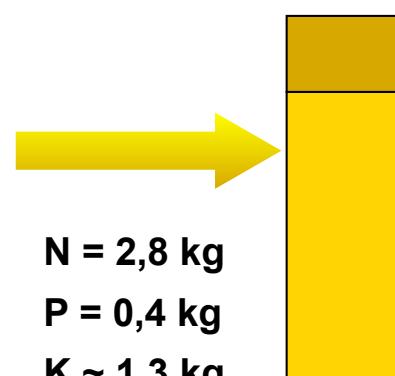
	Benin	Burkina	Congo	Côte d'Ivoire	Guinée Bissau	Guinée	Mali	Niger	Senegal	Togo	Tout les 10 pays
Population	7250000	13580000	3000000	17327000	1388000	9246000	11956000	11360000	10852000	5550000	91509000
Protein totale (g/cap/jour)¹	62,9	72,6	44,8	55,1	39	51,3	63,2	56,9	57	53,7	58,8
Protein vegetal (g/cap/jour)¹	51,6	64,8	28,5	43,1	32	43,2	47	49,1	38	46,6	47,2
Protein totale (kg/cap/année)	22,9585	26,499	16,352	20,1115	14,235	18,7245	23,068	20,7685	20,805	19,6005	21,462
Protein vegetal (kg/cap/année)	18,834	23,652	10,4025	15,7315	11,68	15,768	17,155	17,9215	13,87	17,009	17,228
N (kg/cap/année)²	3,0	3,4	2,1	2,6	1,9	2,4	3,0	2,7	2,7	2,5	2,8
N (kg/pays/année)	21638386	46781335	6377280	45301355	2568563	22506475	35854131	30670921	29350862	14141761	255315601
P (kg/cap/année)³	0,46	0,55	0,29	0,39	0,29	0,38	0,44	0,43	0,38	0,40	0,43
P (kg/pays/année)	3332952	7491556	882899	6831568	395670	3508094	5289968	4834702	4139224	2235010	38945315
K (kg/cap/année)⁴	1,5	1,8	1,0	1,3	1,0	1,3	1,5	1,4	1,3	1,3	1,4
K (kg/pays/année)	11109839,58	24971854,6	2942995	22771894,24	1318900,733	11693647,35	17633226,89	16115674,67	13797413,67	7450033,25	129805480

Fertilizer imported vs fertilizer generated



Source: FAOstat (2005)

Quantity and value of fertilizer in Burkinabè excreta



Burkina Faso
2005

	N (tons/year)	P (tons/year)	K (tons/year)	VALUE (millions \$)
Fertilizer*	22 632	8 801	14 801	102
Excreta	38 024	5780	19 265	119
Ratio excreta/fertilizer	1,68	0,66	1,30	1,16

* Statistics from www.fao.org (2005)

Quantity produced by one family in Niger

Comparing to bags of chemical fertilizer



Nutrient	Kg per person	Kg per family (9)	Kg in one bag of Urea (50kg) and one bag of NPK (15:15:15)
N	2.7	25	27
P	0.45	4	3
K	1.4	12,5	6

Average bought per year:

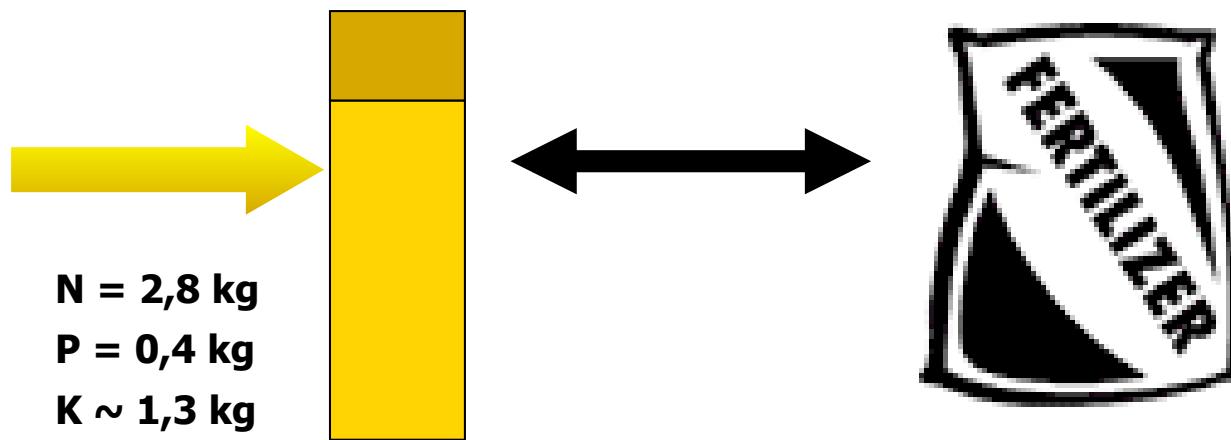
Urea 25 kg

NPK 21 kg





Value of fertilizers in excreta



N = 2,8 kg

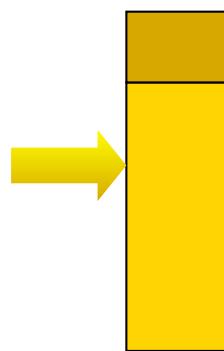
P = 0,4 kg

K ~ 1,3 kg

**Per person
per year**



Value of fertilizers in excreta



N = 2,8 kg



Urée = 6 kg

P = 0,4 kg



TSP = 2 kg

K ~ 1,3 kg

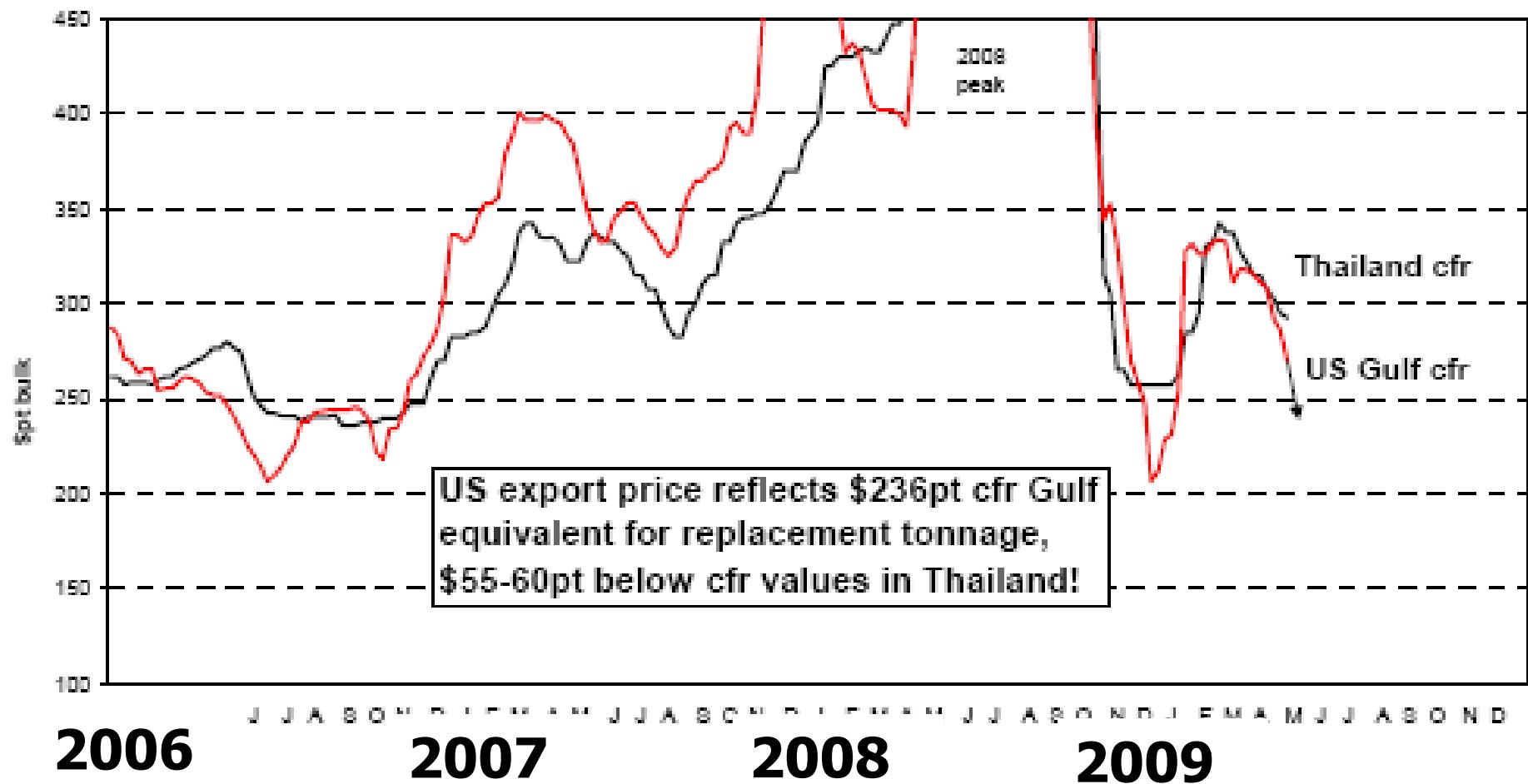


KCL ~ 2,6 kg

Fertilizer prices...



Granular Urea: East-West gap grows





Value of fertilizers in excreta



N = 2,8 kg
P = 0,4 kg
K ~ 1,3 kg

Value from one person

Price of one kg N, P et K in Burkina

Nutrient	Fertilizer	Price (bag of 50 kg)	Kg nutrient	Price / kg nutrient
N	Urée	20000	23	870
P	TSP	20500	9,86	2079
K	KCl	22500	24,8	907

Prix donnés par SOGEDIF sept 2008 (urée) et avril 2008 (TSP et KCl)

Value from one person

Nutrient	N	P	K	TOTAL
kg/person/year	2,8	0,4	1,3	
Price/kg	870	2079	907	
Value (CFA)	2400	800	1300	4500
Value - 10 %				4000



1 person



1 family of 10



13,5 million inhabitants



4000 FCFA
~8 \$

40 000 FCFA
~80 \$

~ 55 milliards FCFA
110 million \$

Fertilizer value in excreta

Sanitized urine - value of a given quantity



1 jerry can of liquid fertilizer (20 litres)

Nutriment	g/l	Kg par bidon	Prix par kg	Valeur par bidon
N	5	0,1	870	87
P	0,5	0,01	2079	21
K	2	0,04	907	36
TOTAL				144
TOTAL - 10 %				~ 130 FCFA

→ 130 CFA per jerry can (~25 c)

Fertilizer value in excreta

Sanitized faeces - value of a given quantity



1 kg of « solid fertilizer » :

Nutriments	g/kg fèces	Prix par kg	Valeur/kg
N	20	870	17
P	15	2079	31
K	15	907	14
TOTAL			62 FCFA
TOTAL - 10%			55 FCFA ~12 c

→ 5,50 \$/ 50 kg bag

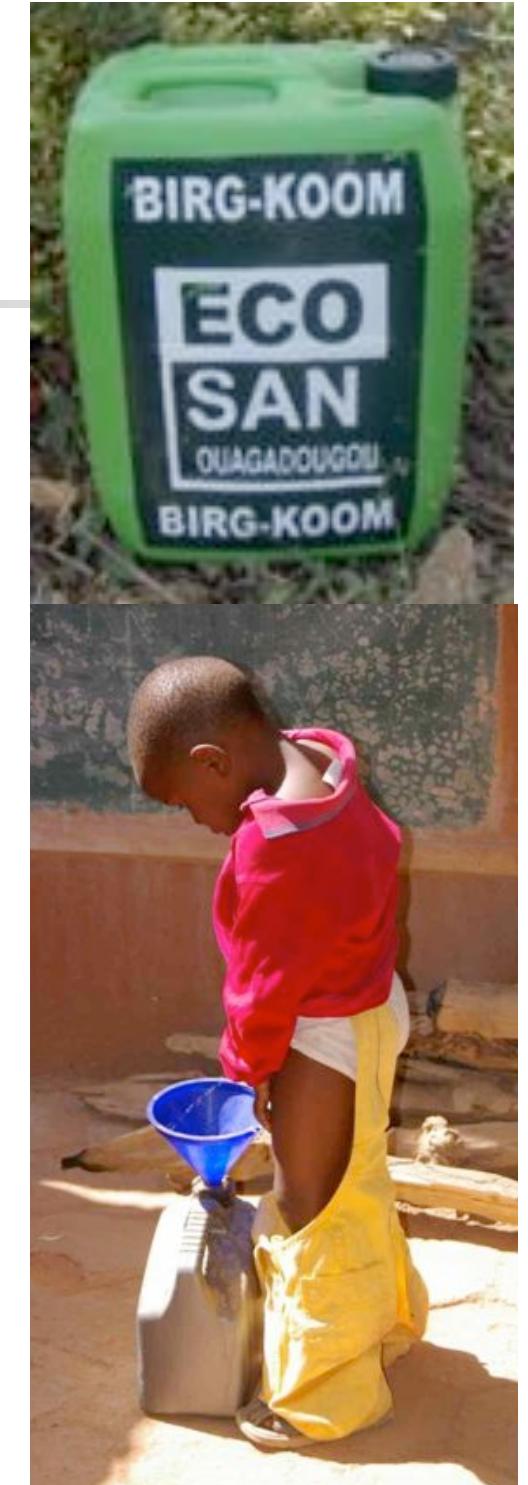


Large part of fertilizer value in urine

You pee 5,5\$ per year and shit 2,5\$ per year (roughly!)

You pee about a 100 kg of cereals!

To collect urine – no latrine is needed!



Discussion



Use of ECOSAN fertilizer

- Cereal fertilization: 60 kg N/ha
1 person = 3 kg N/year
→ Needs excreta from 20 persons
- A good fertilization can give 3 tons of cereal per hectare
(Dr Bonzi, INERA, commentaire personnel, 2007)
- In Burkina a person needs 190 kg of cereal per year to cover energy needs
(Martin-Prevel, IRD, commentaire personnel, 2007)
- Hence 3 tonnes can feed 15 persons – and people who eat well also produce more fertilizer!



Discussion

Value of the crop production

- Cereal production with good fertilization: 3 tons/ha
Production without fertilization: 0,5 tons/ha

→ Fertilisation adds 2,5 tons / ha
- 2,5 tons of cereal with ECOSAN fertilizer from 20 persons
= 125 kg of ECOSAN cereal per person/year
- 100 kg de maize cost about 22 000 CFA (44 \$) at the moment

125 kg = 55 \$ / personne

(NB. Work costs, pesticides etc to take into account)



**THANK
YOU!**

URINE

CONTROL



2. The agriculture challenge



**ECO
SAN
CREPA**

If so high reuse potential –



Why little auto-replication?

- Not enough information/easy to use manuals
- Not enough media coverage yet
- People need to see/experience/touch to believe – information is not enough
- Not enough actors involved, critical mass needed (“more examples to see”)
- Not enough cheap models in CREPA’s projects (extremely poor population)
- ECOSAN as a business needs to be a reality

Public ECOSAN latrines could be profitable

CREPA Dream: “I build your toilet if I can have your human fertilizer”
(cost 200 \$ for toilet – generates 8 \$ fertilizer per person/year)

The Agriculture Challenge

- 927 million people living in 46 countries are malnourished (200 million in Africa)
- 40,000 die every day of hunger and hunger-related diseases
- famine currently threatens nine African countries, where the lives of 20 million people are at risk
- some 75-80% of Africa's farmland is degraded
- Africa loses between 30-60kg of nutrients per ha per yr - the highest rate in the world
- the countries in Africa with the highest rates of depletion: Guinea, Congo, Angola, Rwanda, Burundi and Uganda at 60kg/ha
- 2002/03 Sub-Saharan Africa used 8kg of fertiliser per ha
- compare this to South America (80kg), North America (98kg), Western Europe (175kg), East Asia (202kg), South Africa (61 kg) & North Africa (69kg)
- Food prices rose 52 percent between 2007 and 2008,
- Fertilizer prices have nearly doubled over the past year.

The Agriculture Challenge



Agriculture occupies more than occupies more than 80% of active people in Sub Saharan Africa

but

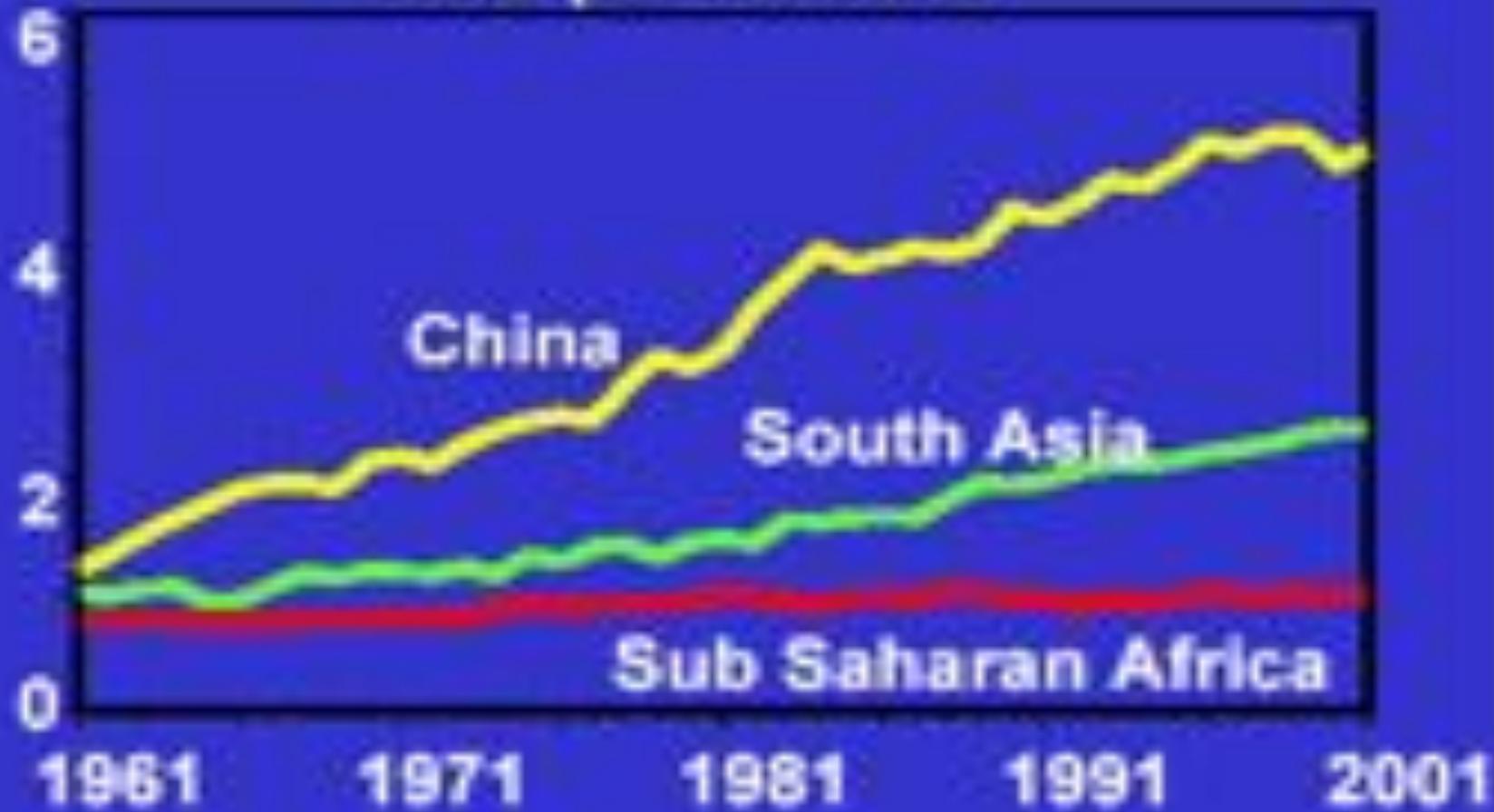
The rate of Yields increase = 1%, versus a demographical increase rate = 3%

Consequences

- High pressure on natural resources, mainly on soils that are more and more degraded,
- 200 million people live in chronical hunger

Cereal yields, 1961-2001

Tons per hectare

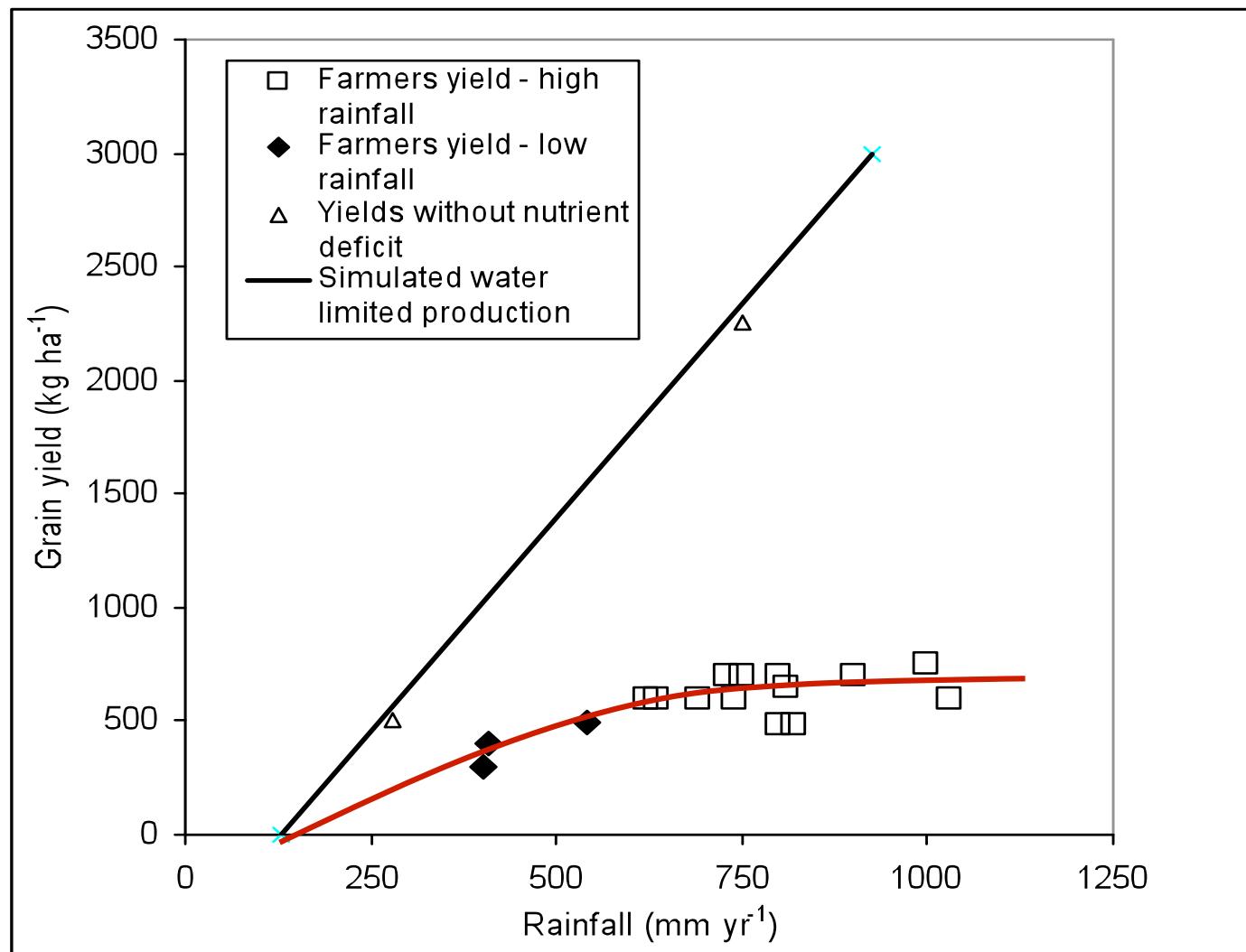


Source: FAOSTAT (2001)

Sub-Saharan Africa stands at the same level of cereal yields since the 60's, while Asia and China have succeeded their green revolution

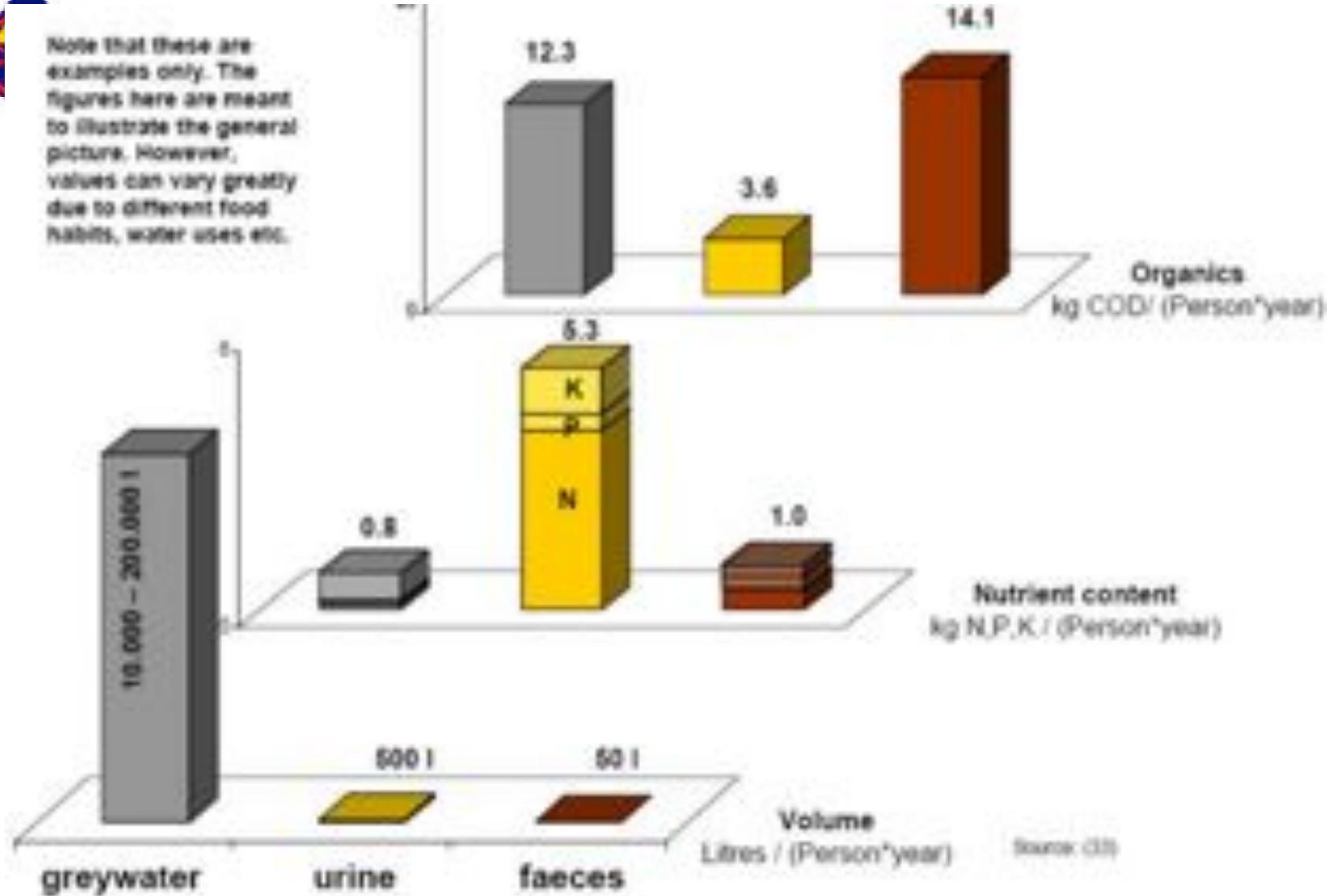


Nutrient Recycling and Agricultural productivity



VOLUMES, ORGANIC MATTER AND NUTRIENTS

Note that these are examples only. The figures here are meant to illustrate the general picture. However, values can vary greatly due to different food habits, water uses etc.



ECOSAN FERTILIZERS



Birg-koenga

“solid fertilizers”



Birg-koom

“liquid fertilizers”

Raie/trou/biner



Raie/trou/biner



Raie/trou/biner



Raie/trou/biner



Raie/trou/biner



Birg koom dans arrosoir



Application Birg koom



Application Birg koom



Application Birg koom



Application Birg koom



Application Birg koom



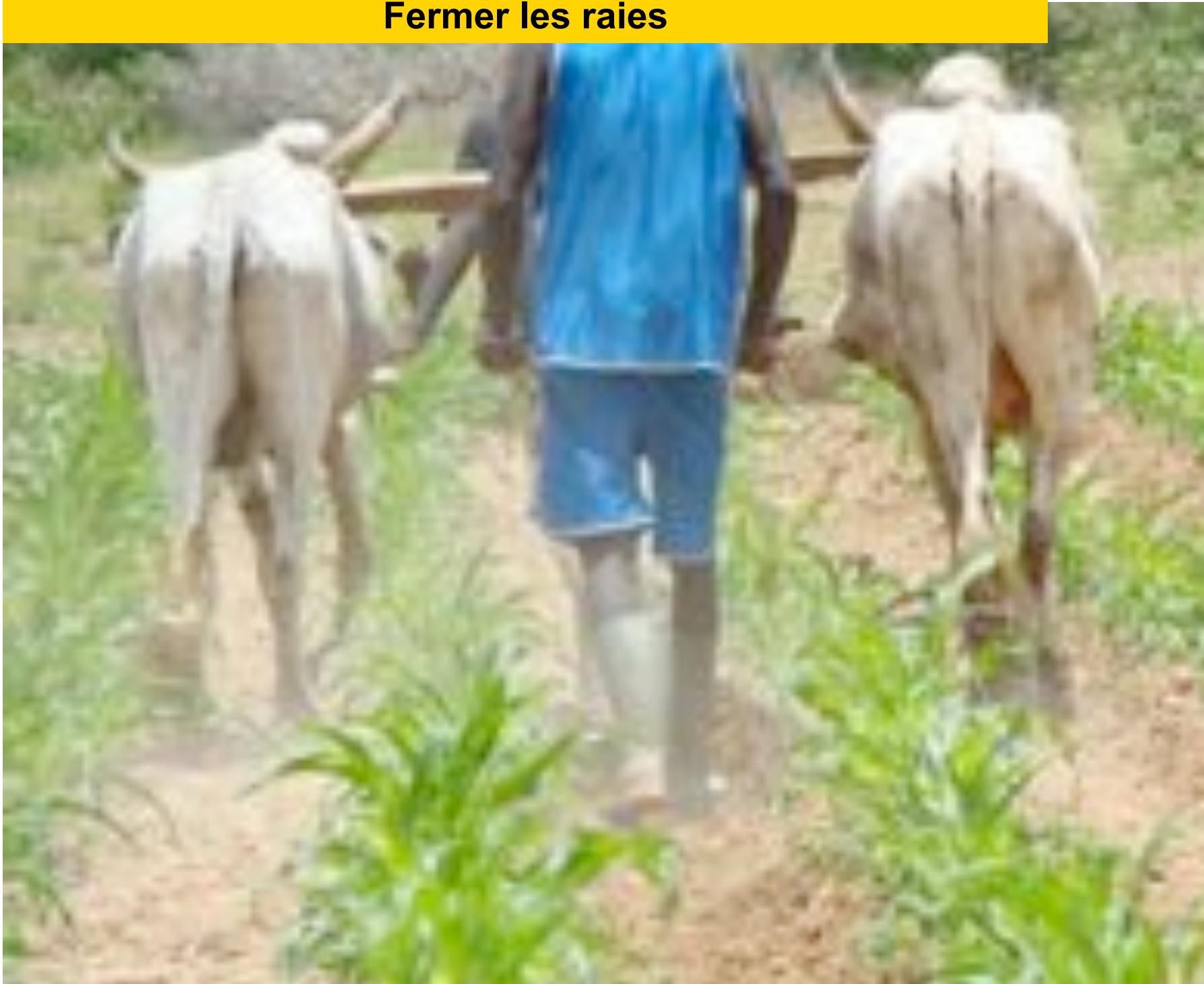
Application Birg koom



Application Birg koom



Fermer les raies



Fermer les raies/trous



Fermer les raies/trous





UREE



BIRG KOOM

Application Birg koom dilué sur cultures serrées



Arrosage après application



Arrosage après application



RESULTAS



Birg koom

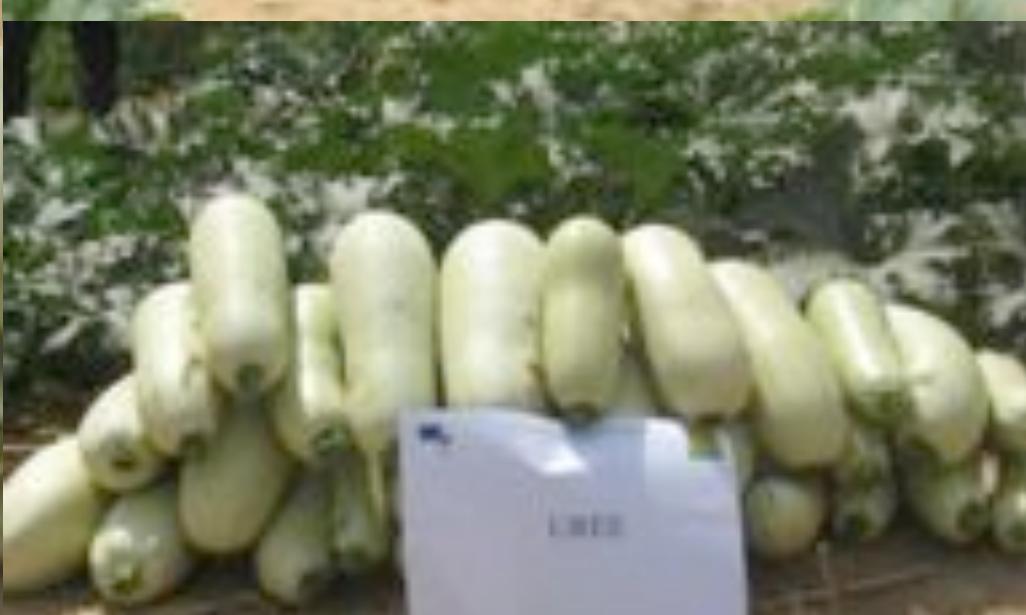


Uree

RESULTATS



Birg koom



Uree

RESULTATS

SECTEUR 19



Birg koom



Birg koom

Uree

RESULTATS



Birg koom



Uree

RESULTATS



Birg koom



Uree

RESULTATS



Birg koom

Uree

RESULTATS



Birg koom



Uree

RESULTATS



Birg koom

Uree

RESULTATS



RESULTATS



Birg koom

Uree

RESULTATS



Birg koom

Uree

RESULTATS



Birg koom

Uree

RESULTATS



Birg koom

Uree

RESULTATS

BURKINA FASO



Zero apport



NPK + Uree



Birg-koenga + Birg-koom

RESULTATS



MALI



RESULTATS

MALI



Urine

Sans urine

RESULTATS



MALI - coton



Urine



Sans urine

RESULTATS GUINEE



Urine



Sans urine

RESULTATS

COTE D'IVOIRE







THANK YOU FOR YOUR ATTENTION