

# IFDC CATALIST ISFM ACHIEVEMENTS

2006-2011 *(Catalyzing Accelerated  
Agricultural Intensification for social and  
Environmental Stability)*



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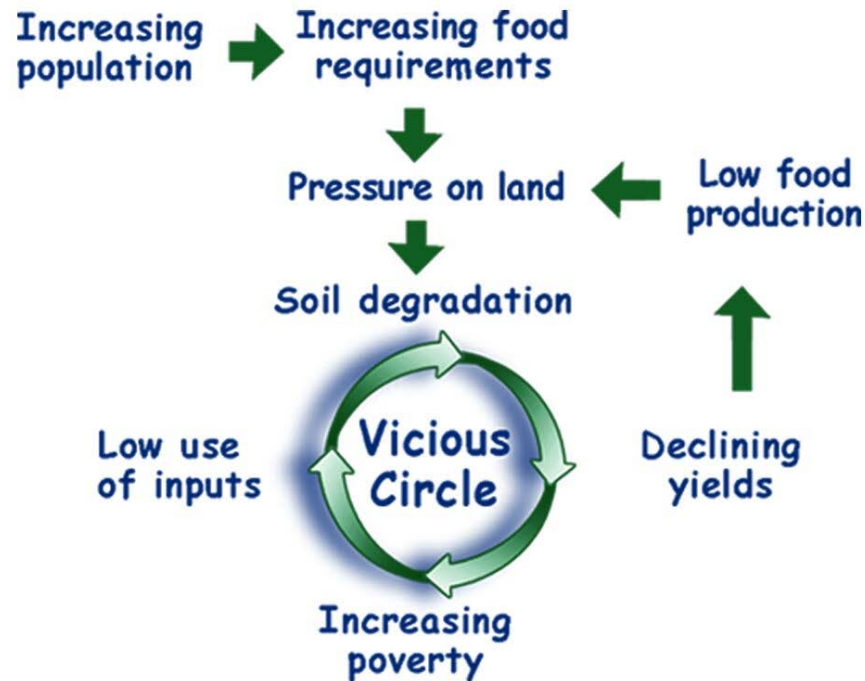
# OUTLINE

- Introduction
- ISFM definition
- IFDC CATALIST achievements in soil health/ISFM
- CATALIST-2 soil health activities
- Conclusion

# INTRODUCTION

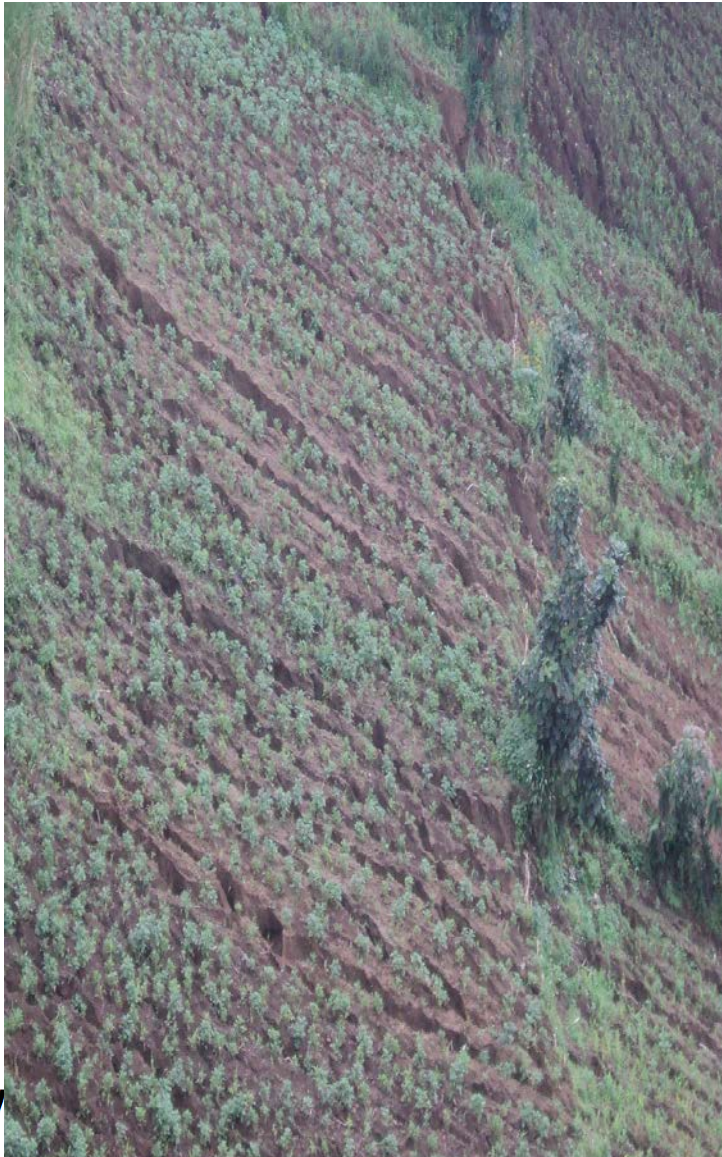


- Nutrient depletion and organic matter loss are severe in Africa – Rwanda and must be addressed



## La durabilité des systèmes agricoles en jeu

Annual loss of 80 kg/ha de N,  $P_2O_5$ ,  $K_2O$



# ISFM?

A set of soil fertility management practices that ***necessarily include*** the use of ***fertilizer, organic inputs and improved germplasm*** combined with the knowledge on how to adapt ***these practices*** to local conditions...

- Soils
- Agro-ecology
- Market opportunities
- ...and a host of other variables.....aimed at ***maximizing agronomic use efficiency of the applied nutrients*** and improving crop productivity.

$$AE_N = \frac{\text{kg yield increase}}{\text{kg N applied}}$$

# What is ISFM? *IFDC definition*

...a set of soil fertility management practices adapted to local conditions, aiming at ***maximizing agronomic use efficiency of nutrients*** and ***improving crop productivity***.

Practices involved include the use of mineral fertilizer, soil amendments (lime, rock phosphate), organic inputs, improved germplasm, agroforestry and the use of rotations or intercropping with legumes.

# ISFM practices

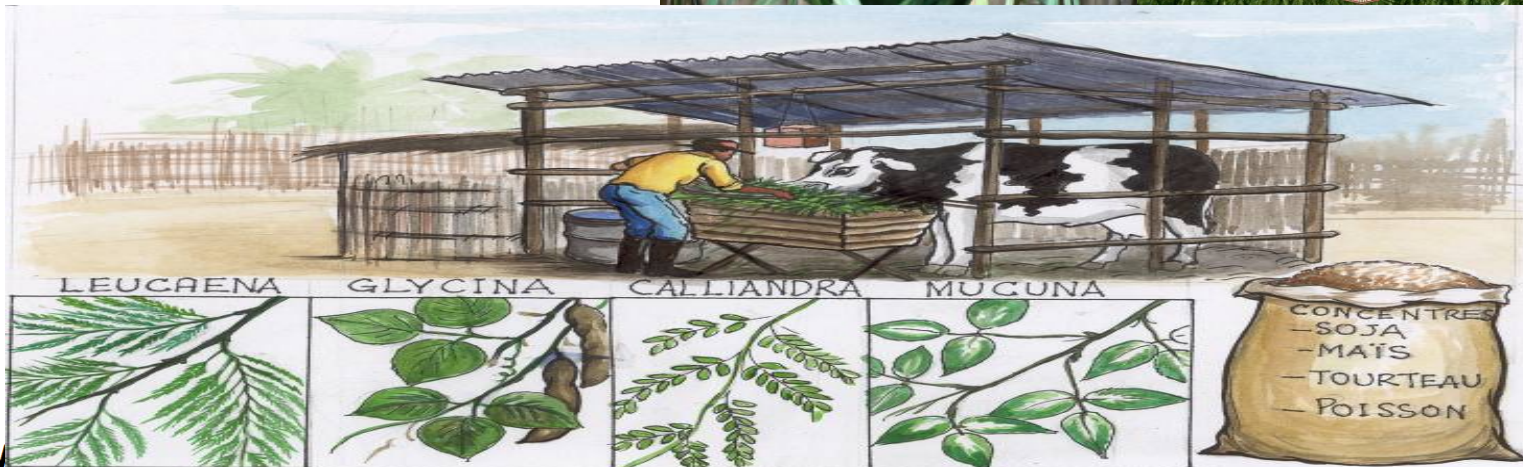




# ISFM practices



# ISFM practices



# IFDC CATALIST Achievements in SOIL HEALTH/ISFM

- IFDC's approach to ISFM focuses on **inorganic fertilizers** as a source of nutrients for crops . **Soil amendments** are used for improving and maintaining soil quality, assuring that fertilizer use is efficient and that environmental risks are limited and controlled.
- The main focus will be on the results of participatory tests and demonstrations in which inorganic fertilizers have been combined with the use of organic matter. The latter is primarily manure or recycled crop by-products such as straw.

- From 2008 A to 2011A seasons, in HTL , HTB and HTBU agro-ecological zones, CATALIST tested different ISFM-based formulae with farmers and demonstrated their effects.
- Potato trials were conducted in: (i) the Musanze-Nyabihu districts (HTL); (ii) the Gicumbi district (HTB); and (iii) in the Nyamagabe district (HTBU). CATALIST trials are shown in Table 2 while yield results are presented in figure 1 which compares ISFM technology to FP in all three AEZ.

**HTL = Hautes Terres des Laves**

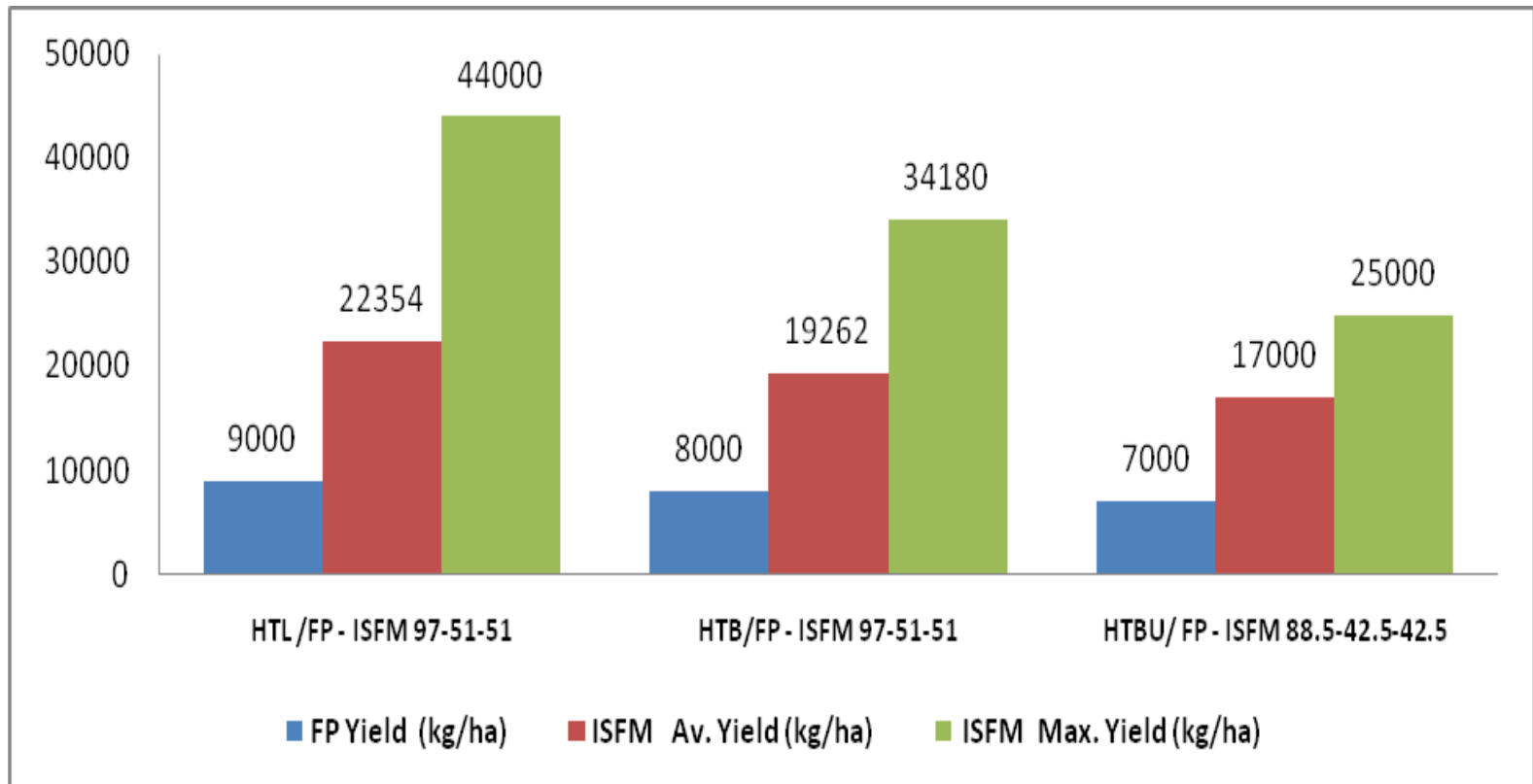
**HTB = Hautes Terres du Budaha-Ndiza-Buberuka**

**HTBU = Hautes Terres du Bufundu-Bushiru**

# Irish potatoes trials 2006-2011

AEZ	Treatment	Nutrient content	Comment
HTL/Musanze-Nyabihu-Rubavu	300kg NPK 17-17-17 and 100kg Urea (46%)	97-51-51	Use of 5 mt/ha of organic manure, crop rotation, use of improved seeds
HTB /Gicumbi	300kg NPK 17-17-17 + 100kg Urea (46%)	97-51-51	Use of 5 mt/ha of organic manure, crop rotation, use of improved seeds
HTBU/Nyamagabe	250kg NPK 17-17-17 +100kg Urea (46%)	88.5-42.5-42.5	Use of 5 mt/ha of organic manure, crop rotation, use of improved seeds and 2500-3000kg of lime after 4 seasons*

- Irish Potatoes yield trend (kg/ha) under ISFM 97-51-51 vs. FP technologies (2008-2011)



*HTL = Hautes Terres des Laves*

*HTBU = Hautes Terres du Bufundu-Bushiru*

*HTB = Hautes Terres du Budaha-Ndiza-Buberuka*

*FP = Farmers' Practices*

*ISFM = Integrated Soil Fertility Management*

A comparison of the agronomic efficiency of N-use and the VCR for different formulas, those of CATALIST ISFM packages

AEZ	Treatment	Nutrient Formula	AE/N	VCR
HTB	CAT/2008-2011	97-51-51	97 - 215	5 - 13
HTBU	CAT/2008-2011	88,5-42,5-42,5	88 - 195	5 - 9
HTL	CAT/2008-2011	97-51-51	110 - 287	6 - 17

# *Value Cost Ratio & Agronomic efficiency for N*

## *VCR: Value Cost Ratio*

- VCR values indicate the financial interest of adopting the use of fertilizers. A VCR  $>3$  indicates that the speculation is profitable for farmers.

## *AE/N: Agronomic efficiency for N*

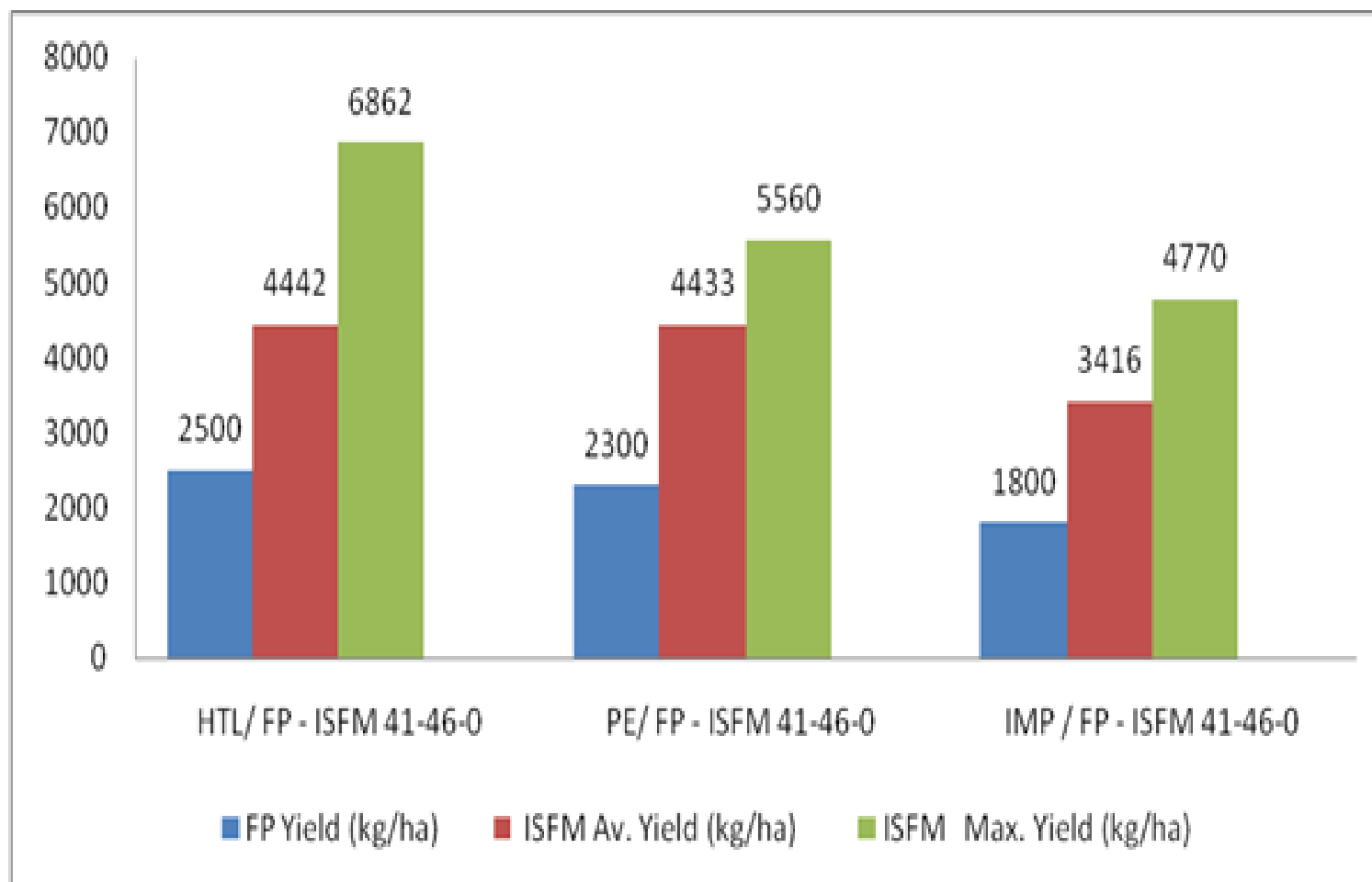
- Agronomic Efficiency (AE) values show the additional yield in kg of grains, tubers, etc. obtained due to the nutrients contained in applied fertilizers (Kg/kg).



# AE interpretation chart

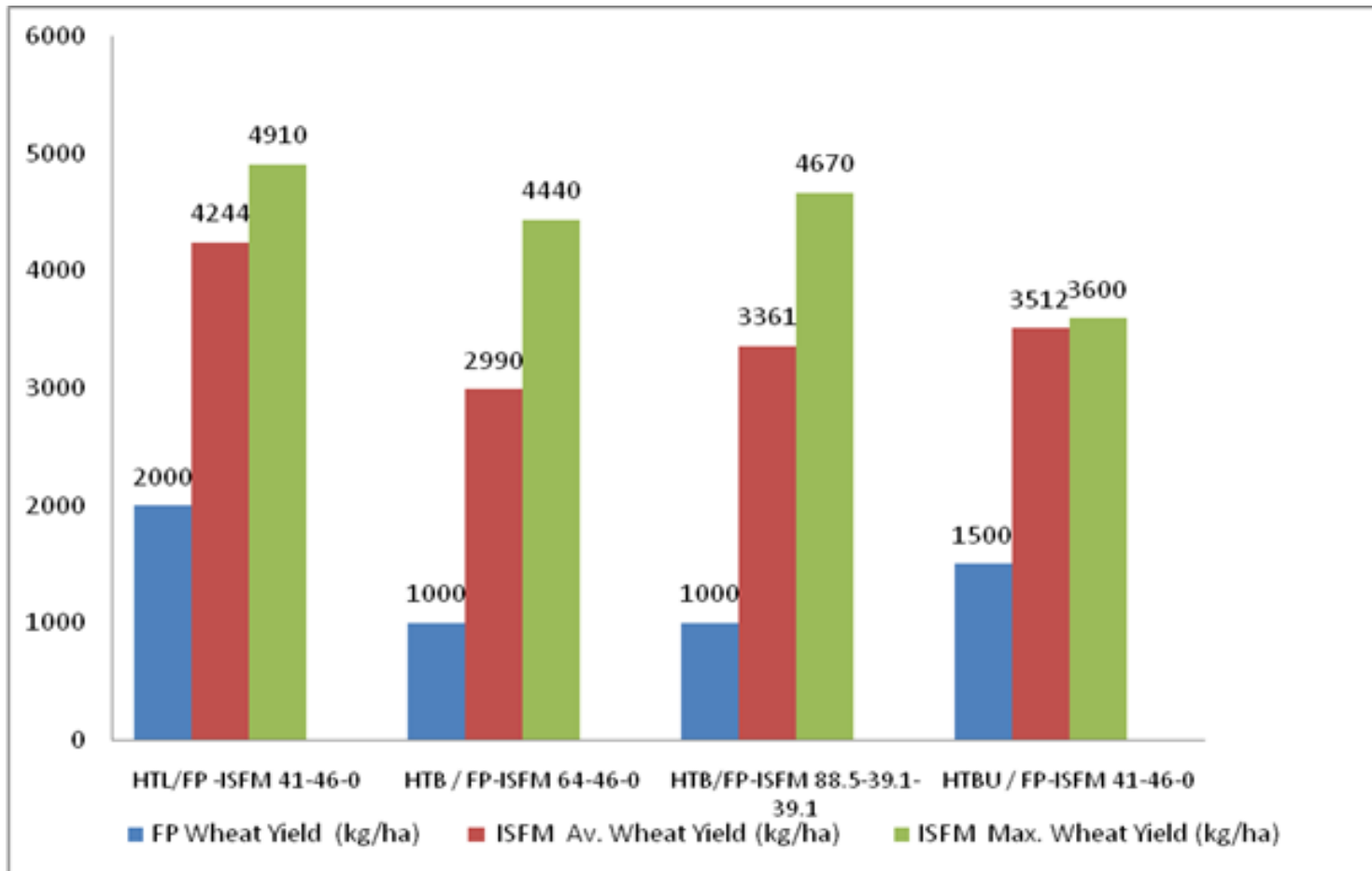
Nutrients	Crops	Agronomic Efficiency in Kg/kg		
		Low	Reasonable	Very Good
N	Cereals	$\leq 10$	15	$\geq 25$
P	Leguminous	$\leq 40$	60	$\geq 100$
K	Tubers (potato)	$\leq 40$	60	$\geq 100$
N	Tubers (potato)	$\leq 70$	100	$\geq 150$

# MAIZE CROP



AEZ	Treatment	Nutrient Formula	AE-N <sup>1)</sup>	VCR
HTL	CAT/2008-'11	41-46-0/hybrid	29 - 66	9
IMP	CAT/2008-2011	41-46-0	24 - 45	6
PE	CAT/2008-'11	41-46-0/hybrid	32 - 49	4

# Wheat crop



AEZ	Treatment	Nutrient Formula	AE-N	VCR
HTL	100 kg of DAP + 50 kg of Urea 46%	41-46-0	55	7
HTB	100 kg of DAP + 100 kg of Urea 46%	64-46-0	31	7
HTB	230 kg of DAP +100 kg of urea 46%	88.5-39.1-39.1	28	5
HTBU	100 kg of DAP + 50 kg of Urea 46%	41-46-0	49	7

# *FDP / UREA DEEP PLACEMENT: EFFICIENT NITROGEN USE UNDER FOR RICE PRODUCTION*



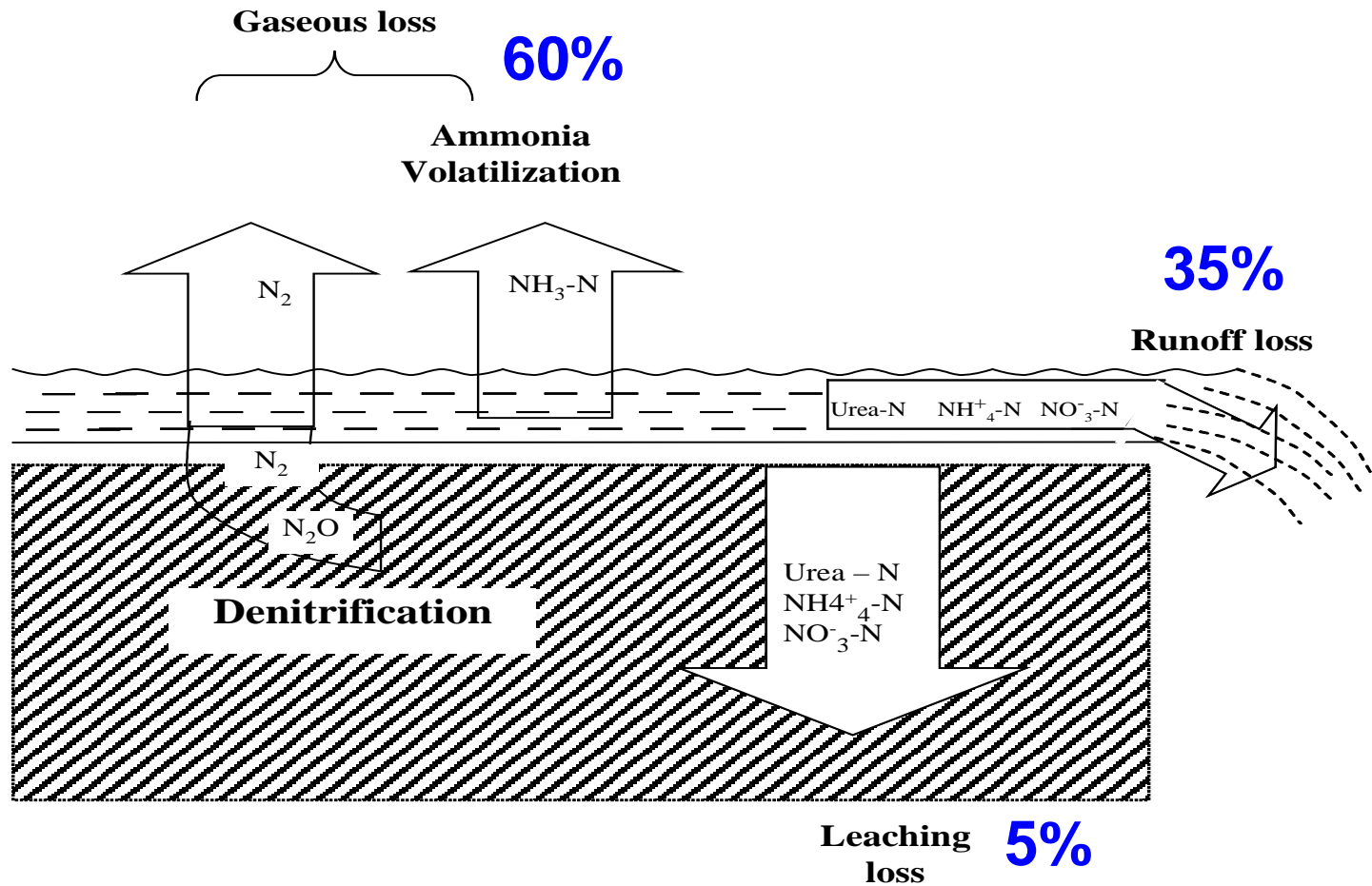
# Urea Management Problems in Irrigated Rice

Fertilizer N Use Efficiency by flooded rice is usually less than 40%



2 out of 3 Bags of Urea are lost

# Challenge: Urea Management In Irrigated Rice





# Conversion of Fertilizers into Briquettes using a Briquetting Machine

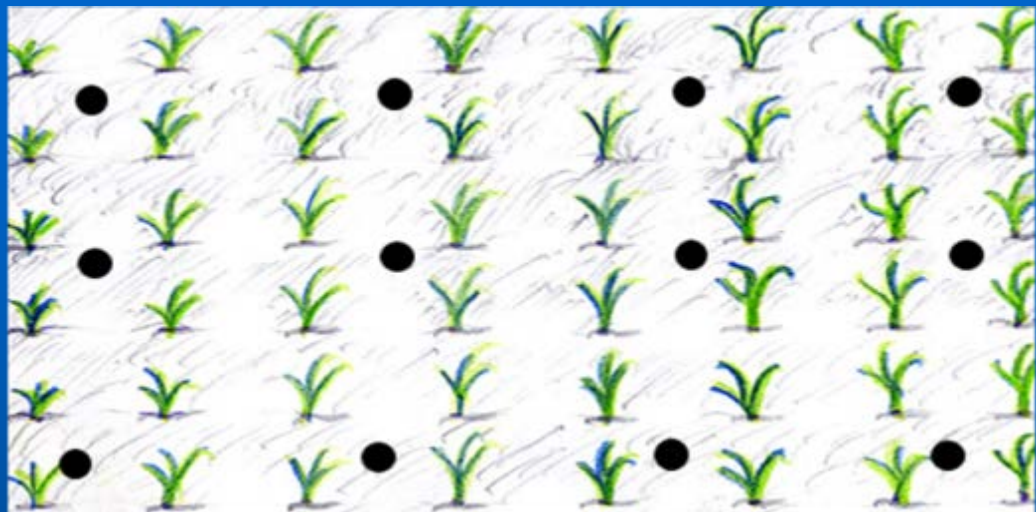


# Fertilizer Deep Point Placement (FDP)

## FDP has two Main Aspects

«**DEEP**» placement - fertilizer is localized near the plant and below the soil surface (7 to 10 cm depth in reduced zone) to reduce gaseous losses

«**POINT**» very high local ammoniacal N concentration ( $\text{NH}_4\text{-N} > 3,000$  ppm), resulting in optimal plant nutrition and inhibition of nitrification (high pH values)



# Results of UDP technology tests

Rwanda<sup>(1)</sup> : Rusizi- Bugarama; Rwanda<sup>(2)</sup> :  
Kirehe, Bugesera et Gikonko

	Traitement	Rwanda (1)	Rwanda (2)
Yield t/ha of paddy	Farmer Practice	6,5	5,4
	UDP	7,4	6,7
	Yield increase in %	13,9	24,1
EA N	Farmer practice	25	21
	UDP	42	33
RVC	Farmer Practice	4	4
	UDP	7	6

# INTENSIVE AGROFORESTRY

*Farmer Practice:* T 0-0-0



T 18-46-0



# Preliminary results with intensive agro forestry ( CATALIST and SEW)

Crop & season	Formula	Without fertilizer		Avec engrais	
		Without trees	With trees	Without trees	With trees
Rwanda					
Bean '10 B	18-46-0	0,5	0,6	0,8	1,3
Maize '11 A	41-46-0	1,0	3,0	-	4,7

# Liming trials results ( Urea vs CAN) Irish potatoes crop

Treatment	Increased yield in Mt/ha <sup>1)</sup>	EA-N
Rwanda (pH<5.2) ; n=20 <sup>2)</sup> ; 97-83-102		
NPK+urée	11,2	116
NPK+urée+chaux	14,5	150
NPK+CAN	12,2	126
Rwanda (pH≥5.2) ; n=16 ; 126-133-132		
NPK+urée	8,8	70
NPK+urée+chaux	12,6	100
NPK+CAN	16,0	127

<sup>1)</sup> Moyens pour 2 saisons

<sup>2)</sup> Nombre de producteurs multiplié par deux (pour 2 saisons).

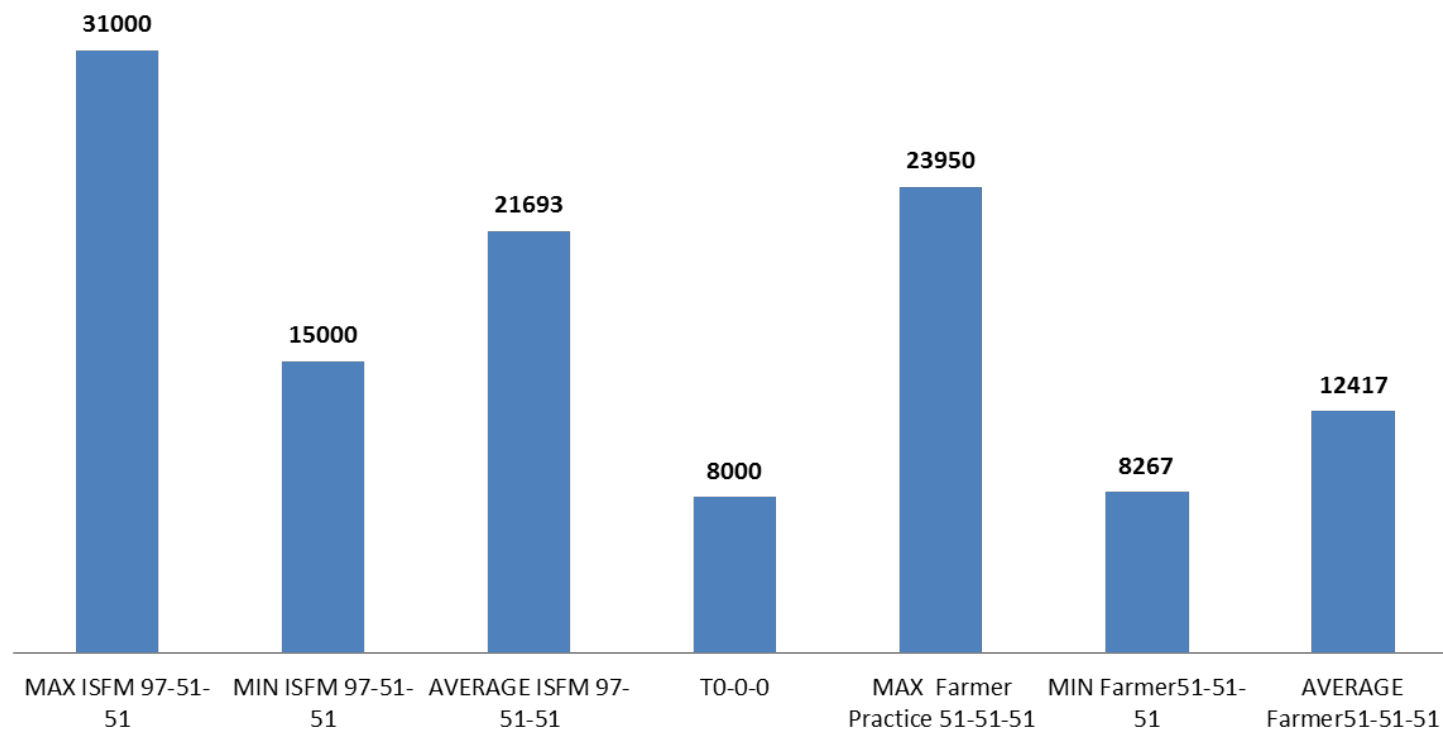
# CATALIST -2 SOIL HEALTH ACTIVITIES

- 744 demonstration plots established as FFS in the course of season 2013 A on various crops (Irish potatoes, Maize Bean and Cassava...) and various sites using two treatments: Farm practice and ISFM packages (General formula N-P-K + Soil amendments + improved seeds.....),
- 16 trials with micronutrients (Cu, Zinc, B, S) :
- FP, ISFM with general formula N-P-K, ISFM + Cu,Zn, B and S; N-P-K; N-P-K +micronutrients

# Some results

**Irish Potatoes yield in kg/ha for both ISFM 97-51-51 and Farmer practice 51-51-51 in Bulera district, for season 2013**

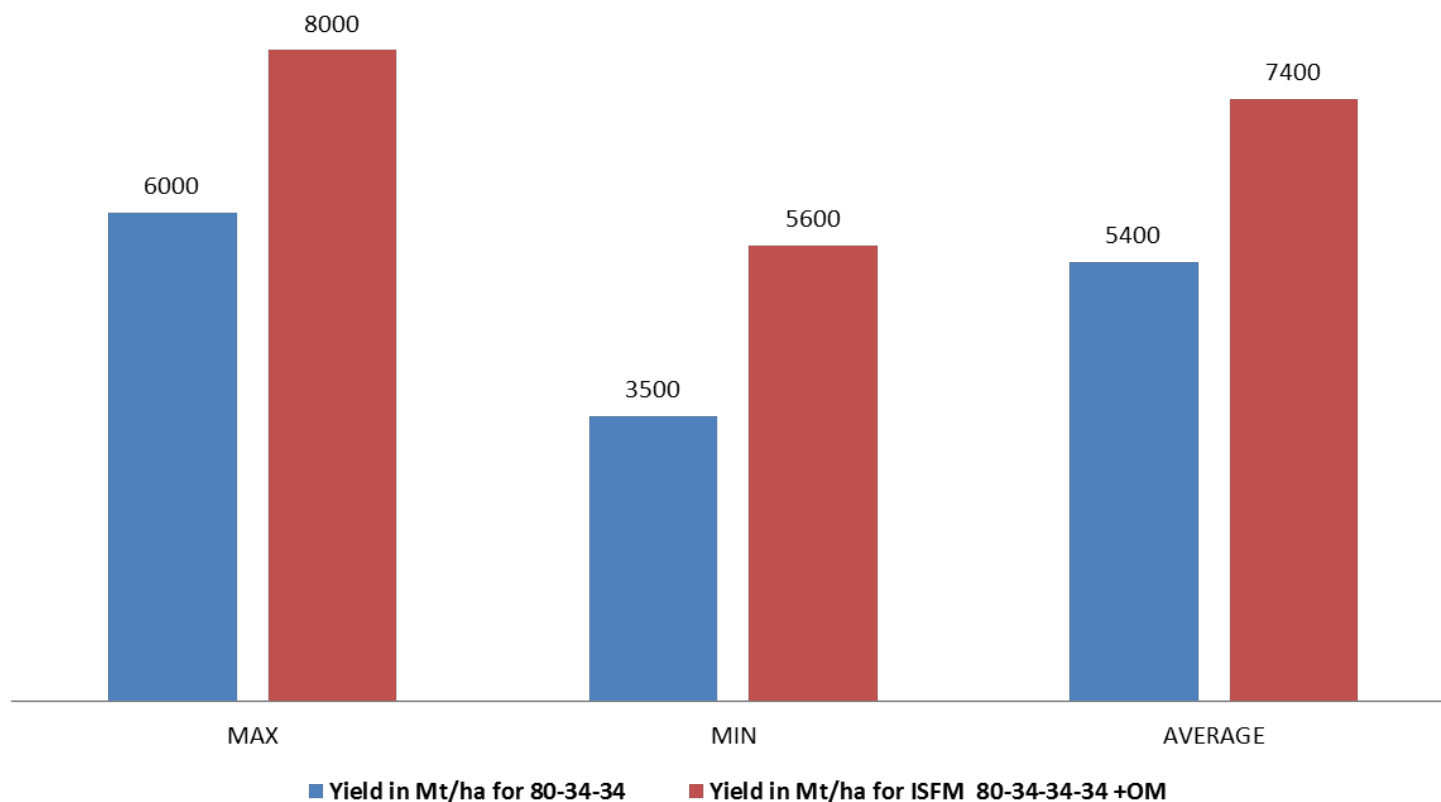
**A**





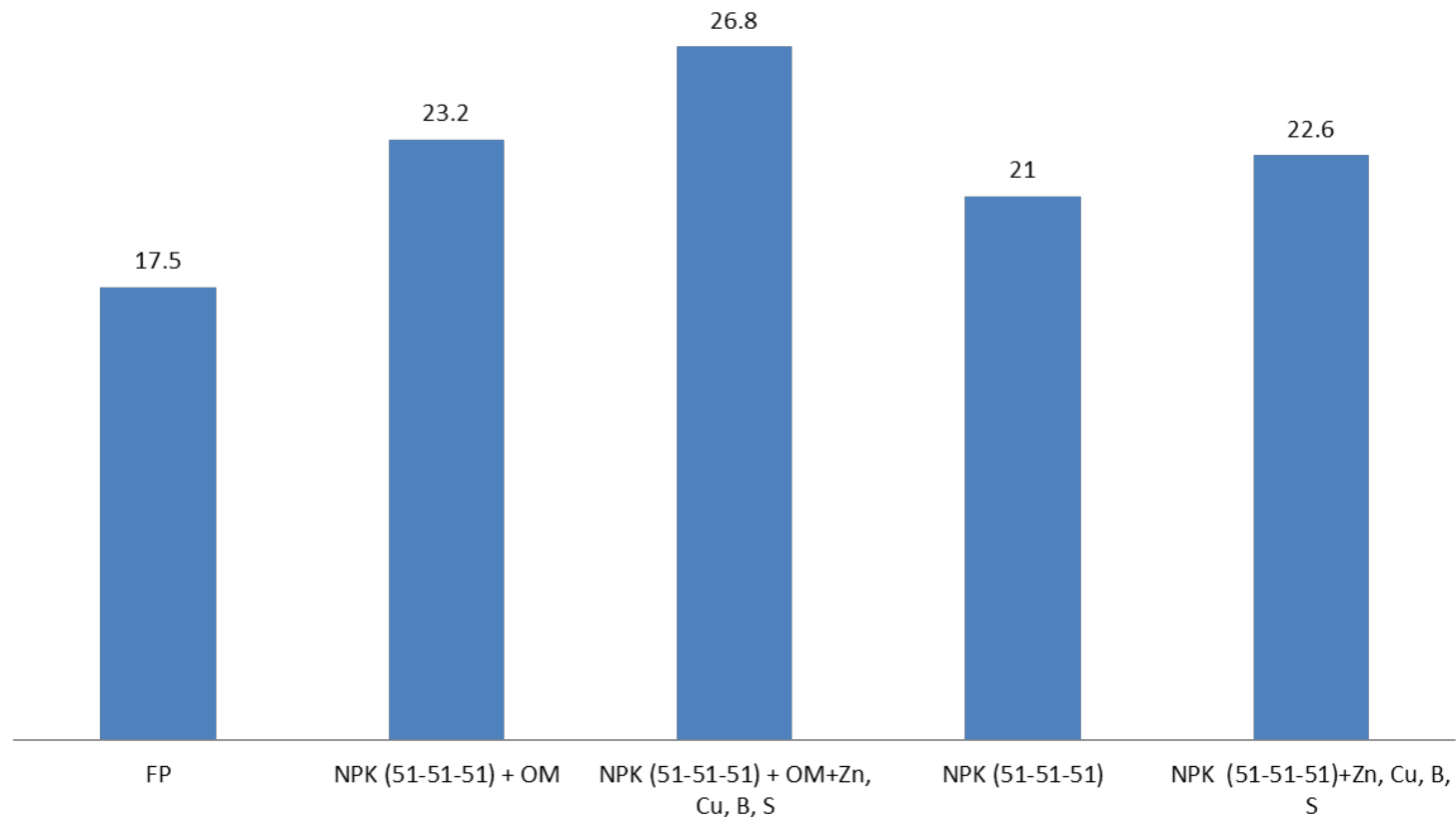
# Results for rice crop in Bugarama

Yield for rice crop in Bugarama marshland, Rusizi district in kg/ha for both ISFM and fertilizer alone, season 2013 A



# Results for trials with micronutrients in Nyabihu

Yield of Irish potatoes crop in Mt/ha for micronutrient trials in Nyabihu district , Kabatwa Sector for site no 2, 2013 A



# CONCLUSION

- ISFM intensifies production:
- Fertilizer provides more nutrients
- Sustains production:
- Added nutrients balance crop removal
- Organic matter sustains soil health
- Efficient production:
- Applied nutrients well-utilized
- Less environmental contamination

MERCI/ MURAKOZE/ AHSANTE SANA



# THANK YOU/ ISFM-SOIL HEALTH

