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Moving from Conservation to Climate Smart Agriculture

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Introduction

Agriculture

- Major source of employment and is an important sector in the Zambian economy,
- Provides food security and reduction in poverty levels,
- The livestock sector is worth over \$1.5bn in Zambia, accounting for around 35% of agriculture' share of national gross domestic product (GDP).
- In Zambia is, however, one of the major contributor of Green House Gases, accelerating climate change. There is need to develop safe low environmental impact practices.

Improvements with Conservation Agriculture (CA)

The introduction of CA in Zambia in the 1970s has led to gains in crop and livestock productivity and production:

- Increased maize grain yields to about 2 tons per hectare,
- Increased grain legume and oil yield to about 2 tons per hectare.
- Increased livestock productivity and production.

Gaps in CA?

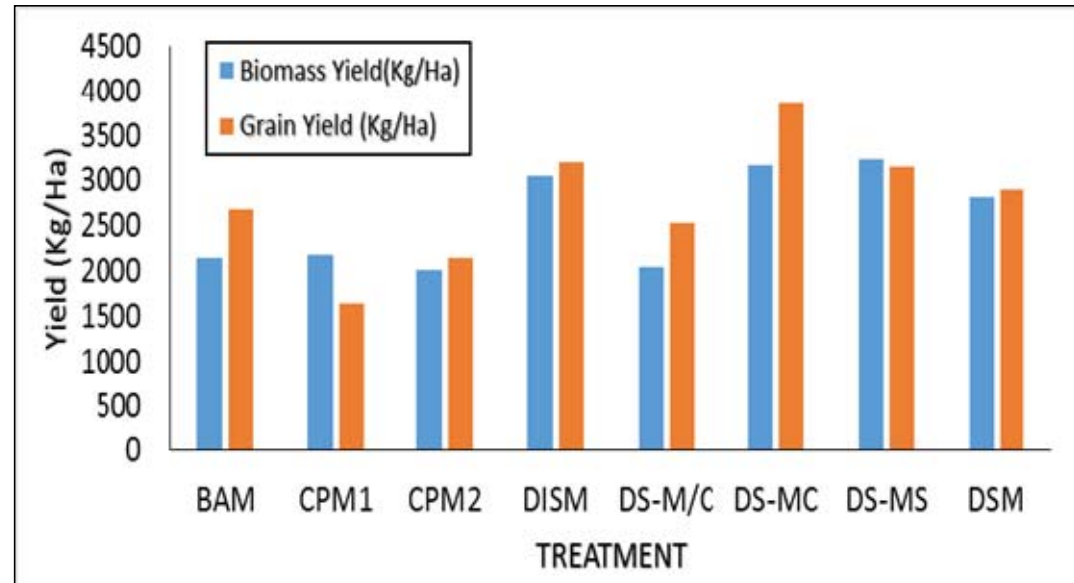
- CA Adoption still remains very low, less than 5% (IAPRI, 2015);
- High dis-adoption rates of CA practices over time, indicating that in large parts of Zambia's agriculture sector CA practices do not yet pass the critical threshold of self-sufficient adoption in the absence of project level donor-support.
- CA traditionally **not linked to climate change adaptation and mitigation benefits**, and therefore potential for reduced (GHG) emissions from agriculture.

Agriculture NAMA — Strengthening Sustainable Agriculture!

- ❑ CA is currently implemented by Large Scale Conservation Agriculture Scaling Up project (FAO), Conservation Farming Unit (CFU) and FISP (GRZ).
- ❑ Agriculture NAMA proposes to strengthen and **move CA to Smart Agriculture** by increasing the potential of CA to:
 - Still **increase**:
 - Crop and livestock productivity and production,
 - Food and nutrition security, and
 - Profit within the crop and livestock sectors while **reducing GHG emissions**.

Agriculture NAMA will address **improved components** of CA in addition to current CA practices:

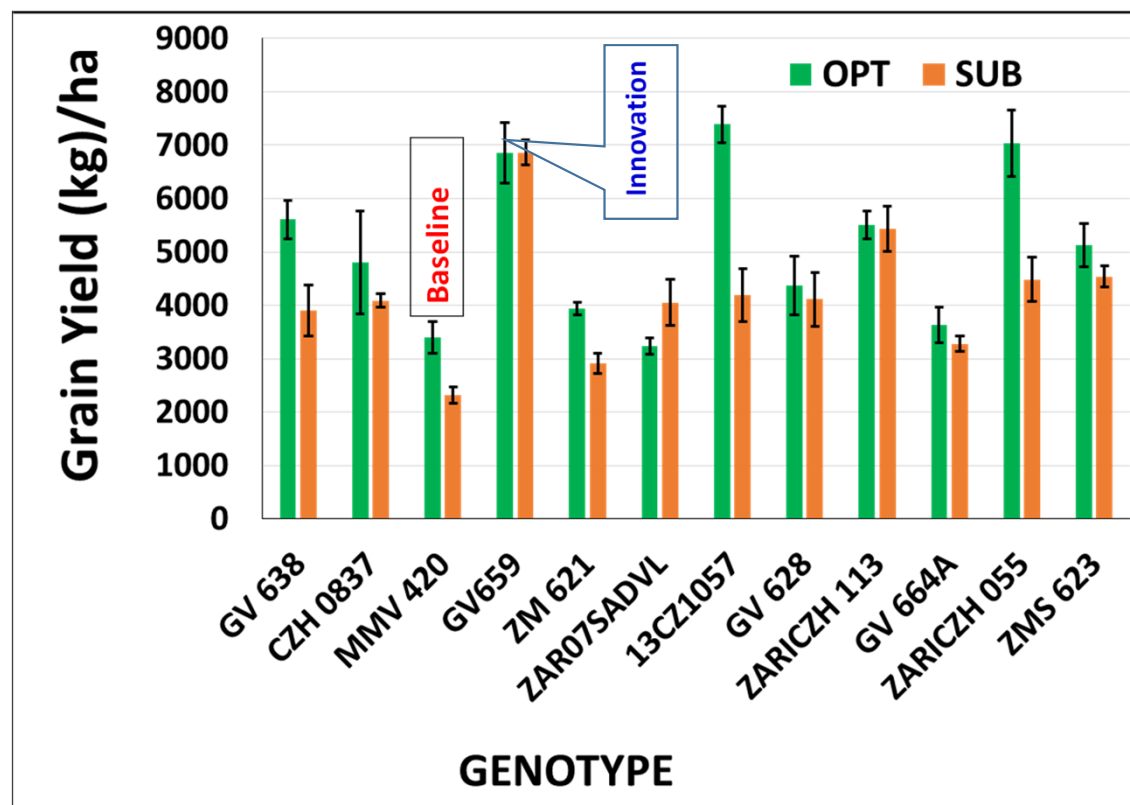
- Minimum tillage,
- Precise application of fertilizers
- Use of green manure and cover crops for soil improvements,
- Crop rotations,
- Timely planting,
- Application of lime,
- Integrated control of weeds.



Performance of maize with CA practices

What has been done?

- Promotion and use of improved crops (cereal, legumes, oil seeds and fibre) varieties with:
 - High yield potential,
 - High nutrient use efficiencies,
 - Tolerance to abiotic and biotic stresses; and climate variability and change.



Variation of Grain Yield with Maize Genotype and Fertilizer Management

Bubebe Cowpea Parent

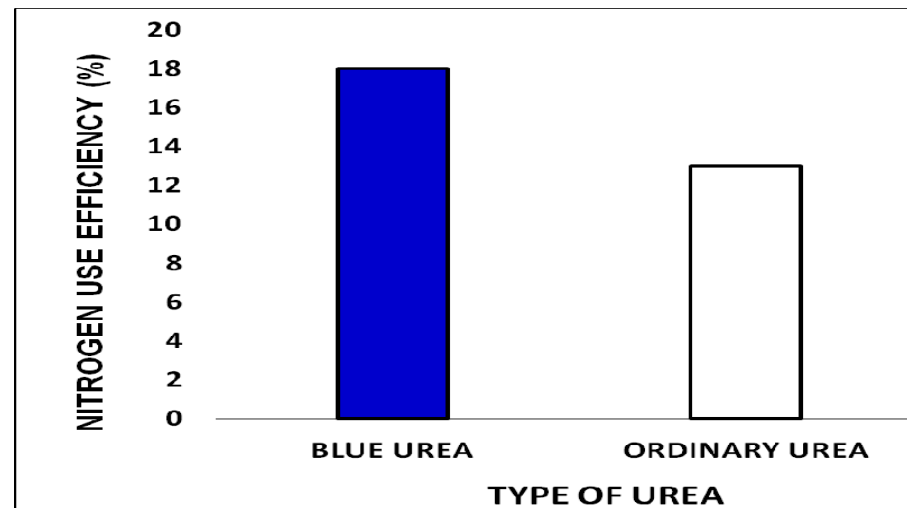


Bubebe Mutation-derived line of cowpea BB10-4-2-3



Management practices

- Promotion and use of:
 - Coated fertilisers with high nutrient use efficiencies; and
 - Organic fertilizers with low mineralization rates.
- Implementation of location specific fertilizer and crop recommendations using satellite, GIS technologies and related ICTs.
- Appropriate agricultural machinery.

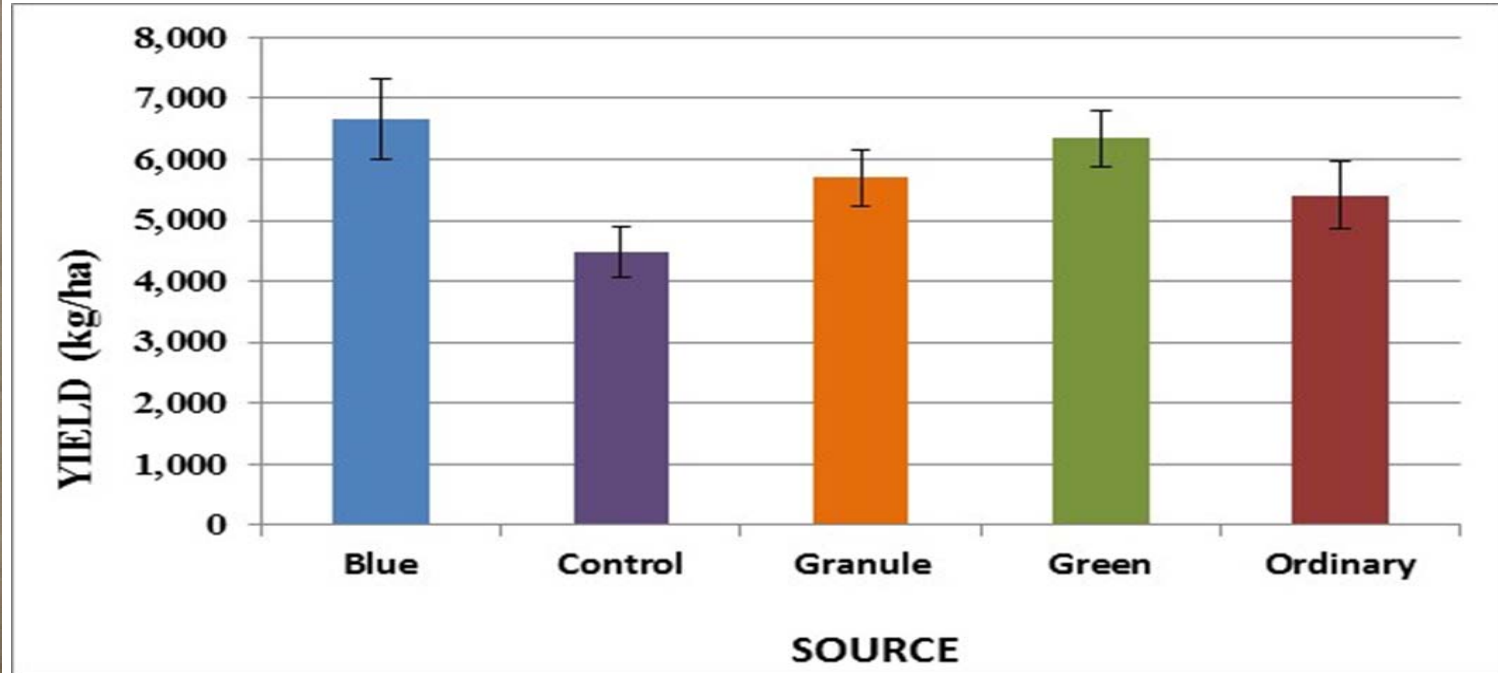


N use efficiency of 18% in the grain was higher with coated urea compared to 13% for normal granular urea, resulting in 40% increase in performance

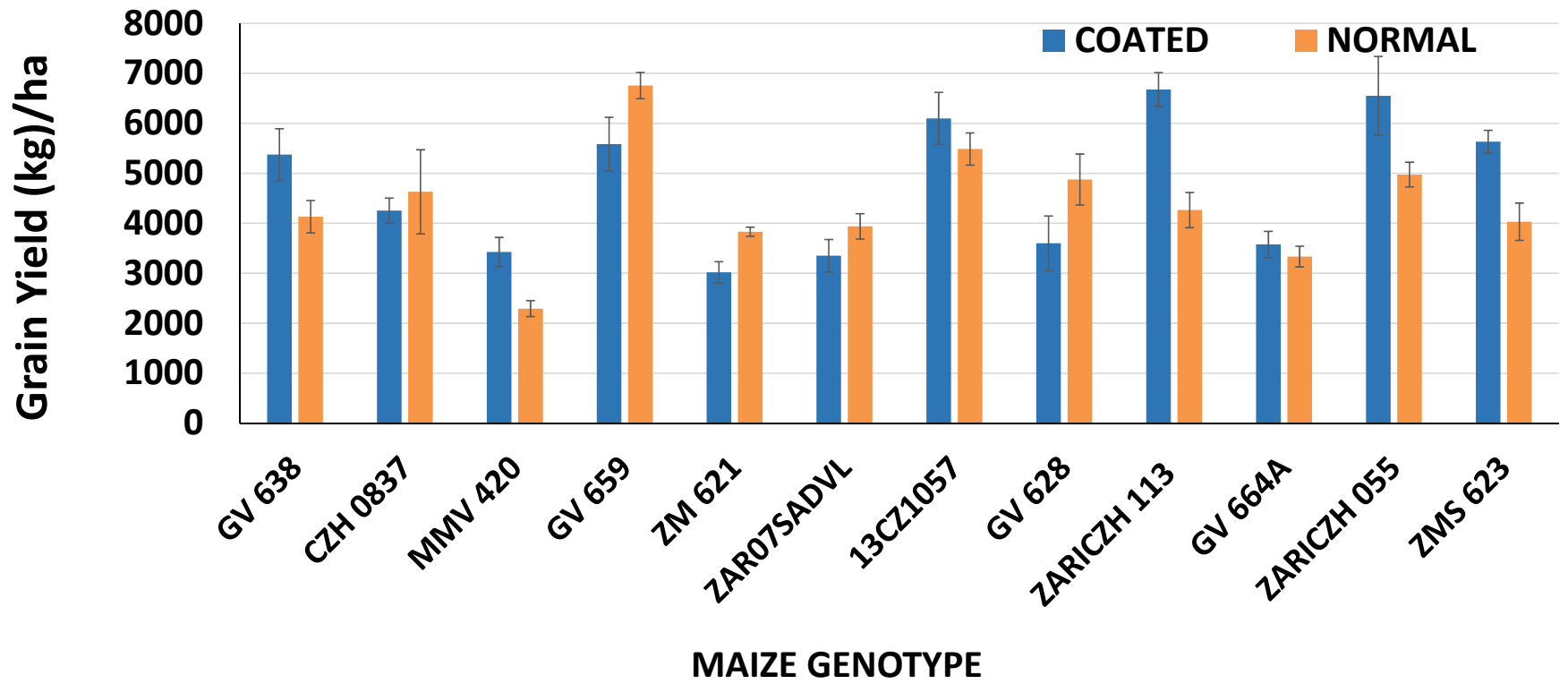
Use of appropriate equipment



Form of Urea



Variation of Maize Grain Yield with Source of Urea on



Variety	Fertilizer Sources				
	Buffalo beans	Inorganic fertilizer	Improved velvet beans	Local velvet beans	Manure
	Fertilizer Use Efficiency (%)				
Local maize	58.362	33.268	53.539	29.756	22.877
MRI 455	63.861	49.50	47.003	63.190	17.327
ZMS 402	79.055	45.667	69.775	42.589	29.865
LSD	11.5106				
CV (%)	14.6				

Genotypic response of maize cultivars to N fertilizer sources using N-15 isotopic techniques



Drought tolerant maize varieties developed under DTMA by CIMMYT & IITA in partnership with 13 African countries

Need to **explore the synergy** of maize cultivars with high yield potential and tolerant to abiotic and biotic stresses and fertilizers with high nutrient use efficiencies

Livestock

Introduction and promotion of:

- Improved pastures and management:
 - Reduce overgrazing and subsequent soil erosion,
 - Increase carbon sink through reduction of wildfires with use of prescribed fires,
 - Improve feed quality and digestibility to **reduce methane production**
- Livestock breeds with **lower methane production** (rumen modification); and
- Integrated pest and disease management;



Tick-borne diseases control measure (plunge dipping tank)



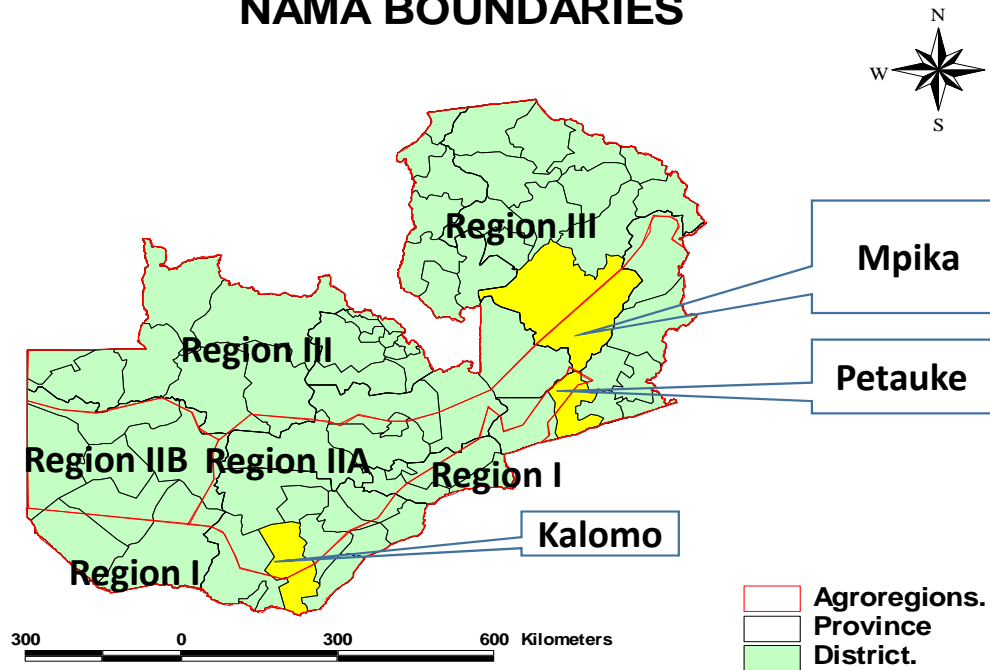
Avoid overgrazing that leads to loss of livestock and soil erosion by planting **improved pasture grasses** such as Rhodes Grass for improved nutrition, reduced methane production and increased carbon sink



- Improved manure management:
 - Reduce contamination of the environment,
 - Reduction in GHGs through collection and storage and use in **compost and bio-digesters** (from locally developed “Ngosa” bio-digester) for heating, cooking and lighting.
- Engagement of relevant stakeholders on policy issues related to scaling up sustainable agriculture and GHG emissions reduction.

Target districts

NAMA BOUNDARIES



Implementation

- The National Implementation Entity is the Department of Field Services of the Ministry of Agriculture and Livestock;
- Number of years for completion of project is 5 years;
- Expected start year of implementation is 2017.

	YEAR			
	2017	2020	2025	2030
Number of farmers	31,227	44,461	80,121	144,380

Table: Inputs at Baseline, Conventional and Innovation CA Scenarios

Baseline Scenario (LIMA)

Inputs (Kg/ha)	2015	2020	2025	2030
Urea	200	200	200	200
D-Compound	200	200	200	200

Conventional CA Scenario

Urea	200	200	200	200
D-Compound	100	100	100	100
Manure	2000	2000	2000	2000
Legumes	2000	2000	2000	2000

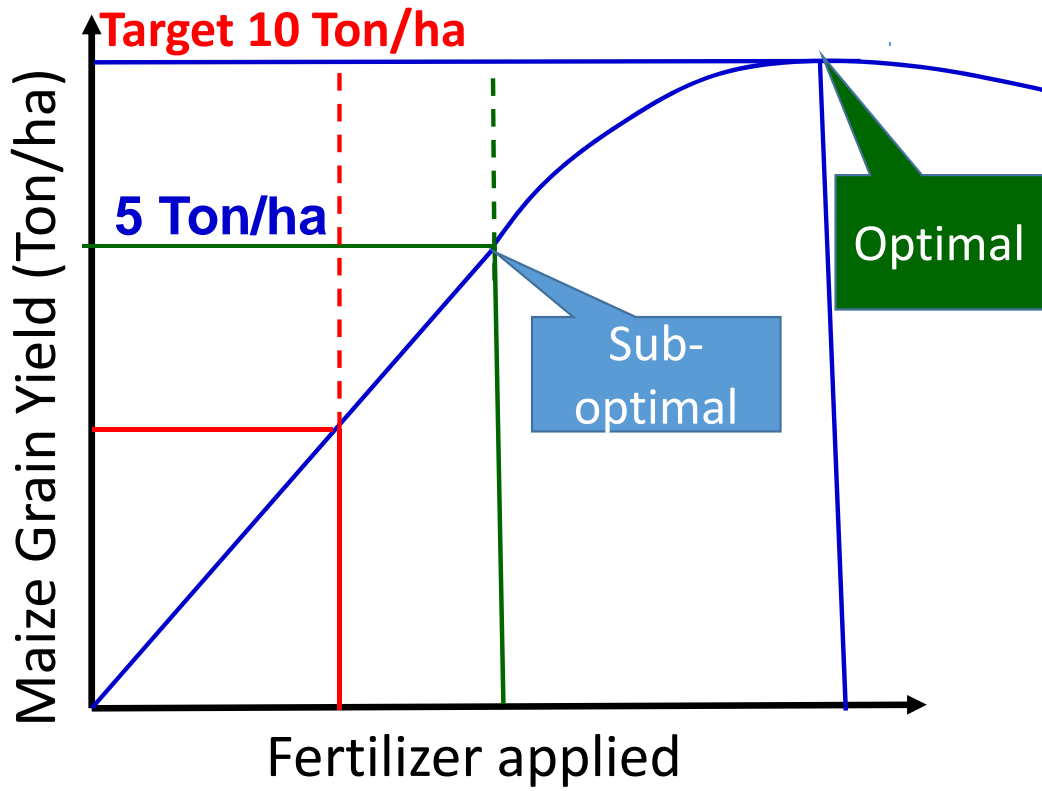
Innovation CA Scenario (SMART)

Inputs (Kg/ha)	2015	2020	2025	2030
Coated Urea	120	120	60	60
Coated D-Compound	140	140	140	140
Manure	4000	4000	4000	4000
Legumes	5000	5000	5000	5000

Urea	46%	46%	46%	46%
D-Compound (NCZ)	10%	10%	10%	10%
D-Compound	13%	13%	13%	13%
Organic	3%	3%	3%	3%
Legumes (Mineralization)	0.13%	0.13%	0.13%	0.13%

N Content of fertilizer materials

Fertilizer and Crop Recommendations

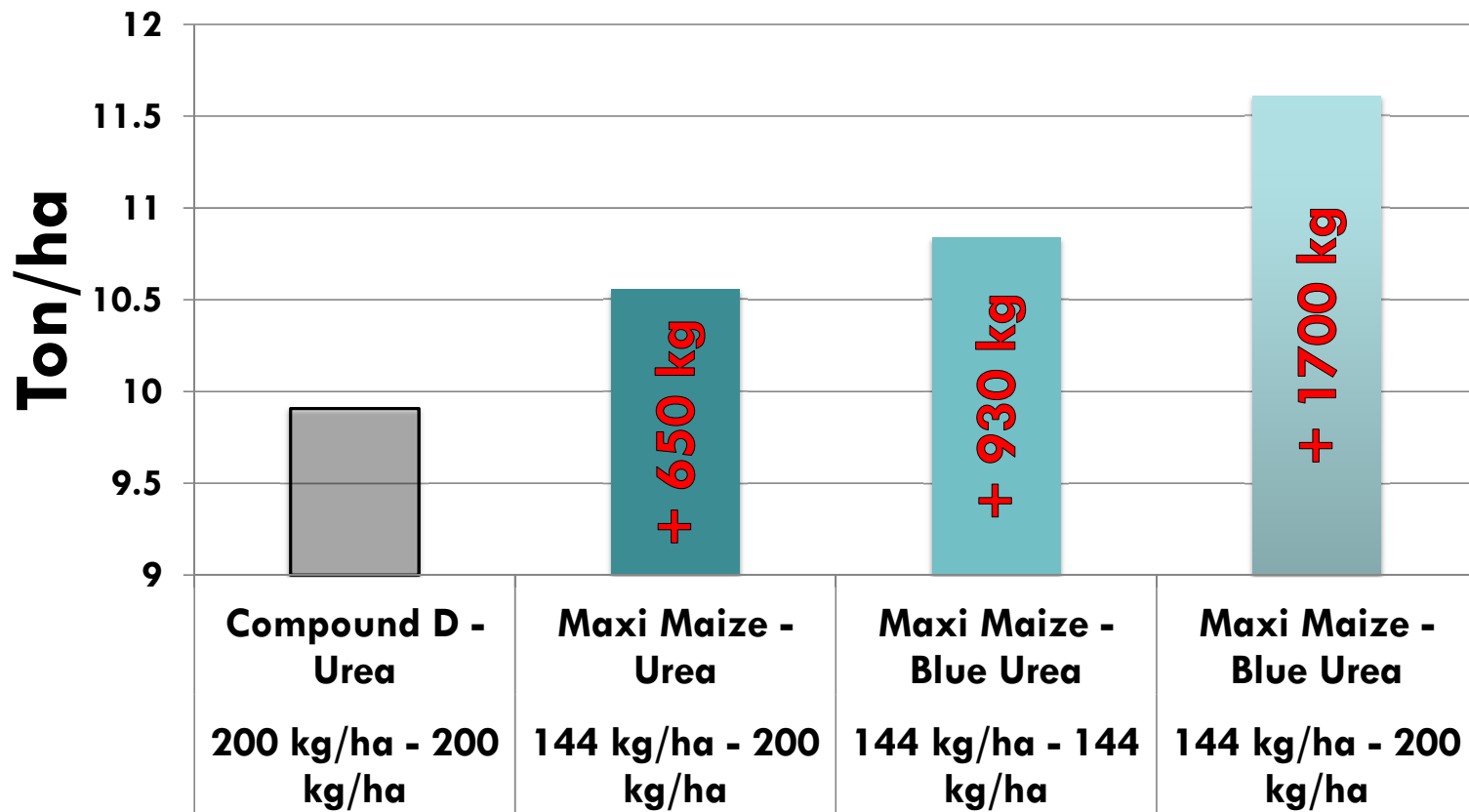


Sub-optimal

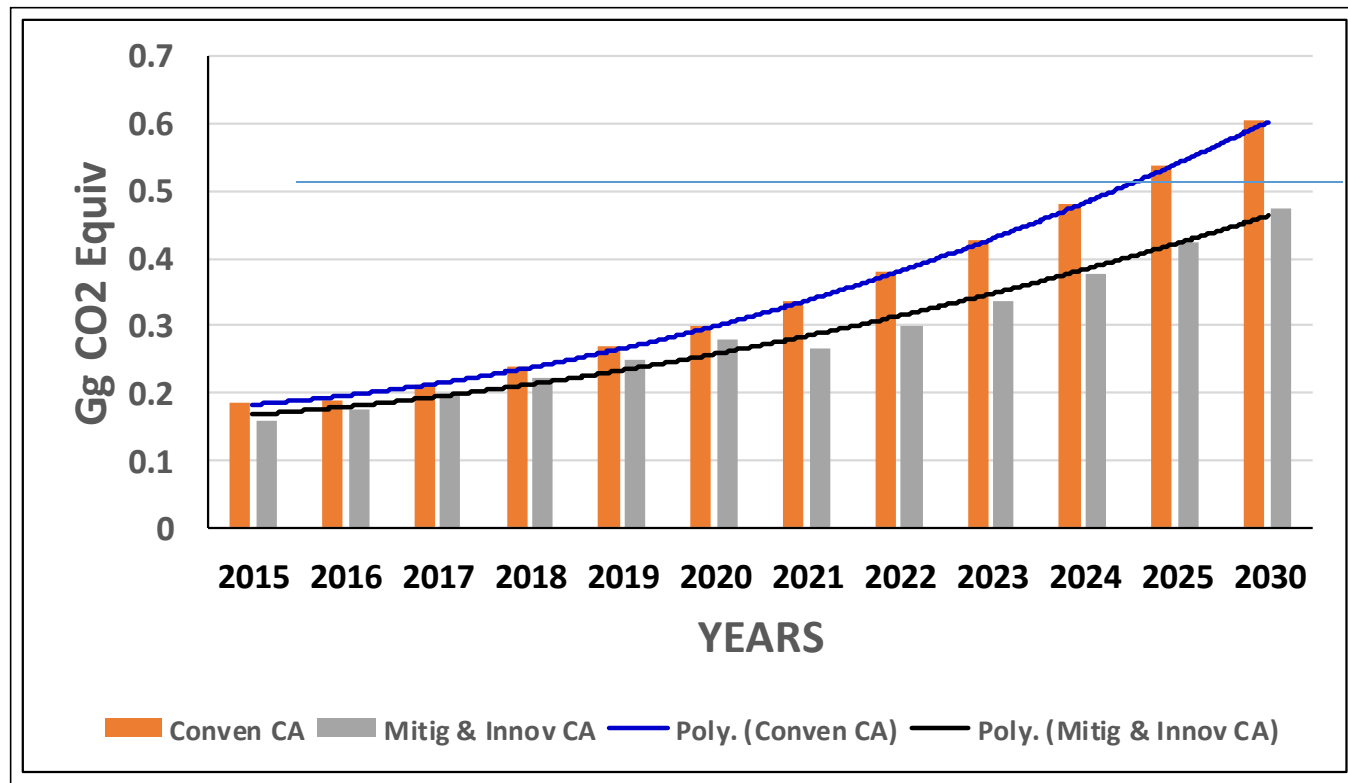


Optimal

Additional kg/ha with Greenbelt Fertilizer



Reduction in GHGs
(1.08 Gg CO₂ eq) and
therefore Global
warming with
improved crop and
livestock production
can be achieved.



Mitigation potential in reduction of GHGs

Interventions

❑ Establish and operate the NAMA Finance Facility to financially support:

➤ Purchase of improved:

- Crop seed,
- Pasture seed,
- Fertilizers,
- Drugs and Dipping chemicals,
- Improved livestock breeds.

➤ Purchase of appropriate equipment required for promotion of conservation technologies to small scale farmers, and

➤ Acquisition of:

- ❖ Biogas digesters in the NAMA focal areas.

□ Establish MoUs and Agreements with:

- Input and equipment suppliers, and**
- Government programmes such as FISIP to supply to farmers in pilot areas with required inputs:**

- Capacity building and entrepreneurship skills development at farm level, and scaling-up of sustainable agriculture practices through:
 - Training, and
 - Outreach programmes,
 - Extension services.
- Provision of **development resources** for research in integrated crop and livestock farming practices applicable to farming households in Zambia
- Establish a **platform** to carry out consultations with various stakeholders in order to influence policy on GHG emissions reduction and sustainable agriculture

COST STRUCTURE

Revolving Fund with an initial capital	US\$ 235,000,000.00
From GRZ	US\$ 135,000,000.00
From NAMA Facility	US\$ 100,000,000.00
Capacity Building	US\$ 11,000,000.00
Total	US\$ 246, 000,000.00

Take Home Message

- High crop yields are obtained at **half** the recommended N and P fertilizer inputs with:
 - Coated basal and top dressing fertilizers,
 - Crop varieties with:
 - high yield potential,
 - high nutrient use efficiencies, and
 - tolerance to abiotic and biotic stresses.

- Soil amendments (lime) will be required to have optimum crop yields with coated urea in acidic soils.
- Use of improved crops and fertilizers could:
 - Reduce import of fertilizers by as much as half,
 - Reduce GHGs significantly,
 - Enable more farmers access fertilizer and increase crop and livestock productivity and production.
- Use of appropriate mechanization,
- Provide financial support,
- Use more sensitive and more accurate **isotopic** (N-15) methods.

THE END