IPNI Southeast Asia Program

INCREASING MAIZE FARMING PROFITABILITY IN THE PHILIPPINES THROUGH THE USE OF NUTRIENT EXPERT® for MAIZE

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Current Situation

Fertilizer application comprises the **largest component** of farmers' overall **cost** of production

But farmers **often do not achieve the full benefit or profit from the fertilizers** they apply

- ✓ Too little or too much fertilizer application
- ✓ Fertilizer nutrients are not applied in the growth stages that they are needed by the crop
- ✓ Unbalanced application of N, P and K

→ Need for science-based fertilizer application

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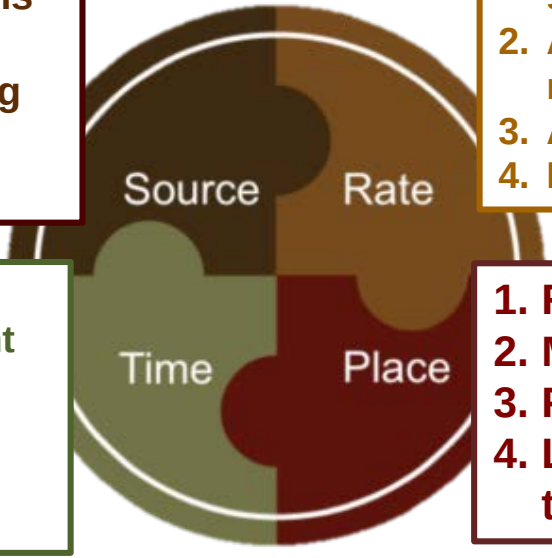
1 Development of Science-Based Fertilizer Recommendation with 4R and SSNM

4R Nutrient Stewardship

Applying the **right source** of plant nutrients at the **right rate**, at the **right time** and in the **right place**

1. Diagnose nutrient deficiencies
2. Supply in plant available forms
3. Suit soil properties
4. Recognize synergisms among elements
5. Blend compatibility



1. Appropriately assess soil nutrient supply
2. Assess all available indigenous nutrient sources
3. Assess plant demand
4. Predict fertilizer use efficiency

1. Assess timing of crop uptake
2. Assess dynamics of soil nutrient supply
3. Recognize timing of weather factors
4. Evaluate logistics of operations

1. Recognize root-soil dynamics
2. Manage spatial variability
3. Fit needs of tillage system
4. Limit potential off-field transport

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(IPNI, 2012)

Site-specific nutrient management (SSNM)

A set of nutrient management principles, which aims to supply a crop's nutrient requirements tailored to a specific field or growing environment.

It aims to:

- account for indigenous nutrient sources, and
- apply fertilizer at optimal rates and at critical growth stages – to meet the deficit between the nutrient needs of a high-yielding crop and the indigenous nutrient supply.

Nutrient Expert® – a tool for implementing 4R and SSNM

NUTRIENT EXPERT®

- A decision support tool for developing science-based fertilizer recommendations
- It uses the principles of 4R and SSNM
- Intended for extension staff or crop advisers
- Does not require a lot of data or detailed information. Information can be easily provided by target users

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What information does Nutrient Expert Maize provide?

- Field-specific fertilizer recommendation
  - ✓ variety type (hybrid, OPV, traditional)
  - ✓ site characteristics (soil, climate, water availability)
  - ✓ crop management practices
  (cropping system, residue management, fertilizer inputs)
  - ✓ Integration of organics
- Options for risk management (drought situations)
- Options based on farmer's budget and expected benefits → cost-profit scenarios

Sample NE Maize recommendation to be given to farmers

Tailored to field-specific conditions

- Variety type
- Site characteristics
- Farmer's crop management practices

Nutrient Expert® for Hybrid Maize

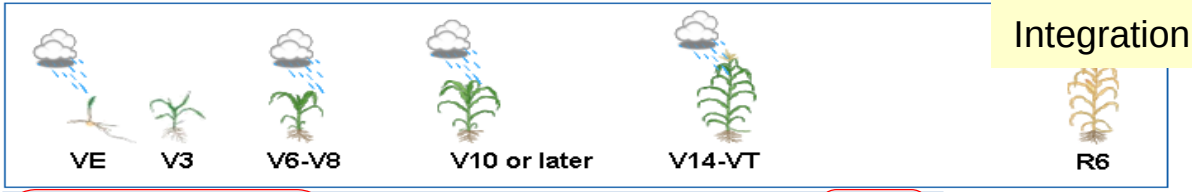
Name and/or location: Isabela **Field size:** 1 ha

Current yield: 5.0 ton (FW) 4.9 t/ha (15.5% MC) **Growing environment:** Favorable rainfed

Recommended alternative practice for hybrid maize

Yield goal: 7.2 ton (FW) 7.0 t/ha (15.5% MC)

Planting density: 69,444 plants/ha **Distance between rows:** 60 cm **Distance between plants:** 24 cm



Integration of organics

Growth stage	Days after planting	Soil moisture	Fertilizer sources	Weight of full bag (kg)	Amount (bags)
Basal	0	sufficient	14-14-14	50	3.5
			Urea	50	0.5
			MOP	50	1
V6	25	sufficient	Urea	50	2
V10	35	sufficient	Urea	50	2

Other sources of nutrients:

Crop residue (maize): low

Organic fertilizer: 1 t

N: 10 kg

P_2O_5: 10 kg

K_2O: 6 kg

Right **time** Right **source** Right **rate**

Micronutrients

Deficient Nutrient	Recommendation to correct deficiency
Zinc	Apply 25-30 kg/ha zinc sulfate as basal.

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Development of Nutrient Expert® for Maize Philippines

2 Field Performance of Nutrient Expert® for Maize Philippines

Nutrient Expert (NE) increased hybrid maize yield and profit through balance application of N, P and K in Region 1, Philippines (2011-13)

	2011–2012 (n = 76)				2012–2013 (n = 83)			
	FFP	NE	(NE – FFP)		FFP	NE	(NE – FFP)	
Grain yield (t/ha)	9.0	10.0	**+1.0**	***	7.9	8.9	**+1.0**	***
Fertilizer N (kg/ha)	173	173	**0**	ns	165	164	**−1**	ns
Fertilizer P_2O_5 (kg/ha)	31	50	**+19**	***	31	51	**+20**	***
Fertilizer K_2O (kg/ha)	27	48	**+21**	***	25	42	**+17**	***
Seed & fertilizer cost (Php/ha)	18,618	19,998	**+1,380**	*	20,466	21,715	**+1,249**	***
GRF[a] (Php/ha)	87,262	97,650	**+10,388**	***	74,001	84,957	**+10,956**	***

***, **, *: significant at <0.001, 0.01, and 0.05 level; ns = not significant

[a]GRF = gross return above seed and fertilizer costs

Plot size = 0.1 to 1 ha; >20 municipalities in 4 provinces

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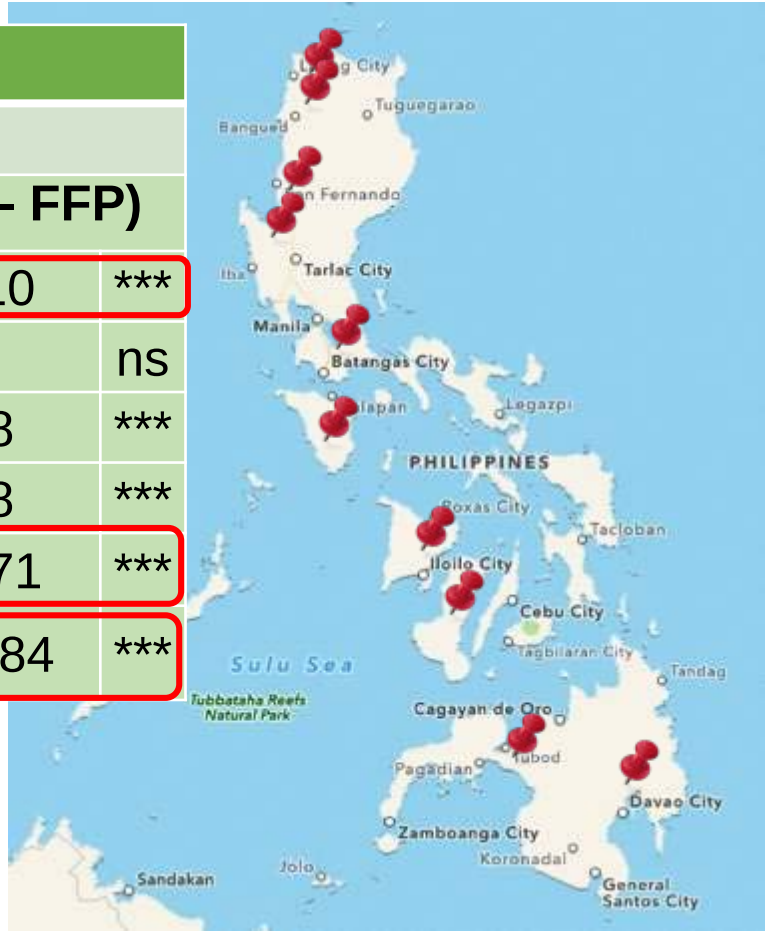
Data source: DA RFU-1, Philippines

NE Maize increased farmers' yields and profits through balanced application of N, P, and K (2010-14)

Parameter	Unit	Philippines[1]			
		(n = 190)			
		NE	FFP	(NE – FFP)	
Grain yield	t/ha	9.4	8.3	+1.10	***
Fertilizer N	kg/ha	162	159	+3	ns
Fertilizer P_2O_5	kg/ha	48	30	+18	***
Fertilizer K_2O	kg/ha	43	25	+18	***
Fertilizer cost	PHP/ha	13775	12204	+1571	***
Gross profit	PHP/ha	98832	87348	+11484	***



[1]NE field validation conducted by DA-RIARCS

*** significant at P<0.001; ns = not significant

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Quick Guide for Maize for a municipality − output of the NE field validation trial

General crop management recommendations:
Distance between rows: 60 cm Distance between plants: 22 cm Soil pH: maintain at 5.3 to 7.3 pH units

Fertilizer rates are adjusted to 1 hectare
Target grain yield based on total dry weight
1 bag fertilizer = 50 kg

Fertilizer guidelines for dry season hybrid maize in:

A. Higher yield with rice-corn cropping system

Target grain yield: 10-11 t/ha

Days after planting	0-7	20-26	26-32	32-38	50-55
With Bio-N application (6 packs/ha)	6.5 bags 14-14-14 0.5 bags MOP	3 bags urea		3 bags urea	If LCC reading is below 4, option to apply 0.5 to 1 bag urea
Without Bio-N application	6.5 bags 14-14-14 0.5 bags urea 0.5 bags MOP	3.5 bags urea		3 bags urea	If LCC reading is below 4, option to apply 0.5 to 1 bag urea

Approximately equivalent to 190-210 kg N; 45 kg P2O5, 60 to 90

These fertilizer guidelines are applicable to dry season hybrid maize fields in Sto. Domingo, Ilocos Sur with:

- enough water supply (from rainfall or supplemental irrigation)
- medium soil fertility
- favorable soil pH*
- residue returned from the previous crop
- no application of organic fertilizer

** To correct the acidity of soils with pH less than 5.3, apply 400 kg lime per hectare for every 0.1 unit until soil pH reaches 5.3. For example, apply 1,200 kg lime per hectare in soils with pH 5.0. Lime should be broadcast and plowed under 3-4 weeks before planting.*

Fertilizer sources in these recommendations are locally-available and meet the guidelines for optimal splitting of nutrients to provide the requirements of the maize crop at critical growth stages during the season.

For fields with other conditions or to use other locally-available fertilizer sources, use 'Nutrient Expert for Hybrid Maize' to develop a field-specific guideline. Consult ILIARC, local DA office, and MAO in your municipality.

B. Typical yield with rice-corn cropping system

Target grain yield: 8-9 t/ha

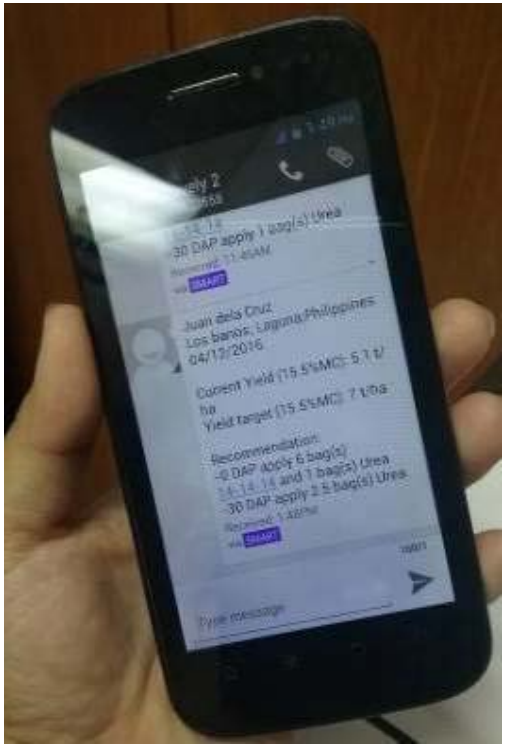
Days after planting	0-7	20-26	26-32	32-38	50-55
With Bio-N application (6 packs/ha)	4.5 bags 14-14-14 0.5 bags urea	2 bags urea		2.5 bags urea	If LCC reading is below 4, option to apply 0.5 to 1 bag urea
Without Bio-N application	4.5 bags 14-14-14 1 bag urea	2.5 bags urea		2.5 bags urea	If LCC reading is below 4, option to apply 0.5 to 1 bag urea

Approximately equivalent to 150-170 kg N; 32 kg P2O5, 55 to 90

3 Current Status and Future Directions of Nutrient Expert® for Maize Philippines

Available for:

- **PCs (Windows, Mac)**
- **Android (mobile gadgets)**



A farmer can receive the Nutrient Expert recommendation through SMS (text message)

English and Tagalog at http://software.ipni.net

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Nutrient Expert captures farmer data and can generate strategic information for decision makers and agri-business providers

Data

- Yield
- Crop Management Practices
- Location
- Site Characteristics

Strategic Information

- Attainable yield
- Yield response to fertilizer N, P, and K
- N, P, and K rates to attain specific yield goals

Decision makers

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Summary

- NE enables farm advisors to rapidly provide economically optimum 4R fertilizer recommendations.
- NE can help in increasing maize farming profitability in the Philippines
- NE can be used by decision makers to develop national agricultural strategies, or by agri-business providers to effectively develop markets in favor of maize production profitability

Acknowledgements:

SALAMAT PO!