Balanced Fertilization for Better Crops in Vietnam

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Vietnam Argiculture 2000 General Information

⇩ **Share in GDP (%)**

- ←Agriculture: 20.8
- ←Fishery: 3.1
- ←Forestry: 1.4
- ←Industry: 36.6
- ←Service: 39.1

⇩ **Share in Agriculture (%)**

- ←Cultivation: 80.4
- ←Animal husbandry:17.1
- ←Service: 2.5

← *Source: GSO and MARD*

Vietnam Agriculture 2000
Value of Agricultural Production

Share in Cultivation (%)

- Food crops: 63.2
- Vegetable & bean: 6.8
- Industrial crops: 20.6
- Fruit crops: 7.6
- Other crops: 1.8

Source: GSO and MARD

Vietnam Agriculture 2000
Sown Area, (000ha)

- Food crop : 9,060 (Rice: 7,655 and Maize:714)
- Coffee: 516
- Rubber: 406
- Fruits: 496
- Sugarcane: 302
- Groundnut: 243
- Cashew: 230
- Tea: 65

Source: GSO and MARD

Major reasons for balanced fertilizer use in Vietnam

Two main factors of production increase:

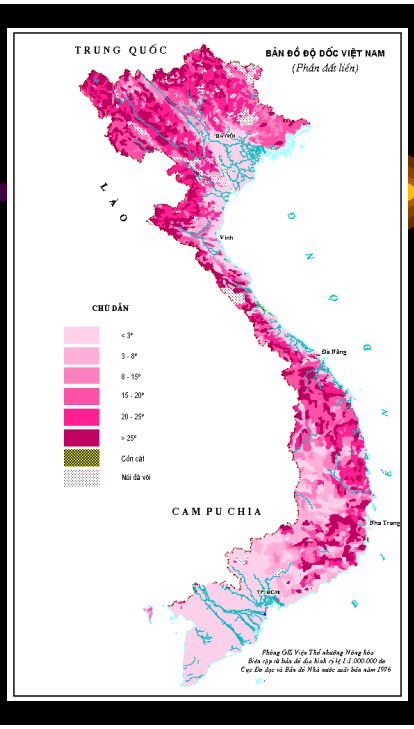
1. Area Expansion
2. Yield Increase

Agro-Ecological Zones

1. North West
2. Central of Northern Mountains
3. North East
4. Red River Delta
5. Northern Coastal
6. Southern Coastal
7. Central Highland
8. North-East of the South
9. Cuu long River Delta

Agro-ecological zones

Sloping Land in Vietnam



Major Reasons : Fertilizer Use… *(cont.)*

	1930	2000
Population (million)	7	78
%	100	459
Cultivated Area (000ha):	4,509	5,500
%	100	122

Need to Increase the Yield!

(IFPRI: Yield Increase contributes 80% of cereal output)

Fertilizer Sources

- Organic Fertilizers: FYM, Green Manure and Crop Residues
- Mineral Fertilizers:
  - Straight Fertilizers: Urea, SSP, FMP, SA, MOP
  - Compound Fertilizers: DAP, NPK
  - Mixed Fertilizers: NPK
- Foliar Fertilizers
- Biological Fertilizers

Fertilizer Consumption (000t)

	Urea	DAP	SSP+ FMP	MOP	NPK	SA
1991	1367	130	391	13	200	n.a
1995	1379	300	799	105	489	n.a
2000	2168	591	1200	637	1200	436

Domestic Fertilizer Production

1. Urea

- 1 factory (capacity): 110,000 t per annum
- Production:
  - 1990: 24,000 t
  - 1995: 111,000 t
  - 2000: 50,000 t
- Record Production in 1987: 130,000 t

Domestic Fertilizer Production

2. Phosphate

4 manufacturing sites:

- 2 for SSP
- 2 for FMP

- Total production in 2000: 1,130,000 t

Domestic Fertilizer Production

*3. **Compound and Mixed NPK***

- More than 30 NPK manufacturing sites (only 3 compound NPK factories)
- Total capacity: 2.7 million tonnes/year
- Total production in 2000: 1.2 million tonnes

Fertilizer Imports, 2000

% of total

Urea	DAP+ MOP+SA	NPK	SSP+ FMP
97.2	100.0	16.7	0

Fertilizer Imports, 2000

MILLION USD

Urea	DAP	MOP	NPK	SA
261.0	105.5	81.5	31.1	29.3

SOURCE: DEAPRTMENT OF CUSTOMS, 2000

Fertilizer Use

Fertilizer NPK used ratio improved between 1990 and 2000:

	1990	2000
• $N+P_2O_5+K_2O$ per ha of crop area (kg)	58.7	117.8
• N: P_2O_5:K_2O	1: 0.12: 0.05	1: 0.44:0.37

Balanced Fertilization

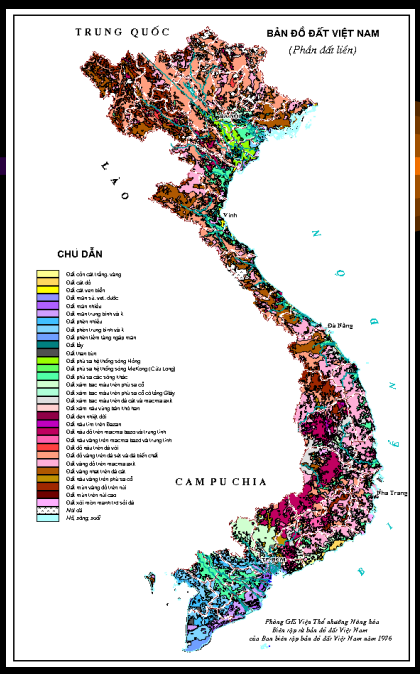
Effects of Balanced Fertilization in relation to:

- Soil characteristics
- Organic-mineral fertilizer combination
- Crops
- Nutrient
- Disease

Balanced Fertilization in Relation to Soil Characteristics

Soil Map of Vietnam

- 19 Groups
- 54 Soil types



Soil Characteristics

Most of the soil types in Vietnam are deficient in nutrient:

- More than 50% of soils types are poor in N
- 87% of soil types are poor in P
- 80% of soil types are poor in K
- 72% of soil types are poor in Ca
- 48% of soil types are poor in Mg

Nutrients became major limiting factor to productivity increase

- N in the 1960's
- P in the 1970's and 80's
- K in the 1990's
- Recently Ca, Mg, S and some micronutrients became limiting factors in many soil types

Soil characteristics (cont.)

Major reasons for the appearance of nutrient limitations:

- Introduction of new (higher yielding) varieties
- Increase in use of fertilizers
- Imbalance of fertilizer use
- Land use intensification
- Shift from soil and organic fertilizer based to mineral fertilizer based agriculture

Soil characteristics (cont.)

Increase in nutrient uptake (kg/ha)

	N	P_2O_5	K_2O
1975-1980	30.7	12.2	33.6
1981-1990	46.4	18.7	50.8
1991-1993	50.1	19.9	52.9
Increase compared to 1975-1980 (%)	63.2	63.1	57.4

Soil characteristics (cont.)

Lowlands:

- Alluvial soils: Balanced Fertilization with emphasis on NP
- Acid sulfate soils: Balanced Fertilization with emphasis on P and Ca
- Soils with light texture (degraded, sandy, grey soils): Balanced Fertilization with emphasis on K, Mg and organic fertilizers

Soil characteristics (cont.)

Uplands:

- Balanced Fertilization with emphasis on P, Ca and organic nutrient sources

Balanced fertilization and soil types

Yield of maize, tonne/ha

Soil types	NP	NPK	Yield increase
• Alluvial	2.80	3.75	0.95
• Degraded	0.45	4.21	3.76
• Grey	2.47	3.64	1.17
• Ferralitic	5.13	5.52	0.39

Balanced Fertilization in relation to crop species

Uptake of Nutrients (kg/ha)

	N	P_2O_5	K_2O
1975-1980	30.7	12.2	33.6
1991-1993	50.1	19.9	52.9
Increase (%)	63.2	63.1	57.4

Uptake of Nutrients in Rice in relation to varieties groups (kg/ha)

	N	P_2O_5	K_2O
Local/traditional varieties	15-25	2.5-4	na
Improved	100-120	40-50	100-120
Hybrid	150-180	70-80	180-200

Balanced Fertilization in relation to organic and mineral combination

Organic and mineral fertilizer partnership

Organic and mineral N- fertilizers support each other's efficiency (Best ratio in term of N is 30:70%):

N-Fertilizer recovery rate for coffee (%):

- Without FYM: 37.2
- With FYM applied: 52.8

FYM effectiveness, kg paddy/ton FYM

- Without mineral fertilizers: 32 - 52
- With FYM applied: 53 - 89

Organic and mineral fertilizer partnership

- Organic fertilizer improves P-fertilizers in upland acid soils, lowland acid sulfate soils due to their impact on P- sorption intensity

Organic and mineral fertilizer partnership

- Organic fertilizers reduce K-fertilizer demand in most soils due to their contribution to K supply

Balanced Fertilization in relation to nutrient interaction

N-P Balance

- N-P synergism for Rice on acid sulfate soils

	Yield, t/ha
N	1.85
NP	3.37

- N-P synergism for Maize

N	1.48
NP	2.80

N-K Balance

- Rice: (t/ha)

Treatment	Soil rich in K	Soil poor in K
NP	4.1-4.5	2.3-2.9
NPK	4.5-4.7	3.3-4.1
Yield increase (%):	7.0	42.3

- Maize: (t/ha)

NP	2.80
NPK	3.75
Yield increase (%):	33.9

N-K Balance: K and N rates

Paddy Yield Increase due to K application (t/ha)

Kg N/ha	Soil rich in K	Soil poor in K
0	0	0.27
60	0	0.95
120	0.22	1.82
210	0.95	1.62

N-K Balance in relation to soil type

Maize yield, t/ha

Soil types	NP	NPK	Yield increase
• Alluvial	2.80	3.75	0.95
• Degraded	0.45	4.21	3.76
• Grey	2.47	3.64	1.17
• Ferralitic	5.13	5.52	0.39

Nutrient balance in relation to fertilizer form

- Urea and SA: Yield of fresh coffee beans (t/ha)
  - Urea: 11.1
  - SA: 12.0
  - Urea+SA: 12.9
- SSP and FMP (yield increase of paddy, t/ha)

- FMP+SSP compared to SSP: + 5.8%
- compared to FMP: + 9.2%

Nutrient balance in relation to disease infection, %

	N P	N P K
H EAD BLIGHT OF R ICE	18-21	12-14
L EAVE BLIGHT OF R ICE	28-32	11-16
H EAD ROT OF C ABBAGE	12	7
B AC TERIAL W ILT OF T OM ATO	29	12

IFA-PPI/PPIC program and fertilizer use improvement

Ratio of Nutrients Used for Rice

Soils	Year of survey	N : P_2O_5 : K_2O
Alluvial	1992	1 : 0.35 : 0.03
	1998	1 : 0.50 : 0.43
Degraded	1992	1 : 0.53 : 0.19
	1998	1 : 0.38 : 0.72
Sandy	1992	1 : 0.49 : 0.18
	1998	1 : 0.45 : 0.53

Conclusion

- Balanced Fertilization Improves:
  - Soil fertility
  - Effectiveness of fertilizers
  - Crop Productivity
  - Product Quality
  - Disease resistance
  - Protection of water resources

THANK YOU FOR YOUR ATTENTION !