Soil Fertility Survey
And
Mapping of Mahottari District

His Majesty's Government
Ministry of Agriculture and Co-operatives
Department of Agriculture
Crop Development Directorate
Soil Testing & Service Section
2059 Ashad (2002)

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Soil Fertility Survey and Mapping
of
Mahottari District

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Foreword

Soil fertility is the key factor for Crop production. By knowing the soil fertility status of a field and recommending the chemical fertiliser and organic manure along with soil amendment, the production and productivity can be increased. So to achieve this sustainable soil fertility recommended dose of fertiliser and organic manure need to be applied. For this purpose, the soil analysis is most essential. Soil Testing and Service Section (STSS) has started the fertility survey and fertility mapping of districts in its regular programs. This fiscal year Syangja and Mahottary district were in target. STSS has completed the survey work and has prepared Soil fertility maps of these two districts.

I hope this map may be useful for the planner, extension workers, farmers and other stakeholders as well.

Lastly I thank Mr. S.N. Jaishy and all his staffs of the STSS, RSTL, DADO, and farmers for their valuable contribution.

Thanks.
2059/3/20

K.K. Shrestha
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Content

Soil Fertility Survey and Mapping of Mahottari District

Location:

Mahottari occupy two topographical regions, Siwalik and Terai. The total area of Mahottari is 1002 Sq. km. Elevation of the district is 61 to 808 meters, which is located $26^0 36'$ to $28^0 10''$ N latitude and $85^0 41''$ to $85^0 57''$ E longitude.

Boundary of the district

East: Dhanusa
West: Sarlahi District and Bihar State of India
North: Sindhuli
South: Bihar State of India

Table 1. Topographical distribution of land

(Area in ha.)

Physical condition	Agriculture		Pasture	Forest	Others	Total
	Cultivated	Non cultivated				
Siwalic	1267	176	55	13428	666	15592
Terai	61677	6203	1038	11029	3206	83153
Total	62944	6379	1093	24457	3872	98745

Source: District Development Profile of Nepal 2001

Table 2. Political distribution

Electorate region	Ilaka	Municipality	VDC
4	15	1	76

Source: District Development Profile of Nepal 2001

Climate:

Influenced by diverse topography and elevation the district has diverse climate tropical to sub tropical. The district receives an annual rainfall about 272 mm to 2200 mm.

Table 3 Demography

Year and Item	1981 Census	1991 census	2001 Projection
Total Population	361054	440146	530261
Male	187092	227627	274231
Female	173962	212519	256030
Total Household	64202	79640	95945
Average Household	5.62	5.5	5.5
Literacy rate of 6 years and above	16.3	26.4	
Population density per sq. Km	360.3	439.3	529.2

Source: District Development Profile of Nepal 2001

Table 4 Land classification (Nepalese System)

Wet land classification				Dry land classification			
Abal	Doyam	Seem	Chahar	Abal	Doyam	Seem	Chahar

Source: District Development Profile of Nepal 2001

OBJECTIVE

The main objective of the project is to assess the chemical characteristics of the soils of Mahottari district and prepare soil fertility map. The specific objectives are

i. Conduct soil survey and collect soil samples from different representative land system locations
ii. Analyse the collected soil samples for soil reaction (pH), organic matter, total nitrogen, available phosphorus and potassium.
iii. Based on the soil reaction and nutrient status recommend sound and sustainable soil management practices
iv. Prepare soil fertility maps showing occurrence and distribution of soil reaction and major nutrient statuses in the district.

METHODOLOGY

Table work:

Kenting earth science ltd. Canada under Land Resources Mapping Project (LRMP) in 1986 has prepared Land Systems Maps of the whole country. These maps show extent and distribution of different land systems and land types. These maps with physiographic details published at the scale of 1:50000 have been used as the base maps for conducting the field survey works. Prior to the actual fieldwork, tentative sampling sites were fixed on the base maps. These sampling sites were set and distributed in such a way that all the agriculturally important land system units are proportionately represented

Field work:

Following the sampling sites fixed in the base map, field works were conducted and surface soil samples were collected by using soil auger and packed in plastic sample bags with proper labels. The samples were collected only from the presently cultivated areas. Soil samples were collected from DADO, STSS and RSTL staffs.

Laboratory work:

Soil samples received from the field were air dried first by spreading in shade. These air-dried samples were then crushed with a wooden pestle and mortar and sieved through 2-mm sieve. Part of the soil samples less than 2 mm diameters were again sieved through 0.2 mm sieve, which were used for the determination of organic matter and other nutrient content. Following chemical properties were assessed using the standard laboratory methods

Soil reaction (pH):

Soil reaction was determined by measuring 1: 1 Soil: Water suspension with the calibrated pH meter.

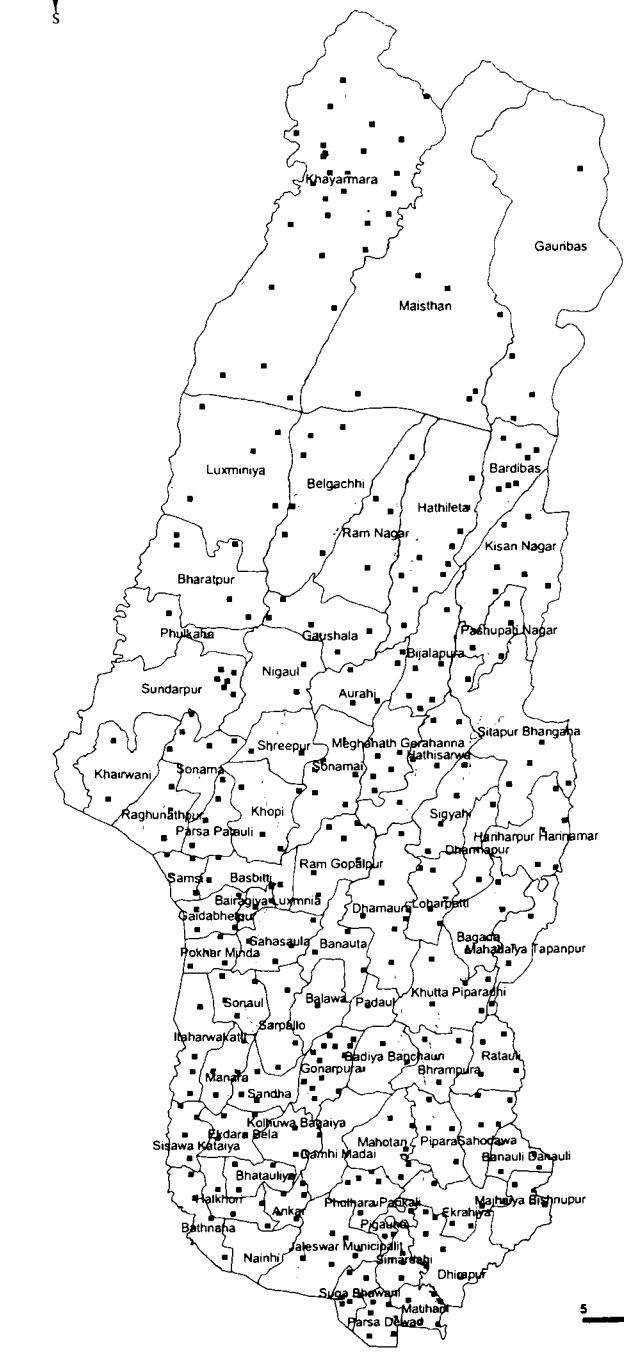
Organic matter:

Organic matter content was determined by following modified Walkley- Black method.

Available Phosphorus:

Available phosphorus was determined by modified Olsen's bicarbonate method. This available phosphorus is expressed in P_2O_5 by using conversion factor.

Mahottary District
Soil Samples Collected Site



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Source: District Development Profile of Nepal 2001

Table 4 Land classification (Nepalese System)

Wet land classification				Dry land classification			
Abal	Doyam	Seem	Chahar	Abal	Doyam	Seem	Chahar

Source: District Development Profile of Nepal 2001

Major Crops of the District

Rice, Wheat, maize, millet, barley, Potato Vegetable, oilseed, lentil, chick pea, green grams, are growing in Mahottari district.

Major Cropping Patterns of the District

Irrigated land

Rice- Wheat-Fallow
Rice- Wheat-Mug
Rice- Wheat- Rice
Rice- Vegetable
Rice- Vegetable- Vegetable
Rice/Lentil - Maize
Rice-Wheat-Maize
Rice- Vegetable- Fallow
Rice – Oil seed
Rice – Pulses
Rice - fallow

Un irrigated land

Rice - Vegetables
Rice -Fallow
Maize -Wheat
Maize - Legume
Maize- Vegetable
Maize - Potato
Maize- Oil seed
Maize- finger millet
Maize - fallow
Maize- Barley
Maize – Other

Major crops, their area and production (1998/99):

		Area (ha.)	Production (MT)
Cereals	Rice	46500	97880
	Maize	3350	6700
	Millet	1700	1700
	Wheat	18000	30600
	Barley	80	70
Cash crops	Oilseed	3510	2071
	Potato	2600	26000
	Tobacco	900	600
	Sugarcane	2900	95700
Pulses	Lentil	5000	4000
	Chickpea	500	500
	Pigeon pea	1200	1200
	Black gram	100	60
	Grass pea	2000	1300

Source: District Development Profile of Nepal, 2001.

Table 5. Irrigation facilities

Irrigation facilities

Available Potash:

Available potash was determined by extracting the sample with neutral ammonium acetate and the K content was determined by flame photometer. The available potassium is expressed in K_2O by using the conversion factor.

Data compilation and Mapping:

The laboratory data were linked with the corresponding auger points in the digitised land systems maps and soil reaction and nutrient status maps were prepared using GIS techniques. While assessing the soil reaction and nutrient status the following standard rating chart for general in formation & lime use.

Soil Reaction class	pH Acidic
Acidic	<4.5
Strongly acid	4.5-5.2
Moderately acid	5.3-5.9
Slightly acid	6.0-6.5
Nearly neutral	6.6-7.0
Slightly alkaline	7.1-7.5
Moderately alkaline	7.6-8.3
Strongly alkaline	8.4-9.0
Extremely alkaline	>9.0

Note: Although this rating chart is widely accepted and used for interpreting the soil reaction status, in our project considering the soil analysis report and limited number of sample the following category have been made viz.

Soil Reaction	***pH***
Acidic	<5.5
Slightly acidic	5.5-6.5
Nearly neutral	6.5-7.5
Alkaline	7.5<

Table 6 Nutrient Rating

Nutrient status	OM%	Total N %	Avail. Phosphorus (P_2O_5 Kg/ha)	Avail. Potash (K_2O kg/ha)
Very low	<0.75	<0.03	<11.2	<56
Low	0.75-1.5	0.03-0.07	11.2-28	56-112
Medium	1.5-3.0	.0.07-0.15	28-56	112-280
High	3.0-5.0	0.15-0.25	56-112	280-504
Very high	>5.0	>0.25	>112	>504

As stated earlier, physiography and land systems within each of this physiography were considered as the major basis for conducting field survey and assessment of the present soil fertility status of the district. The brief descriptions and characteristic features of these land types occurring in the district are as follows:

Description of Physiography and Land systems

LRMP (1986) have identified five physiographic regions in the country based on the repeating patterns of landforms. Of these five physiographic regions Mahottari district falls within two regions: Middle Mountain (Siwalik) and Terai.

Mahottari District

Dominant Texture

Mahottari District

Dominant Soil

District Boundary
VDC Boundary

Haplaquepts
Haplaquepts (Aeric)
Haplaquepts Ustochrepts
Haplustolls Dystochrepts Ustochrepts
Haplustolls Dystrochrepts Rhodustalfs
Haplustolls Ustochrepts
Lithic Subgroups of 7 and Ustorthents
Paralithic, Lithic & Anthropic Subgroups of Dystochrepts
Ustifluvents Fluvaquents
Ustochrepts Haplaquepts
Ustorthents Psamments

LAND SYSTEM LEGEND

Table 7. MAPPING APPROACH

Category:	DIFFERENTIATION CRITERIA
Region	Physiography, Geology and Geomorphology
Land system	Recurrent Patterns of landform, geological materials, slope and Arable Agriculture limits
Land unit :	Land scope feature, Position, slope, degree of dissection, flooding frequency soil characteristic, drainage, depth, texture, profile development, pH.

Terai Region: Quaternary alluvium, Subtropical							
Land system	land form	Land unit	Dominant soils	Dominant slopes	Dominant texture	Seasonal Range of depth to water table	Drainage
1	Active alluvial plain (Depositional)	1a Present river channel	-	-	-	-	-
		1b sand and gravel bar	Ustrothents Psamments	$<1^0$	Sandy / cobby	0-2m	Subject severe river flooding
		1c low terraces	Ustifluvents Fluvaquents	$<1^0$	Sandy	0-2m	Variable; severe river flooding
		1d higher terraces	Ustrocrepts Haplaquepts	$<1^0$	loamy	0-4 m	Variable; subject to occasional river flooding
2	Recent alluvial plain "lower piedmont" (depositional and Erosional)	2a depress ional	Ustrocrepts Haplaquepts	$<1/2^0$	Fine loamy	0-2 m	poor
		2bInter mediate positional; level	Haplaquepts Aeric	$<1/2^0$	loamy	0-6m	Imperfect
		2c Inter mediate positional; undulating	Haplaquepts Ustrocrepts	$<1^0$	Variable	Dependent on position	Variable; low areas; subjected to flooding
		2d high positional	Haplaquepts Ustochrepts	$<1^0$	Loamy	1-10m	Moderately well
3	Alluvial Fan Apron complex "upper pie dmont" (erosion)	3 very gentle slope	Haplustolls Dystrochrept s Ustochrepts	$<1^0$	Loamy	1-10m	Moderately well
		3b gentle slope	Haplustolls	$1\text{-}5^0$	Loamy/ Bouldery	2-10m	Rapid
		3 undulating	Haplustolls	$1\text{-}3^0$	Loamy	2-10m	Well
		3d highly dissected	Ustrochrepts	$0\text{-}20^0$	Loamy	>2m	Rapid

SIWALIC REGION: Tertiary inter bedded sand stone, shale, conglomerate and quaternary alluvium ; subtropical

land system	land form	Land unit	Dominant soils	Dominant slopes	Dominant texture	Seasonal Range of depth to water table	Drainage
4	Active recent alluvial plain	4a sand and gravel bars	Ustrothents Psamments	$<1^0$	Sandy / cobby	0-2m	subject to severe river flooding
		4b Low terrace	Ustifluvents Fluvaquents	$<1^0$	Sandy	0-2m	Variable; subject to severe river flooding
		4c Higher terrace	Ustrocrepts Haplaquepts	$<1^0$	Variable	Dependent on position	variable; low areas; subjected to flooding
5	Fans, Aprons, and Ancient River Terraces (Tars)	5a very gentle slope	Haplustolls Dystrocrepts Ustrochrepts	$<1^0$	Loamy	0 ->15m	Moderately well
		5b gentle slope	,,	$1\text{-}5^0$	Loamy/ Bouldery	2->15m	Rapid
		5c undulating	,,	$1\text{-}5^0$	Loamy	2->15m	Well
		5d rolling	,,	$0\text{-}20^0$	Loamy	2->15m	Rapid
6	Depositional Basin (Duns)	6a Depress ional	Haplaquepts	$<1/2^0$	Fine loamy	0-2m (perched)	Poor
		6b Non-dissected high position	Ustochrepts Haplaquepts	$<2^0$	Fine loamy	0-6m (perched)	Imperfect
		6c gently rolling	,,	$1\text{-}5^0$	Fine loamy	2-15m (perched)	Variable
		6d highly dissected	Ustochrepts	$0\text{-}30^0$	Fine loamy	>15m (perched)	rapid
7	Moderately to Steeply Sloping Hilly and Mountainous Terrain		Paralithic, Lithic, and Anthropic Subgroups of Dystrochrepts Ustochrepts	$<20^0$	Loamy Skeletal	no water table , < 1m to bedrock	Well to rapid
8	Steeply to Very Steeply Sloping Hilly and Mountainous Terrain		Lithic Subgroups of 7 and Ustorthents	$<20^0$	Loamy Skeletal	No water table, < 50 cm to bedrock	Rapid

Soil Reaction status of district soil

Table 8 pH level and area covered

pH level	Ha.
Acidic	8718.44
Slightly Acidic	23666.57
Nearly Neutral	18504
Alkaline	8798.42

Note majority of soil is slightly acidic

Mahottary District Cultivated Area

Legend

VDCBoundary

Roads

HIGH WAY

DISTRICT ROAD

Rivers

MAJOR RIVER

Landuse

Cultivated Land

Non-cultivated Land

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Acid soil management

The pH requirement of different crop is different. Therefore, it is difficult to say anything about correction of soil pH unless we know about the crop farmers grow. However extreme soil pH, either acidic or alkaline, limits the crop growth in various ways. For example in highly weathered acid soil with high iron (Fe) and aluminium (Al) oxides, crops may suffer due to unavailability of phosphorus due to high rate of fixation of soil phosphorus and applied phosphoric fertiliser too. Under such condition rice crops may suffer due to toxicity of iron and aluminium because of high solubility. In highly acidic condition crops also suffer due to deficiency and unavailability of calcium and magnesium. Similarly in highly alkaline soil with pH more than 8, crops may suffer due to deficiency of micronutrient like Fe, Mn, Zn and Cu. In highly alkaline soil phosphorus availability is also reduced due to fixation by calcium compounds in soil. In general a soil having pH from 6.5 to 7.5 (nearly neutral) is considered best for growing almost all of the crops. The soil with pH 5.5 to 6.5 although categorised slightly acidic are safe for growing most of the crops except a few high calcium requiring plants. The soil with pH < 5.5 are considered acidic and requires liming. At this pH range liming gives very good result. Under such condition pH might be the major limiting factor of crop production. Under such condition amelioration of soil pH is a must for soil fertility management and higher crop production. crop requires desiring pH . If the crop is growing within the desiring pH no need to apply the lime to the field. The following table shows the pH range for the crops.

Table 9 a. Optimum pH range for some major crops

Crop	Optimum pH range	Crop	Optimum pH range
Asparagus	5.5-7.0	Oat	5.0-7.5
Banana	6.0-7.5	Olive	6.0-8.0
Barley	6.5-8.0	Onion	5.5-6.5
buck wheat	5.5-7.0	Pea	6.0-7.5
Cabbage	6.0-7.0	Pine apple	5.0-6.5
Chilly	5.5-6.5	Pome fruit	6.0-8.0
Citrus	5.5-6.5	Potato	4.8-6.5
Coconut	6.0-7.5	Radish	6.5-7.5
Coffee	4.5-7.0	Rape	6.0-7.5
Cauliflower	6.5-7.5	Rice	5.0-6.5
Coriander	6.0-7.0	Rubber	4.5-7.5
Cotton	5.0-6.0	Rye	5.0-7.0
Cow pea	5.0-6.5	Soybean	6.0-7.0
Cowpea	5.0-6.5	stone fruit	6.5-8.0
Cardamom	4.5-5.5	Sugar beat	6.5-8.0
Cucumber	6.0-7.3	Sugar can	6.0-8.0
Fenugreek	6.0-7.0	Sun flower	6.0-7.5
Field beans	6.0--7.5	Sweet potato	5.8-6.0
Flax	5.0-7.0	Tea	4.0-5.5
Garlic	6.5-7.0	Tobacco	5.5-7.5
Ground nut	5.3-6.6	Tomato	5.5-7.0
Hemp	6.0-7.0	Turmeric	5.5-6.5
Lma bean	6.0-7.0	Turnip	5.5-6.8
Lucerne	6.2-7.8	Velvet bean	5.5-7.0
Maize	5.5-7.5	wheat	5.5-7.5
mango	5.5-7.0	Zinger	6.8-7.0

Liming:

Agriculture lime application is highly recommended for the soils with acidic reaction. Lime application dose is recommended based on the pH reading. The recommendation chart is given in table 9.b. Careful attention should be paid about the time and dose of lime application. Standing crops should never be limed, as land should be left fallow for at least about 2-3 weeks after liming. In case of higher dose split application is recommended. Increasing the pH by more than one unit at a time is not desirable because sudden increase in soil pH may affect the soil environment affecting the growth of soil microorganisms and availability of plant nutrients.

Table 9.b. Recommendation of agricultural lime for different pH level, for different soils texture

pH	Recommended dose of Agri lime (kg / ropani_					
	Hills			Terai		
	Sandy loam	Loam	Clay loam	Sandy loam	Loam	Clay loam
6.5	15	20	24	8	14	22
6.3	29	40	48	15	24	44
6.2	43	60	72	23	34	64
6.1	58	78	98	30	44	86
6.0	71	92	120	38	52	106
5.9	85	110	146	45	62	128
5.8	97	128	166	52	72	146
5.7	108	142	188	58	82	166
5.6	119	158	208	64	90	184
5.5	130	170	230	70	100	200
5.4	140	188	252	76	110	220
5.3	150	204	274	81	118	238
5.2	160	218	294	86	126	254
5.1	169	228	314	91	136	270
5.0	176	240	334	96	142	286
4.9	184	252	354	101	150	302
4.8	191	262	374	106	158	316
4.7	199	272	390	111	166	330
4.6	205	280	406	115	174	340
4.5	210	290	420	120	180	350

Note:

Test your soil before applying lime.

Use agricultural lime 2-3 weeks before plantation or sowing the seed.

If high dose of lime is recommended, use in split dose of twice.

If pH is less than 4.5, apply agricultural lime according to recommendation for pH 4.5 and application should be repeated as required after checking the soil pH.

It is not advised to raise the soil pH by more than one unit at a time or a season.

Crop management

Amelioration of acidic soil, although pays with higher crop production, is a costly process. Under resource poor farming condition and in remote areas lime recommendation may not be very much practicable because of inability of farmers to buy it and difficulty in transportation. Therefore, low cost alternative solution is required to such condition. In recent years, the concept of "fitting the soil as per crop requirement" has been changed to " fitting the crop as the soil" to solve this problem.

The pH requirement of different crop is different. With proper crop management practice liming may not be necessary, as there are some acid loving plants, which grow well on acid soils. So it would be desirable to manage crops according to pH. However soil pH from 6.0 to 7.5 is considered to be suitable for most of the crops. Acid soils can be used for tea, coffee, pineapple, and blue berry. Black berry, cabbage, corn, peanut, sweet potato, tobacco, wheat are medium lime desiring plants. Incas of lowland irrigated rice the field is flooded, hence the soil chemistry is different than that of upland crops. Rice can tolerate wide range of soil pH but in highly acidic soil the crop may suffer due to iron and aluminium toxicity and unavailability of phosphorus and other plant nutrients. Classification of crops according to soil pH is given in table 11.

Table 10. Classification of crops according to lime requirement.

high	medium	low	Very low
Sun flower, Alfalfa, barley, asparagus, bean pea, soybean, spinach, sugar beet,	Black berry, cabbage, peanut, maize, lettuce, gram, sweet potato, tobacco, wheat,	Buck wheat, oat, rice, potato, and strawberry.	Tea, coffee, , pineapple, Nepier grass, crane berry,

In acid soil management the type of nitrogenous fertiliser that farmers use is also very important. In general the ammoniacal and urea nitrogen aggravate the soil acidity. Therefore, use of nitrate nitrogen instead of these ones, if available, will help to reduce the problem. Organic manures have high buffering capacity and help to maintain the soil reaction. They always keep the soil reaction near neutral range. Therefore, both in acidic and alkaline soil use of high dose of organic manure helps to ameliorate the problem.

Organic matter status of the District

The table below summarizes organic matter status and area covered by each in the district.

Table 11 Organic matter and Nitrogen level area covered

Organic matter level	Area (ha) Covered by Organic matter
High	1534
Medium	7806.05
Low	42803.08
Very low	20850.49

Management of soil organic matter:

Considering the fact that major parts of the area in the district were put to cultivation relatively very recently this high rate of depletion in organic matter content in the soil seem quite alarming. Highly intensive cultivation of land without the application of adequate amount of organic manure seems to be the major factor responsible for this situation.

Hence the following practices are highly recommended to be followed by the farmers in order to enhance the OM level in the soils.

- Promote use of organic manure by utilising all types of biodegradable wastes through improved composting techniques and through the promotion of biogas plants.
- Promote the inclusion of legumes in cropping sequences and green Manuring practices.
- Emphasise more on integrated plant nutrients system
- Plan and implement integrated crops and livestock programs.
- Follow conservation farming in the sloping lands.
- Legume cultivation with rhizobium inoculation
- Use azolla as a green manure in the paddy field.
- Use green Mung bean as sole crop or relay crop in maize.

4.3 Total Nitrogen

Nitrogen is the most important plant nutrient that limits crop production. Its deficiency is directly related to the organic matter status. Nitrogen deficiency is widespread where organic manure are in short supply. The table below summarises different N status in the soils and area covered by each of these categories in the district.

Table 12. Nitrogen status and area coverage

Total Nitrogen Level	Area (ha)
High	1534.26
Medium	7806.05
Low	42803.05
Very Low	20850.49

Nitrogen management in soils

Out of all the nutrients essential for plant growth, Nitrogen is by far the most important one and almost all the cultivated areas experience the deficiency of this essential nutrient with varying degree of magnitude. In lower level of productivity since nitrogen removal is low, it is replenished by local fixation atmospheric nitrogen. Nitrogen is also fixed to some degree by electrical storms during pre monsoon rains. However with the needs to increase more food grain additional application is required in the form of chemical fertilisers and organic manure. Crops invariably respond to N application. Non-response to applied N is indicative of some other none nutrient limitation. Response to N is also very much dependent on climatic conditions, soil moisture status, variety of crop etc. In general in Nepalese mid hill conditions maize crop (grain and straw) has been found to remove about 53 kg/ha Nitrogen; Wheat removes 30 kg and Rice removes about 54 kg (with the yield levels of national average). As the yield level increases so is the removal and equal amount need to be replenished through external source for sustained crop growth.

The nitrogen in soil is mostly in organic form and only a small fraction (1-3%) is present in inorganic form. Therefore, management of Nitrogen is always associated with organic matter management and the practices recommended for OM management also improves N status in the soil. The nitrogen applied in the form of inorganic fertiliser is readily available to crop plant but a substantial proportion of it is lost either by leaching or volatilisation. But the nitrogen in organic form is slowly mineralised and becomes available to crop plants. Application of organic manure together with chemical fertiliser also improves the efficiency of chemical fertilisers.

Balanced application as per the recommendation made by Soil Science Division of NARC (Appendix-2) with adjustments on the basis of Soil test value should be followed. One other

Mahottary District
Nitrogen Level

Legend

- VDCBoundary
- Roads
  - HIGH WAY
  - DISTRICT ROAD
- Rivers
  - MAJOR RIVER
- Nitrogen Level
  - Very Low (<.03 %)
  - Low (.03-.07 %)
  - Medium (.07-.15 %)
  - High (>.15 %)
  - Non-cultivated land
  - Sample Sites

5 0 5 10 Kilometers

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Maottary District Phosphorus Level

Legend

- VDCBoundary
- Roads
  - HIGH WAY
  - DISTRICT ROAD
- Rivers
  - MAJOR RIVER
- Phosphorus Level
  - Very Low(<11kg/ha)
  - Low (11-28kg/ha)
  - Medium (28-56kg/ha)
  - High (56-112kg/ha)
  - Very High (>112kg/ha)
  - Non-cultivated land

5 0 5 10 Kilometers

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Mahottary District Potash Level

Legend

- VDCBoundary
- Roads
  - HIGH WAY
  - DISTRICT ROAD
- Rivers
  - MAJOR RIVER
- Potash Level
  - Very Low (<56kg/ha)
  - Low (56-112kg/ha)
  - Medium (112-280kg/ha)
  - High (280-504kg/ha)
  - Very High (>504kg/ha)
  - Non Cultivated

5 0 5 10 Kilometers

Soil Testing and Service Section HMG Nepal, 2002

factor, which is very important in Nepalese agriculture, is the low efficiency of Nitrogen fertilizers especially in the rice crop as in the present level of management, it is often less than 40%. Therefore, increasing the efficiency of chemical fertiliser will reduce the cost of production and helps to save the foreign exchange, which is spent for import of chemical fertiliser. A number of factors determine the fertiliser use efficiency. The efficiency can greatly be increased by

i. Proper seed bed preparation
ii. Proper seeding
iii. Time sowing
iv. Appropriate crop variety
v. Adequate plant population.
vi. Proper fertiliser placement
vii. Adequate moisture
viii. Proper plant protection measures including weed control and
ix. Balanced fertiliser application (G.S.Sekhon FAI 1978 from D.Joshy 1997.)

Phosphorus Status of District

Table 13. Available Phosphorus level and covered area

Phosphorus level	Hectare
Very High	14773.78
High	14931.79
Medium	16793.56
Low	27925.21
Very low	545.34

Potash Status of district

Table 14. Available Potash level and covered area

Potash level	Hectare
Very High	4051.77
High	1409.75
Medium	15923.11
Low	34142.08
Very low	19498.81

Manure and fertiliser recommendations:

Manure and fertiliser recommendation on the basis of soil fertility status of a place is not so easy but the laboratory recommendation is given as below in table 16.

Table 15. Fertiliser Recommendation Sheet based on Soil Annual Analysis

Soil Test Result:

General Recommendation of fertiliser and Manure Kg/ha (20 Ropani or 30 Kattha)

Crop	Nitrogen (Kg/ha)			Phosphorus (Kg/ha)			Potash (Kg/ha)			FYM (t/ha)	Remarks
	Low	Med	High	Low	Med	High	Low	Med	High		
Paddy irrigated	100	50	25	30	15	8	30	15	8	6 ton/ha (240 Doka)	1 kg Nitrogen = 4.8 kg Ammonium Sulfate = 2.2 Kg Urea 1 kg phosphate = 6.25 kg sing super phosphate = 3.12 kg Double Super phosphate = 2.1 Kg Triple Super Phosphate 1 Kg Potash =1.67 Kg Muriate of Potash,
Paddy un irrigated	60	30	15	20	10	5	20	10	5	"	
Wheat irrigated	100	50	25	50	25	13	25	12	6	"	
wheat unirrigated	50	25	13	50	25	13	20	10	5	"	
Maize (summer + winter)	60	30	15	30	15	8	30	15	8	"	
Barley + naked barley	30	15	7.5	20	10	5	10	5	205	"	
Millet	20	10	5	10	5	2.5	10	5	205	"	
Sugarcane Raton	150	75	37.5	60	30	15	40	20	10	"	
sugarcane (main)	120	60	30	60	30	15	40	20	10	10 ton/ha (200 Doko)	
Buck wheat	30	15	7.5	20	10	5	10	5	2.5	6 ton/ha (240 Doko)	
Ginger	30	15	7.5	30	15	7.5	60	30	15	24 ton/ha	
Potato	70	35	17.5	50	25	12.5	40	20	10	30 ton/ha	
Tobacco	35	17.5	8.75	23	11.5	5.75	60	30	15	10 ton/ha	
Mustard	60	30	15	40	20	10	20	10	5	6 ton /ha	
Sunflower	60	30	15	40	20	10	20	10	5	6 ton/ha	
Vegetable crop	70	35	17.5	50	25	12.5	40	20	10	32 ton/ha	
Lentil, Black gram, green gram	20	10	5	20	10	5	20	10	5	4-6 ton/ha	
Cowpea, Pigeon pea	20	10	5	40	20	10	30	150	7.5		
Chick pea	20	10	5	40	20	10	20	10	5	"	
Pea	15	7.5	3.75	40	20	10	10	5	2.5	"	
Soybean	10	5	2.5	40	20	10	30	15	7.5	"	
Ground nut	40	20	10	60	30	15	20	10	5	6 ton/ha	
Mulberry Teral un Irrigated	300	150	75	140	70	35	180	90	45		
Mulberry Teral Irrigated	150	75	37.5	70	35	17.5	90	45	22.5		
Mulberry Hill irrigated	200	100	50	80	40	20	120	60	30		
Mulberry Hill unirrigated	100	50	25	40	20	10	60	30	15		

L = Low, M = Medium, H = High

Fertiliser Recommendation for fruit Crops:

Age	1	2	3	4	5	6	7	8 and above
1. FYM (Kg/tree)	25	30	40	50	60	60-100	60-100	60-100
2. Nitrogen N (g/tree)	-	100	125	150	200	300	400	500
3. Phosphorus P2O5 (g/tree)	-	50	75	100	150	200	200	200
4. Potash K2O (g/tree)	-	20	30	40	50	5	100	100

It is highly advised to the farmers to use high amount of organic manure in their field. Integrated application of chemical fertiliser along with organic manure is the best way to maintain and sustain the soil fertility. On the basis of soil analysis result, the recommendation is full dose for low nutrients content, if the nutrients content of any soil samples is medium then the recommendation of fertiliser is half dose. Similarly high nutrient content in any soil then one-fourth (1/4) dose is recommended. Fertiliser dose of any field varied with the soil fertility status, crop types, varietal characteristics, cropping intensity, irrigation facility, root system of the crops, crops duration etc affect the fertiliser dose of any soil .

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Errata

Table 8. pH Level and area covered

pH Level	Area (ha)
Acidic	20838.8800
Slightly Acidic	23666.5700
Nearly Neutral	18504.9700
Alkaline	8798.4200

Table 11. & 12. Organic Matter and Nitrozen Level and area covered

OM & N Level	Area (ha)
Very Low	5516.6500
Low	16316.0000
Medium	12397.2800
High	1534.2600

Table 13. Available Phosphorus Level and area covered

Phosphorus Level	Area (ha)
Very Low	545.3400
Low	23971.1700
Medium	13082.6500
High	3938.1500
Very High	21904.5600

Table 14. Available Potash Level and area covered

Potas Level	Area (ha)
High	2161.05
Low	31138.68
Medium	17696.84
Very High	4051.77
Very Low	19977.19