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Plant Nutrient



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How Do The Plants Grow

- What they eat?
- What they drink?
- Do they eat junk food
- Where from they get their food
- How they absorb



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Macronutrients & it's source

- Macronutrients are needed in relatively large amounts by plants.



Element	Symbol	Source
Oxygen	O	Air/Water
Hydrogen	H	Air/Water
Carbon	C	Air/Water
Nitrogen	N	Soil
Phosphorus	P	Soil
Sulfur	S	Soil
Potassium	K	Soil
Calcium	Ca	Soil
Magnesium	Mg	Soil



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Essential Elements Needed for Crop Production

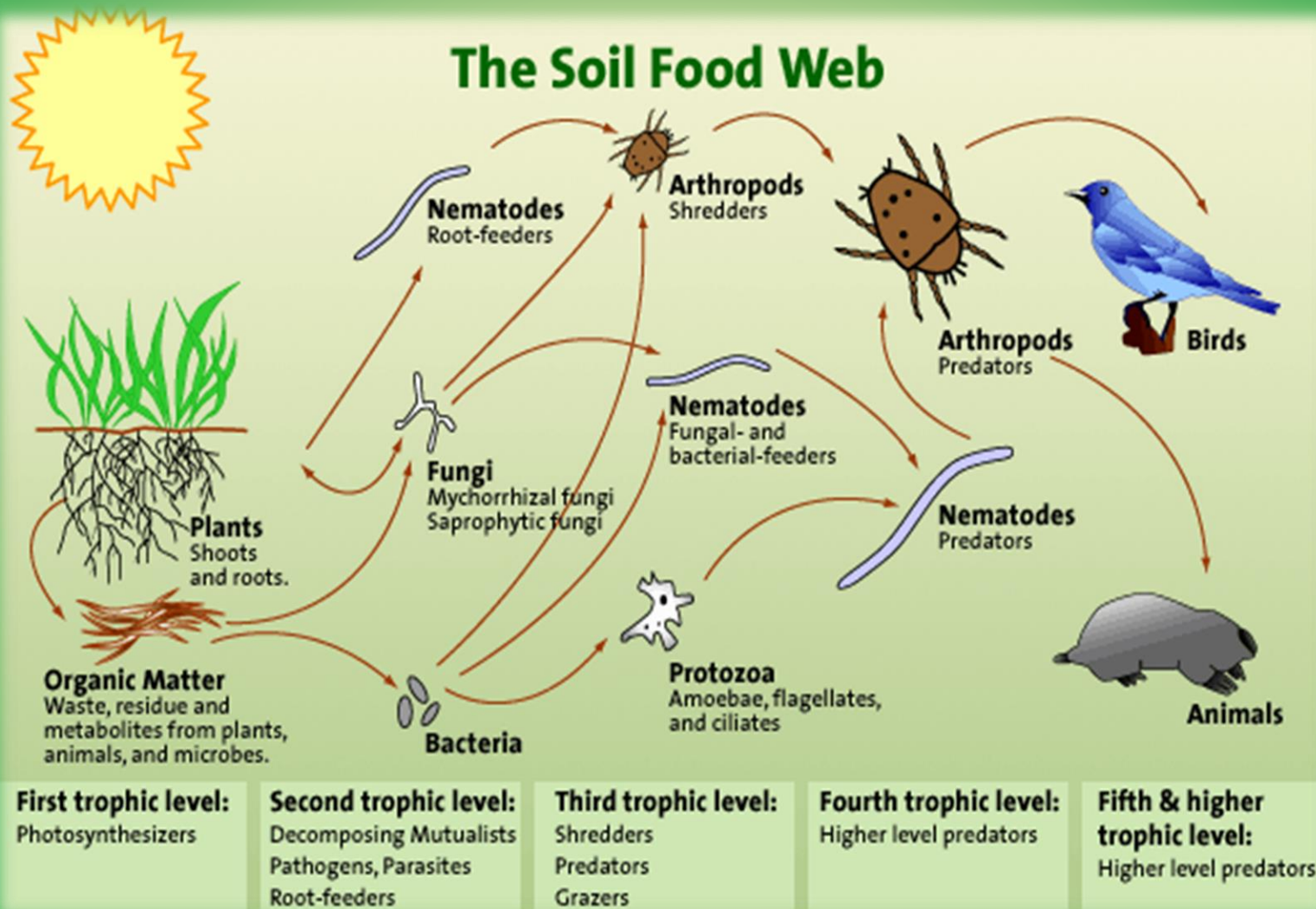


- **Elements From The Atmosphere**
 - C, O, H and N (all constitutive)
 - These represent 92 to 98 % of a plant's dry weight
- **Elements From The Soil** (2-5%, plant's dry wt.)
 - Twelve vital elements of which two are non-constitutive- K and Cl and ten are constitutive- P, B, Ca, Mg, S, Fe, Mn, Mo, Cu and Zn
 - Eighteen elements needed in traces: 4 non-constitutive – Li, Na, Rb, Cs; 14 constitutive – Co, I, Sr, Ba, Al, V, Sn, Ni, Cr, Be, Br, F, Si, Se.

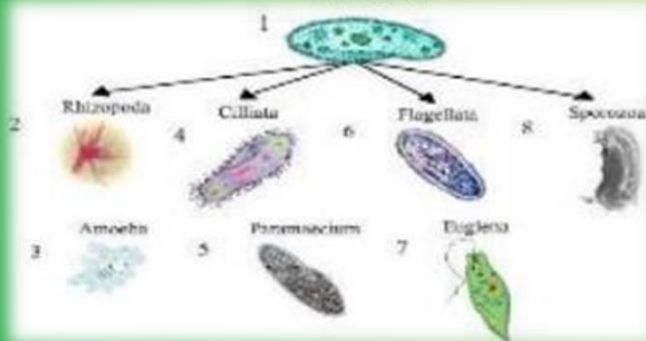
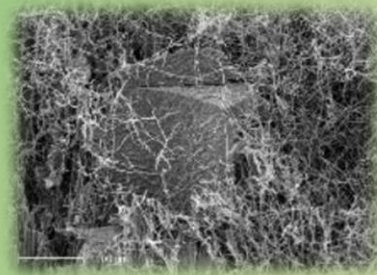
Source: Bourguignon 1998

Required: To internalize these basics into our conduct of research and education programs.

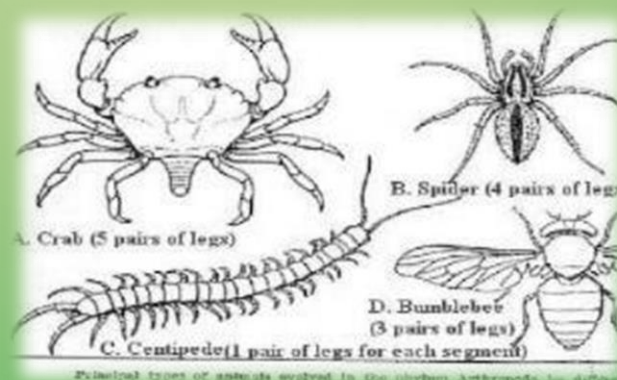
The Soil Food Web



Soil Contains Enormous Numbers of Living Organisms. One Cup of Undisturbed Native Soil may Contain



Organisms	Numbers
Bacteria	200 billion (2×10^{10})
Protozoa	20 million (2×10^7)
Fungi	100,000 meters (1×10^5)
Nematods	100,000 (1×10^5)
Arthropods	50,000 (5×10^4)



Plant Nutrition Tree



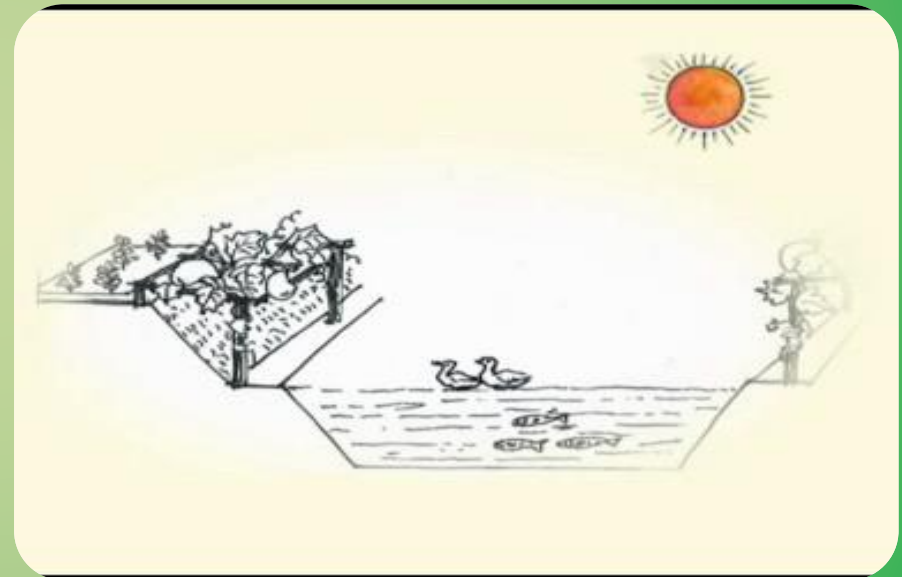


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Essential Elements Required For Plant Growth

- Light
- Mechanical support
- Heat
- Air
- Water
- Nutrients
- Except light all comes from the soils



প্রাকৃতিক সম্পদ

ফুরন্ত

অফুরন্ত

জমি, মাটি, খনিজ
জ্বালানী
(খনিজ, বনজ, কৃষিজ)

জল, সূর্যের আলো
বাতাস

আমাদের দেশে শ্রম শক্তি এখনও অফুরন্ত



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The essential elements...

- What are they :
 - The essential elements must be in forms usable by plants and concentration optimum for plant growth
 - There must be proper balance
 - Too much of one element may hamper uptake of another
 - The element which is in short supply will control the growth of plants



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- Ca, MG Na S are also added through fertilizer or from rain water.
- NPK are commonly supplied to the soils as manure or fertilizer.
- Minor or Trace elements are mostly available from soils in small quantities.
- They may be deficient in sandy soils, organic soils, very alkaline soils.
- They range from 5 ppm to 50,000 ppm.
- Continuous cropping may make a soil deficient.



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Minor or micro elements from soil

Element	Symbol	Source
Manganese	Mn	Soil
Copper	Cu	Soil
Zinc	Zn	Soil
Molybdenum	Mo	Soil
Boron	B	Soil
Iron	Fe	Soil
Cobalt	Co	Soil
Chlorine	Cl	soil



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Availability of nutrients in soil

- Organic matter plays a crucial role in supplying major elements
- N and P are almost always present in very small quantities
- Large proportion are held in combinations unavailable to plants
- K is plenty but mostly in unavailable form Calcium and magnesium shows great variation
- Sulphur is usually plenty in soils
- Phosphorus is mostly fixed in unavailable form



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The Story Of Nitrogen Which Is Taken By Plants In Large Quantities



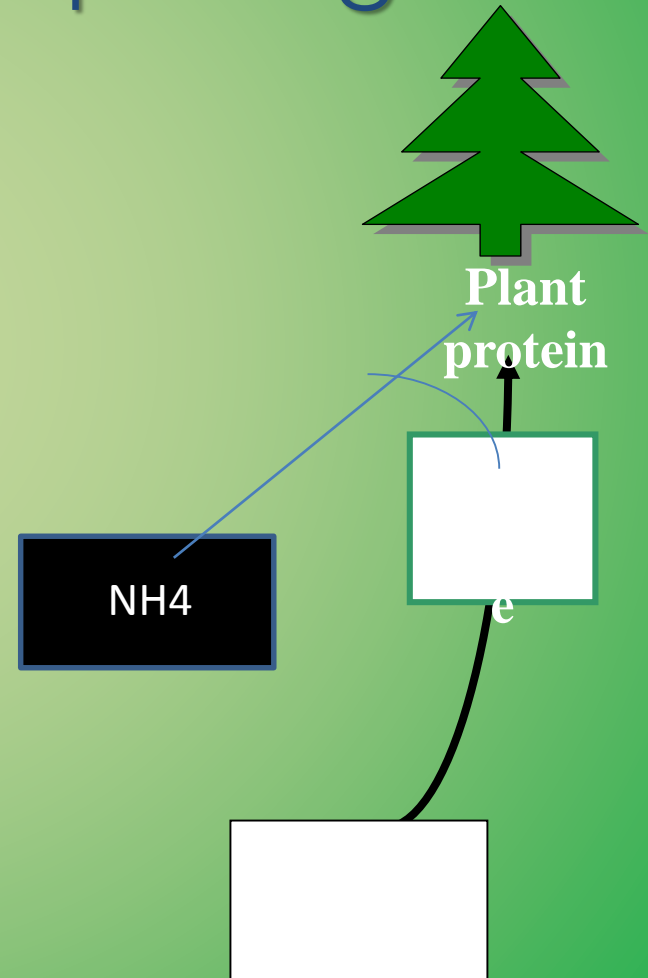
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Nitrogen is *essential* for plant growth



gethupornwattana

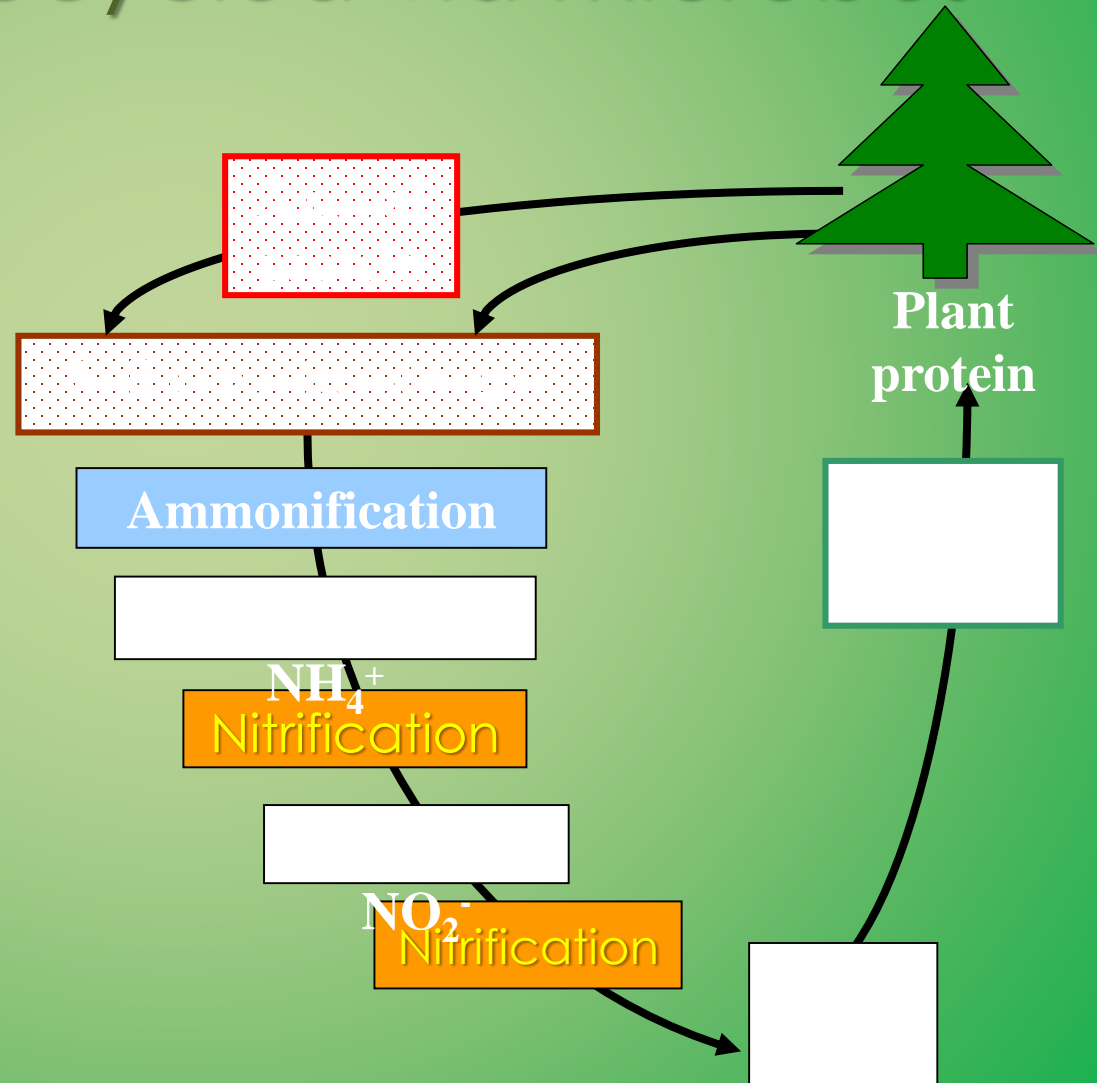




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Nitrates are recycled via microbes





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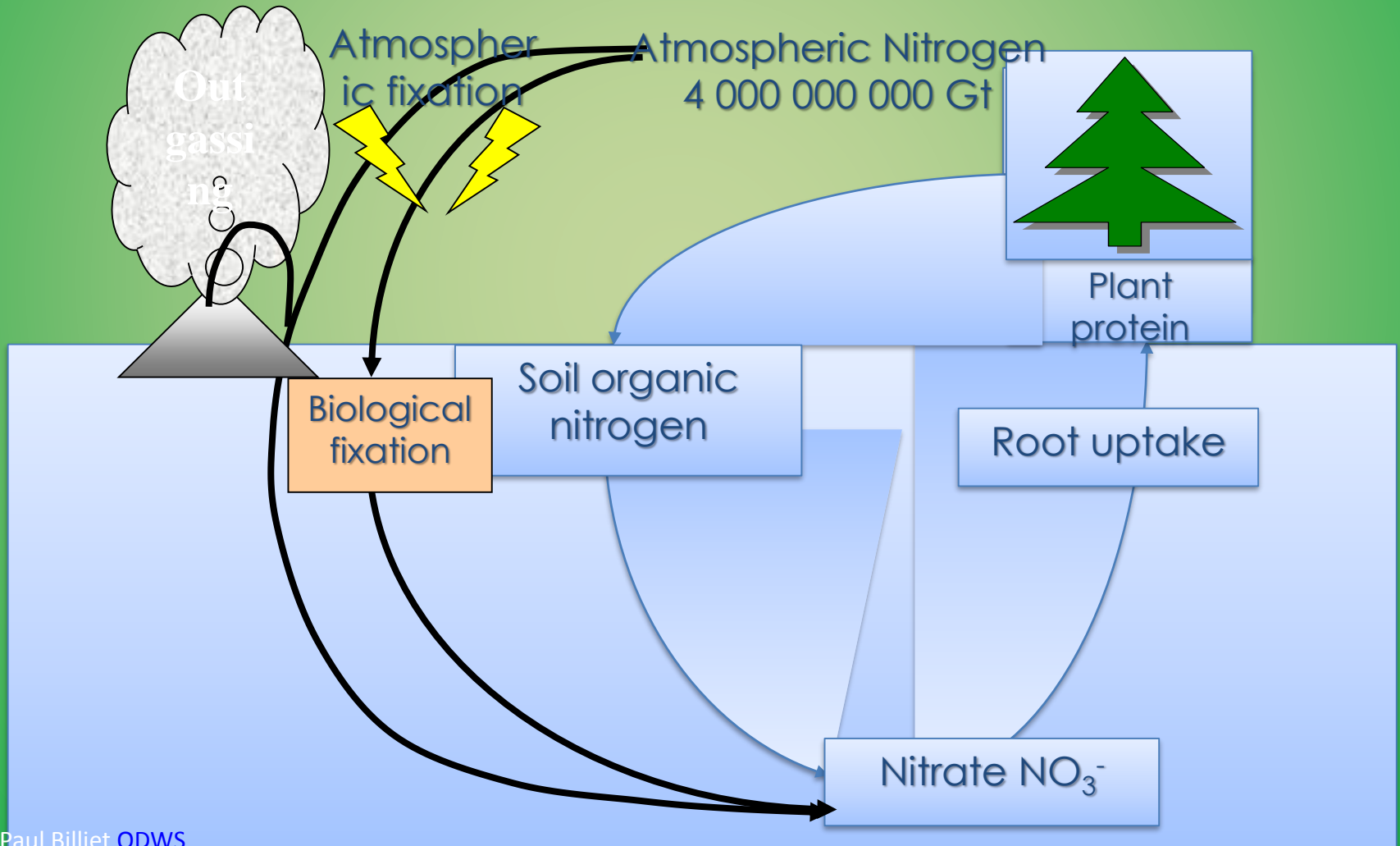


How Organic Nitrogen is converted to Inorganic Nitrogen

- Nitrogen enters the soil through the decomposition of protein in dead organic matter
- **The first process is called ammonification**

Proteins >>>Amino acids>>> NH_3

Nitrogen from the atmosphere





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The nitrogen fixers

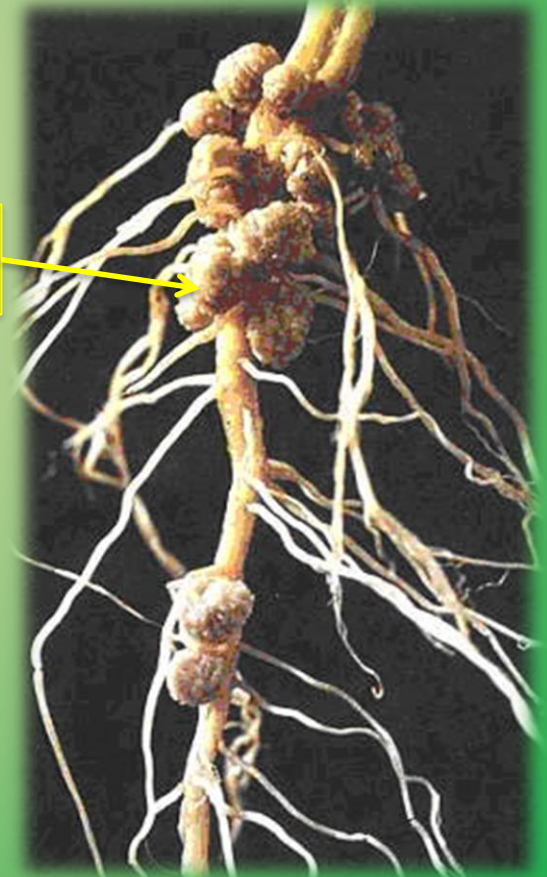
- Cyanobacteria are nitrogen fixers that also fix carbon (these are photosynthetic)
- *Rhizobium* bacteria are mutualistic with certain plant species e.g. Legumes
- They grow in root nodules
- *Azotobacter* are bacteria associated with the rooting zone (the Rhizosphere) of plants in grasslands

Biological nitrogen fixation most efficient process by legumes

Alafalfa (*Medicago Sativa*)



Root nodules





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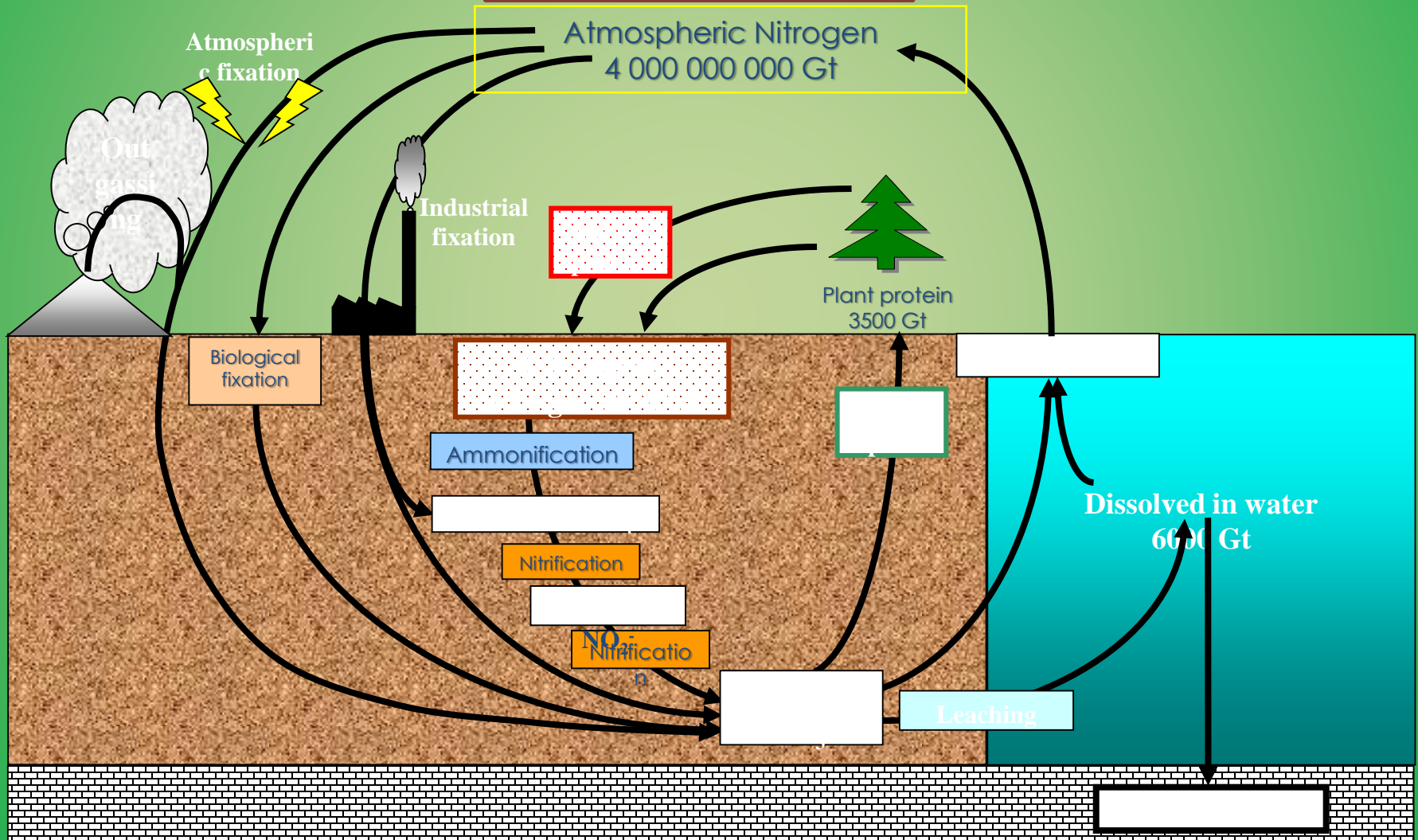


Loss of N by ammonification

- From alkaline soils pH 8.5
- High temperature
- High humidity
- This may happen

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The Nitrogen Cycle





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Now the *two* other major elements

Potassium and Phosphorus





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Story of Potassium

- This an essential element which is required for maturity and ripening of seed apart from strong straw development.
- Balances excess amount of N application
- Is absorbed by plants in larger amount than any other element except N



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How K- behaves in soil

- Of the total amount only a fraction can be immediately utilized by plants
- Soil K exists in 3 forms





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- The unavailable form is around 90-98 % of the total soil K
- The slowly available form 1-10 %
- Readily available form is only 0.1 – 2 %
- The unavailable form gradually decompose and release K ion which may



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Phosphorus – a problem element

- Content may be high but availability may be very low
- As water soluble P which the plants can take are very low at any time.
- P does not leach out like N and it gets fixed
- Therefore addition thru fertilizers or manures application is required for crop growth



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Forms of soil *Potash*

- Can be organic or inorganic
- Organic P is in humus or other organic materials
- Inorganic in combination with Fe, Al, Ca, Fl
- These are very slightly soluble- hence no use to plants
- Inorganic P is much higher than organic fraction



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P is taken by plants as soluble P

- Plants absorb as primary or secondary ortho-phosphate ion
- H_2PO_4^- or HPO_4^{2-}
- Active absorption site is the root tip



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Organic P

- Not well understood
- Compounds are Phospholipids, Nucleic acids, Inositol phosphates
- Not very clear process like Nitrogen



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pH and P

- This has intimate relationship
- In acid soils Fe and Al compounds will form with P rendering it insoluble
- In alkaline soils- Ca and Mg compounds will form insoluble P
- Best availability is between 6-7 pH, plants take more of mono or di-calcium phosphate
- This is known as “P” fixation



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Nitrogen

- Quickest effect
- Affects the vegetative growth
- Deep green color of leaves
- Plumpness of grain
- Increases protein %
- Regulates absorption of other elements
- Deficiency will result in stunted growth, restrict root system, leaves will turn yellowish and tend to drop off
- Over-supply will delay maturation, weakens the stem invite disease and pest delay flowering



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Importance of Phosphorus

- Have pronounced effect on plant growth
- Very important for N fixation in legumes
- Cell division
- Flowering, fruiting and seed formation
- Crop maturation
- Root development Strength of straw in cereals crops
- Crop quality forages and vegetables



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Importance of Potassium in plant growth

- General tone and vigor of plant growth
- Resistance to certain diseases
- Strong root system
- Counteracts excess N effect and Exerts a balancing effect
- Essential for photosynthesis and starch formation
- In grain formation in cereals
- Deficiency – appear dry and scorched at the edges
- Surface chlorotic



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Role of Ca, Mg and Sulphur

- **Calcium** – Deficiency of Calcium results in terminal bud failure or root development. Ca has immense role in maintaining **soil pH**, hence availability of elements when the soil is acidic (pH lower than 5.5) Plant growth is affected, protein synthesis is affected
- **Magnesium** – Is part of chlorophyll molecule hence affects **Photosynthesis**. Symptoms first appear in lower leaves
- **Sulphur** – Usually plenty in soil. Growth is retarded, part of **Chlorophyll**, required for N fixation by bacteria



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Role of micro elements

Micronutrient	Functions in higher plant
Zinc	Formation of protein, seed and grain maturation
Iron	Chlorophyll synthesis
Copper	Carbohydrate and protein metabolism
Manganese	Formation of carotene, riboflavin, ascorbic acid
Molybdenum	Symbiotic N fixation, protein synthesis
Chlorine and cobalt	Root and top growth, helps N fixation by bacteria



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কৃমির ফলে কলার বাগান
হয়রে নিস্ফলা ,
গাছের ফাঁকে গাদাঁর সারি
কৃমির বংশে তালা



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NADEP COMPOST





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MAHILA KISAN SASHAKTIKARAN PARIYOJANA

(A Joint venture Project of Govt. of W.B & Govt. of India)

Mahila Kisan Bio Fertilizer

NADEP COMPOST

Ingredient/Material used : Cow dung , Cow Urine , Available decomposed green leaf & waste materials i.e. Kitchen Waste / Municipal waste etc., Good Soil, Water

Dose: Broadcasting method at the time of land preparation or, at the time of vegetative & reproductive growth stages of existing Crops (Cereals, Pulses & Oil seeds, Plantation Crops, Spices, Vegetables etc.)

Rate : Rs. 75.00 (MSP) :

Date of packing :

Packing size : 5 Kg.

Produced & Marketed By :

Address :



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Preparation of Bio Pesticides



Liquid Manure
like Agnastram,
Brabhastram,
Neemastram,
Sangarak,
Panchagabya,
Amritajal,
Sanjeevak,
Jeebamruth etc.



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19/11/2015 14:38



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Amritajal

- Water – 10 litre
- Cow-urine – 1 litre
- Fresh Cow-dung – 2 Kg.
- Molasses – 100-200 gm.



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Amritajal

Ingredient/Material used : Water, Cow urine, Fresh Cow dung, Molasses etc.

Dose: Spraying method at the time of vegetative & reproductive growth stages of existing Crops (Cereals, Pulses & Oil seeds, Plantation Crops, Spices, Vegetables etc.) / 5-10 ml. per litre of water.

Rate : Rs. 75.00 (MSP) :

Date of packing :

Packing size : 1 lit.

Produced & Marketed By :

Address :



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Jeevamrith

- Water-20 litre
- Cow-urine-2 litre
- Fresh Cow-dung- 2 Kg.
- Pulses dust-200 gm.
- Fresh soil -100 gm





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Neemastram

Ingredient/Material used : Dry Neem leaf dust, Chilli Powder, Turmeric Powder.

Dose: 2 gm. Per Kg. seed at the time of Packing (Cereals, Pulses & Oil seeds, Plantation Crops, Spices, Vegetable Seeds etc.).

Rate : Rs. 100.00 (MSP) :

Date of packing :

Packing size : 100 g.

Produced & Marketed By :

Address :



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Neemastram

- Neem Leaf paste-5Kg.
- Cow-urine-5 litre
- Fresh Cow-dung- 2 Kg.





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(A Joint venture Project of Govt. of W.B & Govt. of India)

Mahila Kisan Bio Fertilizer

NEEMASTRAM

Ingredient/Material used : Neem (*Azadirachta indica*) leaf extracts ,Cow urine, Fresh Cow dung etc.

Dose: Spraying method at the time of pest & diseases infection of vegetative & reproductive growth stages of existing Crops (Cereals, Pulses & Oil seeds, Plantation Crops, Spices, Vegetables etc.) / 3-5 ml. per litre of water.

Rate : Rs. 150.00 (MSP) :

Date of packing :

Packing size : 100 ml.

Produced & Marketed By :

Address :

Brambhastra

- Neem Leaf Paste-3 Kg.



- Cow-urine-10 litre



- Papaya Leaf Paste-2 Kg.



- Guava Leaf Paste-2 Kg.



- Bedana Leaf paste-2 Kg.





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Sanjeevak

- Water-3 litre
- Cow-urine-1 litre
- Fresh Cow-dung- 1 Kg.
- Molases-10 gm.





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Agnayastra

- Bonkolmi Leaf Paste-1 Kg.
- Chilli- 500 gm. 
- Garlic- 500 gm. 
- Neem Leaf Paste-5 Kg. 
- Cow-urine-10 litre 



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Panchyagabya

- Cow-dung liquid- 4 litre
- Cow-dung-1 Kg.
- Cow urine-3-4 Litre
- Cow milk- 2 litre
- Cow-curd- 2 litre
- Cow Ghee- 1 Kg.
- Molases-250 gm.
- Green Coconut-1 piece
- Banana- 6 pieces





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Uddipak

- Subabul Leaf paste-4 Kg.
- Cow dung-20 Liter
- Fresh Water – 20 litre
- Cow urine- 4 litre
- Molasses -250 gm.





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Sanharak

- Neem Leaf Paste-2 Kg.



- Chilli- 100 gm.



- Garlic- 100 gm.



- Turmeric-100 gm.





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Thank you

