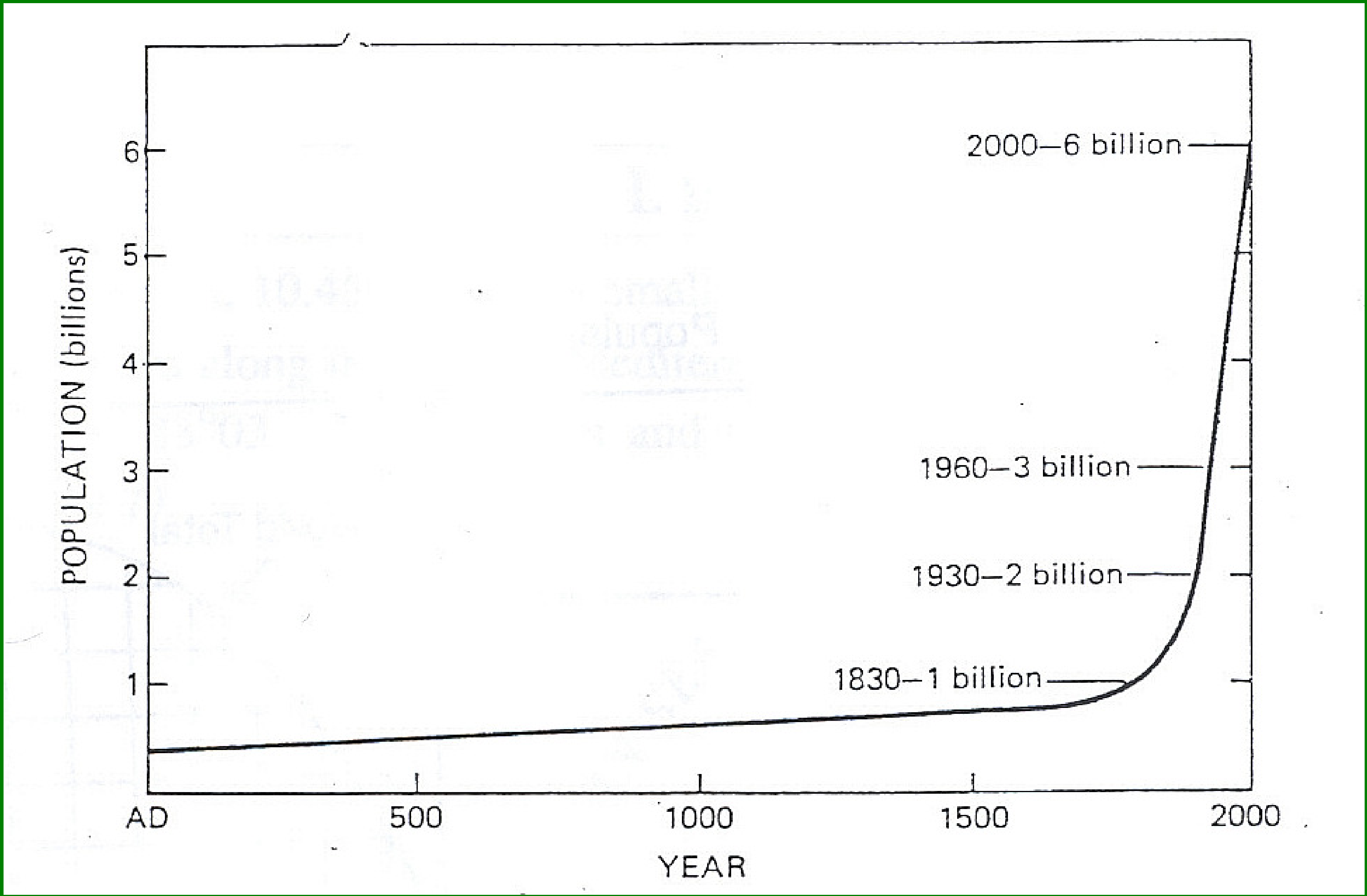
Fertilizers and the Environment

AGRL 201

Dr. Isam Bashour

Population increase as estimated in 1960



Increase in production of crops

Crop	1950	1987	1998
Corn (bu/a)	28	120	200/300
Wheat (bu/a)	14	40	100/200
Soybean (bu/a)	22	34	100/150
Alfalfa (bu/a)	2	3.4	10/15

bu = 35.24 liters

Introduction

The soil's native ability to supply sufficient nutrients has decreased with the higher plant productivity levels associated with increased human demand for food.

Factors influencing world food supply

The ability of a nation to produce food is determined by a multitude of variables.

1. The natural resources available especially soil and water.
2. Available technology, including the knowledge of proper management of plants, animals, and soils.
3. Improved plant varieties and animal breeds which respond to proper management.
4. Supplies of production inputs such as fertilizers, insecticides, and irrigation water.

Proper use of fertilizers improves the environment

1. Gives People Cleaner Air

- A well fertilized field of grain gives 10 tons of O_2 / ha.
- It takes in 13 tons of CO_2.
- A healthy citrus grove uses up to 13 tons CO_2 / ha
- It generates 10 tons of oxygen.
- The 4 million people in Lebanon require an estimated 6-7 million kg of oxygen a day.
- Fertile soils can absorb 10-70 kg $S0_2$/ha.
- Well fertilized soil is an important natural sink for gaseous atmospheric pollutants.

2. Cuts Down on Soil Erosion

Well-fertilized crops have both extensive tops and roots, which minimizes erosion and makes streams run clear and clean.

3. Leaves More Land for open Spaces and Recreational Purposes

- Fertilizer is responsible for approximately 40 percent of agricultural production.
- Intensive farming with fertilizer reduces the need for land.
- Forest fertilization helps grow more timber for wood.

4. Provides Means for Disposing of Degradable Wastes

One gram of soil from Lebanon:

- Surface area = 1000 m2
- 4 billion bacteria, 20 million actinomycetes, 1/4 million protozoa, and 1.5 million algae and fungi.

- The microbial activity in one hectare of soil expends about the same amount of energy as 25,000 people.
- Soil is the only way for disposing of the masses of degradable waste that man generates continuously.

Matching Fertilizer Inputs to Crop Needs

1. Using the RIGHT NUTIUENTS.
2. Using the RIGHT AMOUNT of the nutrients.
3. Applying the nutrients in the RIGHT PLACE.
4. Applying the nutrients at the RIGHT TIME for the corps.

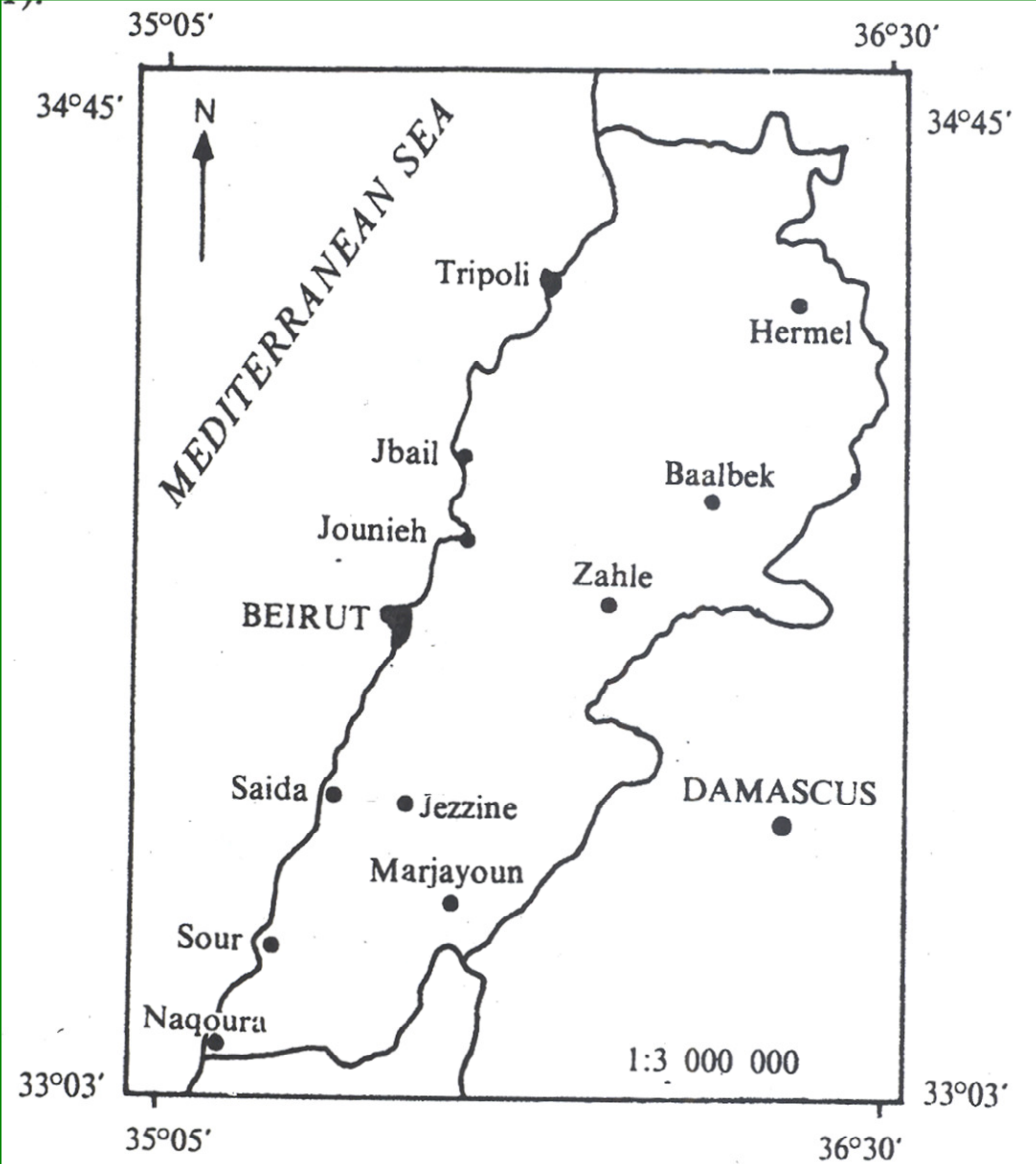


Figure 1. Index Map

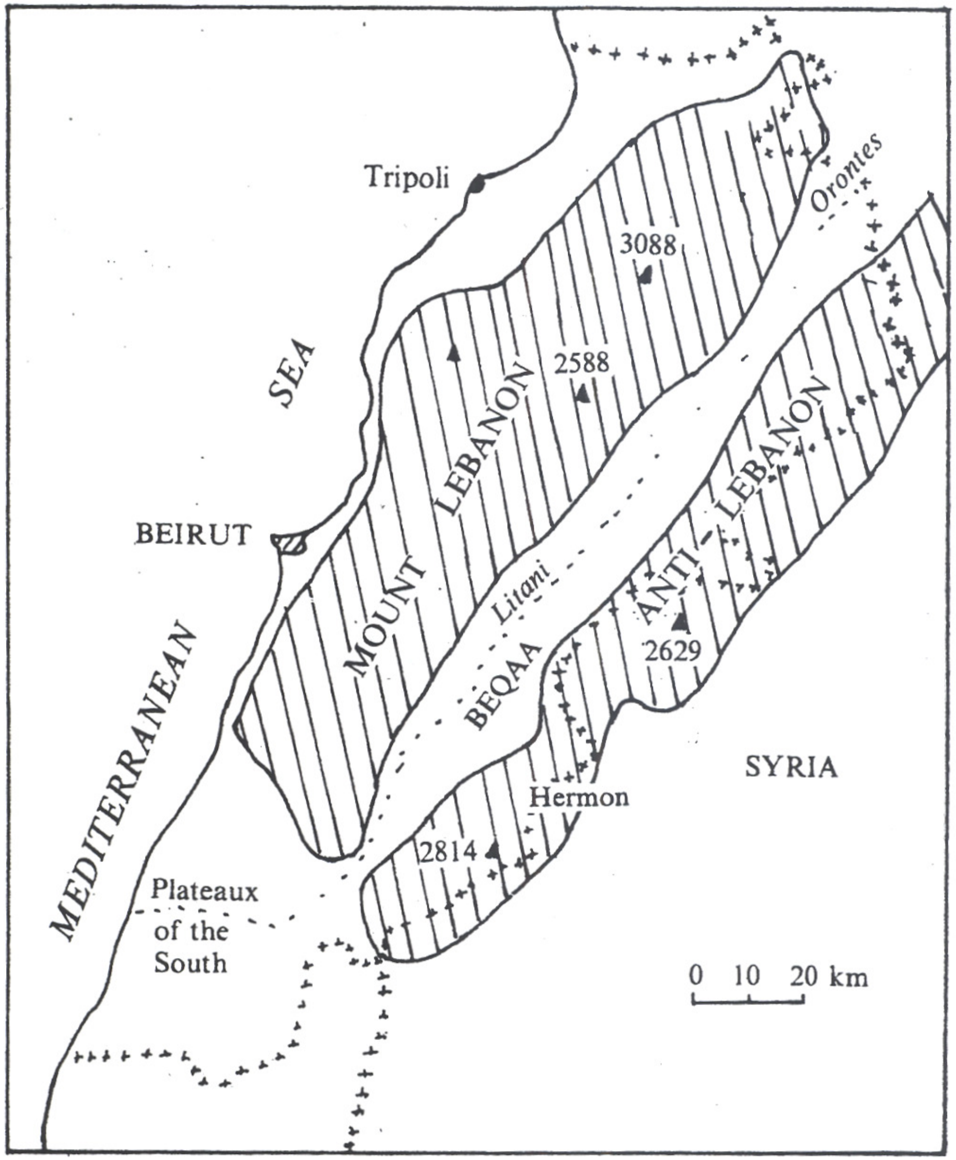
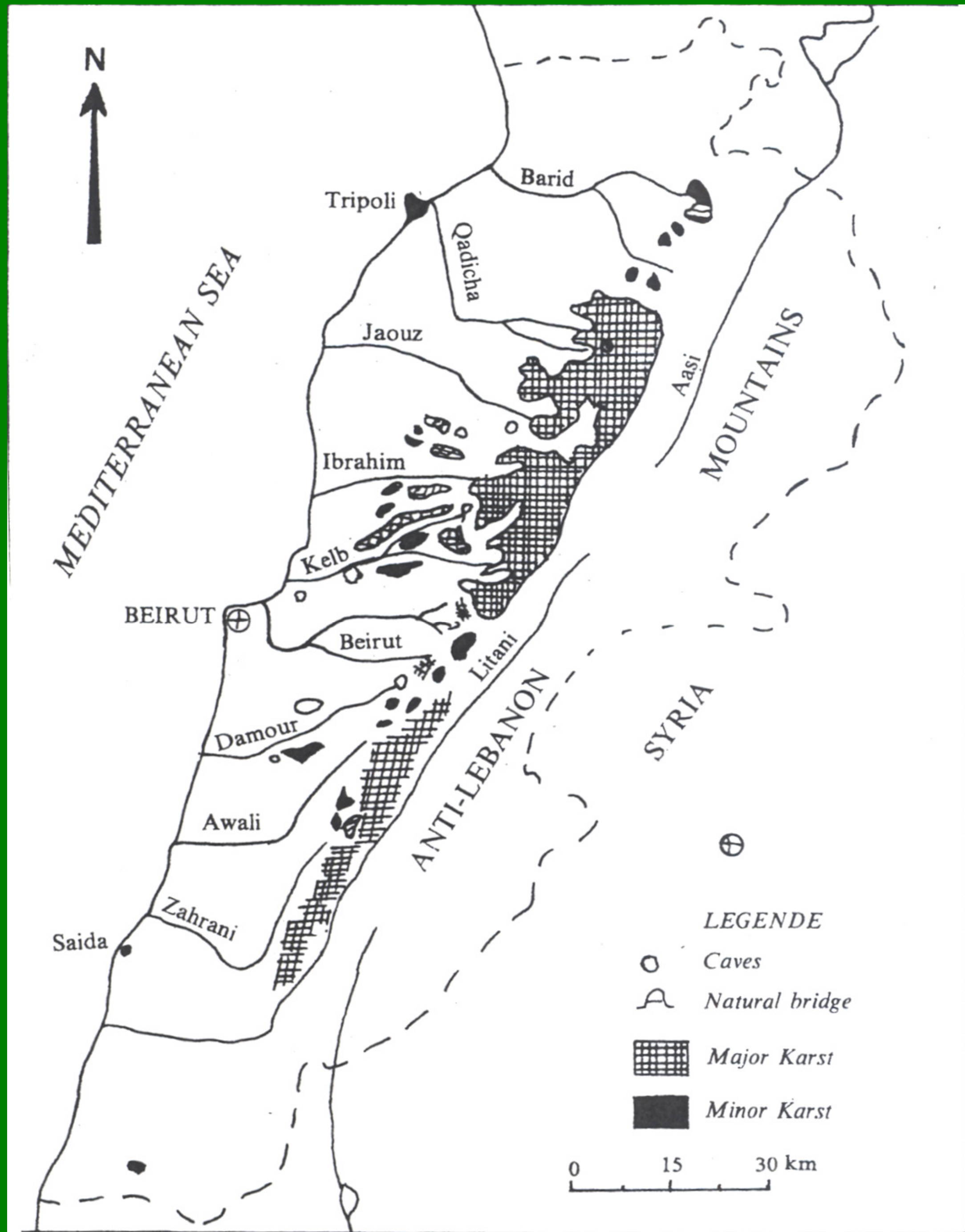
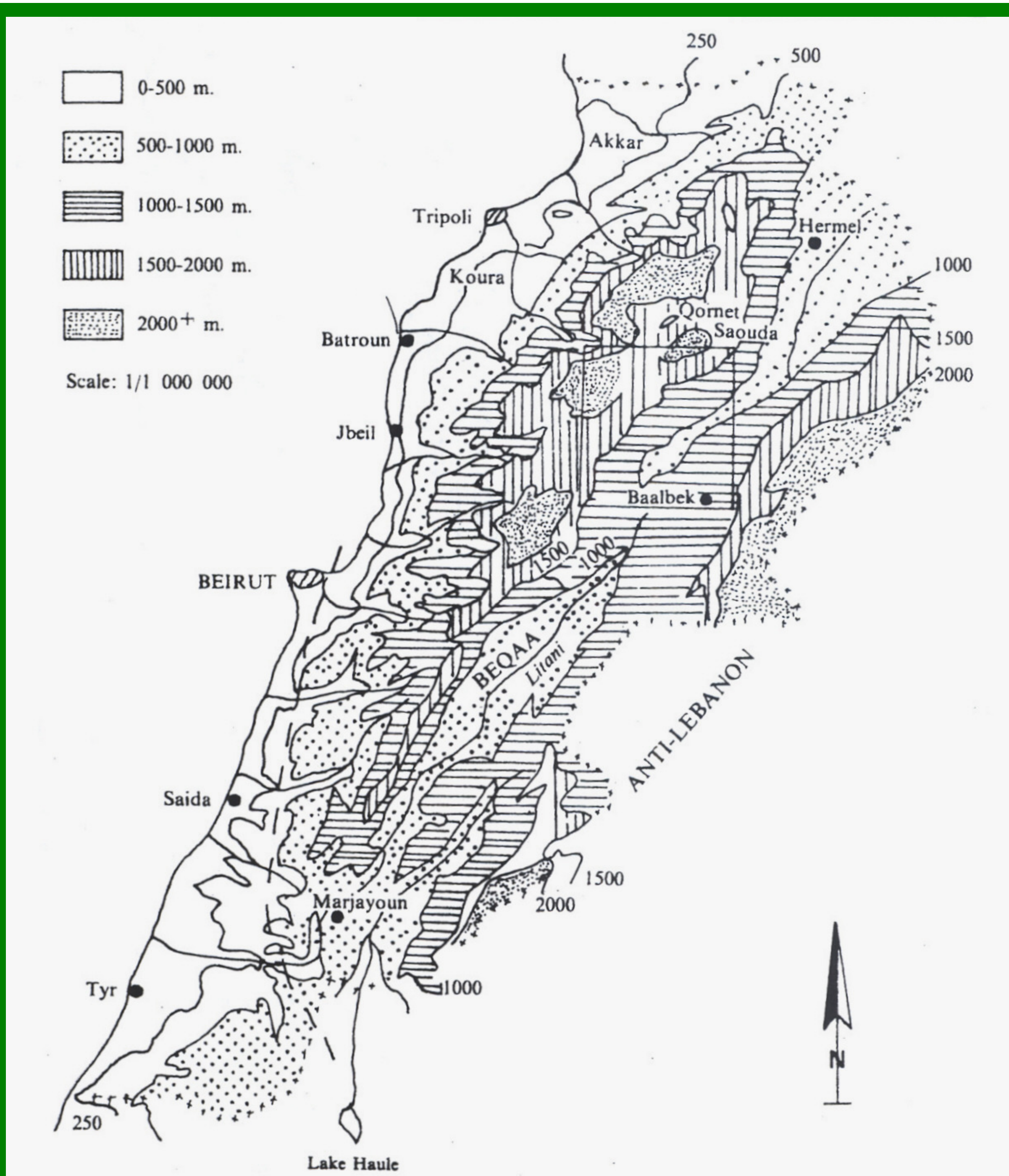


Figure 2. Physiography and general relief of Lebanon


N
MEDITERRANEAN SEA
Tripoli
Barid
Qadicha
Jaouz
Ibrahim
Kelb
BEIRUT
Beirut
Damour
Awali
Zahrani
Saida
Aasi
Litani
MOUNTAINS
ANTI-LEBANON
SYRIA
LEGENDE
Caves
Natural bridge
Major Karst
Minor Karst
0
15
30 km



0-500 m.
500-1000 m.
1000-1500 m.
1500-2000 m.
2000+ m.
Scale: 1/1 000 000
Akkar
Tripoli
Koura
Batroun
Jbeil
BEIRUT
Saida
Tyr
Marjayoun
Lake Haule
Hermel
Qornet
Saouda
Baalbek
BEQAA
Litani
ANTI-LEBANON
250
500
1000
1500
2000
N

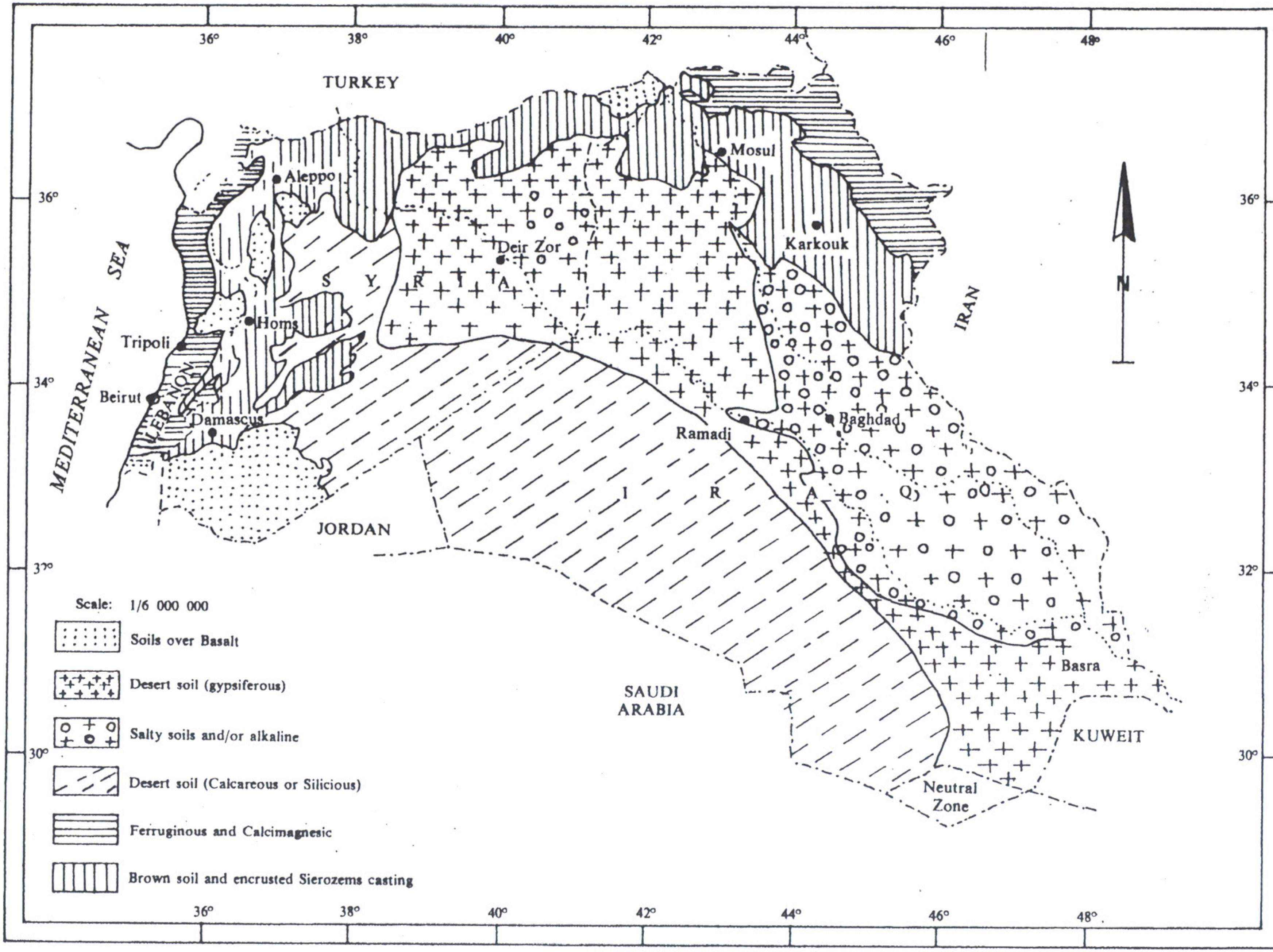


Figure 10. Sketch map of the soils of LEBANON-SYRIA-IRAQ

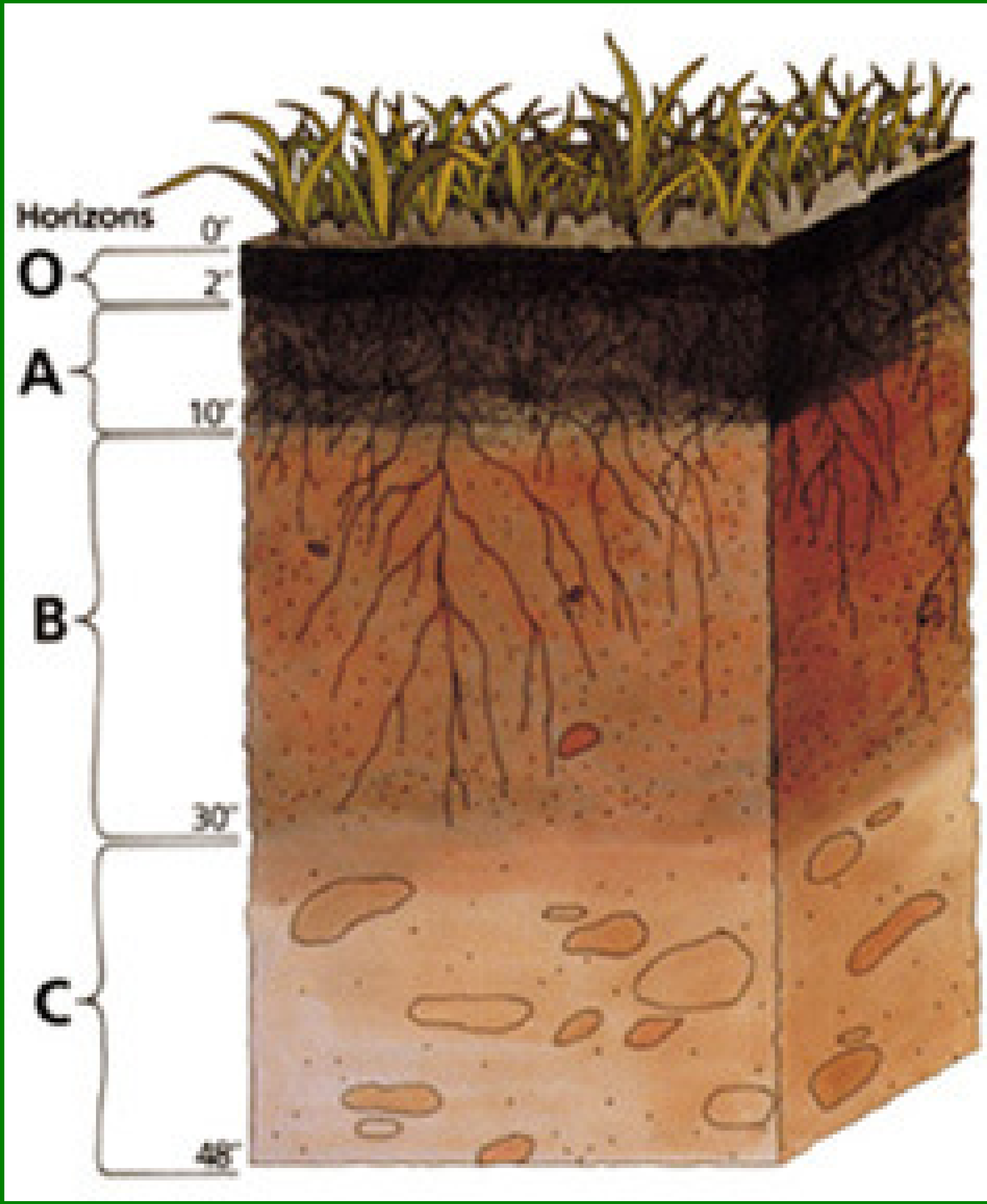
Area of soils dominantly very rich in lime

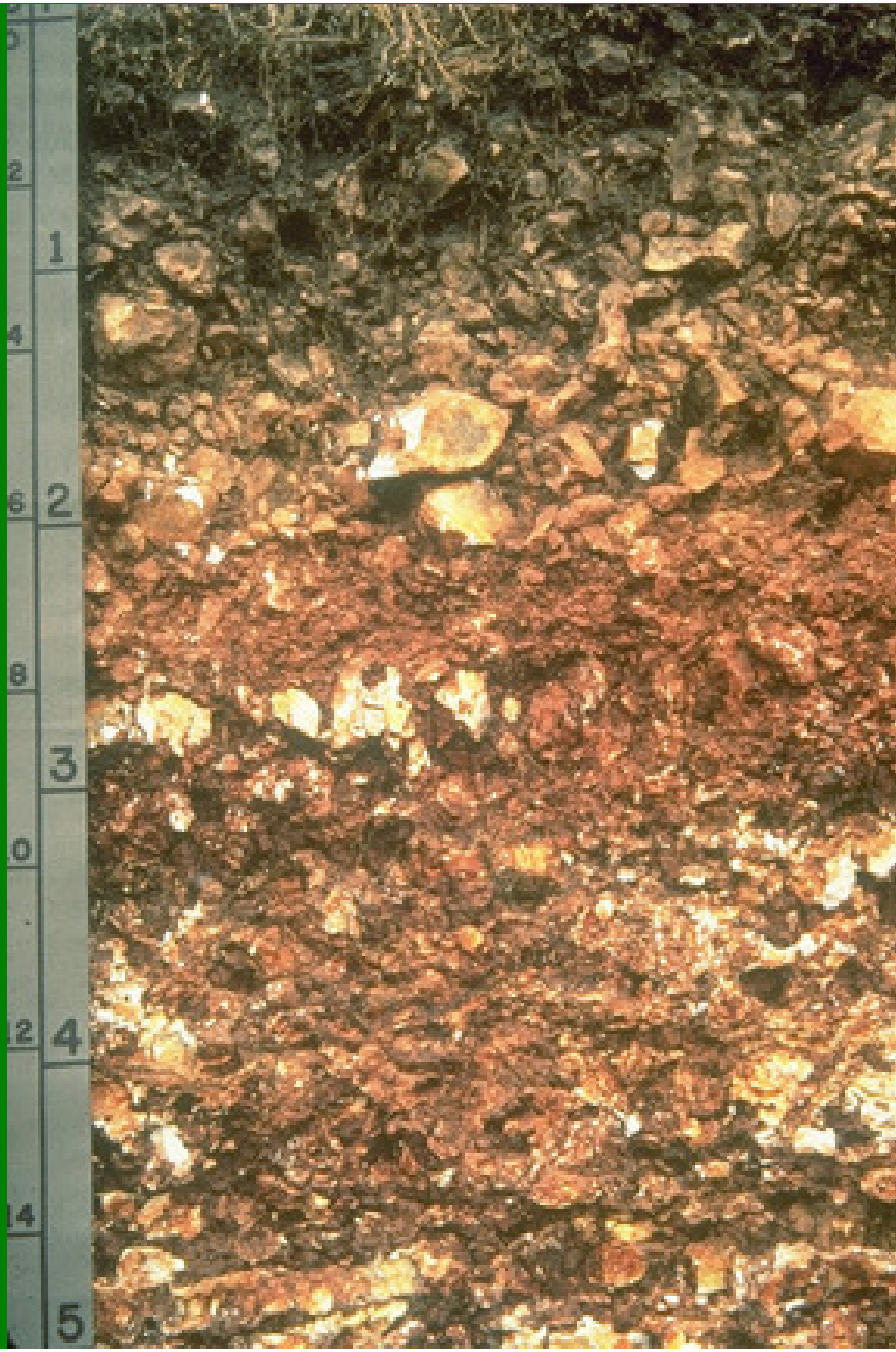
Area having mixed pattern of soils of high and medium lime (or available calcium) content

Soils of Lebanon

- Calcareous derived from limestone
  - Soft limestone
  - Hard limestone
- Basic derived from Basalt

Soil Profile

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2
3
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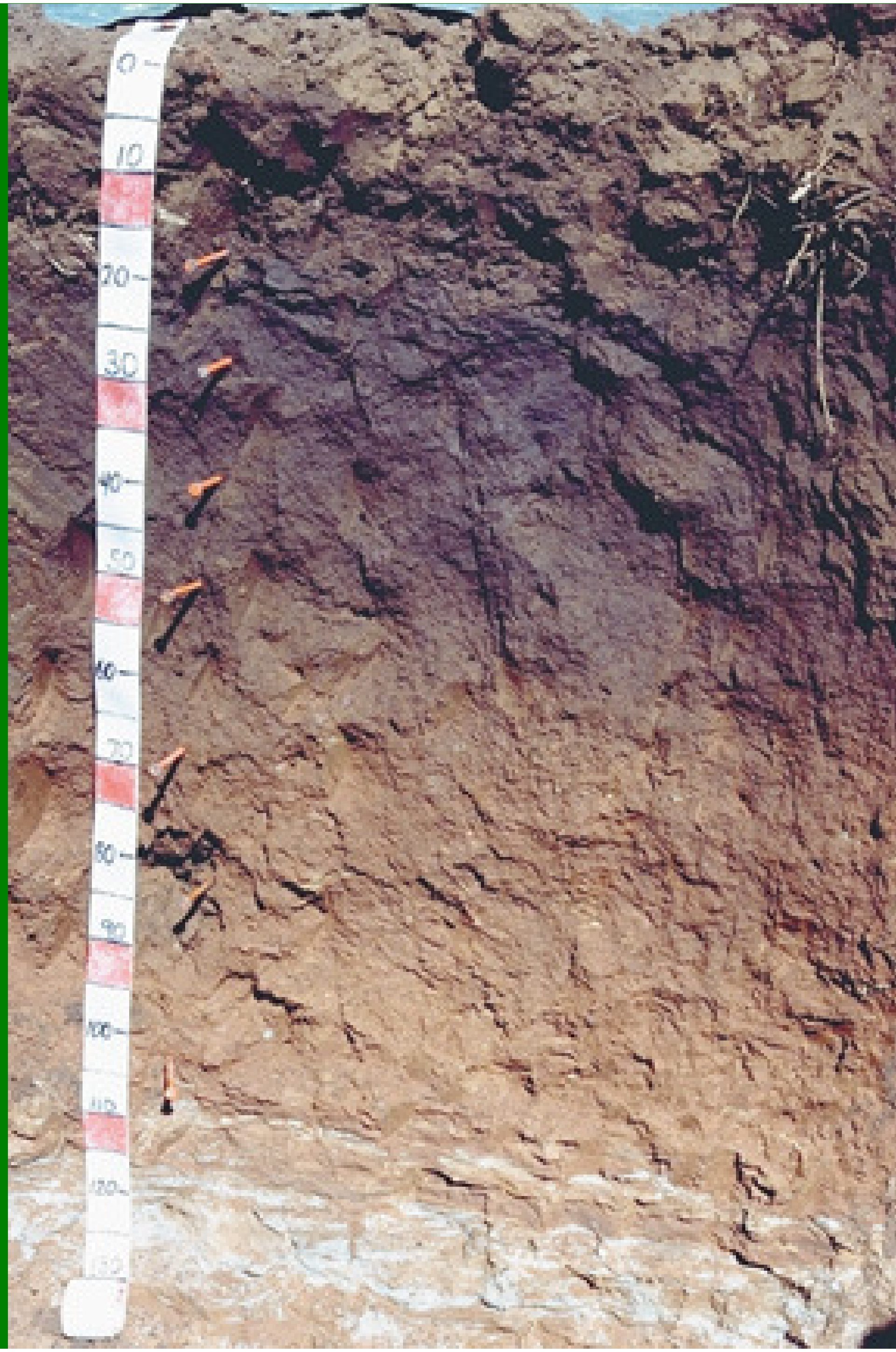

Fig 1. The temperature and rainfall distribution in Lebanon

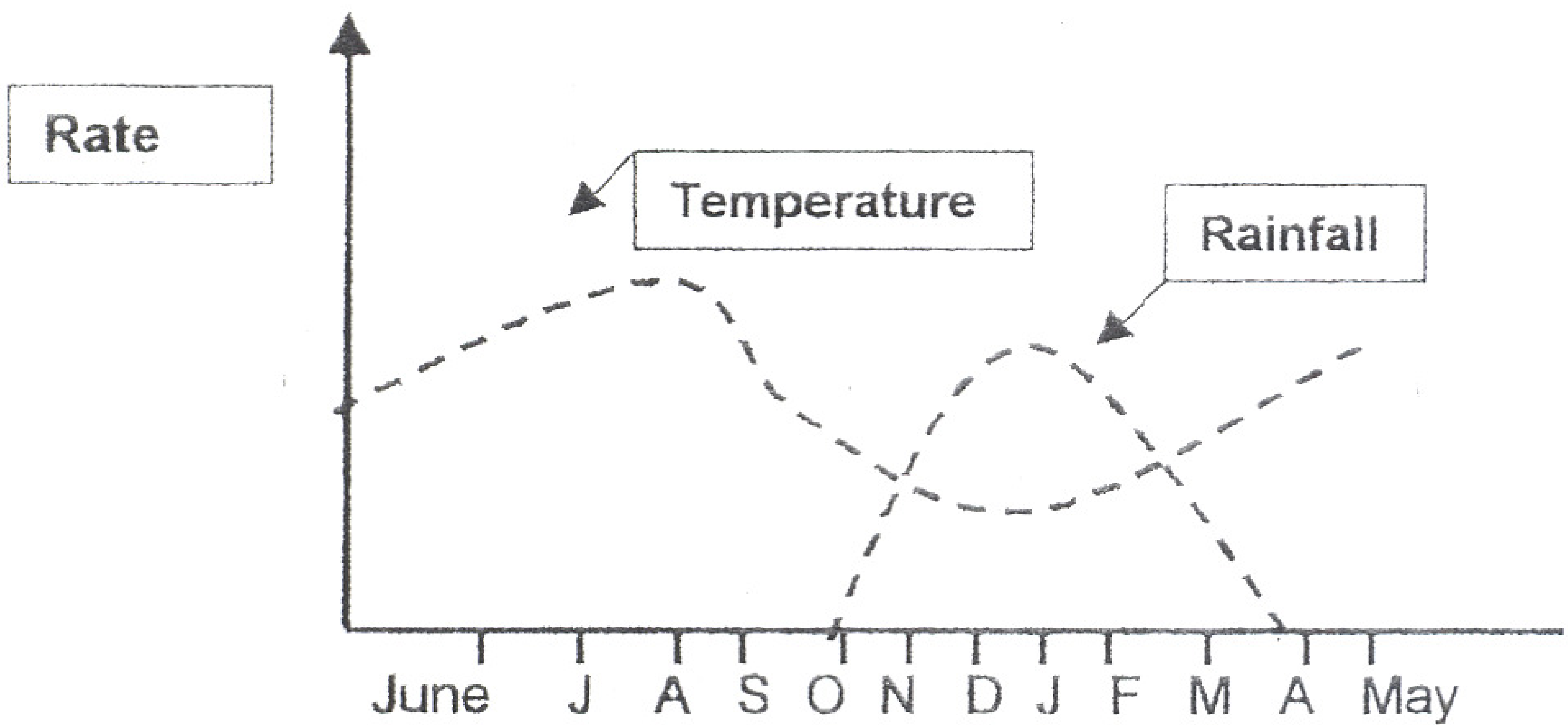

Table I. Organic fertilizers derived from animal products and concentrations of primary plant nutrients on an elemental basis

Fertilizer	*Primary nutrient concentration, % dry mass*		
	Nitrogen	*Phosphorus*	*Potassium*
Farm manure			
Livestock	1 to 3	0.4 to 2	1 to 2.5
Poultry	3 to 5	1 to 3	1 to 2
Guano			
High N	10 to 12	5 to 6	2 to 3
High P	1	6 to 7	nil
Sewage biosolids	1 to 4	0.5 to 2	nil
Steamed bone meal	1 to 2	9 to 13	nil
Dried blood	6 to 12	0.5 to 1.5	0.5
Hoof and horn meal	10 to 16	2 to 3	nil
Feather meal	10 to 16	1 to 2	nil
Hair, wool, and silk	8 to 16	1 to 2	nil
Dried meat and fish scraps	4 to 12	3 to 4	nil

Table II. Organic fertilizers derived from plant products and concentrations of primary plant nutrients on an elemental basis

Fertilizer	*Primary nutrient concentration, % dry mass*		
	Nitrogen	*Phosphorus*	*Potassium*
Seed meals			
Cottonseed	5 to 7	1	2
Soybean	6 to 7	1	2
Castor bean	6 to 7	1	2
Tobacco stems	2	0.2 to 0.5	5 to 9
Compost	0.3 to 3	0.1 to 1.7	0.1 to 2
Hay			
Grass	1 to 3	0.1 to 0.5	1.5 to 4
Legume	2 to 5	0.1 to 0.5	1.5 to 4
Garbage tankage (food waste)	1 to 3	0.2 to 1	1 to 3
Wood ashes	0	1 to 2	1.5 to 10

Table III. Nitrogen fixation by common legumes

Legume	*Fixation, kg N.ha^{-1}.yr^{-1}*
Alfalfa (*Medicago satrva* L.)	>150
Hair vetch (*Vicia villosa* Roth)	>150
Cowpea (*Vigna sinensis* Salvi)	>150
Sweet clover (*Mehlotus officmalis* Lam. Or *M. alba* Desr)	100 to 150
Red clover (*Trifolium pratense* L.)	50 to 150
Soybean (*Glycme max* Merr)	50 to 150
White clover (*Trifolium repens* L.)	50 to 150
Crimson clover (*Trifolium incarnatum* L.)	50 to 150
Garden bean (*Phaseolus vulgaris* L.)	<50
Garden pea (*Pisum sativum* L.)	<50

Inorganic Fertilizer	**N (%)**	**P_2O_5 (%)**	**K_2O (%)**
Ammonium Nitrate	33.5	0	0
Diammonium Phosphate	18	46	0
Urea	46	0	0
Triple Super Phosphate	0	46	0
Potassium Sulfate	0	0	50

Methods of Fertilization

- Broadcast (granular)
- Fertigation
- Foliar
- Injection