Factors affecting the Crops Growth and Distribution

The principal factors that influence localization are climate, topography, characters of soil, insect, pests, plant diseases and economic conditions.

Climate

Climate is the dominant factor in determining the suitability of a crop for a given area.

Temperature

Temperature is an important factor in limiting the growing of certain crops. Temp. is influenced by latitude and altitude. Slopes that face south and west receive the most sun shine, and are warmer than slopes facing north and east.

Crops are different for temperature requirements during their life, and during the stages of life, (germination, seedling, vegetative growth or reproductive growth or blossoming and ripening stages). Temperatures influenced differently with each stage as there are three limits for each stage (minimum, optimum and maximum).

Effects of Temp. on Plants:

Each crop plant has its own approximate temp. range i.e. its minimum, optimum and maximum for growth. Most crop plants make their best development between 16-32°C. They either stop growth or die when the temp. become either too low or too high.

Most cool-weather crop plants cease growth at temp. of 32-38°C, while annual crops are killed by low temp. that range from 0°C down to -40°C. The seeding of spring wheat begins when the normal daily temp. rises to about 3°C, spring Oats at 6°C, corn 13°C and cotton at 17°C. Crops differs in the number of heat units required to mature them.

Day length (Photoperiod)

Response of plant to day length for flowering; plants have been categorized according to their day length requirements as: Short day, long day and neutral or intermediate day plants, however, it is really the length of the night, or dark period that is the critical factor that influences flowering. Long day includes most of winter cereal crops, clovers, sugar beet and some varieties of rice.

Some short-day plants such as cotton, tobacco, maize, sorghum, rice, millets some varieties of soybean and sunflower. While the intermediate plants including broomcorn, faba bean, field bean, alfalfa, peanuts.

Water

Rainfall is recognized as the direct source of most of the water used by our crops. Rainfall may effect on different crops by different degrees and in different ways, depending on such factors as the total annual precipitation, the season of the year, the rate of fall, the ability of the soil to absorb it, the air humidity and temp.

In general, areas that receive an average annual fall (snow or water) less than 10 inches are classed as arid, between 10-20 inches as sub-humid and over 30 inches as humid.

The great cereal production areas are found in section receiving an annual precipitation of 20-40 inches.

Factors which Influence the Water Requirement of Plants

1- Adaptive plant characters: Some plants can use the moisture available to them and then mature so quickly to avoid the "no water" period. Other plants (sorghums) can stop growth and then complete their growth; other plant may take a growth of several centimeters with less moisture available.

Some of morphological plant characters which make it possible to lower the water requirement are:

1- Pubescent or hairy leaves
2- Rolling of the leaf
3- Bloom on leaf and stem (white powder as in sorghum)
4- Number and distribution of stomata
5- Smaller leaf area

2- Water Requirement for Different Plants:

The water requirements of a particular plant may be relatively low, and yet the crop may suffer more drought than one in which the water requirement is more, because of a larger total production of dry matter and therefore of water required per acre.

Humidity

Humidity is a water vapor in the air. Relative humidity is the vapor pressure in the air. A saturated atmosphere that causing fog, dewdrops or rain.

Light

Light is necessary for the formation of chlorophyll in green plants and for photosynthesis. Plant growth may increase with greater light intensities of up to 1800 foot-candles 19.4 lux).

The long summer days at high latitudes enable certain plants to develop and mature in a relatively short time. The life processes of many plants are influenced by the relative high length of day and night which is called (photoperiodism). This led to difference between long-day and short days plants. Long day plants require increase in vegetative growth, but in some crops such as red clover and the small grains (except rice) flower in the long-days of early summer. Long day hasten flowering and maturity of these crops, but reduce vegetative growth**.**

Short-day plants are stimulated to vegetative growth with delayed flowering and maturity, when the days are long, and produce flowers and fruits when the days are relatively short. Corn, sorghum, rice and soybean are short day plants.
Short day plants require daily prolonged darkness to induce flowering, but a short interval of light during the night may prevent flowering. Long-day plants may flower under continuous light. Flowering in long-day plants is hastened by even short light exposures during the night.

The distribution and time of maturity of different crops and crop varieties are influenced by photoperiodic responses. Corn or sorghum varieties mature when planted in the field where the days are long. The time a crop is planted affects the periods required to reach maturity, this is due to temperature and photoperiodic influences.
The growing period of spring-sown crops decreases as seeding becomes later. Most cool-weather crops have a long-day response, whereas most warm-weather crops have a short-day response.

Air

Air not only supplies carbon dioxide for plant growth, but also nitrogen indirectly. It supplies O_2 for respiration of the plant as well as for chemical

and biological processes in the soil. Air sometimes contains gaseous in concentration harmful to plant growth. These gases usually come from fuel combustion or industrial smokes.

Soil requirements

Although soil is less important than climate, soil texture and soil reaction (acidity) play a major role in determining which crops are grown. Crops distribution is determined largely by climatic and soil-moisture factors. Soil provides certain favorable conditions for plant growth. Although it is necessary for balance of soil moisture and essential mineral elements for nutrition of the plants.

Texture

Soil texture has an important influence upon crop adaptation, medium and heavy soils are best for fine-rooted grasses, wheat, and oats, whereas, the coarser rye, corn and sorghum plants cannot succeed, and more common grown on the light sandy soil. Rice demands heavy soil that prevents excessive water losses from leaching. Water infiltrates more quickly and more deeply into light soil, but heavy soils have the greater water storage capacity per volume cubic foot. For this reason, crops in semiarid regions are less subject to drought on sandy soils than on heavy soils, whereas, in regions of high rainfall where much of the water may infiltrate downward below the root zone, crops on sandy soils are more subject to drought.

Texture of the soil refers to the size of its particles, grouped on the basis of diameter as:

2-0.05 mm (sand)
0.05-0.002 mm (silt)
0.002- and less (clay)

Soil class is recognized on the basis of the percentage of these separates. The principal classes as to texture are sand, loamy sand, sandy loam, silt loam, clay loam, silty clay loam and clay. Clay soils calls a heavy soils and sandy soils calls a light soil or sometimes called hard and soft land.

Soil Constituents:

Water: The most important constituent in the soil occurs in three forms besides occurring in the form of vapor. Capillary water is the water used mostly by plants. When plants wilt, the soil may contain 2-17% moisture

depending upon its texture and humus content. Water below this permanent wilting point is largely unavailable to plants. Gravitational water is moved downward by gravity and may percolate beyond reach of the roots of crop plants. Hydroscopic water is adsorbed water on soil particles and that is not available to plants.

Air: which constitutes from 20-25% by volume of an ordinary moisture soil, supplies the O_2 necessary for root growth and for oxidation of O.M. (organic matter) and other soil constitutes. Aeration maybe too poor for plant growth in a soil having much water.

An adequate supply of plant nutrients is essential for the growth of crop plants. About 25-30 chemical elements are found in plants. C, O_2, H_2, are most abundant. The essential mineral elements are N, P, K, but Ca, Mg, S, also essential elements are absorbed by crops in considerable quantities. The minor elements are Mn, Fe, Bo, Cu, Zn, Mo, Co, which plants need in small quantities. Zinc is essential for plant growth and development including cell division, starch mixture and seed formation. Manganese and iron serve as catalysts in chlorophyll synthesis, while chlorine is involved in electron transport during photosynthesis. Molybdenum is for nitrogen fixation and as component of enzymes. Cobalt is for nitrogen fixation. Copper is for oxidizing enzymes and boron in cell division and growth processes.

Crops for Special Conditions

1- Crops tolerant to salinity:

A- Barley, sugar beet, rapeseed, and cotton maybe grown in soil contains 0.8-1.67% salts (8-16 millimhos per centimeter).

B- White and red clover, field bean has low tolerance (0.3-0.4%).

C- Most of the other field crops have a medium tolerance which salt content should not exceed 0.8%.

2- Crops tolerant to acid soils:

A soil with pH 7 is neutral, one higher than 7 is alkaline, while a soil with a pH below 7 is acid. These pH values are for hydrogen-ion activity. High acidity may increase absorption of aluminum and manganese by plants and delay absorption of calcium or phosphorus as a result of iron exchange.