

Hundreds of books have been written about agriculture, but in most of these, principles are hard to identify. If a principle is a basic truth of wide application, and agriculture is the production of crops and the raising of livestock, then some principles of agriculture are as follows:

1. Agriculture probably began in the Tigris-Euphrates area about 8000 B.C.

2. Most of our present crops and livestock were established as such before written records.

3. Most domestic plants and animals grow faster and become larger than their ancestors, but cannot survive in competition with wild forms in nature and are more subject to disease.

4. Of some 500 world crops, the major ones are wheat, rice, maize, potatoes, yams, sweet potatoes, barley, manioc, oats, sorghum, and soybeans. Most crops are most productive in areas other than their site of origin.

5. The highest caloric yields per unit area of land are from sugar cane, sugar beet, maize, sweet potatoes, rice, soybeans, and white potatoes, in approximately decreasing order, but this is modified by environment and cultural practices.

6. Food production per unit area of land is several thousand times greater with present agriculture than in a hunting and food-gathering economy.

7. The capacity of land to feed people is several times greater in a vegetarian economy than in one based on animal products.

8. Whereas all plants serve as food for some animals, relatively few species—and only parts of them—are appetizing to man. Present crops are the result of selection for characteristics such as size, productivity, flavor, disease or pest resistance, ease of harvest, storage, and so on.

9. In the absence of selection for transient characters, these characters tend to disappear.

10. The potential for agricultural production decreases with increasing distance from the subtropics. The optimum temperature for most crops is about 25°C, but varies greatly among crops and is lower at night than during the day.

11. Mechanization has greatly increased agricultural production per man, but not per unit area of land.

12. Agriculture based on petroleum power uses more calories to produce and process most crops than are recovered in the crop.

13. In the U.S. one person on the farm produces enough food for about 50 others.

14. Production per man and per unit area of land is still increasing. The present limit is enough food per hectare (2.47 acres) for about 40 persons.

15. The principal function of tillage is to control weeds. Most crop land is tilled, but tillage is not necessary for high crop production and increases erosion by wind and water.

Some principles and perspectives of agriculture

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16. Rotating crops reduces buildup of unfavorable soil conditions, but growing the same crop on the same land for many years has been successful in many cases.

17. Laying land fallow for one or more seasons increases its production.

18. Elements known to be essential for plant growth are C, H, O, N, P, K, Ca, Fe, S, Cl, Mg, Mn, B, Zn, Mo, and Cu. N, P, or K are most likely to be deficient.

19. If necessary nutrients are otherwise supplied, as in hydroponics, soil is not necessary for good crop growth.

20. Legumes, through their nodules, are the only agricultural crops that fix atmospheric nitrogen.

21. It takes 140 to 1400 pounds of water to produce a pound of dry matter of crops.

22. Naturally fertile soils contain many bacteria, fungi, and other microorganisms and organic matter, some of which favor plant growth, some are injurious, but none is necessary.

23. The principal limitations to agricultural production are deficiency of water, unfavorable soil, unfavorable weather, weeds, insects, diseases, and predators.

24. Weeds and plant diseases are unknowingly encouraged by many of man's activities.

25. All crops are attacked by pathogens and other pests, and the more widespread the culture of a crop, the greater the number of pathogens that attack it.

26. Many pathogenic and non-pathogenic microorganisms grow more readily in the proximity of roots than elsewhere in the environment.

27. When pathogenic or non-pathogenic organisms are introduced into soil, their growth is commonly inhibited by those already present.

28. Chemicals are now the most efficient methods of control of weeds, insects, and diseases, but are frequently injurious to man and the environment.

29. Pests and crop plants may develop physiologic or genetic resistance—or both—to pesticides.

30. Pests may be controlled by biological as well as by chemical means.

31. The microflora and microfauna of soils are largely determined by the plants growing there.

32. Monoculture, genetic homogeneity, and tillage favor many diseases.

33. Cultivated plants have less fixed dormant periods than wild plants.

34. The principal methods of destroying competing wild plants are tillage, herbicides, and fire.

35. The relation of yield to density of plants has been quantified as

$$y = \frac{a}{b} x \text{ when } y = \text{yield per plant,}$$

a = yield per plant with unrestricted growth, b = slope, and x = plants per acre.

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