农业英语自学丛书

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〔英〕N. A. 勃克夫 选注

李鲸石 等译

农 业 出 版 社

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农业出版社出版（北京朝内大街 130 号）

新华书店北京发行所发行　　农业出版社印刷厂印刷

787×1092 毫米 32 开本　15.5 印张　356 千字

1982 年 7 月第 1 版　1985 年 2 月北京第 2 次印刷

印数 9,801—13,050 册

统一书号 9144·21　定价 1.95元

目　录

1 The Principles of Crop Production: *Growth and Germination*

1. The basis of all forms of agriculture is the growth of plants, and their utilization as food for man or for animals. Farming can only be carried on successfully in conditions in which plants will grow. Even a simple type of farming, such as the keeping of sheep on a hillside, depends upon the fact that certain plants, in this case grasses, are able to grow in this environment. Many systems of farming are concerned not with the plants that would flourish under natural conditions, but with crops that demand a considerable amount of time and attention from a farmer, who must provide them with conditions under which they will grow and yield an economic return. A thorough understanding of the principles and practice of crop husbandry must begin with a knowledge of how a plant grows, and of the conditions in which a plant will grow successfully.

2. Plants of importance to agriculture are of many different forms, but they all consist essentially of three main parts. Below ground is the rooting system, which serves as an anchorage to attach the plant firmly to the soil, and which is able to absorb water, and water solutions of plant nutrients, from the soil. Above ground are the stems and the leaves, which are the green parts of the plant. The stems are, in most cases, rigid and capable of keeping the plant erect, and the leaves are arranged on the stems in a manner that exposes them to sunlight, from which they absorb energy for the manufacture of materials for plant growth. The third essential structure in a plant is the flower, which contains the parts associated with reproduction and which is ultimately responsible for seed formation.

3. The rooting system remains in darkness below the surface of the soil and is usually white in colour. In many rooting systems, there is a central root, sometimes known as the tap root, from which a number of side roots develop as branches, and the side roots end in a number of fine rootlets. When

examined under a lens the end of a rootlet is seen to consist of a cap at the very tip, and behind the tip are numerous fine root hairs, which absorb water and water solutions of plant nutrients from the soil. The rootlets and the side roots contain a series of hollow vessels, which connect with those of the central root, and through these the substances absorbed by the root hairs pass, and in time reach the base of the stem. Another series of vessels in the stem is available for the passage of these materials to the leaves and the flowers. There are other vessels present in the leaves and stems through which the plant foods manufactured in the leaves are transferred to the roots or to the flowers. In one sense, a living plant may be described as a self-contained system of transport, which moves water and nutrients taken in from the soil and plant foods from the leaves and distributes these substances throughout the plant as they are needed for growth or storage. Provision is also made for the disposal of surplus water out into the surrounding atmosphere by ways of openings in the leaves.

4. In the course of its growth, a plant passes through a definite cycle consisting of three separate stages: germination, the development of vegetative parts, and flowering, with the final production of seed. Some plants complete the cycle of growth within one season and are referred to as annuals. The cereals and pulse crops, which are grown on the farm for the purpose of utilizing their seeds as foods, are annuals. Some common farm weeds have an even shorter cycle of growth. *Shepherd's purse*, for example, goes through several growing cycles in one season, and plants of this nature are known as ephemerals, a word meaning short lived. Many weeds of a troublesome character found on farms are annuals, and unless destroyed before flowering they produce a large number of seeds, which infest the soil for another season.

5. Many plants need two years to complete their cycle of growth. The first season of growth is devoted to the growth of vegetative parts and the building up of a reserve of plant foods which is available in the second year of growth for the production of flowers and seeds. Plants in this group are known as biennials, and all of them create a reserve of food for the second year.

6. There is a third group of plants known as perennials. Many of these produce flowers and seeds every year, but the

plants themselves survive and gradually increase in size. Some perennials are described as herbaceous, and the leaves and stems die down at the end of the growing season. A familiar example of a herbaceous perennial is the Michaelmas daisy, which is found in most gardens, and there are a large number of similar herbaceous flowering plants. The potato is a herbaceous perennial and the tubers are a form of underground stem.

7. The first stage of plant growth is the germination of the seed. A seed consists of a small embryo plant with rudimentary roots and leaves, and a supply of plant food which can be made available to the young plant when growth begins. This will feed the young plant during the first stage of its life before it has been able to establish an independent existence. Seeds mature and ripen before they are harvested, and, provided they are kept dry and not at too high a temperature, they remain alive but dormant for quite a long time.

8. Three conditions are necessary before seeds will germinate. The first is a supply of water, which is absorbed by the seed and causes it to swell. Next, the temperature must be high enough to encourage growth to begin, and to allow the reserve of food in the seed to turn into a soluble form for absorption by the newly developing plant. Lastly, the germinating seed and the growing embryo need a supply of air from which they obtain the oxygen needed for growth. No seed will germinate unless it is provided with water, warmth and air, and the absence of any one of the three will prevent growth from starting. This has an important bearing on farming practice. In the winter, the soil contains an ample supply of moisture, but the temperature is too low to permit of germination. At the height of the summer, the temperature is suitable for germination, but there is every likelihood of an absence of sufficient moisture. Thus the two main seasons for the sowing of farm crops are the autumn and spring.

(*The Principles of Agriculture by* RONALD EDE, 1946)

NOTES

Line

1 *basis:* the thing on which other things are built
2 *utilization:* being put to use
3 *carried on:* managed
4 *type:* kind; here, method
5 *depends upon:* is based on (as a necessary condition). Note that *depend* is always followed by one of the prepositions *upon* or *on*
6 *grass:* any plant of the family *Gramineae*, having blade-like leaves and on which cattle and sheep often feed
environment: the conditions or influences surrounding us
7 *are concerned . . . with:* are . . . interested in; deal with
8 *flourish:* grow well
crops: A farmer *cultivates* or works his land, and the *cultivated products* of his land, such as grain or fruit, are called *crops*
9 *considerable:* large
attention: care
10 *provide them with:* give
11 *yield:* produce
economic: Any business or trade activity in which the total income so far exceeds the total expenditure that the activity is considered worthwhile is economic
return: the profit obtained from work or land
thorough: complete; pronounced 'θʌrə
12 *principles:* basic rules
practice: the actual doing of something (as opposed to the theory)
husbandry: farming
16 *consist:* are made up of; are composed of
essentially: basically
17 *rooting system:* the arrangement of roots, which are the parts of a plant which grow down into the earth and get food from it
serves: acts
anchorage: An anchor is a heavy metal weight or hook used to keep a ship at rest. Thus here *anchorage* means holding the plant into the soil. *Anchor* is pronounced 'æŋkə; *anchorage* is pronounced 'æŋkəridʒ
18 *attach:* fix
firmly: strongly; securely
soil: the top part of the earth's surface on which plants grow
absorb: drink in; take up
19 *water solution:* water in which a solid has been dissolved
nutrients: substances that provide nourishment and permit growth

Line

21 *stem:* the chief upright part of a plant, which normally grows in the opposite direction to the root
rigid: stiff; cannot be bent
22 *capable of keeping:* able to keep
erect: upright; standing up straight
23 *in a manner:* in a way
exposes them to the sunlight: allows sunlight to fall on them
24 *energy:* power; strength
materials: substances
manufacture: production
25 *structure:* arrangement of parts
26 *flower:* part of the plant producing seeds. See fig. 2.1, page 17
associated with: connected with
reproduction: the natural process among animals and plants by which new individuals or plants are produced and the species is enabled to continue in existence
27 *ultimately:* finally
responsible for: the cause of
formation: produced; creation
30 *tap root:* a main root
32 *fine:* very thin
rootlets: small roots
33 *lens:* here, a magnifying glass; *to magnify:* to make things look larger
34 *cap:* a covering
tip: extreme end
36 *series:* a number of things arranged in succession one after the other
37 *hollow:* empty inside; not solid
vessel: here, something rounded that can hold liquid
39 *base:* lower part; bottom
40 *available:* ready for use
for the passage of these materials: to allow these materials to pass
42 *plant foods:* plant (noun) is here used like an adjective, so that *plant foods* has the meaning of *foods for the plant*
43 *transferred:* moved
44 *self-contained:* independent; containing in itself all that is necessary
45 *transport:* moving from one place to another
46 *distributes:* shares out
48 *storage:* keeping in reserve (see line 67) for later use
Provision: Arrangement
disposal: here, sending (out)
surplus: more than is required; unwanted
49 *atmosphere:* the air around us
51 *In the course of:* During the time of

Line

52 *definite:* clearly defined; exact
cycle: a recurring period of time in which events repeat themselves in the same order and at the same intervals
stages: periods
germination: beginning of growth or development; pronounced dʒəːmi 'neiʃən
53 *vegetative parts:* those parts of a plant which are concerned with growth and nutrition
with the final production of seed; and finally (i.e. after all the other processes) with the production of seed
55 *season:* one of the four divisions of the year—spring, summer, autumn, winter
are referred to as: are called
annuals: plants that live for only one year
56 *cereals:* grass-like plants producing hard edible grains or seeds such as wheat, rye, barley, or rice; pronounced 'siəriəl
pulses: plants producing seeds in pods, such as beans or peas; a *pod* is a long seed-vessel opening down one side
58 *weeds:* any uncultivated plant that grows in large quantities and may crowd out a desired crop
61 *ephemerals:* (plants) which last a very short time
62 *troublesome:* causing difficulty
64 *infest:* spread in a troublesome way
66 *devoted to:* spent in; used for
67 *reserve:* something kept back for later use
70 *biennial:* lasting for two years; pronounced bai'eniəl
create: produce; make
72 *perennial:* having a life cycle of more than two years; pronounced pə'renjəl
74 *survive:* continue to live on
gradually: slowly; little by little
75 *herbaceous:* from *herb* (noun), meaning any seed plant whose stem dries up to the ground after each season of growth, as distinguished from a tree or shrub whose woody stem lives from year to year; pronounced həː'beiʃəs
76 *familiar:* common; well-known
77 *Michaelmas daisy:* The name given to a plant of the aster family, with small star-shaped flowers, pronounced 'miklməs
79 *potato:* a plant, Solonium tuberosum, which is a native of South America and was discovered by Europeans in the sixteenth century. Its underground roots (*tubers*) are a common food
83 *embryo:* a living organism in the earliest stages of its development; pronounced 'embriou

Line

83 ***rudimentary:*** incompletely developed, pronounced ru:di'mentri
86 ***feed:*** give food to
87 ***establish:*** to start
existence: life
mature (verb): become fully grown. The word ***mature*** can also be used as an adjective. See note line 88 on ***harvest***
88 ***ripen:*** become fully developed and ready to be used as food
harvested: harvested (verb) from ***harvest*** (noun): time of the year when mature grain, fruit and vegetables are gathered
provided: on condition that
90 ***dormant:*** temporarily inactive
92 ***supply:*** amount sufficient and available for use
93 ***swell:*** to become large as a result of pressure from within
95 ***soluble:*** capable of being dissolved
98 ***oxygen:*** a colourless gas, forming one-fifth of the volume of the atmosphere and essential for respiration; symbol O
99 ***provided with:*** given
warmth: moderate or gentle heat
absence: not being there, something which is 'not present' is ***absent*** (adj.), ***absence*** is the related noun
100 ***prevent . . . from starting:*** not allow . . . to start
101 ***bearing on:*** relation to; influence on
102 ***ample:*** more than enough
moisture: here, water
103 ***permit of:*** allow
height of the summer: hottest time of the summer
104 ***suitable for:*** right for
105 ***likelihood:*** probability
106 ***sow:*** to scatter or plant seed

EXERCISES

I Comprehension (A)

State which of the following statements is true *and which* false, *according to the passage. Justify your answers by reference to the text.*

1 Successful farming can take place anywhere. (¶ 1)
2 Sheep farming is complicated. (¶ 1)
3 Sheep farming depends on a number of facts. (¶ 1)
4 If he wants his crops to succeed the farmer must give them a great deal of time and care. (¶ 1)
5 A knowledge of the conditions necessary for successful plant

growth is essential for an understanding of the principles of crop production. (¶ 1)

6 The three main parts of agriculturally important plants are (1) the rooting system, (2) the stems and the leaves, (3) the flower. (¶ 2)

7 The rooting system has only one purpose. (¶ 2)

8 The materials for plant growth are made from the plant nutrients absorbed by the roots. (¶ 2)

9 The rooting system of a plant is quite simple. (¶ 3)

10 The passage of plant nutrients is a one-way process from root to stem. (¶ 3)

11 If a plant has more water than it requires for growth then that water is absorbed by the soil. (¶ 3)

12 The three stages of the growth of a plant are: (1) germination, (2) flowering, (3) production of seed. (¶ 4)

13 Since many weeds are only annuals they die after one season and so do no harm. (¶ 4)

14 Perennials grow larger every year. (¶ 6)

15 When a young plant first begins to grow, it gets its nutrients from the soil. (¶ 6)

16 Winter is not a good time for sowing because the soil is too wet. (¶ 8)

II Comprehension (B)

Answer the following questions as briefly and simply as possible. No answer requires more than two sentences.

1 What is the basic requirement for successful farming? (¶ 1)

2 Describe one function of the leaves. (¶ 2)

3 How do nutrients from the soil reach the stem? (¶ 3)

4 Why does the writer describe a living plant as 'a self-contained system of transport'? (¶ 3)

5 What is the difference between an annual and an ephemeral? (¶ 4)

6 Describe the difference between a herbaceous and a non-herbaceous perennial. (¶ 6)

7 In what way is a seed similar to a grown plant? (¶ 7)

8 What are the three necessary conditions for germination? (¶ 8)

III Nouns and determiners (1)

Nouns can be divided into three groups:

1 *Count nouns*—nouns that are used in either their singular or their plural form, and that can occur with numerals.

e.g. The rooting *system* remains in darkness
In many rooting *systems* there is a central root

2 *Mass nouns*—nouns that normally do *not* have a plural form and are followed by the verb in the singular

e.g. *Farming* can only be carried on successfully . . .

3 *Proper nouns* such as London, Mendel, etc.

A count noun must normally be preceded by a determiner (a word like *a, an, the, many, this, some*) unless it is used in a general sense

e.g. A *seed* consists of a small embryo plant
but *Seeds* mature and ripen before they are harvested.

A mass noun is not usually preceded by a determiner unless it is used in a particular sense or with a special meaning

e.g. No seed will germinate unless it is provided with *water*, warmth and air.
but The *water* from this well is not fit for drinking.

In the following exercises insert one of the determiners a, an, the, many, one, no, some, every, these, their, its, this where necessary.

a. (1) rooting system remains in (2) darkness below (3) surface of (4) soil and is usually white in colour. In (5) rooting systems there is (6) central root, sometimes known as (7) tap root, from which (8) number of side roots develop as branches. When examined under (9) lens (10) end of (11) rootlet is seen to consist of (12) cap at (13) tip and behind (14) tip are (15) hairs, which absorb (16) water from (17) soil. In (18) sense, (19) living plant is like (20) self-contained system of transport.

b. (1) germinating seed and (2) growing embryo need (3) supply of (4) air from which they obtain (5) oxygen needed for (6) growth. (7) seed will germinate unless it is provided with (8) water, (9) warmth and (10) air, and (11) absence of any one of (12) three will prevent (13) growth from starting. At (14) height of (15) summer (16) temperature is suitable for (17) germination, but there is (18) likelihood of (19) absence of (20) moisture.

IV Clauses and Sentences (1)

'The first stage of plant growth is the germination of the seed' (lines 82–83).

This is a simple English sentence consisting of:

Noun Phrase (NP)	+	*Verb Phrase* (VP)
The first stage of plant growth		*is the germination of seed*

Here are other examples:

NP	*VP*
Plants of importance to agriculture	*are of many different forms*
They all	*consist essentially of three main parts*

A simple sentence contains one NP (the subject) and at least one VP. If two or more simple sentences are joined by the conjunctions *and, but, or, for, either . . . or, neither . . . nor* we get a new sentence which is called a Compound Sentence:

'Plants of importance to agriculture are of many different forms, but they all consist essentially of three main parts' (lines 15–16).

The two (or more) sections of a compound sentence are called Clauses; thus in a simple sentence, the clause and the sentence are identical.

The commonest conjunctions which are used to make compound sentences are *and* and *but*. *And* has the effect of giving additional information, sometimes with explanations; *but* usually has the effect of contrast or denial.

Find the compound sentences in ¶ 6 and ¶ 8, *and comment on the function of the* and *or the* but. (*You should find three in* ¶ 6 *and two in* ¶ 8.)

V Vocabulary

Rewrite these sentences, replacing the words printed in italics by other words which are used in the passage. Change the order of the words in the sentence or add a word if necessary:

1 Some plants are able to grow in *these conditions that surround us.*
2 The stems are *standing upright.*
3 The third *necessary* structure in a plant is the flower.
4 A living plant is like *a system of transport containing in itself all that is necessary.*
5 During its growth a plant passes through a *recurring period of time in which events repeat themselves in the same order and at the same intervals.*
6 Many weeds *spread over* the soil *in a troublesome way.*
7 Many perennials *have stems which die after each season of growth.*
8 A seed has *incompletely developed* roots and leaves.
9 Seeds *become fully grown* before they are harvested.
10 In the winter the soil has *more than enough* moisture.

VI The Main Idea or Topic (1)

A paragraph usually deals with one main idea or topic and should have a unity of its own based on that topic.

To find the topic of a paragraph you should read the paragraph right through two or three times and then note down very briefly your main impressions. Then read the paragraph more slowly, checking to what extent each sentence fits in with the impressions you have noted down. You may then find that you missed out something or emphasized one aspect too much. You are then in a position to decide on the topic, and in a final reading you should find that each sentence represents a fact or thought which explains or supports or proves or illustrates the topic.

Your impressions of paragraph 1 might be:

basis of all agriculture is the growth of plants;
farming is only successful in a suitable environment;
most crops require time and attention;
a knowledge of how, and in what environment, a plant grows is essential for an understanding of crop husbandry.

From this you will see that the paragraph deals with the growth of plants and the conditions necessary for successful agriculture, and so the topic could be: 'Successful agriculture depends on a knowledge of how plants grow.'

Paragraph 2 is simpler, and the topic is: 'Agriculturally important plants consist of three parts.'

Now decide on the topic of each of the next six paragraphs. Try and make each answer as brief as possible—normally not more than about twelve words.

2 The Principles of Crop Production: *Development of Vegetative Parts and Flowering*

1. The second stage of plant growth, following germination and the establishment of the young seedling, is the development of the vegetative parts, which comprise the rooting system in the soil and the stems and the leaves above the surface. The materials necessary for growth are obtained partly by absorption through the root hairs in the soil, and partly from the materials made in the green leaves. The conditions necessary for growth to take place in a satisfactory manner are complex in character and include the soil and its constituents, which are to some extent under the control of the farmer, and the presence above ground of air and light, matters over which the farmer has little or no control.

2. The most important of the factors affecting plant growth is the supply of water. A growing plant contains at least 80 per cent of water, and it is the water contained in the soft parts of the plant, such as the leaves, which keeps them in a firm and fresh condition. A shortage of water leads almost at once to a plant wilting and becoming soft and limp. Water is also the medium by which the roots absorb plant nutrients. The solution of salts to be absorbed is very weak; and when the plant has extracted the nutrients from the solution, there remains a far greater quantity of water than is needed to keep the tissues in their shape. The excess water has to be disposed of, and it passes out to the atmosphere through small openings found mainly on the underside of the leaves.

3. The process of the movement of water from the leaves to the air is known as transpiration. A growing crop removes very large quantities of water from the soil in the course of the season. Under the climatic conditions that prevail in the British Isles, it has been estimated that for every 1 lb. of dry matter

produced by a crop, the plants have absorbed and transpired from 250 to 300 lb. of water.

4. Another factor essential to plant growth is a supply of air from which the plant can obtain oxygen. As with most living organisms, a plant cannot exist without oxygen, which is taken in and used in the breaking down of carbohydrates to provide the energy required for life. This breakdown results in the formation in the plant of carbon dioxide, which passes out to the atmosphere. The process is known as respiration, and may be simply defined as the process of breathing in oxygen and breathing out carbon dioxide. If there is a shortage of air in the soil, the roots do not obtain sufficient oxygen and plant growth is stunted, and in extreme cases the plant will die. The most likely cause of a shortage of air in the soil is the presence of too much water, so that the soil is waterlogged; thus good drainage in the soil is essential for plant growth.

5. In addition to the factors of water, air and warmth, the plant must be provided with a supply of nutrients to support its growth. These come in part from the soil, and there are a number of chemical elements that are essential for growth and must be in a form in which the roots can absorb them. The most important of these elements are nitrogen, phosphorus and potassium. They are not used by the plants as single chemical elements, but are combined with other elements to form substances which dissolve in water. Thus, nitrogen as a single element is a gas, but for plant nutrition it is combined with oxygen to form a nitrate, and the nitrate is combined with another chemical, for example calcium, to form a salt which dissolves in water. It is of the greatest importance to realize that plant nutrients are more readily absorbed by the roots when they are soluble in water.

6. Nitrogen is mainly associated with the development of leaves and stems, and the presence of sufficient nitrogen is shown by green healthy leaves. The phosphorus needed for plant growth is associated more especially with the development of the rooting system, and it also has an effect on flowering and seed formation by encouraging early ripening. The effect of potassium on plant growth is not as clearly defined as with nitrogen and phosphorus. It is needed by the plant as a whole and helps to keep it in a healthy condition by making it less liable to attack by disease. It has a more direct effect on the

leaves and causes them to retain a healthy green colour, which makes them more efficient in the manufacture of materials for plant growth. In addition to nitrogen, phosphorus and potassium, there are many other elements essential to plant growth, but they are not required in the same quantity. They include calcium, sulphur, magnesium, iron, manganese, and others, but they are required in very small amounts and most soils contain sufficient quantities.

7. Annual plants complete the period of vegetative development early in the growing season, and enter upon the final stage. This consists of the production of a flowering stem, and in due time the emergence of a flower. The seeds develop in a structure called the ovary, which is usually found inside the base of the flower, and has attached to it a style with a sticky end known as a stigma. The flower is provided with a number of stamens, which produce the pollen needed to fertilize the ovule and promote the formation of seed. At the time of pollination, a grain of pollen becomes attached to the stigma, where it germinates and grows down to the ovary. Some plants make use of the pollen from the stamens of their own flowers, and are described as being self-fertile. Other flowers are only fertilized successfully by pollen from the flowers of another plant of the same species. The chief agents for the transfer of pollen are wind and insects, in particular bees, which in their search for honey, collect grains of pollen on their bodies and deposit them on the stigmas of other flowers which they visit. The bright colours of flowers are mainly an attraction to insects for the purposes of pollination, whilst wind pollinated plants, such as the cereals and sugar beet, do not develop highly coloured flowers.

8. Once the flower has been pollinated and fertilized, the plant provides the newly formed seeds with a reserve of food materials, which will be needed when they themselves germinate. Practically all the food materials contained in the plant are transferred to the seeds. As this material nears completion, the leaves and stems gradually lose their green colour, and develop the brown and yellow colours associated with ripening. When the process is complete, the plant itself dies, and the seeds lose their moisture and become hard. They are then in a condition in which they remain dormant and can be stored. It is at this point that the cereal and pulse crops, which are grown