4-H M–58 AGRICULTURAL EXTENSION SERVICE UNIVERSITY OF MINNESOTA

Resource Guide for 4-H Leaders in Plant Sciences, Horticulture, Plant Pathology, Entomology and Commodity Marketing

How To Use This Guide

There are four major objectives that we should be thinking about as we work with and program for youth enrolled in plant and soil sciences, horticulture, commodity marketing, plant pathology and entomology projects.

I. To encourage personal growth and development of 4-H youth

II. To develop a knowledge and appreciation of plant biology and environmental management, including
   a. Understanding how plants grow
   b. Understanding the natural resources that are necessary for plant growth (soil, air, water, sunlight, and temperature)
   c. Learning how man manages his environment for plant growth (cultural practices, biological competition)

III. To apply principles of plant biology and management to
   a. Food and fiber production
   b. Culture of ornamental plants
   c. Environmental design and maintenance

IV. To provide background for relating plant and soil science to current world problems
   a. Understanding world need for environmental quality
   b. Understanding world need for food and fiber

Our total effort should be directed through program planning to meet these four objectives. However, we should also remember that the five projects mentioned above, although independent, are interrelated. Parts (exercises) of any or all may be used independently to design a particular emphasis for youths.

The purpose of this guide is to help you develop such specialized programs. In looking at the guide you will notice that each of the four objectives has been subdivided into different topics. All of the subtopics have been arranged to suggest a logical sequence of principles, beginning with the most basic items and moving to the more complex ones. For example, the guide suggests that youth should first know how plants grow, then understand some of the natural resources needed for plant growth, and then go on to learn how people manage their environment for plant growth. Logically following this would be the application of these principles to food and fiber production, culturing of ornamental plants and environmental design. Finally youth need to understand the world need for food, fiber, and environmental quality, plus careers associated with these fields.

Following each topic, you will find some code letters and numbers. These codes indicate exercises or reference areas within the members' and/or leader manuals that refer to that topic. For example: If you are interested in plant identification under the topic of "Understanding How Plants Grow" (see Objective II) you will note that there are several references listed: IA4, IIA3, IIA4, IID21, IID22, III5, and III6. Number IA4 refers to exercise IA4 in the members' manual entitled "Exploring The World of Plants and Soils Unit I." Number IIA3 refers to exercise IIA3 in the members' manual entitled "Plant Reproduction Unit IIA." In other words, these exercises could be selected to help teach basic concepts in the area of plant identification. A reference, such as FG5 would mean page 5 of the Flower Gardening reference while FG alone would mean the entire publication as a general reference.

Other codes are as follows:

IA — Exploring the World of Plants and Soils Unit I
IIA — Plant Reproduction Unit IIA
IIB — Soils Unit IIB
IIC — Plant Growth Factors Unit IIC
IID — Plant Characteristics Unit IID
IIE — Growing and Using Plants Unit IIE
III — Plant Growth and Food Production Unit III
CM — Commodity Marketing
EYE — Exploring Your Environment; 4-H B-47
FFH — Fruit for the Home; Extension Bulletin 255
FG — Flower Gardening Members Manual; Extension Bulletin 62
FM — Forest Management; 4-H B-87
IG — Indoor Gardening Members Manual; Extension Bulletin 61
LLSD — Lawn and Landscape Design Members Manual; Extension Bulletin 60
PF — Preparing Flowers for the Flower Show; 4-H M-37
PPCSST — Plant Pathology; Cold Soil Seed Test
PPDC — Plant Pathology; Plant Disease Specimen Collection
VG — Vegetable Gardening
YEP — Your Entomology Project; 4-H 422

Objective I

To encourage personal growth and development of 4-H youth through personal indepth subject matter education and leadership competence through helping others learn.

Objective II

To develop a knowledge and appreciation of plant biology and its management.

A. Understand How Plants Grow

1. Classification of plants . . . . . ID1, IE2, IID18, IIE11, III5, FG3, PPDC
   annuals, perennials, monocots, dicots, parasites, saprophytes, bryophytes, virus, fungi, bacteria

2. Identification of plants
   Seeds IA4, IIA3, IIA4
   Plants IID21, IID22, III5, III6, FG9-10, IG14-15, 21, 23

3. Biological Processes of Growth
   Seed germination IA2, IA3, IIA1, IIA5, IIA6, IIC6, IIC7, IIC12, IIC20, IID1, IID13, IID14, IID15
   Propagation IIA10, IIA11, IIA12, IIA13, IIA14, IIA15, IIA16, IIA17, IG5-6, 15
   Cell division IC4A, IIC10, IIC16, IID7
   Root growth IC4B, IIA6, IIC12, IID2, IID3, IID4, IID5B, IID20
   Plant nutrition and growth. ID3, IE1, IIB12, IIC11, IID1, IID5, IID6, IID7, IID9, IID11, IID19, IID24, III13

- Transpiration ID3, IID5, IID8, III1
- Photosynthesis IE1, IIB12, IIC11, IID9, IID16
- Pollination and seed production ID2, IIA2, IIA7, IIA8, IIC22, IID10, III17
- Genetics—developing a crop variety IIA7, IIA8, IIA9, IIC13, IIC18, IID10

4. Physical Factors Affecting Plant Growth
   - Evapotranspiration
     - Plant factors ID3, IID5, IID8
     - Soils factors IID15
     - Atmospheric factors IE2, IID8
   - Air temperature (growing degree days) IIC7, III4, IG20
   - Soil temperature . . . . . IIC3, IIC6, III3, PPCSST
   - Soil water IIC4, IIC5, IIC6, III1, III2
   - Light IIC11, IID9, IIE2, IG12, 20
   - Carbon dioxide IIC6, IIC7, IIC9, IID15

B. Understand The Natural Resources That Are Necessary For Plant Growth (soil, air, water, sunlight, temperature)

1. Climate IIC1, IIC15
   - Temperature IC1A, IIC1, IIC2
   - Wind IIC2
   - Light IC2, IIC2, IIC11
   - Precipitation IC1B, IIC2, IIC4, IIC5, III2
   - Evapotranspiration IIC2
2. Areas suited to different crop growth IIC1, IIC2, IID18
3. Soils
   - Composition IB1, IB2, IB4, IIC9
   - Formation IB3, IIB7, IIB14, III8
   - How soils differ IIB1, IIB4, IIB7, IIB8, III8
   - Soil physical factors affecting plant growth . . . . . IB1, IB2, IIB1, IIB3, IIB9, IIB17, PPCSST
   - Kinds or types of soil in Minnesota IB4, IIB9, IIB14, IIB15, IIB16
   - Why soils differ
     - Parent material IB1, IIB14, III8
     - Vegetation III8
     - Climate IC1, IC2, III8
     - Time III8
     - Topography III8
   - Soil water LLSD5, 7, 10, IG4, 12, 20, 24, VG10
     - Types of water IIB4
     - How soil supplies water to plants IIB4, IID3
     - Water holding capabilities IIB1, IIB3, IIB6, IIB7

C. Learn How Persons Manage Their Environment For Plant Growth—The Cultural Practices Used, The Biological Competition Encountered, etc.

1. Soil management
   - Structure IC3, IIB7, IIB9, IIB11, IIB16, IIB17, IIC9
   - Fertility
     - Soil testing IIB13, III13, LLSD3, 6, IG5, 20
     - Effect of fertility levels on crop yields IIB2, IIB10, IIC12, IID11, III14
     - What's in the fertilizer bag? IIB2, III13
     - Minor elements III13
   - Cultural practices LLSD6, 7, FG3-4, 10-11, IG3-5, 15, 18, 22, VG7
     - Tillage IIB10, IIB11
     - Rotations IID18
2. Water management
   - Humidity IIC2, IID8
   - Erosion—cultural practices IIB5, III9, III10
   - Irrigation IIC3
3. Temperature control and management
   - Cold—frost damage prevention IC1A, IIC2, IIC3
   - Heat—early warming of soil IIB10, IIC3
   - Exposure IIC3
   - Cover—tillage IIB5

4. Light control
   - Supplemental—greenhouses
   - Day length—photoperiod IIC2
   - Exposure

5. Air regulation
   - Carbon dioxide
   - Pollutants IIC8
   - Cultural practices—wind breaks

6. Biological competitors
   - Weeds ID4, IIC12, LLSD4, 5, VG10, FG5
   - Diseases . . . . . IIC17, IIC18, VG11, IG10, PPDC
   - Insects . . . . . IIC19, IIC20, VG10, 11, LLSD5, YEP
   - Animals IIC14, IIC16, VG12
   - Birds IIC14, LLSD29

Objective III

To apply principles of plant biology, management and competition to:

A. Food and Fiber Production
   - Agronomic crops . . . . . IIA5, IIC12, IIC13, IIC18, IIC21, IIC22, IID11, IID12, IID17, IID19, IIE1, IIE10, IIE12, IIE14, III14, III15, III16, III17, PPDC
   - Vegetables . . . . . IIC13, IIC18, IID17, IID19, IIE1, IIE10, IIE12, IIE14, PPDC, VG
   - Fruit . . . . . IIC13, IIC18, IID17, IID19, IIE1, IIE12, IIE14, PPDC, FFH
   - Potatoes . . . . . IIA12, IIC18, IID19, IIE1, IIE10, IIE12, IIE14, PPDC
   - Trees and forest products . . . . . IIC16, IIC18, IID19, IIE1, IIE8, IIE10, IIE14, PPDC, FM

B. Culture of Ornamental Plants
   - Floriculture—annuals, biennials, perennials (indoor and outdoor) . . . . . IA5, IIA10, IIA11, IIA13, IID17, IIE8, IIE9, IIE10, IIE14, FG, IG
   - Woody plants—trees, shrubs, vines IIA17, IIA18, IIC16, IIE8, IIE10, LLSD8-10
   - Lawn grasses and ground covers . . . . . IID17, IIE14, LLSD

C. Environmental Design and Maintenance
   - Home landscape development . . . . . IID17, IIE14, FG, LLSD12-30
   - Recreation landscape planting and maintenance . . . . . Usually done by professionals for public development. Career possibilities could be studied through tours.
   - The Citizen's role in town and country beautification . . . LLSD, FG11-15, PF
   - Use of plants in indoor spaces . . . . . IE2, IIE14, FG11-15, IG
   - Land use planning IB4
   - Wise use of natural resources . . . . . IIB5, EYE

Objective IV

To provide background for relating plant science to current world problems.

A. Understanding World Need for Food and Fiber IIE12
   - Plants in the food chain IIC14, IIE12
   - Distribution and economic value of crops IID12, IIE12
   - International trade IID12
   - Supply and demand CM29-40
   - Price CM9-12, 25-27, 45-49
   - Marketing IIA5, IIE13, CM3-8, 13-19, 41-44

B. Understanding World Need For Environmental Quality
   - Influence of plants on air and water quality IIC8, IID16
   - Influence of plants on temperature, wind velocity, light and humidity IID8, IID9, IID11
   - People's need for green space in home, work, education or recreation . . . . . FG

C. Introduction to Careers in Plant Science and Related Fields . . IIE13, tours

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