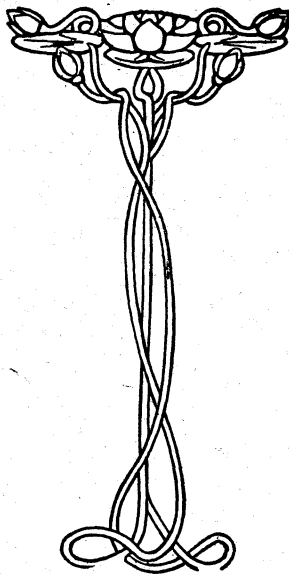


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AGRICULTURAL EXPERIMENT STATION

Students and Teachers' Manual of Agriculture for Arizona



Compiled by J. B. GRIFFING
Department of Agriculture

TEMPE NORMAL SCHOOL
TEMPE, ARIZONA

PART ONE

Bibliography and Key to References.

I. Books.

- HO Hilgard and Osterhout's "Agriculture for Schools on the Pacific Slope"—Macmillan Pub. Co.
JD Jackson and Daugherty's "Agriculture Through Laboratory and School Garden"—Orange Judd Pub. Co.
W Warren's "Elements of Agriculture"—Macmillan Pub. Co.
BC Bergen & Caldwell's "Introduction to Botany"—Ginn & Co.
BS Burkett's "Soils"—Orange Judd Co.
K King's "The Soil"—MacMillan Co.
LF Lyon and Fippin's "Soils"—MacMillan Co.
Wh Whitson and Walster's "Soils and Fertility"—Webb Pub. Co.
KI King's "Irrigation and Drainage"—MacMillan Pub. Co.
Ha Harwood's "New Creations in Plant Life"—MacMillan Pub. Co.
H Hunt's "Cereals in America"—Orange Judd Co.
WV Wilson and Warburton's "Field Crops"—Webb Pub. Co.
WiF Wickson's "California Fruits and How to Grow Them"—Pacific Rural Press, San Francisco.
WiV Wickson's "California Vegetables"—Pacific Rural Press, S. F.
He Hemenway's "How to Make a School Garden"—Doubleday, Page & Co.
P Parson's "Gardens for Pleasure, Health and Education."—Sturges & Walton Co.
HM Hummel's "Materials and Methods in High School Agriculture"—MacMillan Pub. Co.
DS Davis' School and Home Exercises in Elementary Agriculture"—Dobson-Evans Pub. Co., Columbus, O.
DR Davis' "Rural School Agriculture"—Orange Judd Co.
CS Call & Schafer's "Laboratory Manual of Agriculture"—MacMillan Pub. Co.
LH Liggett & Hay's "Rural School Agriculture"—McGill-Warner Co., Printers, St. Paul, Minn.
B Butterfield's "Chapters in Rural Progress"—Chicago Univ. Press.
Enc. I, II, III and IV, Bailey's Encyclopedia of Agriculture—MacMillan Pub. Co.
-

II. Arizona Publications.

A. Arizona Bulletins—A B.

These may be procured free of charge by writing to the University of Arizona, Tucson, Arizona, giving the number of bulletins desired.

- No. 35. Vegetable Growing in Southern Arizona.
No. 49. Cost of Pumping for Irrigation.
No. 52. Alfilaria, Erodium cicutarium, as a Forage Plant in Ariz.
No. 58. Citrus Culture in the Arid Southwest.
No. 62. Olive Culture and Oil Manufacture in the Arid SW.
No. 63. Irrigation and Agricultural Practices in Arizona.
No. 65. The Grazing Ranges of Arizona.
No. 67. Native Cacti as Emergency Forage Plants.
No. 70. Dry-Farming in the Arid Southwest.
No. 71. Gasoline Engine Troubles.

B. Arizona Timely Hits—ATH.

These may be procured from the University of Arizona.

- No. 1. Green Manuring Plants for Orchards.
- No. 3. Improvement of Ariz. Soils.
- No. 4. Winter Irrigation of Orchards.
- No. 5. The Crown Gall.
- No. 6. Desirable Varieties of Peaches.
- No. 7. The Danger of Introducing Insects on Trees.
- No. 9. Winter Remedies for Injurious Insects.
- No. 10. Care of Milk for the Factory.
- No. 11. Black Alkali.
- No. 12. White Alkali.
- No. 13. Selecting Dairy Cows.
- No. 15. Dehorning Cattle.
- No. 17. Summer Cultivation.
- No. 21. The Use of Chemical Preservatives in Milk.
- No. 23. The Value of a Dairy Herd Record.
- No. 24. The Use of the Babcock Test.
- No. 27. The Spring Vegetable Garden.
- No. 28. Some Trees and Plants for Barren Places.
- No. 29. The Use of Hand Separators on the Farm.
- No. 30. Well Waters for Irrigation.
- No. 32. Wild Barley.
- No. 34. Millets.
- No. 36. Legumes for Forage and Green Manuring.
- No. 38. The Dairy Cow and the Weather.
- No. 39. Extermination of Gophers and Ants.
- No. 40. Observations on "The Rise of the Alkali."
- No. 42. Strawberry Culture.
- No. 43. Skim Milk for Pigs.
- No. 44. Watermelon Growing.
- No. 45. Combatting the Flat-Headed Borer.
- No. 45. The Use of Branding Fluid.
- No. 50. Some practical Suggestions Concerning Seed Germination.
- No. 51. Potato Culture.
- No. 52. Singed Cacti as a Forage.
- No. 53. Pickling Olives for Home Use.
- No. 54. Pear Culture.
- No. 55. Some Practical Suggestions Concerning Seed Testing.
- No. 56. Making the Most of a Small Water Supply.
- No. 57. Weirs for Irrigating Streams.
- No. 61. Cultivation of Alfalfa.
- No. 64. Suggestions for the Control of the Coddling Moth.
- No. 65. Contagious Abortion in Cattle.
- No. 66. Observations on Nurse Crops for Alfalfa.
- No. 71. Preserving Eggs.
- No. 74. Farm Management with Sheep.
- No. 75. Winter Onions in the Southwest.
- No. 76. Some Common Plant Diseases.
- No. 77. Cantaloupe Growing.
- No. 78. Pruning of Deciduous Orchards.
- No. 79. Ornamental Planting for Higher Altitudes in Arizona.
- No. 80. Pin-Money from Hens.
- No. 81. Pruning of Ornamental Plants.
- No. 82. Tomato Culture.
- No. 83. Drought-Resistant Plants for the Arid Southwest.
- No. 84. Sorghum as a Forage and Grain Ration for Sheep.
- No. 85. Some Hardy Flowers for Southwestern Gardens.
- No. 86. Sweet Potato Culture.
- No. 88. Bermuda Grass.
- No. 89. Silos and Ensilage in Subtropical Countries.

- No. 90. Farm Sanitation.
- No. 91. Resistance to Frost of Introduced Trees and Shrubs.
- No. 93. The Intensive Cultivation of Alfalfa.
- No. 94. The Scrubums for Dry-Farming in Southern Arizona.
- No. 95. Windmills for Irrigation Pumping.
- No. 96. Cabbage and Cauliflower.
- No. 97. Grain Smuts.
- No. 98. The Improvement of Country Roads.
- No. 99. How to Control Rose Aphids and Rose Mildew.
- No. 100. First Arizona Farmers' Corn Contest.
- No. 101. Asparagus Culture.
- No. 102. Apple Culture.
- No. 103. Johnson Grass Control.
- No. 104. Grasshoppers.
- No. 105. Three Arsenical Insecticides and How to Use Them.

III. California Publications.

A. California Bulletins—CB.

These may be procured free of charge by writing to the University of California, Berkeley, California.

- No. 128. Nature, Value and Utilization of Alkali Land.
- No. 133. Tolerance of Alkali by Various Cultures.
- No. 164. Poultry Feeding.
- No. 181. The Selection of Seed-Wheat.
- No. 188. Lining of Ditches and Reservoirs to Prevent Seepage Losses.
- No. 191. California Peach Blight.
- No. 192. Insects Injurious to the Vine in California.
- No. 197. Grape Culture in Calif.; Improved Methods of Wine-Making; Yeast from Calif. Grapes.
- No. 199. Bovine Tuberculosis.
- No. 204. The Dairy Cow's Record and the Stable.
- No. 207. The Control of the Argentine Ant.
- No. 211. How to Increase the Yield of Wheat in California.
- No. 212. California White Wheats.
- No. 214. Citrus Fruit Insects.
- No. 218. California Plant Diseases.
- No. 234. Red Spiders and Mites of Citrus Trees.
- No. 235. Further Proof of the Cause and Infectiousness of Crown Gall.
- No. 241. Vine Pruning in California.

B. California Circulars—CC.

These may be procured from the University of California.

- No. 1. Texas Fever.
- No. 3. Hog Cholera.
- No. 5. Contagious Abortion in Cows.
- No. 17. Agriculture in the High Schools.
- No. 55. Farmers' Institutes and Uni. Extension in Agriculture.
- No. 58. Experiments with Plants and Soils in Laboratory, Garden and Field.
- No. 62. The School Garden in the Course of Study.
- No. 67. Development of Secondary School Agriculture in Calif.
- No. 68. The Prevention of Hog Cholera.
- No. 108. Grape Juice.
- No. 109. Community or Local Extension Work.

IV. New Mexico Publications.

New Mexico Bulletins—NMB.

Obtained by addressing New Mexico College of Agriculture,
Mesilla Park, N. M.

- No. 30. Effect of Spring Frosts on Peach Crop.
 - No. 68. Injurious Insects.
 - No. 75. Apple Culture Under Irrigation.
 - No. 76. Peach Experiments 1906-10.
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V. Texas Publications.

Texas Bulletins—TB.

Obtained by addressing Texas Agricultural Experiment Station,
College Station, Texas.

- No. 159. Steer Feeding.
-

VI. Kansas Publications.

Kansas Bulletins—KB.

Obtained by addressing the Kansas Experiment Station, Man-
hattan, Kansas.

- No. 170. Breeding for Type of Kernel in Wheat.

Kansas Circulars—KC.

- No. 28. Sorghum Crops for Silage.

Kansas Agricultural Education Circulars—KAEC.

- No. 3. Study of Insects.
 - No. 13. Boys' and Girls' Clubs and Contests.
-

VII. Publications of U. S. Dept. of Agriculture.

These publications with a few exceptions can be obtained free of charge by writing to one of the Congressmen from the state asking him to procure the publications indicated. Publications that cannot be so obtained can be purchased for a nominal sum from the Superintendent of Documents, Washington, D. C.

A. Farmers' Bulletins—FB.

- No. 22. The Feeding of Farm Animals.
- No. 51. Standard Varieties of Chickens.
- No. 55. The Dairy Herd.
- No. 88. Alkali Lands.
- No. 106. Breeds of Dairy Cattle.
- No. 113. The Apple and How to Grow It.
- No. 127. Important Insecticides.
- No. 134. Tree Planting on Rural School Grounds.
- No. 138. Irrigation in Field and Garden.
- No. 157. The Propagation of Plants.
- No. 158. How to Build Small Irrigation Ditches.
- No. 170. Principles of Horse Feeding.
- No. 173. Primer of Forestry. Part 1: The Forest.
- No. 174. Broom Corn.
- No. 181. Pruning.
- No. 192. Barnyard Manure.
- No. 195. Annual Flowering Plants.
- No. 198. Strawberries.
- No. 200. Turkeys.

- No. 205. Pig Management.
- No. 206. Milk Fever and Its Treatment.
- No. 213. Raspberries.
- No. 218. The School Garden.
- No. 229. The Production of Good Seed Corn.
- No. 245. Renovation of Worn-out Soils.
- No. 246. Saccharine Sorghums for Forage.
- No. 253. The Germination of Seed Corn.
- No. 263. Practical Information for Beginners in Irrigation.
- No. 266. Management of Soils to Conserve Moisture.
- No. 278. Leguminous Crops for Green Manuring.
- No. 279. A Method of Eradicating Johnson Grass.
- No. 287. Poultry Management.
- No. 311. Sand-clay and Burnt-clay Roads.
- No. 313. Harvesting and Storing Corn.
- No. 321. The Use of the Split-log Drag on Earth Roads.
- No. 338. Macadam Roads.
- No. 339. Alfalfa.
- No. 346. The Computation of Rations for Farm Animals by the Use of Energy Values.
- No. 351. The Tuberculin Test of Cattle for Tuberculosis.
- No. 358. A Primer of Forestry. Part II: Practical Forestry.
- No. 371. Drainage of Irrigated Lands.
- No. 373. Irrigation of Alfalfa.
- No. 379. Hog Cholera.
- No. 380. The Loco-weed Disease.
- No. 394. The Use of Windmills in Irrigation in the Semi-arid West.
- No. 395. Sixty-day and Kherson Oats.
- No. 399. Irrigation of Grain.
- No. 401. The Protection of Orchards in the Pacific Northwest From Spring Frosts by Means of Fires and Smudges.
- No. 406. Soil Conservation.
- No. 415. Seed Corn.
- No. 420. Oats: Distribution and Uses.
- No. 424. Oats: Growing the Crop.
- No. 427. Barley Culture in the Southern States.
- No. 428. Testing Farm Seeds in the Home and Rural School.
- No. 443. Barley: Growing the Crop.
- No. 448. Better Grain Sorghum Crops.
- No. 458. The Best Two Sweet Sorghums for Forage.
- No. 471. Grape Propagation, Pruning and Training.
- No. 480. Practical Methods of Disinfecting Stables.
- No. 482. The Pear and How to Grow It.
- No. 490. Bacteria in Milk.
- No. 498. Methods of Exterminating the Texas-fever Tick.
- No. 507. The Smuts of Wheat, Oats, Barley and Corn.
- No. 511. Farm Bookkeeping.
- No. 524. Tile Drainage on the Farm.
- No. 528. Hints to Poultry Raisers.
- No. 530. Important Poultry Diseases.
- No. 536. Stock Poisoning Due to Scarcity of Food.
- No. 537. How to Grow an Acre of Corn.
- No. 552. Kaffir as a Grain Crop.
- No. 559. Use of Corn, Kaffir and Cowpeas in the Home.
- No. 562. The Organization of Boys' and Girls' Poultry Clubs.
- No. 566. Boys' Pig Clubs.
- No. 569. Texas or Tick Fever.
- No. 576. Breeds of Sheep for the Farm.
- No. 577. Growing Egyptian Cotton in the Salt River Valley, Arizona.
- No. 578. The Handling and Feeding of Silage.

- No. 579. Crimson Clover.
- No. 593. How to Use Farm Credit.
- No. 597. The Road Drag and How It Is Used.
- No. 602. Clean Milk; Production and Handling.
- No. 606. Collection and Preservation of Insects and Other Material for Use in the Study of Agriculture.
- No. 612. Breeds of Beef Cattle.
- No. 617. School Lessons on Corn.
- B. Experiment Station Circulars—ExC.
 - No. 77. A Secondary Course in Agronomy.
 - No. 90. Normal School Instruction in Agriculture.
 - No. 94. Publications Classified for Use of Teachers.
 - No. 96. How to Test Seed Corn in School.
- C. Bureau of Plant Industry Bulletins—BPIB.
 - No. 128. Egyptian Cotton in the Southwest of the United States.
 - No. 210. Hindi Cotton in Egypt.
 - No. 249. The Branching Habits of Egyptian Cotton.
- D. Bureau of Plant Industry Circulars—BPIC.
 - No. 29. Experiments with Egyptian Cotton in 1908.
 - No. 112. Opportunities in Pecan Culture.
 - No. 113. Importance of Soil Bacteriology.
 - No. 115. A New System of Cotton Culture.
 - No. 118. Abortion of Fruiting Branches in Cotton.
 - No. 123. Egyptian Cotton Culture in the Southwest.
 - No. 644. Boys' Demonstration Work.
 - No. 865. Results of Demonstration Work in Boys' and Girls' Clubs in 1912.
 - No. 803. Organization and Instruction in Boys' Corn Club Work.
- E. Bureau of Entomology Circulars—BEC.
 - No. 84. Grasshopper Problems and Alfalfa Culture.
 - No. 124. San Jose Scale and Its Control.
- F. Department Bulletins—DB.
 - No. 7. Agricultural Training Courses for Teachers.
 - No. 28. Experiments with Bulb Growing.
 - No. 38. Seed Selection of Egyptian Cotton.
 - No. 94. Domestic Breeds of Sheep.
 - No. 124. The Alfalfa Caterpillar.
- G. Year Book Separates—YBS.
 - No. 527. Community Work in the Rural High School.
 - No. 605. Improved Method of Handling and Marketing Cotton.
- H. Yearbooks of the Department of Agriculture, 1899 to 1913, inclusive.
- I. Lists of Materials for Teachers.
 - List of Publications Now in Print.
 - Monthly List of Publications.
 - Monthly Catalog of Documents.
 - Lists of Material Classified for Use of Teachers.
 - List of Publications of Interest to Farm Women.
 - Experiment Station Record.
- VIII. Publications of Bureau of Education, Washington, D. C.
 - To be obtained from a Congressman.
 - Annual Reports of Commissioner of Education, 1909 to 1913, inclusive.—CEdR.
- IX. Farm Magazines.
 - Arizona Stockman and Farmer, Phoenix, Arizona.
 - The Country Gentleman, Curtis Pub. Co., Philadelphia, Pa.
 - Breeder's Gazette, Sanders Pub. Co., Chicago, Ill.
 - Hoard's Dairyman, Fort Atkinson, Wisconsin.

PART TWO

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 - 4. Conservation of moisture. (W85-88, HO 46-49, FB 266, ATH 17.)
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 - d. Growth of appropriate crop. (ATH 94, ATH 83.)
 - 5. Dry Farming. (FB 266, AB 70, BS 176:184.)
 - a. Soils best adapted. (AB 70:771-776.)
 - b. Crops best adapted. (ATH 94, ATH 83, YB 1911:351-362.)
 - c. Methods. (AB 70:794-798, YB 1911:247-256.)
 - 6. Irrigation. (FB 138, FB 158, FB 263, FB 373, FB 399.)
 - a. Furrow irrigation. (HO 51-54, KI 352-9.)
 - b. Flooding. (HO 51, KI 338-350, AB 53.)
 - c. Sub-irrigation. (KI 396-402.)
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 - b. Tiling of land. (FB 187, FB 524.)
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- B. Improvement by green manuring. (ATH 1, ATH 36, FB 278, W 147.)
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- E. Improvement by crop rotation. (FB 365:8 and 14-15, FB 318:22-24, FB 372:20, HO 125-126, W 272-280.)
- F. Control of alkali. (FB 88, HO 131-138, CB reprint of 128 and 133.)
 - 1. Removal of alkali. BSB 34:17-20.
 - 2. Use of antidotes. (BSB 34:16.)
 - 3. Growth of alkali resistant crops. (BSB 34:14-15, FB 97:6-8, FB 446.)

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 - 2. Quantity.
 - 3. Peculiarities.
- C. Methods of improving seed plants. (FB 334, FB 229, YB 1906:221-236, FB 342:10-14, YB 1904:341-352, H 14-25, YB 1902:363-386.)
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 - 4. Fixing the type. (JD 265-268.)
 - 5. Seed testing. (ATH 55, W 47-55.)
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4. Treatment of fungous diseases. (FB 91, FB 243, FB 544, FB 316, FB 507.)
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 - b. Mechanical methods.
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 2. In dry farming districts. (AB 70:793-794.)
 - D. Grading seed, selection and judging. (CB 181, CB 211:279-296.)
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 - H. Wheat diseases and enemies. (FB 250, FB 219.)
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 - C. Uses. (FB 246, FB 458, FB 559:6-7.)
 - D. Feeding value. (FB 37:9-11, KC 28.)

- IV. Corn. (FB 409, H 138-276, W 155-178, HO 278-279, WW 47-134.)
 - A. History.
 - B. Varieties.
 - C. Seed selection and testing. (FB 229, FB 253, FB 415, FB 428, FB 617)
 - D. Culture. (FB 537, FB 414, FB 313.)
 - 1. In irrigated districts.
 - 2. In dry farming districts.
 - E. Uses.
 - F. Feeding value.
 - G. By-products.
- V. Barley. (HO 277, H 38-342, FB 427, FB 443, WW 212-232.)
 - A. Varieties.
 - B. Culture.
 - C. Uses.
 - D. Feeding value.
- VI. Oats. (FB 436, FB 424, FB 395, FB 250.)
 - A. Varieties.
 - B. Culture.
 - C. Feeding Value.
- VII. Egyptian Cotton.
 - A. History. (BPIB 128, BPIC 29.)
 - B. Characteristic type and variations. BPIC 118:11-16, BPIC 115:15-22, BPIB 249, BPIB 210.)
 - C. Culture. (BPIC 123:21-28, FB 577.)
 - 1. Preparation of soil.
 - 2. Seeding.
 - 3. Thinning.
 - 4. Cultivation.
 - 5. Irrigation.
 - D. Picking and handling.
 - E. Ginning.
 - F. Co-operation.
 - G. Market problems. (YBS 605, YB 1912:443-462.)
 - H. Production of seed cotton. (DB 38.)
 - I. Growth under peculiar soil and moisture conditions.
 - J. Diseases and enemies. (FB 555.)
- VIII. Miscellaneous crops.
 - A. Millets. (FB 101.)
 - B. Broom corn. (FB 174.)

CHAPTER SIX

Horticulture.

- I. Fruits. (HO 300-316, W 227-234, WiF.)
 - A. Pome fruits. (ATH 102, ATH 54, NMB 75, FB 482, FB 113:16-21; ATHI, ATH 54.)
 - B. Stone fruits. (NMB 76, NMB 30, ATH 6, CB 191.)
 - C. Citrus fruits. CB 234, CB 214, AB 58.)
 - D. Grapes. (FB 471, CB 197, CC 108, CB 241.)
 - E. Small fruits. (FB 213, FB 154, HO 326-330, ATH 42, FB 198.)
 - F. Olives. (AB 62, ATH 53.)
 - G. Nuts. BPIC 112.)
- II. Tree Planting. (W 227-228, FB 134.)
- III. Pruning. (ATH 78, W 230-232, FB 181, FB 471, CB 241.)
 - A. Purposes of pruning. (JD 212-232.)
 - B. Methods of pruning. (JD 271-277.)

- IV. Propagation of Plants. (JD 201-240, FB 157, W 36-56, FB 218:21131, HO 91-105, FB 471.)
 - A. Budding.
 - B. Grafting. JD 232-237.)
 - C. By cuttings. (JD 200-229.)
 - D. By seeds. (JD 201-212, W 47-55, EC 96, FB 409:14-20.)
- V. Relation of Plants to Frost. (ATH 91, FB 104, FB 401.)
- VI. Garden Crops. (AB 61, ATH 63, HO 317-326, ATH 27, AB 35, FB 255. WiV.)
 - A. Leaf vegetables. (ATH 96.)
 - B. Root vegetables. (ATH 86.)
 - C. Stem vegetables. (ATH 75, ATH 101, ATH 51.)
 - D. Fruit and seed vegetables. (ATH 77, ATH 82.)
- VII. Floriculture. (HO 330-333, CC 46, ATH 85, ATH 81, ATH 28, Seed Catalogues.)
 - A. Bulbs. (DB 28.)
 - B. Roses.
 - C. Ornamental shrubs.
 - D. Seed flowers.
- VIII. Forestry. (FB 173, FB 358, W 216-226, HO 334-345.)

CHAPTER SEVEN

Animal Husbandry

- I. Horses. (W 301-317, AB 170.)
 - A. History. (JD 393-402.)
 - B. Types. (W 307-308, JD 404-405.)
 - 1. Light driving.
 - 2. Coach.
 - 3. Draft.
 - 4. Pony.
 - C. How to tell age. (W 308-311.)
 - D. Care of horses. (W 311-317.)
 - E. Common diseases.
 - F. Marks of unsoundness.
- II. Cattle.
 - A. Types. (W 323-330, JD 413-421.)
 - 1. Beef. (FB 612.)
 - 2. Dairy. (FB 106.)
 - 3. Dual purpose.
 - B. Care and feeding. (AB 50, TB 159, AB 65.)
 - C. Common diseases. (W 337-342, FB 569, FB 380, FB 439, FB 496, FB 351, FB 480.)
- III. Sheep. (AB 69, FB 96, FB 576.)
 - A. Types. (W 351-355, JD 421-426, DB 94.)
 - B. Sheep for ditch cleaning. ATH 103.)
 - C. Care and handling. (W 355, FB 159, ATH 74, ATH 84.)
- IV. Swine. (FB 205.)
 - A. Types. (W 358-360, FB 576.)
 - B. Care and feeding. (W 360-361.)
 - C. Common diseases. (W 361, FB 379.)
- V. Dairying.
 - A. Characteristics of good dairy cows. (ATH 13.)
 - B. Pedigrees, registry and advanced registry. (W 330-333.)
 - C. Types of dairy cattle. (FB 106.)

- D. Feeding of dairy cows. (ATH 38.)
 - 1. Pastures. AB 65, ATH 88.)
 - 2. Silage. (ATH 89.)
 - 3. Concentrates.
 - 4. Hay and fodder.
 - E. Dairy records. (W 337, CB 204:65-79, ATH 23.)
 - F. Diseases of dairy cattle. (FB 206, FB 351, ATH 65.)
 - G. Care of milk. (W 334-336, FB 42, FB 63, FB 241, ATH 10, FB 348, FB 490, FB 602.)
 - H. Cream separators. (FB 201, ATH 29.)
 - L. Milk and cream testing. (W 345-348, ATH 24.)
- VI. Poultry.
- A. Chickens. (ATH 80, FB 51, FB 236, HO 402-405, ATH 80, FB 287, FB 528.)
 - 1. Types. (W 363-364, FB 51, JD 431-432.)
 - 2. Care. (W 366-368.)
 - 3. Feeding. (W 365-366, CB 164.)
 - 4. Diseases. (FB 530.)
 - B. Ducks, gees and trukeys. (FB 64, FB 200.)
 - 1. Kinds.
 - 2. Uses.

CHAPTER EIGHT

Feeds and Feeding. (FB 22, FB 170, FB 346.)

- I. Composition of feeds. (W. 282-284, FB 22; 45, FB 170:6-7.)
- II. Function of nutrients. (W 285-287, FB 22:5-6, FB 170:7-9.)
- III. Digestibility. (W 287-288, HO 354-360, FB 170:27-30, FB 22:6-9.)
- IV. Nutritive ratio. (W 293.)
- V. Balanced rations. (W 292-296, FB 346.)
- VI. Kinds of feed.
 - A. Concentrates.
 - 1. Grains. (FB 170:11-14.)
 - 2. By-products. (FB 22:20-22, FB 170:14-16.)
 - B. Roughage.
 - 1. Hay and fodder. (FB 170:16-19.)
 - 2. Succulent feeds.
 - a. Pastures. (FB 170:16-19, FB 22.)
 - b. Soiling crops. (FB 22:26-28.)
 - c. Silos and silage. (ATH 89, FB 578.)
 - d. Root crops. (FB 170:19, FB 22:22-23.)
 - e. Cacti. (ATH 52, AB 67.)

CHAPTER NINE.

Agricultural Economics.

- I. Farm management. (FB 511, FB 593, Enc. IV 215-238.)
- II. Good roads. (FB 311, FB 321, FB 338, FB 597.)
- III. Marketing problems. (FB 62, Enc. IV 238-276.)

PART THREE

Agricultural Education.

CHAPTER ONE.

School Gardening. (CC 46, FB 218, EXC 90:18-22)

- I. Laying off gardens. (CC 46:33-36.)
- II. School garden management. (CC 46.)
- III. Culture of garden crops. (CC 46 AB 35, AB 61, ATH 27.)
- IV. Culture of flowers. (ATH 85, CC 46:38-39, FB 195.)
- V. Improvement of school grounds. (ATH 28, FB 134, ATH 79, ATH 81, CC 46:39-40.)

CHAPTER TWO.

Observation Studies. (HM 65-86.)

- I. Field Observation. (ExC 90:24-25, Ex C 77, HM 76-79.)
 - A. Field crops.
 - 1. Alfalfa.
 - 2. Cotton.
 - 3. Wheat (cearel grains).
 - 4. Milo Maize (Sorghum).
 - 5. Corn.
 - B. Weeds.
 - 1. Johnson grass.
 - 2. Bermuda grass.
 - 3. Pigweed.
 - 4. Cocklebur.
 - 5. Ground cherry.
 - 6. Other weeds.
 - C. Trees.
 - D. Flowers.
 - E. Insects. (FB 606.)
 - F. Farm animals.
 - G. Physical geography.
 - H. Soils.
 - I. Use of water.
- II. Field Experiments. (Ex C 77.)
 - A. Cultivation.
 - B. Irrigation.
 - C. Plant selection.
 - D. Plant propagation.
 - E. Pruning.
- III. Class room experiments.
 - A. With plants. (FB 157, FB 218, FB 408, FB 409, ExC 77, HO. W, DR DS, JD, CS, LH.)
 - 1. Seed. (ExC 96, FB 428, FB 617.)
 - 2. Root.
 - 3. Stem.
 - 4. Leaf.
 - 5. Light relation.
 - 6. Moisture relation.
 - 7. Air relation.
 - 8. Plant food relation.
 - B. With soils. (FB 408, ExC 77, HO, W, DR, DS, JD, CS, LH.)

CHAPTER THREE

Community Work.

- I. Boys' and Girls' Clubs. (BPIC 865, FB 385, KAEC 13.)
 - A. Corn clubs. (BPIC 803, BPIC 644.)
 - B. Sorghum clubs.
 - C. Cotton clubs.
 - D. Live stock clubs. (FB 566, FB 562.)
 - E. Canning clubs. (FB 521.)
- II. Development of Agricultural Libraries. (YB '99:491-512.)
- III. Extension work. (CC 109, YBS 527, YB 1910.)

CHAPTER FOUR

Recent Movements in Agricultural Education.

CEdR 1909, 1910, 1911, 1912, 1913. YB 109, 1910, 1911, 1912, 1913. Enc.
IV 355-477.

GENERAL SUGGESTIONS

This pamphlet is by no means an exhaustive outline of the subject of Agriculture, but an endeavor has been made to list the references most pertinent to conditions in Arizona. The subject of School Gardening is of primary importance to the teacher in Arizona, not only because of its educational value, but because climatic conditions permit gardening in the majority of the agricultural sections throughout the year. Many books tre published on the subject, but practically none of them are adapted to local conditions. California Circular No. 46 furnishes in concise form the most valuable suggestions. Agriculture is best taught in elementary schools by means of observational work as far as practical. The reading of textual matter, bulletins, etc., may be introduced gradually in the upper grades. Experiments and demonstrations performed either in the classroom or the field furnish the best possible means of clinching fundamental ideas in the minds of pupils. The Laboratory Manual, by Call and Schafer, contains experiments of high school grade, but the other references are to experiments of a more elementary character. The majority of experiments in any collection are either too complicated or too impractical for use in the average school room, but from the great number suggested it is possible to select a series adapted to any grade or locality.

Instruction through field observation is one of the most efficient and available means of teaching, though seldom conducted in its most efficient manner. As there are few references to that line of work a few special suggestions may be appropriate. General observational work is the simplest form in which agriculture may be taught, and should be used in, though not limited to, the lower grades. It should precede the more analytical experimental work and the use of reading matter. To make the most of field observations they should be correlated with drawing and composition. The field trips should have in each instance but one definite purpose and should follow a logical sequence of studies adapted to the locality and season of the year. If, for example, the object of the day's study is alfalfa, the teacher may take the pupils to a nearby alfalfa field and assist them in seeing for themselves such things as the following: The habit of growth of the plant, the shape of the leaf, the variation in shape with different leaves, the cluster of flowers, each of which is the typical leguminous pea-blossom-shaped flower, the spiral seed pod, the crown of the plant, the tap root, and if young plants are available the tubercles upon the roots, the

number of plants per square foot or square yard, the weeds in the alfalfa field, the insects that are present, especially the yellow butterfly or its green caterpillar, the way in which the hay has been put up, the way in which it has been fed, the kind of animals that are being pastured upon alfalfa, the way in which the field has been watered, the way in which it has been cultivated, etc. When the observations have been made, each pupil should collect for himself specimens for pressing between newspapers. The recitation may conclude with pressing and putting away of specimens, with each paper bearing the name of its owner. At the next recitation or in the near future the specimens may be mounted on stiff paper sheets about 10x14 inches. Each sheet should show a specimen of flower, seed pods, stem and leaves, and if small plants are available, the tap root, with tubercles. One or more recitations may be given to drawing from fresh specimens. The most important feature of the work will be a recitation in which each pupil will write a composition about the subject studied. In this the teacher will review the items observed and put upon the blackboard an outline from which the pupils may write. The compositions should be presented to the teacher upon scratch paper and then copied neatly in a note book in such a way that the composition will be opposite the drawing of the same subject. A suitable note book for such a purpose would be a loose-leaf note book provided with ruled note paper and unruled drawing paper. By following some such system of observational work the teacher will find abundant opportunity to stimulate the interest of the pupils through exhibits, not only in the school room daily, but at fairs and on special occasions.

Above all things, agriculture should be taught not as a unit in itself but closely correlated with the other subjects of the curriculum. By means of agriculture, the bugbear of subjects for compositions and for drawing immediately disappears, while through these studies comes an observation of detail, and deeper interest in the agricultural work. Arithmetic is another subject that should be linked with agriculture. Problems should be drawn from farm conditions that the pupil will have to meet when out of school. In reading classes a portion of the time given to supplementary reading may be profitably spent with texts in elementary agriculture or appropriate government publications. The relationship of agriculture with geography, hygiene or any other subject should also be established whenever possible.

