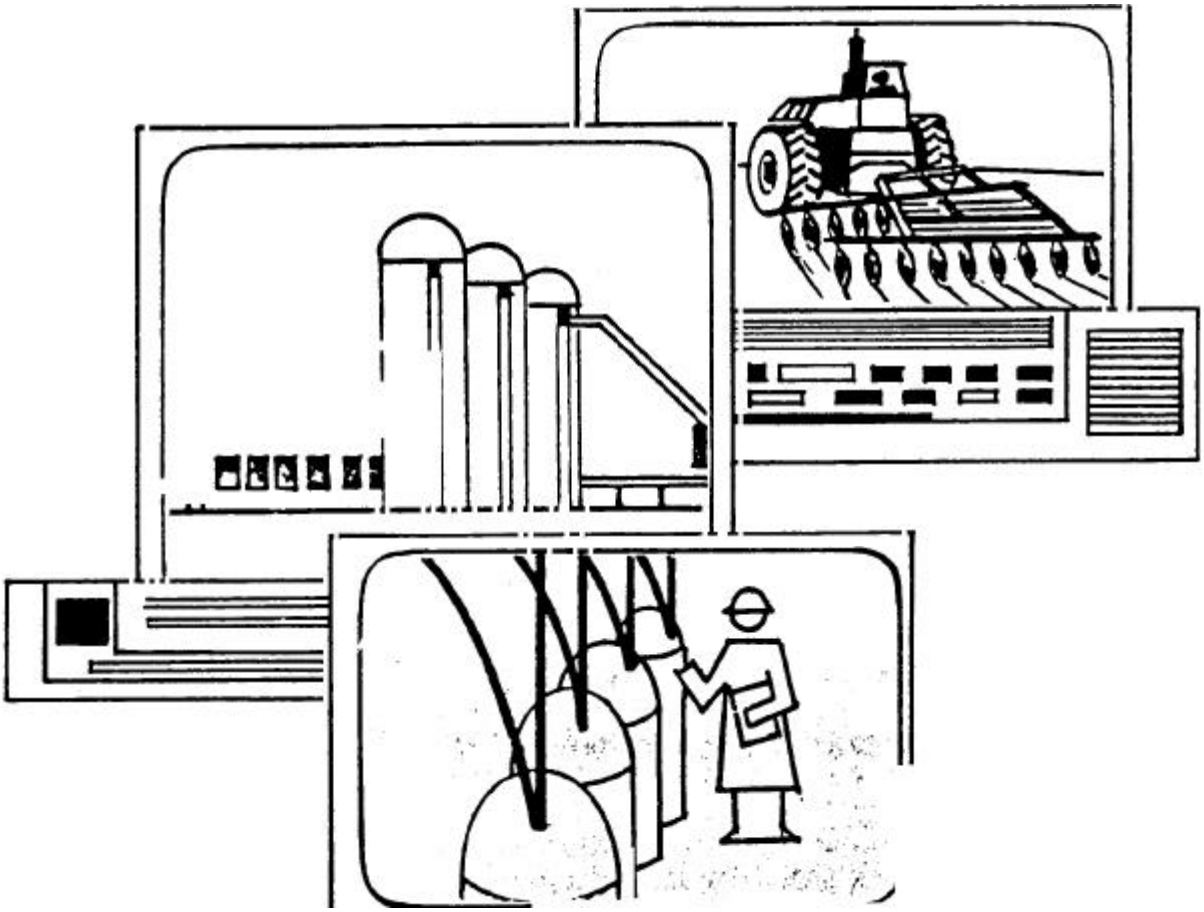
AGRICULTURAL EDUCATION

EQUIPMENT AND FACILITIES GUIDE



The University of the State of New York/The State Education Department
Career and Technical Education
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PLANNING FOR FACILITIES AND EQUIPMENT ADJUSTMENTS FOR THE AGRICULTURAL EDUCATION CURRICULUM

This publication is designed to give the school professional staff direction on general kinds of equipment, space and layout of facilities for the new curriculum in agricultural education.

The facilities and equipment recommended are to meet the needs of a program leading to a *4,5,* or more unit sequence in agriculture.

It may be desirable to own all of the recommended equipment. Some items of equipment may be available on a shared basis with other departments in the school, from machinery and equipment dealers, local agribusiness people on a loan basis or from other nearby businesses. In certain locations, rotating classrooms and/or team teaching could help in sharing specialty areas and/or equipment.

A local consultant committee may be helpful in the acquisition and/or use of equipment.

I. EQUIPMENT CONSIDERATIONS AND RECOMMENDATIONS

The lists of equipment are suggestions and recommendations for categories of tools. There could be items of equipment essential or appropriate to your program that are not listed. Access to AV equipment is an essential consideration in order to share the use of projection screen, filmstrip, projector, slide projector, cassette tape player combination, 16mm movie projector, VCR with TV monitor, taping equipment and camera.

A. Basic Agricultural Skills

The Basic Agricultural Skills consists of a one unit core of ten instructional modules which are required for all agriculture students in a sequence program.

Equipment listed for the modules may be in addition to items already included in the three agricultural clusters (Figure 1, 2, and 3). Equipment should be technically up-to-date, state of the art.

Basic Agricultural Skills Modules

I. Tools for small engines, measuring, wood working, masonry, metal working, plumbing, and electricity
2. Agricultural machinery to illustrate shafts, pulleys, gears, clutches, hydraulic systems, sprockets, chains, belts, etc.
3. Measuring and monitoring devices for engines and electricity
4. Lubricants and grease gun
5. Small engine (operable)
6. Tractor or lawn mower and rototiller with operators manual, as applicable to program emphasis
7. Fasteners and fastening tools
8. Personal safety equipment
9. First aid kit
10. Fire extinguishers
II. Calculators (hand held)
12. Microscope

13. Plant and animal models
14. Soil pH test kits
15. Soil auger

B. Advanced Agricultural Skills

A second unit in agriculture instruction is required for each cluster in Advanced Agricultural Skills. One-half unit is to come from modules identified as required for all students in the cluster. The second half-unit in Advanced Agricultural Skills will be made up of modules selected by the school or student from the list of modules provided for each cluster. The modules selected will determine the equipment needed.

Required modules for Advanced Agricultural Skills equipment needs:

I. Modules common to all three clusters.

A. Preparation and Analysis of Financial and Operational Records, AG-3102
Calculators, (hand held)

B. Computer Applications, AG-3330
Computer w/disk drive and printer (128 K or more)
Several computers are desirable for this module.

2. Additional modules for Agricultural Business Management and Service Occupations Cluster

A. Performance of Basic Skills in Verbal Communication, Reading and Writing in Agricultural Business, AG-3008
Tape recorder with microphone
Typewriters

B. Salesmanship Techniques and Supply and Demand, AG-2052
Cash register (electronic preferred)
Scales
Calculators (hand held)

3. Additional modules for Natural Resources and Ecological Occupations Cluster

A. Natural Resource Management, AG-4014
Soil auger
Soil test kits

C. Specialized Agricultural Skills

Additional units for the sequence can be offered from Specialized Agricultural Skills by selecting modules from this area specific to meeting the goals of the program as determined by the school administration in consultation with the program consultant committee.

The following charts contain a list of equipment appropriate by cluster and emphasis area. There may be certain programs such as oceanography that are not covered adequately by this equipment list.

II. EXPLANATIONOF RECOMMENDED SPACE ALLOCATIONS FOR AGRICULTURAL EDUCATION FACILITIES

A. Agricultural Education in BOCES Area Occupational Education Centers

Space requirements and layout will vary with the courses to be offered, enrollment in each, special needs of the area, terrain, and other local factors. The following recommendations will for the most part apply anywhere in adapting to the local situations.

General Layout

It is desirable that all agricultural facilities be located as close together as is practical. This will allow easier sharing of facilities and rotation of students through instructional modules in related areas.

Classrooms should be equipped with library shelves, a window between the classroom and shop, an outside telephone line, and facilities for audiovisual instruction.

The greenhouse is considered an instructional facility and must meet the instructional facilities requirements for schools with accessibility for special needs students, etc. Depending on the extent of the Plant Science Emphasis, an 800 to 2000 square foot greenhouse is recommended. The greenhouse should be on the south or southeast of the building for adequate light exposure. Two heat zones are needed with work space provided in a 600 square foot headhouse plus storage for tools, equipment, and supply items. An energy conservation thermal blanket is recommended.

A paved courtyard into which the Mechanical Science Emphasis shop and other shops open will greatly increase the efficiency of the program. An open shed may well form one side of this court and the greenhouse may form another side. A non-climbable fence with a high and secure gate is needed to complete the enclosure. If vandalism is a problem, it may be advisable to extend such a fence around the greenhouse and include the land laboratory of the ornamental horticulture program. Such a courtyard offers extra space for fair weather work on equipment, class demonstrations, and dead storage of equipment that may be waiting for parts. The shed offers protection for instructional field and power equipment used in the program, and shelter for farm equipment and other equipment being worked on. The fence and gate provide desired security. Proper drainage must be provided for this area. For a Natural Resources and Ecological Cluster the area just outside the shop overhead door may better be a crushed stone or gravel driveway for the operation and testing of track-type vehicles.

Wiring should meet codes for all areas. Current supply at 220 volts and 110 volts should be available in all shops and laboratories. A 110 volt duplex outlet should be provided above bench height next to each bench and machine along the walls of the shop. An overhead or under floor conduit grid is needed for stationary electrical machines and a 220-volt supply should be provided for electric welding. Panic switches should be located in strategic areas.

All laboratories and shops must have sinks with hot and cold water. The size and nature of such sinks will vary with proposed uses.

Floors should be of reinforced, sealed concrete in shops and laboratories. Such floors must be strong enough to carry heavy equipment, such as a bulldozer that might be brought in. All such floors must have floor drains and must be sloped to the drains in any area where hoses might be used. In the Mechanical Science Emphasis of the

Agricultural Business Management and Science Occupations shop it is generally advisable to have the whole floor slope slightly toward trench drains. All drains should lead to sediment and oil separators. Large unrestricted instructional work floor spaces are necessary to accommodate multiple units of large farm equipment.

Compressed air should be accessible to all work areas. The compressor should be located outside the shop area or insulated for sound to cut down on noise. Walls should be free of projections to allow efficient placement of benches, machines, and cabinets. Windows should be at least five feet above the floor.

Safety/Working Conditions

All laboratories are to conform to safety codes, environmental and other regulatory agencies' recommendations to ensure a healthy and safe environment for the staff and students.

Overhead Doors

For Mechanical Science Emphasis of the Agricultural Business Management and Service Occupations Shop: At least one and preferably two insulated overhead doors are needed in this shop. Faculty and students must be able to get to any part of the shop without disturbing torn-down equipment. None of these doors should be less than 12 feet wide - 14 feet is better. One door should be 16 feet wide and 14 feet high to accommodate the biggest machines in the foreseeable future. All lights and other fixtures in the open shop area must be above door height. At least one outside door for personnel is needed. Water, an electric welding outlet, and a 120-volt outlet should be provided just outside one overhead door.

For the Plant Science emphasis of the Agricultural Business Management and Service Occupations headhouse: One insulated overhead door 12 feet wide by 10 feet high is essential. Overhead doors should be located at least 7 feet from the corners of the shop.

Heat/Ventilation

Locally controlled heat is desirable, especially as evening classes become a more important part of Occupational and Continuing Education. For the greenhouse, constant failproof heat with an auxiliary heat source is a basic necessity. All labs generating toxic fumes must have adequate exhaust systems with heated make-up air provided.

Lockers

Adequate numbers to be provided for student shop coats, notebooks, and projects.

Land Laboratory

The land laboratory at BOCES needs to be appropriate for the program cluster and emphasis area provided for in figure 4.

Equipment

In the area center tools and equipment can be exchanged between occupational clusters and emphasis areas. Also facilities can be used by different clusters and

emphasis areas. Rental or lease of large machinery and equipment is a way of providing instruction without the large purchase price. Use consultant committees for obtaining equipment or for donation of items.

B. Agricultural Education for a Local High School

Classroom

A classroom of *750* sq. ft. is needed for a class of 20 students. This should include storage cupboards and display areas for instructional materials. If classes with more than 20 students are expected, the classroom should be made bigger to accommodate the biggest class expected. The increase in size should provide 25 sq. ft. additional for each student over 20. This classroom should be adjacent to the shop with a 6' X 4' transparent wall opening between,to give the instructor student control in both areas at once. Five or six 4' X 8' tables are needed to accommodate the student projects. A desk or instructional table is needed for the instructor.

Greenhouse

The greenhouse is considered an instructional facility and must meet the instructional facilities requirements for schools with accessibility for special needs students, etc. Depending on the extent of the plant science emphasis, an 800 to 2000 square foot greenhouse is recommended. The greenhouse should be on the south or southeast of the building for adequate light exposure. Two heat zones are needed with work spaces provided in a 600 square foot headhouse plus storage for tools, equipment, and supply items. An energy conservation thermal blanket is recommended. Water, heat, electricity, and ventilation are needed in this facility.

Land Labs

All land labs should be convenient to the school to minimize transportation of students and equipment.

Size and Location of Shop

The shop instructional area should have an unrestricted space of at least 2250 sq. ft. for a class of 20. An additional 125 sq. ft. should be added for each pupil above this number, figured on the largest class to be scheduled. Part of this space could be partitioned off for a storage area, if the teacher wishes. Extra storage facilities should be provided if the shop is to be used for evening adult education classes.

Agricultural shops should be located on the ground level. Provide an outside entrance (at least 16 feet wide by 14 feet high) with paved access through which large pieces of equipment can be moved. Refer to BOCES specifications for recommendations for:
heat/ventilation, walls, electrical service, compressed air, sinks, and water and electrical supply near overhead doors.

Floors

Concrete floors which can hold heavy equipment are needed in the service area. A sump drain should be placed in the center of this area. A trench-type drain is also needed, parallel to the overhead door, to wash down equipment brought into the shop.

Lockers

Each student should have his/her own locker for storage of shop coats, notebooks, and the student's projects. A general wash sink should be provided in this area.

AGRICULTURAL PRODUCTION AND SCIENCE OCCUPATIONS

Business Management Emphasis	Animal Science Emphasis	Plant Science Emphasis	Mechanical Science Emphasis
Figure 1			
• Calculators • Computers with disk drive, 128K printer, etc. • Cash register • Typewriters • Tables or desks suitable for business equipment; VCR with monitor • Access to AV equipment	• Dehorning, hoof maintenance equipment • Models of cow, horse, etc. • Grooming equipment (can include Horse Handling and Care equipment • Microscope	• Soil Test equipment • Moisture tester • Greenhouse equipment, automatic watering, temperature control, fertilizing, pesticide control, thermal blanket and benches • Safety equipment for application of dusts, sprays, etc.	• Tools for carpentry, wood working, metal working, plumbing, masonry, electrical and engine repair • Testing equipment for engines and hydraulics • Power tools, drill grinder, sander, saw and saber saw • Mechanics tool set • Electrical testing equipment: ammeter volt meter, ohmeter • Steam cleaner or pressure washer • Parts cleaner • Work benches or stations • Welders (arc and gas) • Transit (laser type)
General: Farm tractor, with soil fitting, planting, spraying, cultivating and harvesting equipment or other equipment applicable to the local agriculture			
Figure 2			
• The same basic equipment is needed as listed for Agricultural Production and Science Occupations Cluster (see listing above)	• Animal cages with feeders, waterers • Animal grooming equipment • Health maintenance and monitoring equipment • Sanitizing equipment for cages and instruments • High pressure washer	• Greenhouse equipment, automatic watering, temperature control, fertilizing, pesticide control, thermal blanket and benches • Display cooler • Drafting table with equipment • Safety equipment for application of dust, sprays, etc. • Garden tractor with loader and soil fitting and lawn equipment,	• Tools for carpentry, wood working, metal working, plumbing, masonry, electrical and engine repair • Hydraulic trainer and test equipment and repair tools • Diesel test and repair equipment • Electrical test and repair equipment • Engine analyzer • Hydraulic press • Metal lathe, power hack saw

Business Management Emphasis	Animal Science Emphasis	Plant Science Emphasis	Mechanical Science Emphasis
		york rake, brush hog, snow plow, post digger • Lawn mower, rototiller, snow blower	• Power tools, drill press, grinders, saws • Portable tools • Welding (arc, TIG, MIG, gas) • Transit(s) (laser) • Measuring tools, calipers, micrometers • Cylinder glaze breaker and hones, ridge reamer • Steam cleaner, pressure washer • Air impact tools • Tractor dynamometer • Tire changer with split rim safety cage • Work benches, assembly and disassembly benches and stands • Tilt bed truck, eighteen foot bed • Stationary diesel engine

NATURAL RESOURCES AND ECOLOGICAL OCCUPATIONS

Business Management Emphasis	Conservation Science Emphasis	Plant Science Emphasis	Mechanical Science Emphasis
Figure 3			
• The same basic equipment is needed as listed for Agricultural Production and Science Occupations Cluster (see previous sheets)	• Electronic meters for pH, O2, gas air pollution • Microscopes • Boat with outboard motor, depth sounder, radio and trailer • Water sampling equipment • Dredges • Laboratory equipment: incubators, autoclave, centrifuge • Fish tank (1000 gal) • Animal cages with feeders and waterers • Compasses, topographic maps, plane table, measuring tapes • Walkie-talkies		• Tools for carpentry, wood working, metal working, plumbing, masonry, electrical and engine repair • Test equipment for gas, diesel, small engines and hydraulic units • Power tools • Portable power tools • Welders (arc, gas) • Hydraulic press • Work benches • High pressure washer or steam cleaner • Parts washer • Portable water pump and generator
Common to Conservation and Plant Science			
• The same basic equipment is needed as listed for Agricultural Production and Science Occupations Cluster (see listing above)	• Forester measuring equipment, cruising log scale, increment borer, calipers, prisms, measuring tapes, range finder, abney level, clinometer • Maple syrup production equipment • Forestry tools; peavy, axe, bow saw, tree climbing, pruning tools, etc. • Safety equipment for operating chain saws and application of spray, dust, etc. • Chain saws • Transits (laser) **<u>General</u>** • Van for student transportation • Wheel tractor with backhoe and		

Business Management Emphasis	Conservation Science Emphasis	Plant Science Emphasis	Mechanical Science Emphasis
	loader 60-80 H.P. • 5-yard dump truck • Equipment trailer • Wheel tractor with 3 pt. hitch • Bush hog, york rake, wood splitter, tree planter • Log winch for 3 pt. hitch		

RECOMMENDED SPACE ALLOCATIONS FOR
AGRICULTURAL EDUCATION PROGRAM
(Each line is for one teaching station)

Program Area	Number of Students	Classroom Floor Space	Lab or Shop Floor Space	Storage	Other
Figure 4					
I. Agricultural Production & Science	20* (1)	600* (1)	2000*(1)		Land lab, 10 acres
1. Plant Science Emphasis	20* (2)	750* (2)	2250*(2)	500	Greenhouse, 800 to 2000 sq. ft. depending on Plant Science emphasis Headhouse 600 sq. ft., storage for tools, sprays, soils, equipment; land lab 10 acres
2. Animal Science Emphasis (horse handling)	12	600		850	Stable area, 1500 sq. ft.; outdoor area, 3000 sq. ft; race track at least 3/8 mil; Stables for 10 horses with the following for each horse: Min. box stall 10' x 10', stable working area at least 15'x 10' for all-weather use
II. Agricultural Business and Service Occupations	20	750	1200	200	
1. Business Management Emphasis	20	750	3900		Storage for cages and materials
2. Animal Science Emphasis	20	600	1200		Greenhouse – 800-2000 sq. ft. depending on Plant Science emphasis
3. Plant Science Emphasis					Headhouse 600 sq. ft.; storage for tools, sprays, soils, equipment – land lab 5 acres
4. Mechanical Science Emphasis	20	600	4000	400	Storage shed – 2000 sq. ft.
III. Natural Resources & Ecological	20	600	2000	2000 (shed)	Locker room, shower, toilet, 250 sq. ft. Land lab – 50 acres – convenient to school

*(1) BOCES area centers
*(2) Local High Schools (larger classes occur with introductory courses)