LABORATORY HANDBOOK AGRICULTURAL TECHNOLOGY

Foreword

Gratitude we pray to Allah, because above his love and grace of creation laboratory handbook Agricultural Technology, Faculty of Agriculture, Bengkulu University has been resolved. This handbook contains profile, policies and procedures for all parties which using the Laboratory Agricultural Technology. The use of this Handbook is expected to help understand regulations relating to use of tools and materials used for research as well as practicum. This manual book is of course still far from perfect, both in context and content, for that we are open to suggestions and criticisms for future improvements. We would like to thank all those who have contributed greatly to the preparation of this guide book.

Bengal, October 2021

Head of Laboratory

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CHAPTER I
PRELIMINARY

A. BACKGROUND

The laboratory is one of the educational infrastructures, which can be used as a place for students to practice understanding concepts by conducting experiments and observations. Thus, the laboratory is an integral part that cannot be separated from teaching in the classroom. The existence of a laboratory is needed to provide direct experience from the application of theories received through laboratory/practical activities, to support teaching and learning activities.

In connection with the above, the role of the laboratory becomes very important, because the laboratory is the center of the teaching and learning process to conduct research college gems, penstudent and lecturer research. The laboratory has a function as a place for supporting activities from class activities, or vice versa class activities are supporting laboratory activities.

The laboratory is one of the means of encouraging the optimization of the learning process. According to the Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform No.03/Januari/2010 and the Joint Regulation of the Minister of National Education and the Head of the State Civil Service Agency no. 02 and No. 13/May/2010, what is meant by an EDUCATION LABORATORY is an academic support unit in an educational institution in the form of a closed or open room that is permanent or movable, managed systematically for testing, calibration, and/or production activities on a limited scale using equipment and materials based on scientific methods. certain activities, in the context of implementing education, research, and community service. The functions of the laboratory in the educational process according to Sukarso (2005) are as follows:

a. As a place to practice developing intellectual skills through observing, recording, and reviewing activities in the agricultural and food industries.
b. Develop students' motor skills. Students will increase their skills in using toolsy available so they willseek and find the truth.
c. Giving and cultivating the courage to seek the nature of the scientific truth of an object in the natural and social environment.
d. Cultivating student curiosity as the capital of a prospective scientist's scientific attitude.
e. Build self-confidence as a result of skills and knowledge or discoveries obtained.

B. NAME AND FUNCTION OF AGRICULTURAL TECHNOLOGY LABORATORY DIVISION

Plearning process in the laboratory Agricultural Technology, Bengkulu University Faculty of Agriculture is divided into several sections Division based on use including:

1. Bioindustry Division

The Bioindustry Room is a place for conducting practicum and related research to analyze the use of food microorganisms. In the Bioindustry Division, there are practical activities. The equipment available and often used in Bioindustry Division including glassware (Petri, Goblet and refigator (refrigerator), binocular microscope, laminar air flow, Autoclave, Incubator, centrifuge, scale and kiln. The practicum carried out in Bioindustry Division among them Industrial Microbiology, Biology, and Basic Microbiology practicum.

2. Post Harvest Division

Post-harvest division functions to carry out practical and related research about how to handle post-harvest agricultural products such as sorting, grading, etc. Equipment that is in Post-harvest division including glassware, penetrometer, oven, selear cup, vacuum selar, refrigerator. The activities in the post-harvest division are practicum on the physical properties of agricultural products, handling and transportation systems for agricultural products, and packaging technology.

3. Food Engineering Division

Food engineering division function to conduct practicum and research related to sensory test analysis, and the testing process related to agricultural products. The food engineering division has several the equipment used among them mixer, ice cream maker, oven, stove, desiccator. The practicum carried out in Food engineering division among them PBA (Agro-Industrial Materials Knowledge), Entrepreneurship, biomass.

4. Industrial Chemical Division

Industrial chemical division useful for student practicum and research related to the field food chemistry among them analyze food-related chemistry such as Fat Content Test, Moisture Test, Titration, etc. The practicum carried out in Industrial chemical division that ischemistry, and biochemistry. The equipment in the chemical industry division is spectrophotometer, hot plate, soxhlet, desiccator, chemical glassware, vacuum evaporator, water bath, lovibond tintometer, flame photometer, bomb calorimeter, gastec gv, ion meter, lovibond.

5. System Division

System division useful for student practicum including support lecture activities related to industrial systems and management. The equipment in the nematology laboratory includes:computer, focus.The practicum carried out in System divisionas follows operational research, computer application, and industrial project planning.

6. Machinery and Equipment Division

Machinery and equipment division useful for practice and research students include support lecture activities related to getting to know industrial equipment machines. Equipment that is in Machinery and equipment division among them spinner machines, flour milling machines, and generators, 2 stroke motors, and 4 stroke motors.The practicum carried out in Machinery and equipment divisionas follow sphysics, industrial physics, layout and material handling, engineering work procedures, measurement and instrumentation, and agricultural mechanization.

C. ROLE OF THE LABORATORY

1. Laboratory as a place for practicum and research for students or lecturers and other users
2. The laboratory is a place to prove the theory learned by students or students.
3. Laboratory as a place to prepare students or students to be more skilled before entering the world of work.
4. Laboratory as a place to train students or students to be more disciplined, careful, thorough, and more patient
5. Laboratory as a place for students to develop knowledge.

CHAPTER II
PROFILE OF AGRICULTURAL TECHNOLOGY LABORATORY

The laboratory is one of the educational infrastructures, which can be used as a place for students to practice understanding concepts by conducting experiments and observations. Thus, the laboratory is an integral part that cannot be separated from teaching in the classroom. The existence of a laboratory is needed to provide direct experience from the application of theories received through laboratory/practical activities, to support teaching and learning activities.

In connection with the above, the role of the laboratory becomes very important, because the laboratory is the center of the teaching and learning process to conduct experiments, investigations, or research in lectures. Thus the laboratory has a function as a place for supporting activities from class activities, or vice versa class activities are supporting laboratory activities.

A. LABORATORY FACILITIES

1. Administration Room
2. Food Engineering Division
3. Post Harvest Division
4. Industrial Chemical Division
5. Bioindustry Division
6. Computers and printers
7. LCD
8. Bathroom
9. prayer room
10. Practical chair
11. Glasswarechemical
12. Instruments
13. YSD dryer
14. Pyrolysis Furnace
15. Chemical material

B. LABORATORY USERS

1. Lecturer

2. Student
3. Researcher

C. LABORATORY PROCEDURES

1. Laboratory Service Hours are Monday - Friday 08:00 - 16:00 WIB
2. It is not permitted to conduct research outside of working hours, (Saturday, Sunday, and National Holidays) in the Laboratory except for simple observations which must be continuous with the following conditions: Submit an application for research outside of working hours to the Head of the Laboratory known to the supervisor
3. Student / lecturer PenUse Labmust complete the administration of the laboratory use permit to the laboratory manager, fill out a receipt for borrowing tools.
4. All activities carried out in the laboratory are required to: Wear a practicum coat, Wear closed shoes, Do not eat/drink in the Lab. Maintain order, safety and cleanliness of the laboratory, mutual respect and appreciation with fellow laboratory users, not noisy, crowded, joking and or carrying out activities that have nothing to do with research such as the application for laboratory access permits.
5. Pspecial lab useStudents from outside the TP Department must bring a cover letter from the Department/Faculty concerned.

D. PENALTY

1. Lab users must return the equipment on time a maximum of 2 days if it exceeds the specified limit, the researcher will be penalized in the form of a warning.
2. Lab users who break, break, break, damage the equipment will not get a free letter from the laboratory before replacing the equipment with the same specifications.

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CHAPTER III
LABORATORY MANAGEMENT

According to Permenpan No. 3 of 2010 Laboratory is an academic support unit in educational institutions which is an open or closed place that is permanent or movable, managed systematically for testing activities, calibration and or production on a limited scale using materials and equipment based on certain knowledge in the context of implementing education, research, and community service. Based on the above, the laboratory Service technology perform laboratory management so that it can facilitate all laboratory users, both students, lecturers, and researchers. The laboratory management carried out includes:

A. LABORATORY ACTIVITY PLANNING

Laboratoryagricultural technologyBengkulu University creates or arranges a programwork such as practicum scheduling, inventory of tools and chemicals (stock taking)chaired by the head of the laboratory.Laboratory planning includes activities that will be carried out both routine activities such as practicum,room use, the need for tools and practicum materials, procurement of tools and fresh practicum materials.This is very important because the agricultural technology laboratory in addition to facilitating the TIP study program practicum also facilitates the practicum of several other study programs, namely Soil Science Study Program, Agroecotechnology Study Program, Forestry Study Program, Plant Protection Study Program and Marine Study Program.

B. EQUIPMENT MANAGEMENT

Equipment management in the laboratory Agricultural Technology includes maintenance, storage and administration. Equipment in the laboratory Agricultural Technology consists of glass ware chemical, instruments and equipment YSD (Yuwana Solar Dryer) drying .At the end of the semester an inventory of tools is carried out after all practicum activities are completed which includes all the existing tools, both tools that are in good condition and tools that are in damaged condition, then record them in the tool inventory list book, and report whether the equipment will be repaired or destroyed.

1. Maintenance
    a. Glassware

Before storage, make sure that the glassware is clean by cleaning it with detergent and rinsing it with distilled water. If the equipment is difficult to clean with distilled water, it can be cleaned by immersing it in a 10% bichromate solution in concentrated sulfuric acid. Then wash with running water and rinse with distilled water then dry.

    b. Instrument equipment

For optical instruments such as microscopes, the function of the microscope parts is checked and the microscope lens is checked if there is dirt, it is cleaned with lens tissue and alcohol. For other instrument equipment, a tool operating manual is made in each equipment to provide instructions to the user and avoid misuse. For measuring instruments, cleaning is carried out from dust and dirt or chemicals attached to the tool, then checking the function of the tool and storing the tool in the room provided, performing a simple calibration of the tool.

2. Storage

Storage of glassware and instruments is carried out separately in different rooms, glassware is stored in a dry state and stored in one room equipped with a cupboard. Glassware is stored based on the type of tool and its size. Meanwhile, instrument equipment is stored by type of tool and placed in a cupboard, such as a microscope stored in a microscope cabinet equipped with lights.

3. Tool administration

The administration of the tool is done to make it easier Laboratory know the number of tools and the condition of the tools in the laboratory, as well as facilitate Laboratory when making proposals for equipment procurement. Equipment administration includes: tool name, tool specifications, number of tools, date of procurement, and condition of tools. Newly arrived equipment is recorded, recorded and included in the inventory list.

C. MATERIAL MANAGEMENT

Material management in the laboratory Agricultural Technology include:

1. Maintenance

The principle of material maintenance is to maintain the condition of chemicals or other supporting materials in practicum and research in order to remain optimal in

their use, among others by maintaining the cleanliness of the material storage area and maintaining room conditions such as maintaining humidity and good ventilation so as to reduce the occurrence of pollution and other accidents. Materials in the laboratory consist of general materials and special materials that require periodic maintenance considering the properties of different materials. Chemicals must be tightly closed after use to avoid contact with air and avoid evaporation. Consumables are separated between chemicals and non-chemicals, the rest of the chemicals in the practicum are placed in closed containers and stored in closed cabinets.

2. Storage

Chemicals in the Laboratory Agricultural Technology placed in a chemical room which is equipped with a chemical cabinet and also a fume hood, the composition of the ingredients is separated between solid and liquid materials arranged alphabetically to facilitate searching, each bottle of material is numbered, arranged in the chemical cupboard alphabetically. Chemicals that are strong acids are placed in a special place or fume hood.

3. Material administration

At the end of each semester, material administration is carried out which includes recording the amount of material used, checking material stock. Any consumables that have just entered the laboratory are recorded in the incoming goods list book and then included in the material inventory list. At the end of each semester, the materials used for one semester are counted and then included in the list of consumables, and make suggestions for materials to be used in the following semester.

D. WORKING METHODS MANAGEMENT

Activities in the laboratory Agricultural Technology Bengkulu University includes practicum activities, research, both student research for final assignments or research by lecturers and other researchers and service providersnto society.

1. **Practical activities**

   Practical activities support the achievement of teaching and learning activities, laboratories Agricultural Technology holding a practicum carried out by a lecturer who is assisted by a lecturer assistant. The TP Laboratories

carry out practicums for various subjects in the TIP, Soil Science, Agroecotechnology, Forestry, Marine, and Plant Protection study programs. Prior to the implementation of the practicum, a practicum schedule was prepared foruse of space so that avoid conflicts in practice. The preparation of materials and equipment during the practicum is carried out by Laboratory Assistant and PLP Supervis or concerned by referring to the submission of tools and materials the day before the practicum is carried out.

Borrowing flown usage practical tools and materials.

a. Lecturer/assistant submits a receipt for borrowing tools and materials 2-3 days before practice starts
b. PLP and Laboratory prepare tools and materials will be used.
c. PLP and Laboratory hand over tools and materials to assistants/lecturers before practice starts
d. If the practicum has been completed, the practitioner must return the equipment coordinated by the assistant.
e. PLP and the Lab will check the tools and materials and ensure that all are in good condition.
f. If using instrument equipment, its use must be known and accompanied by the PLP and Laboratory concerned.
g. If there is damage to the tool, the practitioner must replace it.

Practice Rules at the Agricultural Technology Laboratory:

1. Practitioners must be present on time
2. Practitioners are required to use JAS Lab
3. Don't use T-shirts and sandals
4. Do not eat/drink during practicum
5. Do not go in and out without the permission of the Practicum Assistant
6. The practitioner must tidy up or clean the tools used again
7. The practitioner must replace the damage or loss of laboratory equipment/equipment
8. Every practitioner is required to cultivate K3 (Occupational Health and Safety) during the practicum
9. Make a practicum report

2. Research activities

Laboratory Agricultural Technology serving research Students and Lecturers as well as study program student other who is doing the final task.

Research mechanism in the laboratory Agricultural Technology:

1. Laboratory Service Hours is Working Hours Monday – Friday 08.00 – 16.00
2. Researcher students/lecturers before research must complete the administration of laboratory use permits to the laboratory manager, fill out a receipt for borrowing tools.
3. Administration of permission to use the laboratory at least 3 days prior to the implementation of the research.
4. Student researchers from outside the TP Department must bring a cover letter from the Department/Faculty concerned.
5. Researchers must reconfirm related to the research schedule, the tools to be used to the laboratory staff.
6. Researchers are not allowed to move laboratory equipment from one laboratory to another.
7. Researchers who start research not according to the written schedule are not allowed to use the laboratory and must make a rescheduling.
8. Researchers who break, break, break, break the equipment will not get a letter of release from the laboratory before replacing the equipment with the same specifications.
9. The return of the borrowed equipment must be in the same condition as before, if the returned tool does not match the initial state, the other party will not accept it.
10. Researchers who do not keep the laboratory clean are not allowed to use the laboratory before cleaning again including research tools.
11. Researchers must return the tools on time if they exceed the time limit the researchers will get sanctions. (maximum limit of 2 days)
12. It is not permitted to conduct research outside of working hours, (Saturday, Sunday, and National Holidays) in the Laboratory except for simple observations which must be continuous with the following conditions: Submit an application for research outside of working hours to the Head of the Laboratory known to the supervisor

13. All activities carried out in the laboratory are required to: Wear a practicum coat, Wear closed shoes, Do not eat/drink in the Lab. Maintain order, safety and cleanliness of the laboratory, mutual respect and appreciation with fellow laboratory users, not noisy, crowded, joking and or carrying out activities that have nothing to do with research such as the application for laboratory access permits.
14. Submit 1 yellow perforated violin folder.
15. User leaves ID card (valid KTM/KTP/SIM), a number that can be contacted from the user and the person in charge of the activity
16. REQUIRED WEARING MASK INSIDE

3. Community service activities

   Community service activities consist of community service carried out by lecturers and the role of PLP and Lab for provide and operate laboratory equipment (if needed) and conduct sample analysis from communities in need.

E. LABORATORY WORK ENVIRONMENT MANAGEMENT

Management of the work environment is very important to pay attention to Avoiding accidents in the laboratory requires a conducive working environment, knowledge of the kinds of accidents in the laboratory and their causes. Laboratory Agricultural Technology made in the form of an announcement board regarding safety and work safety guidelines in each sub-lab, and warning signs are made so that they can be used as guidelines by students, lecturers and other laboratory users. Besides that, PLP also makes SOP/IK on security and safety guidelines in Agricultural Technology.

1. Types of accidents that can occur in the laboratory:
   a. Burning, can occur due to incorrect use of tools, errors in the heating process of the material.
   b. Injured, can be caused by being hit by broken glass or being stabbed by a sharp object
   c. Poisoning, can occur due to inhalation of harmful chemicals
   d. Electrocuted, due to using the wrong tool
   e. Explosion, caused by mishandling of materials.
2. Safety equipment in the laboratory

a. PPE personal protective equipment consists of practicum clothes, glasses, masks, gloves, boots or closed shoes.
b. APAR or fire extinguisher
c. First Aid Box

3. Steps to avoid accidents
   a. Laboratory users are required to comply with the regulations set by the laboratory.
   b. Laboratory users are required to wear PPE when working in the laboratory.
   c. Always read the instructions for use of the appliance before starting to use it.
   d. Always keep the room clean, if there is a spill of material or spilled water, clean it immediately.
   e. Do not leave the tool in a state of life except with certain notes
   f. Do not eat/drink in the laboratory.

F. INCREASING THE QUALITY OF LABORATORY SERVICES

To improve the laboratory status Agricultural Technology One of the ways to do this is by developing PLP knowledgeand Laboratory Laboratory Agricultural Technology through many trainings that must be followed including knowledge of laboratory management, use of category 3 instrument equipment, knowledge of safety in laboratories, waste managementand use of chemicals, competency tests both internally and externally and others in accordance with laboratory standards in general. For this reason, it is very necessary for the relevant institutions to plan programs for PLP training and workshopsand laboratory.

CHAPTER IV
CLOSING

Handbook Laboratory Agricultural Technology, Bengkulu University Faculty of Agriculture in generalconvey about profiles, procedures and related policies laboratory infrastructure facilities and services asfacilities to support learning, research and service activities.