CURRICULUM

MASTER OF AGROECOTECHNOLOGY STUDY PROGRAM

GRADUATE
2021

DEPARTMENT OF AGROECOTECHNOLOGY
FACULTY OF AGRICULTURE
UNIVERSITY OF JAMBI

CURRICULUM

GRADUATE PROGRAM

STUDY PROGRAM OF AGROECOTECHNOLOGY (MASTER)

DEPARTMENT OF AGROECOTECHNOLOGY
FACULTY OF AGRICULTURE
JAMBI UNIVERSITY
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FOREWORD

Praise be to the presence of Allah SWT who has given His mercy and grace so that the Curriculum of the Master Study Program of Agroecotechnology (MSPA), Faculty of Agriculture, University of Jambi that has been developed based on the Indonesian National Qualifications Framework and National Standards Higher Education can be completed properly. Curriculum development for the MSPA involved various elements within the MSPA, Graduate Program, Faculty of Agriculture, Jambi University, alumni of the MSPA, as well as sources from outside institutions and other stakeholders. The process was carried out through various stages starting from "tracer studies", workshops with stakeholders, and input from curriculum experts and farmers in the agricultural sector, to a series of workshops within the internal environment of the MSPA, Jambi University. The MSPA would like to thank all those who have provided input for the formulation of the "Curriculum of the MSPA". It is hoped that this document can be used as a guide for students, lecturers and leaders of the MSPA, Jambi University to produce graduates/masters in accordance with the Learning Outcomes and Graduate Competency Standards that have been determined.

Jambi, August 2021

Dean of the Faculty of Agriculture

Prof. Dr. Ir. Suandi, M.Sc. IPU
NIP. 196311011989021001

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CHAPTER 1 INTRODUCTION

1.1 Background

The Master's Study Program of Agroecotechnology (MSPA) was formed based on the need to increase Indonesian human resources in the Jambi region and its surroundings who are competent in the development of sustainable agricultural technology. The MSPA was officially opened on 28 January 2014 based on a letter from the Directorate GeneralHigher Education no85/E.E2/DT/2014 and followed by an implementation permit from the Directorate General of Higher EducationMay 19, 2014through Decree No. 107/E1.3/HK/2014 dated 03 July 2014.

In 2018, the MSPA received accreditation from BAN-PT with a B rating which is valid for 5 years from 13 February 2018 to 21 November 2022 in accordance with SK BAN-PT No.478/SK/BAN-PT/Akred/M/II/2018. The learning process in the MSPA is oriented towards science based on research, so the graduates produced are entitled to use the title Master of Agriculture abbreviated as "MP (Magister Pertanian)".

This graduate profile is determined based on the results of a study of the needs of the job market required by the government and the business and industrial world, as well as the need to develop science and technology. The formulation of learning outcomes produced is by the provisions in SN-DIKTI and IQF. After learning outcomes has been achieved, the courses were determined. This activity started with the selection of study materials to be able to fulfill the achievements of learning outcomes that have been set. After determining the study material, then determine the courses along with the credit load. For this purpose, it involved all lecturers in the study program, groups/fields/laboratories in the study program, with reference to the scientific clusters, branches and branches related to the study program. The composition of the courses, accompanied by descriptions of learning outcomes and learning plans for each course, constitutes a curriculum document.

The curriculum development process involved various elements, both within the MSPA Faculty of Agriculture, Jambi University of and other

stakeholders. The process was carried out through various stages starting from SWOT analysis, tracer studies, workshops with stakeholders, and input from curriculum experts and s in the agricultural sector, to a series of workshops within the MSPA at the University of Jambi.

1.2. Study Program Identity

Table 1. The Identity of MSPA, University of Jambi

University	:	University of Jambi
Faculty	:	Agriculture
Major	:	Agroecotechnology
Study program	:	Agroecotechnology
Educational level	:	Master (S2)
Qualification Levels of Graduates Based on EQF	:	Level 7 EQF
Graduate Degree	:	Master of Agriculture (MP)
SK Number. PS establishment	:	85/E.E2/DT/2014
PS establishment decree date	:	January 28, 2014
The Signing Officer of the SK Establishment of PS	:	Director General of Higher Education Ministry of National Education of the Republic of Indonesia
Month & Year of Commencement of PS	:	May 2014
Operational Permit Decree Number	:	107/E1.3/HK/2014
Operational Permit Decree Date	:	May 19, 2014
Final Accreditation Grade	:	B (Very Good)
Decree of Higher Education National Accreditation Board	:	No.478/SK/BAN-PT/Akred/M/II/2018
Address	:	University of Jambi, Graduate Program Secretariat, Jl. HA Manap – Telanaipura
Phone Number	:	0741-583453
Homepages	:	https://agroekotechnology.unja.ac.id/s2-prodi-agroekotechnology/
e-mail		s2agroekotechnology@unja.ac.id

1.3. Curriculum Evaluation

Evaluation of the implementation of the study program curriculum is an activity that is routinely carried out to ensure that the implementation of the curriculum remains on the desired track. Its contents are the development of the scientific field (scientific vision) of agroecotechnology,

adjustment to market needs (market signals), and adaptation to the National Higher Education Standards (SNPT) based on existing provisions, namely the Regulation of the Minister of Research, Technology and Higher Education of the Republic of Indonesia Number 44 of 2015.

In addition, evaluations are carried out so that the curriculum can respond to the challenges that continue to develop. Based on the evaluation of the existing curriculum, several important issues as challenges for study programs that need to be resolved are:

a. Most of the fields of knowledge developed in the study program are not in accordance with the needs of the desired graduate profile, and the graduates do not have a good grasp of the profile they choose;
b. There is a gap between market needs and the quality of the resources produced. This can be seen from the fact that most of the graduates produced are not yet working or are still unemployed, and only a small number can create their own jobs but in a small business capacity;
c. Adjustment of study program education that is aligned with SNPT has not gone well and as expected due to the need to improve the quality of study program management resources and the existence of study program opportunities to continue learning and follow various developments in study program management.

Related to the above, study program management needs to be improved in quality and quantity, to ensure adequate capacity so that all existing developments can be read and able to provide the right solutions for the development of quality graduates and in accordance with the vision and mission of the study program that has been determined and has accommodated the interests of implementing existing government policies.

1.4. Data Tracer Study

The data tracer study conducted shows that all alumni use their funds to study at the MSPA. Furthermore, the survey results show that around 66% are those with working status so that further studies can be carried out at their own expense, while the rest are fresh graduates who still get support from their families.

The survey results showed that most (87%) got a job or had worked for less than 6 months after graduating from the MSPA. Approximately 53% of graduates work in government agencies, 20% in the private sector and the rest work in non-profit institutions/NGOs or self-employed, and some continue their studies to the doctoral level (Figures 1 and 2).

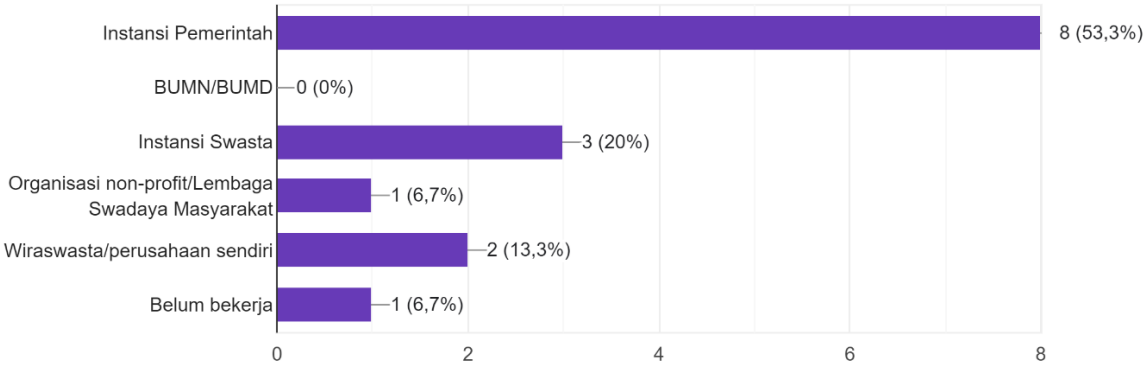

Figure 1. Types of work sectors for alumni of the MSPA

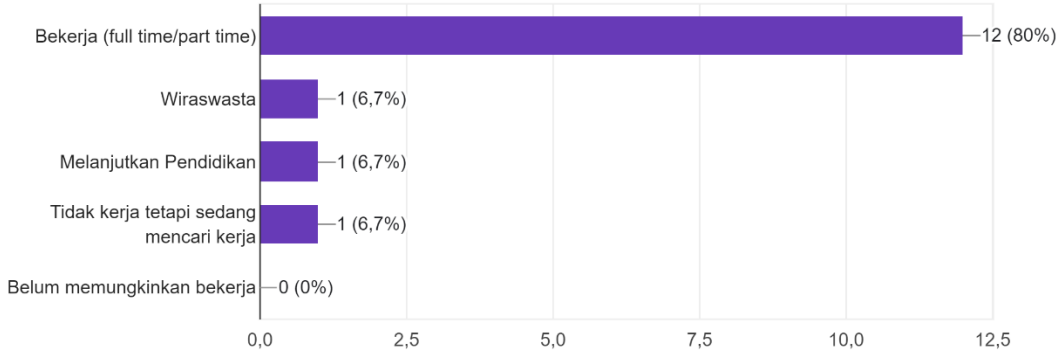

Figure 2. Data on employment status of the MSPA alumni

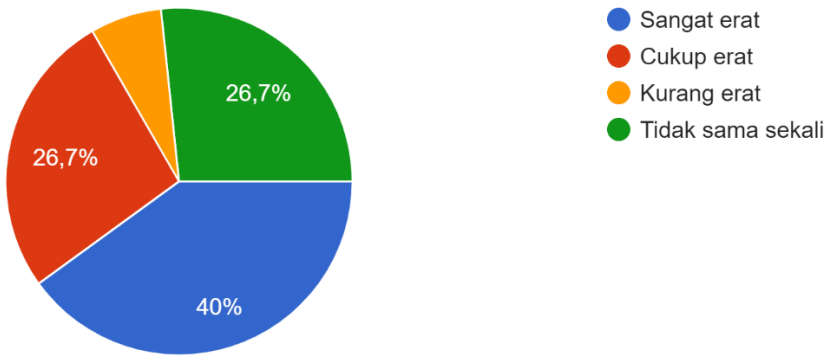

Figure 3. The close relationship between the fields of study and the work of alumni of the MSPA

The results of the tracer study can be concluded that graduates have worked in places that are in accordance with the field of study taken at the

MSPA. This can be seen from the survey that approximately 70% stated that the field of work taken at this time is very closely related to the field of study taken so that it can be said that after graduating alumni can utilize the knowledge and knowledge gained for career development in the agency they work in (Figure 3).

1.5. Basis for Curriculum Design and Development

a. Philosophical Foundation

The philosophical foundation in curriculum development is the assumptions or formulations obtained from the results of thinking deeply, analytically, logically, and systematically (philosophically) in planning, implementing, fostering, and developing the curriculum. The use of this philosophy is suitable in curriculum development in the form of programs (written), as well as curriculum in the form of operational implementation) on campus. To formulate and develop every aspect of the four elements of the curriculum, namely the development of objectives, content/materials, methods/processes, and evaluation development) must be carried out by developing in-depth, logical, systematic, and comprehensive thinking or in other words the reasons formulated using the results of philosophical thought.

The MSPA is part of the University of Jambi which is one of the tertiary institutions with a curriculum that is able to accommodate efforts to produce graduates who have knowledge and understanding, intellectual skills, Practical Skills, Managerial Skills and Attitudes, with intellect and resourcefulness. scientific reasoning and the ability to develop science and technology to increase faith and piety to Allah SWT in order to educate the nation for the attainment of national goals as stated in the opening of the 1945 Constitution.

The philosophical foundations that guide the MSPA are: (i) National Education Goals (ii) Government Regulation No. 60 of 1999 concerning Higher Education (iii) Permendikbud Number 3 of 2020 concerning National Higher Education Standards; (iv) Jambi University Statutes 2020 (v) Jambi University RIP 2020 (vi) Jambi University Strategic Plan 2020.

b. Sociological Basis

The sociological foundation concerns social forces in society. These forces are developing and always changing according to the times. This power can be in the form of real or potential power, which influences the development of culture in tune with the dynamics of society.

Any discussion of the curriculum must consider the social background, especially the relationship between the campus and the community, and how that relationship influences curriculum decisions. Social intelligence is very important for curriculum planners and developers. Curriculum decisions take place in a complex social environment, through demands imposed by society and filtered out in the Postgraduate. Curriculum development must consider and use social foundations.

Sociologically the MSPA, Faculty of Agriculture, University of Jambi, is part of the stake holders of higher education in their field which cannot be separated from the influence of other stakeholder components including (i) The academic community of the MSPA including the Jambi University management to the Rector who have a role in determining the direction and development of the MSPA curriculum ; (ii) Professional organizations in the field of Agroecotechnology both regionally, nationally and internationally; (iii) the MSPA alumni which have experiences in the field of work in the community in implementing science and technology of Agroecotechnology and other related sciences; (iv) Users especially those related to agriculture and other related fields; (v) The public in general who have an interest in the implementation of science and technology in the field of Agroecotechnology and other related fields.

c. Psychological Foundation

The psychological foundation is a foundation that is used as a starting point in the educational process which discusses various information about the human soul or psyche which is always experiencing development so as to facilitate the implementation of the educational process. The psychological implications are one of the cornerstones of curriculum development, namely for teachers as designers, and developers and at the same time the forefront, namely as curriculum implementers.

The psychological foundation in the application of the educational foundation is very important. By knowing educational psychology (developmental psychology, learning psychology, and social psychology), the provision of material portions and approaches used in educational activities will be appropriate according to the level of development. Students are individuals who are in the process of development (physical, intellectual, social, emotional, moral, and so on). The main task of a teacher as an educator is to help optimize student development based on their developmental tasks.

By applying a psychological foundation in the process of implementing the curriculum in study programs Master of Agroecotechnology. It is hoped that education can be carried out that is relevant to the nature of students, both in terms of adjustments in terms of the materials that students must provide/learn, as well as in terms of delivery and learning processes as well as adjustments from elements of other educational efforts.

d. Historical Foundation

The MSPA is one of the study programs with strong legality with a letter of establishment by the Directorate General of Higher Education no85/E.E2/DT/2014and continued with Lettersoperating permit from the Directorate General of Higher Education dated May 19, 2014 through Decree No. 107/E1.3/HK/2014 dated 03 July 2014.

This study program is under the coordination of the Faculty of Agriculture, University of Jambi. The curriculum of the MSPA was compiled based on the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, Regulation of the Minister of Research, Technology and Higher Education of the Republic of Indonesia Number 44 of 2015 concerning National Higher Education Standards (SNPI) and curriculum implementation referring to the Indonesian National Qualifications Framework Standards (IQF).

The study program has also reflected the learning outcomes obtained both through the education process and independent learning in accordance with the subjects being taught. The developed curriculum is expected to be able to facilitate student learning in accordance with the

times; a curriculum that is able to pass on the cultural values and golden history of past nations, and transform it in the era in which one is studying; a curriculum that can prepare students to live better in the 21st century, have an active role in the industrial era 4.0, and be able to read signs of its development.

e. Juridical Foundation

1. Law Number 20 of 2003 concerning the National Education System (National Education System Law)
2. Law Number 12 of 2012 concerning Higher Education (UU DIKTI)
3. Regulation of the President of the Republic of Indonesia Number 8 of 2012 concerning the Indonesian National Qualifications Framework (KKNI)
4. Regulation of Minister of Education and Culture No. 03 of 2012 concerning SN Dikti
5. Government Regulation of the Republic of Indonesia No.23 of 2013 concerning Amendments to Government Regulation No.19 of 2005 concerning National Education Standards
6. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 73 of 2013 concerning Implementation of IQF at PT
7. Government Regulation Number 4 of 2014 concerning Implementation of Higher Education and Management of Higher Education
8. Regulation of the Minister of Research, Technology and Higher Education of the Republic of Indonesia Number 44 of 2015 concerning National Higher Education Standards
9. Jambi University Rector Regulation Number 09 of 2020 concerning academic regulations.

CHAPTER 2. VISION, MISSION, OBJECTIVES AND TARGETS OF THE STUDY PROGRAM

2.1. Vision, Mission, Goals and Educational Strategy

The MSPA as the institution of agricultural education at the Master level (Masters), Department of Agroecotechnology, Faculty of Agriculture, University of Jambi has the following vision, mission and objectives:

Vision: in 2029 it will become the Agroecotechnology Masters Study Program which produces graduates with entrepreneurial characteristics in the field of agroecotechnology.

Mission:

1. Organizing higher education in the field of agroecotechnology to produce graduates who master science and technology with entrepreneurial insight.
2. Organize and develop research with actual and strategic themes and contribute to developing science and technology in the field of Agroecotechnology.
3. Organizing community service activities in the field of Agroecotechnology and implementing them for the welfare of society.
4. Organizing extensive institutional cooperation with stakeholders.

Objectives

1. To produce graduates who have faith, uphold moral and ethical values, have the ability to developing science and technology in the field of Agroecotechnology.
2. Producing graduates who are independent, competitive and have an entrepreneurial spirit.
3. Increasing the quantity and quality of research for the development of science and technology in the field of agroecotechnology.
4. Increasing the quantity and quality of community service activities in a sustainable manner
5. Establish cooperation in the field of agroecotechnology with various stakeholders globally and sustainably.

Strategy to achieve goals

1. Expanding access and improving the quality of study program education through improving the quality of the education process and strengthening the curriculum.
2. Strengthening the management system through improving organization and management, increasing credibility, transparency, accountability and responsibility.
3. Improving the quality of research and community service on an entrepreneurial basis through increasing the competence of lecturers.
4. Increasing the capacity of human resources through strengthening external roles and cooperation networks.
5. Improving the facilities and quality of publication of scientific work by lecturers and students.

2.2 Profile of Permanent Lecturers

The lecturers in the Agroecotechnology Masters Study Program are all permanent lecturers as listed in Table 1.

Table1Permanent Lecturer in the Agroecotechnology Masters Study Program, Faculty of Agriculture, University of Jambi

No.	Full Lecturer Name	NIDN**	date Born	Academic Position	Academic degree	Education S1, S2, S3 and from the University	Fields of Expertise for Every Level of Education
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Ahmad Riduan	0027056709	05-27-1967	Head Lecturer	Ir. M.Sc. Dr.	S1 (UNJA) S2 (IPB) S3 (IPB)	AgronomyAgronomy/Plant BreedingAgronomy/Plant Breeding
2.	Anis Tatik Maryani	0025025801	02-25-1958	Professor	Ir., MP., Dr., Prof.	S1 (UNJA) S2 (UNAND) S3 (IPB)	AgronomyAgronomyAgronomy
3	Asmadi Saad	0009036803	09-03-1968	Lector	Ir. M.Sc. Dr.	S1 (UNJA) S2 (IPB) S3 (IPB)	Soil ScienceEvaluation of Land ResourcesEvaluation of Land Resources
4.	Asniwita	0015116502	11-15-1965	Head Lecturer	Ir., M.Si., Dr	S1 (UNAND) S2 (IPB) S3 (IPB)	Plant DiseasesPlant DiseasesPlant Diseases
5.	Aswandi	0027126206	27-12-1962	Head Lecturer	Ir. MSc., Dr.	S1 (UNAND), S2 (IPB) S3 (UNSRI)	Soil Science DAS ManagementEnvironmental Science
6.	Anthony Dedy	0020097802	09-20-1978	Lector	SP., M.Sc. Ph. D	S1 (UNJA) S2 (IPB) S3 (University of Reading)	Geology Regional Planning Science SoilScience
7.	Ellis Kartika	0016116308	11-16-1963	Head Lecturer	Ir. MSc., Dr.	S1 (IPB) S2 (IPB) S3 (IPB)	Seed technologyAgronomyBiotechnology
8.	Eliyanti	0028116707	28-11-1967	Head Lecturer	Ir. MSc., Dr.	S1 (UNJA) S2 (IPB) S3 (IPB)	AgronomyAgronomy/Plant BreedingPlant Breeding-Biomolecular
9.	Emadani	0014016502	14-01-1965	Lector	Ir., M.Sc., Dr.	S1 (UNPAD) Masters's Degree (University of New England)	Geology Fertility Soil Chemistry Fertility Soil Chemistry

No.	Full Lecturer Name	NIDN**	date Born	Academic Position	Academic degree	Education S1, S2, S3 and from the University	Fields of Expertise for Every Level of Education
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
						S3 (UNAND)	
10.	Fuad Nurdiansyah	0012128101	12-12-1981	Expert Assistant	SP., M.PlaHBio., Ph.D	S1 (UNJA)S2 (The Univ. of Adelaide)S3 (The Univ. of Gottingen)	Pests and Plant Diseases Soil Health Agroecology
11.	Henny H	0009106209	09-10-1962	Head Lecturer	Ir., M.Sc., Dr.	S1 (UNAND) S2 (IPB) S3 (IPB)	Soil Science Soil and Water Conservation Watershed Management
12	Heri Junedi	0012066407	12-06-1964	Lector	Ir., M.Sc., Dr.	S1 (UNSRI) S2 (KUL, Belgium) S3 (UNSRI)	Geology Water resources Land Management
13.	Husda Marwan	0021037105	21-03-1971	Head Lecturer	Ir,. MP, Dr.	S1 (UNAND) S2 (UNAND) S3 (IPB)	HPTHPT Phytopathology
14.	Lizawati	0005127005	05-12-1970	Head Lecturer	SP., M.Si., Dr.	S1 (UNJA) S2 (IPB) S3 (IPB)	AgronomyPlant BiotechAgronomy
15.	M.Sharif	0001015808	01-01-1958	Head Lecturer	Ir. MS., Dr.	S1 (UNJA) S2 (UGM) S3 (UNIBRAW)	BDP-Soil Science Soil and water management (PTA) Plant nutrition and soil fertility
16.	Made Deviani Duaja	0008036408	08-03-1964	Lector	Ir. MS., Dr.	S1 (UNDANA) S2 (UNPAD) S3 (UNPAD)	AgronomyEcophysiologyHorticulture
17.	Mapegau	0013045406	13-04-1954	Professor	Prof. Ir., MS., Dr.	S1 (UNJA) S2 (UNPAD) S3 (UNPAD)	AgronomyAgronomyTan. Food
18.	Nerdy Soverda	0004045907	04-04-1959	Head Lecturer	Ir., MS. Dr.	S1 (UNJA) S2 (UNPAD) S3 (IPB)	AgronomyAgronomy Agronomy

No.	Full Lecturer Name	NIDN**	date Born	Academic Position	Academic degree	Education S1, S2, S3 and from the University	Fields of Expertise for Every Level of Education
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
19.	Novalina	0020017304	01-20-1973	Lector	SP., MSc., Dr.	S1 (IPB) S2 (IPB) S3 (IPB)	Soil ScienceBiologyBiology
20	Rainiyati	0027096307	27-09-1963	Head Lecturer	Ir., M.Sc., Dr.	S1 (UNJA) S2 (IPB) S3 (IPB)	AgronomyAgronomy/BiotechnologyAgronomy/Biotechnology
21.	Sarman S.	0004085908	04-08-1959	Head Lecturer	Ir. MP.,.	S1 (UNJA) S2 (UNIBRAW) S3 (UNSRI)	AgronomyAgronomyAgronomy
22.	Nusifera socialist	0024067701	24-06-1977	Lector	SP., MP. Dr.	S1 (UNPAD) S2 (UNPAD) S3 (UNPAD)	Breeding Tan. Breeding Tan. Breeding Tan.
23.	Sunarti	0027127307	27-12-1973	Head Lecturer	Dr., SP, MP.	S1 (UNJA) S2 (UNPAD) S3 (IPB)	Soil ScienceSoil Conservation and ReclamationDAS Management
24.	Wilyus	0023096402	23-09-1964	Head Lecturer	Ir. M.Si, Dr	S1 (UNAND) S2 (IPB) S3 (UNSRI)	Plant PestsPlant PestsPlant Pests
25.	Yuni Ratna	0011067006	11-06-1970	Lector	SP. MP. Dr.	S1 (UNJA) S2 (UNIBRAW) S3 (UGM)	AgronomyHPTHPT
26.	Zulkarnain	0010106209	10-10-1962	Professor	Ir., M. Hort Sc., Dr., Prof.	S1(UNSRI),S2 (Univ. of Melbourne)S3 (Univ. of New England)	AgronomyPlant BiotechPlant Biotech

2.3. Learning Resources

MAE has adequate learning resources facilities and infrastructure to support the implementation of the learning process well. The PSMAE is supported by the Postgraduate Program (PPs) of the University of Jambi and the Jambi Faculty of Agriculture, which continues to improve its capacity and quality to be able to improve services in the implementation of the learning process.

Facilities available include lecture halls and seminar rooms with air conditioning equipped with Smartboards, Whiteboards, LCD Projectors, and free internet access facilities, and administration rooms and toilets. The internet network has a very good signaland electrical outlets (terminals) that can be accessed 24 hours a day.

Genetics and Plant Breeding Laboratory, Plant Physiology Laboratory, Horticulture Laboratory, Tissue Culture Laboratory, Seed Science and Technology Laboratory, Plant Pest and Disease Laboratory, Soil Survey and Watershed Management Laboratory, Chemistry and Soil Fertility Laboratory, and Food Analysis Laboratory are available. to support research activities for both students and lecturers, a multi-purpose room or hall, computer room, prayer room and canteen, and parking lots are also available for use together with other master' study programs within the University of Jambi.

These facilities are to create a climate that encourages the development of professional academic activities in the teaching and learning process, as well as creating a conducive climate, especially in student-lecturer interactions. Jambi University Homepage which is used to obtain academic information and is used as an e-learning tool (https://elearning.unja.ac.id/). Information systems are also available for academic guidance through SIAKAD (www.siakad.unja.ac.id) and final task guidance (www.elista.unja.ac.id).

The library is available at the Jambi University PPs level and the University level equipped with a collection of books and journals as well as internet facilities and national and international scientific e-journals. Use of library facilities under the coordination of the Central Library.

Academics can utilize the library by showing identity cards issued by the University such as KTM (Student Identity Card) for students, employee cards for lecturers and administrative staff. In addition, PSMAE has a reading room which is under the coordination of the Agrotechnology Study Program (S1) so that student literature needs can be obtained in the reading room.

2.4. Student Support Facilities

Other facilities available at the University level include several sports facilities, namely tennis courts, open fields (for public activities and sports), Foot Ball Field and Sport Center and student activity center building. In addition, there are bank and ATM facilities, mushalla and campus mosque, parking lots, green open spaces, canteens and others.

2.5. Graduate Profiles

Graduate Profile is the role expected to be carried out by graduates of the Agroecotechnology Masters Study Program in a particular field of expertise or work after completing their studies. The profile of graduates is determined based on the vision and mission of the Study Program,SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats)and market needs through tracer studies of alumni and input from professional associations, as well as stakeholders. By having a graduate profile set, tertiary institutions can guarantee that their prospective students will be able to play the role in the field of agriculture as: 1) Consultant, 2). Managers and Entrepreneurs, 3). Researcher and educator, who are reliable and professional in the fields of land resource management, agronomy, horticulture, plant breeding and seed technology, plant protection, forestry, biology, biotechnology, and environmental sciences according to the needs of society and scientific developments.

The profile of graduates of the Master Study Program of Agroecotechnology (MSPA) is also compiled referring to the vision and mission of the Faculty and the University, the level 8 Indonesian National Qualifications Framework (KKNI) descriptors, National Higher Education

Standards No. 3 of 2020, and the ability of graduates in the industrial era 4.0, as well as based on the agreement of institutions administering similar study programs (Prodi) and evaluation results from other internal and external stakeholders. A description of the graduate profile is presented in Table 2.

Table 2 Profile Description of Agroecotechnology Masters Study Program Graduates Based on KKNI

No.	Graduate Profiles	Profile Description
1	Consultant	Graduates who are able to advocate, bridge and guide the implementation of problem solving in agriculture
2	Manager and Businessman	Graduates who are able to act as organizational drivers who understand the vision and mission of organizations and agricultural business s who utilize resources optimally
3	Researcher and Academics	• Graduates who are able to identify, formulate and analyze problems appropriately, design and carry out research, publish innovative research that is competitive at the national and international levels. • Graduates who are able to become educators in disseminating knowledge in agriculture

This graduate profile is a reference in determining Graduate Learning Outcomes (PLO), which includes mastery of attitudes, general skills, specific skills, and knowledge. In addition to considering the needs of stakeholders and studies from the development of scientific disciplines.

CHAPTER. 3. FORMULATION OF GRADUATE LEARNING OUTCOMES AND DETERMINATION OF STUDY MATERIALS

3.1. Formulation of Graduate Learning Outcomes

Graduate Learning Outcomes (PLO) or Learning Outcomes in the Indonesian National Qualifications Framework (KKNI) are defined as abilities acquired through the internalization of knowledge, attitudes, skills, and work experience accumulation. Based on the Indonesian National Qualifications Framework (KKNI) level 8, the competence of master graduates must fulfill three (3) aspects of competence, namely (1) aspects of work scope based on the knowledge possessed; (2) aspects of ability in the field of work; and (3) aspects of managerial ability. Concerning the description of the IQF CP, the formulation of the PLO Study Program in the Graduate Competency Standards (SKL) includes Attitudes, Knowledge, General Skills and Special Skills stated in the PLO formulation of the Agroecotechnology Masters Program, Faculty of Agriculture, University of Jambi.

Based on Permenristekdikti No. 44 of 2015 and Permendikbud No. 3 of 2020, attitude is correct and cultured behavior as a result of the internalization and actualization of values and norms that are reflected in spiritual and social life through the learning process, student work experience, research and/or community service related to learning. Meanwhile knowledge is systematic mastery of concepts, theories, methods, and/or philosophies of certain fields of science obtained through reasoning in the learning process, student work experience, research, and/or community service related to learning. While skills are the ability to perform work using concepts, theories, methods, materials, and/or instruments, obtained through learning,

The formulation of the MAE Study Program PLO corresponds to level 8 of the KKNI and SN-DIKTI which is then translated into Graduate Competency Standards which include Attitude standards, Knowledge standards, and Skills standards (Table 3).

Table 3 Learning Outcomes of the Masters Study Program of Agroecotechnology

Element	Code	PLO description
Attitude	S01	Demonstrate a lifelong learning attitude, and have an entrepreneurial and professional spirit in daily life and at work.
	S02	Demonstrate honest, responsible, ethical, disciplined, law-abiding, objective and competitive attitudes.
Knowledge	P01	Able to master the knowledge of sustainable plant cultivation technology through research based on local resources, to produce innovative and widely tested works.
	P02	Able to develop new knowledge in the field of sustainable plant cultivation using a scientific approach.
	P03	Able to master modern science and technology to produce quality research products in the field of sustainable plant cultivation.
General Skills	KU01	Have the ability to formulate and solve challenges that arise in plant cultivation technology, involving aspects of ecology, planting media and production.
	KU02	Able to design a sustainable crop cultivation model based on multidisciplinary research using a scientific method and reasoning approach.
	KU03	Able to apply various technologies in the field of plant cultivation in a sustainable, competitive manner, and develop new concepts through a scientific approach in agricultural disciplines.
Special skill	KK01	Able to apply appropriate methods in conducting specific research based on the latest scientific findings in the field of agricultural cultivation technology.
	KK02	Able to investigate, analyze, evaluate, and conclude changes in the external environment based on research results in the development of competitive plant cultivation technology.
	KK03	Able to manage research and develop new technology of plant cultivation in a sustainable manner that benefits the community and the environment, and can gain national and international recognition.

3.2. Determination of Fields and Study Materials

Agroecotechnology is a field of agriculture related to cultivation technology and plant production, which consists of several fields of study, namely (1) attitude/character of plant cultivators and production, (2) planting media, (3) plant cultivation technology, (4) environment, and (5) communication. The field of study is the scientific core of the MAE study program which is poured into more detailed study material as a form of courses in the curriculum. Fields of study and early study materials needed to support the achievement of the study program PLO (Table 4).

Table4Field of study of Cultivation Technology and Plant Production as well as study materials as forming courses in the Curriculum of the Agroecotechnology Masters Study Program

No	**Field of study of Plant Cultivation Technology and Production**	**Study materials as forming courses**
1.	Attitude/Character of Plant Cultivation and Production s	1. Thesis
2.	Growing media	2. Soil Fertility Management 3. Interactions between Nutrients and Plants 4. Fertilizer and fertilization technology
3.	Plant cultivation technology	5. Plant Biotechnology 6. Plant Physiology 7. Plant Adaptation Mechanisms 8. Sustainable Agriculture 9. Genetical manipulation 10. Molecular biology 11. Anther culture 12. gene transfer 13. Somaclonal diversity 14. Seed physiology and biochemistry 15. Seed deterioration 16. Seed anatomy 17. Plant Ecology 18. Plant Resistance Mechanisms 19. Environmental Stress 20. Stress Physiology 21. pest management 22. Organic fertiliser

No	Field of study of Plant Cultivation Technology and Production	Study materials as forming courses
		23. Pesticide 24. Peatlands 25. Wetlands 26. Acid sulfate soil 27. Lebak swamp land 28. Saline land 29. Soil and plant analysis 30. Fertilizer and environment 31. Statistics 32. Abiotic and biotic factors 33. Sources and sinks 34. Plant Cultivation Techniques 35. Experimental and Survey Methods 36. Biological agent 37. Biodiversity and habitats 38. Management of agricultural resources
4.	Environment	39. Soil and water quality
5.	Communication	40. Research methods 41. Regression And Correlation 42. Philosophy of science and knowledge

The field of study is adjusted to the PLO of the Agroecotechnology Masters Program by creating a matrix of links between elements of the PLO Study Program and the field of study (Table 5)

Table 5 Matrix of Correlation between PLO Study Program and Field of Study

PLO		Field of Study
Attitude		
S01	Demonstrate a lifelong learning attitude, and have an entrepreneurial and professional spirit in daily life and at work.	(1) The attitude/character of the farmers and producing plants (5) Communication
S02	Demonstrate honest, responsible, ethical, disciplined, law-abiding, objective, and competitive attitudes.	(1) The attitude/character of the farmers and producing plants (5) Communication

PLO		Field of Study
Knowledge		
P01	Able to master the knowledge of sustainable plant cultivation technology through research based on local resources, to produce innovative and widely tested works.	(1) Attitude/character of cultivators and crop production (2) Growing media (3) Plant cultivation technology (4) Environment (5) Communication
P02	Able to develop new knowledge in the field of sustainable plant cultivation using a scientific approach.	(2) Planting media (3) Plant cultivation technology (5) environment
P03	Able to master modern science and technology to produce quality research products in the field of sustainable plant cultivation.	(2) Planting media (3) Plant cultivation technology
General Skills		
KU01	Have the ability to formulate and solve challenges that arise in plant cultivation technology, involving aspects of ecology, planting media and production.	(1) Attitude/character of cultivators and crop production (2) Growing media (3) Plant cultivation technology (4) Environment (5) Communication
KU02	Able to design a sustainable crop cultivation model based on multidisciplinary research using a scientific method and reasoning approach.	(1) Attitude/character of cultivators and crop production (2) Growing media (3) Plant cultivation technology (4) Environment (5) Communication
KU03	Able to apply various technologies in the field of plant cultivation in a sustainable, competitive manner, and develop new concepts through a scientific approach in agricultural disciplines.	(1) Attitude/character of cultivators and crop production (2) Growing media (3) Plant cultivation technology (4) Environment (5) Communication
Special skill		

PLO		Field of Study
KK01	Able to apply appropriate methods in conducting specific research based on the latest scientific findings in the field of agricultural cultivation technology.	(1) Attitude/character of cultivators and plant production (2) Growing media (3) Plant cultivation technology (4) Environment (5) Communication
KK02	Able to investigate, analyze, evaluate, and conclude changes in the external environment based on research results in the development of competitive plant cultivation technology.	(1) Attitude/character of cultivators and crop production (2) Growing media (3) Plant cultivation technology (4) Environment
KK03	Able to manage research and develop new technology of plant cultivation in a sustainable manner that benefits the community and the environment, and is able to gain national and international recognition.	(1) The attitude/character of the farmers and producing plants (3) Plant cultivation technology (5) Communication

3.3. Description of Study Materials

The description of the study material will guide the accuracy of the naming of the course and make it easier for the course teaching team to prepare the Semester Learning Plan (RPS) presented in Table 6 below:

Table6Description of Curriculum Study Materials for the Agroecotechnology Masters Study Program

No	Study Materials	Description of Study Materials
1	Thesis	Designing research, proposal seminars and research results, and being responsible for the resulting design results
2	Soil Fertility Management	Factors influencing and indicators of soil fertility and its management
3	Soil and Water Quality	Soil and water quality management
4	Interaction of nutrients and plants	Mechanisms of nutrient availability and plant nutrient absorption processes
5	Fertilizer and fertilization technology	Characteristics of fertilizers and their reactions in the soil

No	Study Materials	Description of Study Materials
6	Plant Biotechnology	Explain the meaning and role of biotechnology in agriculture, cells, DNA structure, understanding and methods of plant genetic transformation, transgenic plants, genetic engineering of plants against herbicide resistance, genetic engineering of plants against pests and diseases, genetic engineering of plants against environmental stresses, genetic engineering of plants for improvement yield quality, antisense RNA technology, and biotechnology applications in agriculture.
7	Plant Physiology	Metabolism that occurs in plants which includes photosynthesis, respiration, photorespiration, water transport, nutrients, and photosynthesis, as well as hormones and their effects on plant growth, development and production
8	Plant Adaptation Mechanisms	Plant adaptation mechanisms, namely morphology, physiology, and habits or behavior. This adaptation will produce physical characteristics, physiology, as well as special habits in plants to survive in certain environments.
9	Sustainable Agriculture	Understanding of the implementation of sustainable agriculture (definition, indicators, and its aspects)
10	Genetical manipulation	Describes the principles of genetic engineering: genomic DNA, restriction enzymes, ligation, transformation, Recombinant DNA; Molecular analysis: PCR, DNA Sequencing, Southern Hybridization analysis, Microarray, and Next Generation Sequencing (NGS). Laboratory practice is an integral part that is expected to clarify concepts and theories given in lectures. It also discussed the application of genetic engineering in agriculture
11	Molecular biology	Molecular foundations of the processes of replication, transcription, and translation of genetic material
12	Anther culture	Technology for obtaining pure strains through the production of multiple haploid plants
13	gene transfer	Transferring genetically engineered foreign genes inserted in plant species.

No	Study Materials	Description of Study Materials
14	Somaclonal diversity	Genetic diversity produced through tissue culture
15	Seed physiology and Biochemistry	Germination power, germination rate, content of starch, fat, protein, and electrical conductivity
16	Seed deterioration	Deterioration process, factors affecting deterioration, technology and seed management strategy
17	Seed Anatomy	The internal structure and main components of the seed
18	Plant Ecology	Agricultural ecosystem, description of its components, and the interaction between plants and their environment.
19	Plant Resistance Mechanisms	Types of plant resistance, factors affecting plant resistance, as well as various methods and mechanisms that can be used to increase plant resistance from pathogen infections and pest attacks
20	Environmental Stress	Abiotic stresses are produced by natural environmental factors such as extreme temperatures, wind, drought, and salinity as well as biotic stresses such as pests, diseases and weeds.
21	Stress Physiology	Plant physiology to the suboptimal growing environment associated with plant adaptability against stress. Explaining the mechanism of plant tolerance to environmental stress in the tropics, which has implications for the inclusion of important physiological characteristics for crop improvement (crop improvement) and development of agronomic aspects. Environmental stress that occurs in the tropics, namely high temperature stress, low light intensity (shade), drought, inundation and immersion, salinity, and specific ions (Al and Fe). The linkages of some of these environmental stresses to the issue of climate change will be briefly discussed
22	pest management	Understanding the management of plant pests, understanding and methods of integrated OPT handling

No	Study Materials	Description of Study Materials
23	Organic fertilizer	Understanding and application of microorganisms that are useful for soil and plant productivity
24	Pesticide	Understanding the implementation of pesticides that can be used for the control of plant pests
25	Peatlands	Management of peatlands, characteristics and characteristics of peatlands, suitability of peatlands for agriculture, cultivation, and management of agricultural land on peatlands
26	Wetlands	Definition of Wetlands, Characteristics and problems of management of wetlands, efforts to overcome the problems
27	Acid sulfate soil	Definition of acid sulfate soil, formation and identification of acid sulfate soil, nature and character of acid sulfate soil, cultivation and management of acid sulfate soil
28	Lebak swamp land	Characteristics and problems of leak swamp land
29	Saline land	Characteristics and problems of saline soils
30	Soil and plant analysis	Relationship between soil and plant nutrient content with fertilizer requirements.
31	Fertilizer and environment	Fertilizer application and its impact on environmental quality
32	Statistics	Presentation and data analysis methods for problem solving in agricultural cultivation
33	Abiotic and biotic factors	Understanding of abiotic and biotic factors that affect plant growth and production
34	Sources and sinks	The balance between source-sink to increase plant growth and production
35	Plant Cultivation Techniques	Understanding of Cultivation Engineering activities starting from seed preparation, planting, maintenance to production
36	Experimental and Survey Methods	Meaning, space scope, and experimental and survey methods in research
37	Biological agent	Predators, Parasitoids, Entomopathogens, Antagonistic agents, Induction of plant resistance by endophytic microorganism

No	Study Materials	Description of Study Materials
38	Biodiversity and habitats	Ecological functions and ecosystem services to terrestrial, aquatic, and habitat living things
39	Management of agricultural resources	Development and utilization of biological natural resources, especially productive plants that produce and can be used as human life
40	Research methods	Methods of conducting scientific research, being able to make research proposals, carry out research and prepare research reports. Know the research process in general, starting from problem determination, literature review, identification of research variables, experimentation, observation and data collection, interpretation of experimental analysis results, and procedures for writing theses and scientific publications as well as seminar procedures.
41	Regression and Correlation	Correlation analysis is an analysis used to determine the closeness of the relationship between several variables. Usually this correlation test will be closely related to the regression test which shows whether each variable influences the other. Regression analysis is to predict how far the existing influence is
42	Philosophy of science and knowledge	Essentially correct knowledge is obtained through a philosophical method or system approach

CHAPTER 4. COURSE DISTRIBUTION MATRIX

4.1 Matrix of Relationship between Graduate Learning Outcomes and Graduate Profiles

Graduate learning outcomes become graduate competency standards that include attitudes, knowledge, general skills and specific skills. Fulfillment of learning outcomes can be measured to evaluate the process and results of meeting the expected competency standards. To achieve the desired graduate profile, appropriate learning outcomes are needed, so they need to be compiled suitability of PLO and profile of Agroecotechnology Study Program graduates (Table 7).

Table 7. PLO relationship matrix with Graduate Profiles

PLO		Consultant	Manager and Business man	Researcher and Academics
Attitude				
S01	Demonstrate a lifelong learning attitude, and have an entrepreneurial and professional spirit in daily life and at work.	☑	☑	☑
S02	Demonstrate honest, responsible, ethical, disciplined, law-abiding, objective and competitive attitudes.	☑	☑	☑
Knowledge				
P01	Able to master the knowledge of sustainable plant cultivation technology through research based on local resources, to produce innovative and widely tested works.	☑	☑	☑
P02	Able to develop new knowledge in the field of sustainable plant	☑	☑	☑

PLO		Consultant	Manager and Business man	Researcher and Academics
	cultivation using a scientific approach.			
P03	Able to master modern science and technology to produce quality research products in the field of sustainable plant cultivation.	☑	☑	☑
General Skills				
KU01	Have the ability to formulate and solve challenges that arise in plant cultivation technology, involving aspects of ecology, planting media and production.	☑	☑	☑
KU02	Able to design a sustainable crop cultivation model based on multidisciplinary research using a scientific method and reasoning approach.	☑	☑	☑
KU03	Able to apply various technologies in the field of plant cultivation in a sustainable, competitive manner, and develop new concepts through a scientific approach in agricultural disciplines.	☑	☑	☑
Special skill				
KK01	Able to apply appropriate methods in conducting specific research based on the latest scientific findings in the field of agricultural cultivation technology.	☑	☑	☑
KK02	Able to investigate, analyze, evaluate, and conclude	☑	☑	☑

PLO		Consultant	Manager and Business man	Researcher and Academics
	changes in the external environment based on research results in the development of competitive plant cultivation technology.			
KK03	Able to manage research and develop new technology of plant cultivation in a sustainable manner that benefits the community and the environment, and can gain national and international recognition.	☑	☑	☑

4.2 Formation of Courses and Credit Weights

The link map of study materials and competencies simultaneously is also used to analyze the formation of a course. This can be achieved by analyzing the proximity of study materials and the possibility of effectiveness in achieving competence if several study materials are studied in one subject, and with the right learning strategy or approach. Several study materials into a course can be made through several considerations, namely: (a) there is a close relationship between study materials which if studied in an integrated manner is expected to have better results; (b) the consideration of the scientific context, meaning that students will master a scientific meaning in a certain context; (c) There is an appropriate learning method that makes competency achievement more effective and efficient and has a positive impact on students when a study material is studied in a comprehensive and integrated manner.

As stated by Permendikbud No. 3 of 2020 concerning the National Higher Education Standards (SN-Dikti), the depth and breadth of learning material are formulated by referring to the description of learning outcomes for graduates from the KKNI which contains four elements, namely attitudes and values, workability, scientific mastery, and elements of authority and responsibility.

The level of depth and breadth of learning materials for graduates of the Agroecotechnology Masters program can develop knowledge, technology, and/or art in their scientific field or professional practice through research, to produce innovative and tested works, able to solve problems in science, technology, and/or art in scientific field through an inter or multidisciplinary approach, as well as being able to manage research and development that is beneficial to society and science, as well as being able to gain national and international recognition.

Furthermore, in Permendikbud No. 3 of 2020 Article 9 also states, that the level of depth and breadth of learning material referred to is outlined in Study Materials (BK) which are structured in the form of Courses (MK). Study material is determined by considering the depth and scope of mastery of the material, and is taken from the fields of science that make up the Study Program. Furthermore, from Study Materials it is lowered into Courses, where one Course can consist of one or several Study Materials (Table 8).

Table 8 Study Materials Forming Courses in the Agroecotechnology Masters Study Program

No	Study Materials	Code	Subject	Credits weight
1	Statistics	MAE511	Statistics	3 (3-0)
2	Experimental and Survey Methods Computerized Data Processing Research methods	MAE512	Research methods	3 (3-0)
3	Plant Physiology Plant Ecology	MAE513	Plant Ecophysiology	3 (3-0)
4	Soil and Water Quality Soil Fertility Management	MAE514	Advanced Soil Fertility	3 (3-0)
5	Plant Resistance Mechanisms	MAE515	Plant Resistance	3 (3-0)
6	Genetical manipulation Plant Biotechnology	MAE121	Agricultural Biotechnology	3 (3-0)
7	Thesis	MAE523	Proposal Seminars	1 (1-0)
8	Scientific philosophy and knowledge	MAE522	Science phylosophy	3 (3-0)
9	Interactions between Nutrients and Plants Sustainable Agriculture	MAE126	The Relationship Between Nutrients and Plants	3 (3-0)
10	Plant Physiology Plant Ecology	MAE134	Advanced Plant Metabolism	3 (3-0)
11	Abiotic and biotic factors	MAE125	Special Problems of Plant	3 (3-0)

No	Study Materials	Code	Subject	Credits weight
	Sources and sinks Plant Cultivation Techniques		Production I	
12	Plant Adaptation Mechanisms Plant production potential	MAE123	Special Problems of Plant Production II	3 (3-0)
13	Stress physiology Environmental stress	MAE124	Stress Physiology for Plants	3 (3-0)
14	Fertilizer and fertilization technology Soil and plant analysis Fertilizer and environment	MAT132	Nutrient Management	3 (3-0)
15	Biological agent	MAH122	Biological Control	3 (3-0)
16	pest management	MAH124	Integrated Pest and Disease Management	3 (3-0)
17	Regression And Correlation	MAE631	Regression And Correlation Analysis	3 (3-0)
18	Seed physiology and biochemistry Seed deterioration Seed anatomy	MAE133	Seed Physiology	3 (3-0)
19	Pesticide	MAH133	Pesticide Toxicology	3 (3-0)
20	Molecular biology Anther culture Gene transfer Somaclonal diversity	MAE134	Advanced Plant Breeding	3 (3-0)
21	Wetlands Peatlands Acid sulphate soil Lebak swamp land Saline land	MAT122	Wetland Management	3 (3-0)
22	Plant ecology Biodiversity and habitats Management of agricultural resources	MAE131	Agricultural Ecosystem	3 (3-0)
23	Organic fertilizer	MAE132	Biofertilization	3 (3-0)
24	Thesis	MAE641	Thesis	6 (6-0)

4.3 Structure of Courses in Study Program Curriculum

4.3.1. Curriculum Matrix

The curriculum structure is a set of plans and arrangements regarding courses, credit weights, and semesters. The MAE Study Program curriculum structure functions as a guideline for organizing learning activities to achieve the MAE Study Program educational goals. The courses formed based on the study material in the MAE Study Program curriculum are supporting subjects for achieving the study program's PLO, which consists of Compulsory Courses and Elective

Courses (Table 9).

Table 9 Distribution of Agroecotechnology Study Program Subjects based on Management

No	Classification of Courses	credits
a.	Compulsory Courses	28
b.	Elective courses	15
Number of credits		43

4.3.2 Curriculum Map Based on PLO Prodi

The Curriculum Map is a description of the relationship between each course and graduate competencies. The curriculum map directs the achievement of graduate competencies through learning each subject. Curriculum map, describing the role of each course and academic activities in achieving graduate competence. Through the curriculum map filling in substance and learning methods can be made easier (Table 10).

Table10. Learning Achievement Load for Graduates in each Course in the Agroecotechnology Masters Study Program

Element	Code	PLO description	Subject
Attitude	S01	Demonstrate a lifelong learning attitude, and have an entrepreneurial and professional spirit in daily life and at work.	1. Science phylosophy 2. proposal seminars 3. thesis
	S02	Demonstrate honest, responsible, ethical, disciplined, law-abiding, objective, and competitive attitudes.	1. Science phylosophy 2. Proposal Seminars 3. thesis
Knowledge	P01	Able to master the knowledge of sustainable plant cultivation technology through research based on local resources, to produce innovative and widely tested works.	1. Statistics 2. Research methods 3. Regression and Correlation Analysis
	P02	Able to develop new knowledge in the field of sustainable plant cultivation using a scientific approach.	1. Plant Ecophysiology 2. Advanced Soil Fertility
	P03	Able to master modern science and technology to produce	1. Advanced Soil Fertility

Element	Code	PLO description	Subject
		quality research products in the field of sustainable plant cultivation.	2. Plant Resistance 3. Plant Ecophysiology
General Skills	KU01	Have the ability to formulate and solve challenges that arise in plant cultivation technology, involving aspects of ecology, planting media, and production.	1. Stressed Environmental Plant Breeding 2. Advanced Plant Breeding
	KU02	Able to design a sustainable crop cultivation model based on multidisciplinary research using a scientific method and reasoning approach.	1. Advanced Soil Fertility 2. Special Problems of Plant Production I 3. Special Problems of Plant Production II 4. Statistics 5. Pesticide Toxicology
	KU03	Able to apply various technologies in the field of plant cultivation in a sustainable, competitive manner, and develop new concepts through a scientific approach in agricultural disciplines.	1. Plant Resistance 2. Plant Ecophysiology
Special skill	KK01	Able to apply appropriate methods in conducting specific research based on the latest scientific findings in the field of agricultural cultivation technology.	1. Relationship between Nutrients and Plants 2. Biological Control 3. Seed Physiology
	KK02	Able to investigate, analyze, evaluate, and conclude changes in the external environment based on research results in the development of competitive plant cultivation technology.	1. Advanced Plant Metabolism 2. Nutrient Management 3. Stress Physiology for Plants 4. Integrated Pest and Disease Management 5. Wetland Management 6. Research methodology

Element	Code	PLO description	Subject
			7. Stressed Environmental Plant Breeding
	KK03	Able to manage research and develop new technology of plant cultivation in a sustainable manner that benefits the community and the environment, and is able to gain national and international recognition.	1. sw

Table 11. Learning Achievement Load for Graduates in each Course in the Agroecotechnology Masters Study Program

Courses / credits	Graduate Learning Outcomes (PLO)										
	S01	S02	P01	P02	P03	KU01	KU02	KU03	KK01	KK02	KK03
Stats /3(3-0)			☑				☑				
Research Methodology/ 3 (3-0)			☑				☑				
Plant Ecophysiology/3 (3-0)				☑	☑			☑			
Advanced Soil Fertility /3 (3-0)				☑	☑		☑				
Plant Resistance/3 (3-0)					☑			☑			
Proposal Seminar/3 (3-0)	☑	☑									
Philosophy of Science/3 (3-0)	☑	☑									
Regression and Correlation Analysis/3 (3-0)			☑				☑				
Pesticide Toxicology/3 (3-0)										☑	☑
Stressed Environmental Plant Breeding/3 (3-										☑	

Courses / credits	Graduate Learning Outcomes (PLO)										
	S01	S02	P01	P02	P03	KU01	KU02	KU03	KK01	KK02	KK03
0)											
Relationship Between Nutrients and Plants									☑		
Advanced Plant Metabolism/3 (3-0)										☑	
Special Problems of Plant Production II/3 (3-0)							☑				
Specific Problems of Plant Production I/3 (3-0)							☑				
Stress Physiology for Plants/3 (3-0)										☑	
Nutrient Management/ 3 (3-0)										☑	
Biological Control/3 (3-0)									☑		
Integrated Pest and Disease Management/ 3 (3-0)										☑	
Seed Physiology/3 (3-0)									☑		
Wetland Management/ 3 (3-0)										☑	
Advanced Plant Breeding/3 (3-0)						☑					
Agricultural Ecosystems/3 (3-0)											☑
Pesticide Toxicology/3 (3-0)											☑
Biofertilizatio n/3 (3-0)											☑

Courses / credits	Graduate Learning Outcomes (PLO)										
	S01	S02	P01	P02	P03	KU01	KU02	KU03	KK01	KK02	KK03
Thesis	☑	☑									

4.4 List of Distribution of Courses for Each Semester

The curriculum in the Agroecotechnology Masters Program is scheduled for completion by students over 4 semesters, so the courses are spread over 4 semesters (Table 11).

Table11 Distribution of Courses per Semester in the Agroecotechnology Masters Study Program

No	Code	Course Name	credits	
Semester I				
1	MAE511	Statistics	3	(3-0)
2	MAE512	Research methods	3	(3-0)
3	MAE513	Plant Ecophysiology	3	(3-0)
4	MAE514	Advanced Soil Fertility	3	(3-0)
5	MAE515	Plant Resistance	3	(3-0)
Semester I credits			**15 credits**	
Semester II				
1	MAE523	Proposal Seminars	1	(1-0)
2	MAE522	Science philosophy	3	(3-0)
3	-	Elective Course 1	3	(3-0)
4	-	Elective Course 2	3	(3-0)
5	-	Elective Course 3	3	(3-0)
Number of Semester II credits			**13 credits**	
Semester III				
1	MAE631	Regression And Correlation Analysis	3	(3-0)
2	-	Elective Course 4	3	(3-0)
3	-	Elective Course 5	3	(3-0)
Semester III credits			**9 credits**	
Semester IV				
1		Thesis	6	(6-0)
Semester IV credits			**6 credits**	
Number of Semester I-IV credits			**43 credits**	

The Agroecotechnology Study Program curriculum consists of compulsory

courses (27 credits) and elective courses (12-15 credits). The implementation of elective courses is carried out by freeing students to choose courses in Table 12.

Table12 List of Elective Courses in the Agroecotechnology Masters Program

No	Code	Course Name	credits		Semester
1.	MAE121	Stressed Environmental Plant Breeding	3	(3-0)	II
2.	MAE126	Relationship Between Nutrients and Plants	3	(3-0)	II
3.	MAE122	Advanced Plant Metabolism	3	(3-0)	II
4.	MAE125	Special Problems of Plant Production II	3	(3-0)	II
5.	MAE123	Special Problems of Plant Production I	3	(3-0)	II
6.	MAE124	Stress Physiology for Plants	3	(3-0)	II
7.	MAT132	Nutrient Management	3	(3-0)	II
8.	MAH122	Biological Control	3	(3-0)	II
9.	MAH124	Integrated Pest and Disease Management	3	(3-0)	III
10	MAE133	Seed Physiology	3	(3-0)	III
11	MAT122	Wetland Management	3	(3-0)	III
12	MAE134	Advanced Plant Breeding	3	(3-0)	III
13	MAE131	Agricultural Ecosystem	3	(3-0)	III
14	MAH133	Pesticide Toxicology	3	(3-0)	III
15	MAE132	Biofertilization	3	(3-0)	III

Course Description

Statistics

Understand probability theory, random variables, probability distribution, parameter estimation, hypothesis testing, regression and correlation, analysis of variance, experimental design, environmental design, treatment design and analysis design and computer programs for statistics

Research methods

Discusses the philosophy and ethics of research, preparation of proposals, implementation of research, preparation of research reports and scientific publications in the field of agrotechnology, starting with the planning, selection of appropriate experimental designs, data collection methods, procedures, and preparation, field trial techniques, various experimental designs and analysis research data and drawing conclusions. The practice of preparing research proposals and seminars based on the synopsis of each student at the time of registration

Plant Ecophysiology

Discusses the role of plant ecophysiology in the process of plant

production, aspects of plant physiology related to abiotic and biotic environmental dynamics, physiological responses of plants to microclimate dynamics, global climate, and human activities that affect plants, physiological responses of plants in facing environmental changes through adaptation and evolution processes with an emphasis on tropical plants

Advanced Soil Fertility

Discusses the meaning and importance of land management from various dimensions, aspects of soil physics, chemistry, and biology, the relationship between soil properties and land and plant management, nutrient management and soil fertility, tropical soil studies, and their problems

Plant Resistance

Discusses the types, characteristics, symptoms, and morphology of pests and pathogens. Biology and life cycle of pests and pathogens. Ways of attack of pests and mechanisms of infection of pathogens. Physiological functions of plants are disrupted due to attacks by pests and pathogens. Host reaction to pest and pathogen attack and plant resistance. Disease genetics and pathogenic variability. Environmental influences on pests and pathogens. Integrated pest and disease control strategies

Stressed Environmental Plant Breeding

Discusses the concepts of plant biotechnology at cellular and molecular levels including improving plant properties in vitro through mutation, somatic hybridization, molecular markers in plant breeding, genetic engineering, production of secondary metabolites, application of biotechnology in pest and disease control, increasing resistance and advanced biotechnology techniques in plant protection, biofertilizer biotechnology, and organic fertilizers, use of mycorrhiza and other microorganisms, land bioremediation and phytoremediation, biosafety and regulation of biotechnology products as well as patents for biotechnology products, bioethics, and halal biotechnology products

Proposal Seminars

Presentation of research proposals containing plans for research activities for the preparation of the final project, written by the applicable guidelines for writing research proposals and theses and the preparation of which is supervised by the Supervisory Commission

Seed Physiology

Discusses the theory and practice of seed science and technology development both at home and abroad, seed philosophy, seed viability,

seed production process, seed storability and factors that influence it, seed decline process, seed germination metabolism process, quality improvement and seed health, seed certification and testing including ISTA and AOSA regulations, seed quality control. The role and relation of seed science and technology with various fields of science

Thesis

Implementation of research and writing of theses which are written works prepared based on research results, which are prepared in a manner and format by applicable regulations, and their preparation is guided by the Advisory Commission. Presentation of the results of the thesis research followed by the supervising committee and other academic staff, students of the Faculty of Agriculture Postgraduate Program and other interested parties to provide suggestions for improving the thesis manuscript

Advanced Plant Breeding

Discusses the role of plant breeding, genetic diversity and its management, plant reproduction systems, and genetic systems related to breeding programs, incompatibility, male sterility and control of sex expression in plants, genotype x environment interaction, deep cross pressure and heterosis, various selection methods, systems comprehensive plant breeding and cross design. Procedures for releasing, propagating, spreading, and how to maintain new varieties

Agricultural Ecosystem

Discusses the management of agricultural ecosystems in a sustainable manner, which includes ecological foundations for agro-ecosystem management, principles and strategies for designing sustainable farming systems, management of biodiversity and habitats, development of home gardens, use of organic fertilizers and mulches, nutrient management through biological/ecological cycles, the role of socio-culture in the management of agroecosystems, the role of biotechnology on agroecosystems and the ecological impact of transgenic plants. Environmental policy and basic principles in ecosystems

Biofertilization

Discusses land remediation and waste management, the effect of pollution on ecosystems, alternative technologies for managing and controlling pollution; basic techniques of land remediation, grouping and implementation of land remediation, specific studies of soil and water remediation, phytoremediation, potential use of industrial waste and its management practices, remediation and efforts to deal with land polluted by organic and inorganic matter, and its relation to sustainable and environmentally friendly and economical agriculture, progress of land remediation with various methods in several countries

Integrated Pest and Disease Management

Discusses population dynamics/epidemiology of Plant Pest Organisms, ecosystems, and characteristics of agro-ecosystems, as well as the impact of control on ecosystems. Assembling agroecosystem specific control methods. Ecosystem analysis as the basis for implementing control, developing integrated pest control programs

Biological Control

Discusses concepts and theories, the development and implementation of systematic pest predators. Discusses concepts and theories, development and implementation of pest pathogens systematically. Discusses the concept and theory, development, and implementation of plant pathogen antagonistic agents in a systematic manner; Discusses concepts and theories, development and implementation of induction of plant resistance with endophytic microorganisms for plant pathogen control.

Wetland Management

This course discusses the definition, scope, constraints, and opportunities for using wetlands for sustainable farming, the differences in land management based on the type of wetlands (peat land, acid sulfate land, leak swamp land, and saline land)

Pesticide Toxicology

Discusses pesticides and the environment related to global food security, due to losses from plant-disturbing organisms in the form of insects, pathogens and weeds. Implement pesticide application strategies to develop and implement modern crop protection techniques while observing challenges and residue control as well as utilizing pesticide-degrading microorganisms and conserving natural resources.

CHAPTER V. ASSESSMENT

5.1 Learning Assessment

Evaluation of study results is carried out for:

a. Assessing understanding and mastery of lecture material in the semesterwalk.

b. Evaluation results are grouped into several criteria; that is

Range	Category	Weight
80.00 – 100.00	A	4.00
76.67 – 79.99	A-	3.75
73.34 – 76.66	B+	3.50
70.00 – 73.33	B	3.00
66.67 – 69.99	B-	2.75
63.34 – 66.66	C+	2.50
60.00 – 63.33	C	2.00
56.67 – 59.99	C-	1.75
53.34 – 56.66	D+	1.50
50.00 – 53.33	D	1.00
< 50.00	E	0.00

5.2. Assessment Procedures

Learning assessment standards are the minimum criteria for evaluating student learning processes and outcomes to fulfill graduate learning outcomes. Assessment of student learning processes and outcomes includes:

a. Assessment principle;

The assessment principles include educative, authentic, objective, accountable, and transparent principles that are carried out in an integrated manner. The educational principle is an assessment that motivates students to be able to improve planning and learning methods and achieve graduate learning outcomes. The authentic principle is an assessment that is oriented towards a continuous learning process and learning outcomes that reflect students' abilities during the learning process. The objective principle is an assessment that is based on agreed standards between lecturers and students and is free from the influence

of the subjectivity of the assessor and those being assessed. The principle of accountability is an assessment carried out by clear procedures and criteria, agreed upon at the beginning of the lecture, and understood by students.

b. Assessment techniques and instruments;

Assessment techniques consist of observation, participation, performance, written tests, oral tests, and questionnaires. The assessment instrument consists of assessing the process in the form of a rubric and/or assessing the results in the form of a portfolio or design work. Attitude assessment using observational assessment techniques. Assessment of mastery of knowledge, general skills, and specific skills is carried out by selecting one or a combination of the various assessment techniques and instruments above. The final result of the assessment is an integration between the various assessment techniques and instruments used.

c. Appraisal mechanisms and procedures;

The assessment mechanism consists of:

1. compiling, conveying, agreeing on the stages, techniques, instruments, criteria, indicators, and the weight of the assessment between the assessor and those who are assessed according to the lesson plan;
2. Carry out the assessment process by the stages, techniques, instruments, criteria, indicators, and assessment weights which contain the assessment principles above;
3. provide feedback and the opportunity to question the results of the assessment to students; And
4. Document the assessment of student learning processes and outcomes in an accountable and transparent manner.

The assessment procedure includes the planning stage, the activity of giving assignments or questions, observing performance, returning the results of observations, and giving the final score. Assessment procedures at the planning stage can be carried out through gradual assessments and/or reassessments.

d. Implementation of the assessment;

The assessment is carried out according to the lesson plan. The assessment is carried out by:

1) supporting lecturers or a team of supporting lecturers

2) supporting lecturers and/or supporting lecturer teams by involving students; supporting lecturers and/or a team of supporting lecturers by involving relevant stakeholders

e. Assessment Components and Requirements

1. The assessment consists of a minimum of 4 (four) assessment components namely Quizzes, Assignments, Mid Semester Exams (UTS), and Final Semester Exams (UAS).
2. Assessment is carried out in the form of oral, written examinations, assignment presentations, seminars, writing of papers, or a combination of these forms of examination.
3. The weight of the assessment for each form of exam in a course is determined proportionally according to the material being tested.
4. Students who due to certain conditions do not take the exam, then based on the considerations of the lecturer in charge of the course, can be given a follow-up exam, which is carried out before the deadline for submitting the Participant List and Final Score (DPNA).
5. To take the end-of-semester exams, students must have an attendance of ≥75% of the total 16 weeks face to face.
6. If the student does not meet the attendance requirement of >75%, then the student's score is not allowed to take the Semester Final Examination.

5.3 Management and Curriculum Implementation Mechanism

The curriculum of the Master's Program in Agroecotechnology which includes the integration of graduate profiles, graduate learning outcomes, courses, and their weights, and curriculum structure is stipulated by a Decree of the Chancellor of the University of Jambi. A review of the curriculum will be carried out at least once every 4-5 years but also adjusted to developments in policies or regulations set by the government regarding higher education.

Implementation of the curriculum is carried out through a learning process that is adjusted to learning outcomes both at the study program (PLO) and subject (CPMK) levels. Implementation of learning is based on the Semester Learning Plan prepared by the course supervisor team. Learning includes face-to-face theory in class and structured and/or independent assignments.

The curriculum of the Agroecotechnology Masters Program will be evaluated to obtain feedback as consideration for improvement. Evaluation can be done by assessing the achievement of the PLO Study Program through the achievement of the CPMK and sub-CPMK determined by the team of lecturers in charge of the course. In addition, curriculum evaluation was also carried out by involving internal and external stakeholders. Evaluations involving various stakeholders are carried out periodically every 4-5 years. The results of the evaluation of the curriculum can also be used as consideration for improving/developing the curriculum.

Control over the curriculum of the Agroecotechnology Masters Study Program is carried out by the Quality Assurance Unit and Quality Assurance Group at the Faculty of Agriculture and the Learning Development and Quality Assurance Institute (LP3M) at the University of Jambi. The three quality assurance institutions at the faculty and university level conduct internal quality audits periodically every semester.

CHAPTER VI. SEMESTER LEARNING PLAN

Referring to SN Dikti 2015, the Semester Learning Plan (RPS) is a learning planning document that is prepared as a guide for students in carrying out lecture activities for one semester to achieve a predetermined PLO. Semester learning plans (RPS) are determined and developed by lecturers independently or together in a group of expertise in a field of science and/or technology in the study program.

The designed learning is student-centered (student-centered learning, abbreviated as SCL) and must be reviewed periodically. The objectives of the RPS are as follows:

1. There is a learning plan that guarantees the achievement of graduate learning outcomes (PLO) entrusted to the Courses (CP-MK)
2. There is a guide for lecturers, teaching teams (assistants) in carrying out evaluations and reporting the results of the assessment
3. There is a guide for students to study
4. As one of the study program quality assurance instruments.

The RPS component consists of:

1. Study Program name, course name, and code, semester, credits, name of the supporting lecturer
2. Graduate learning outcomes assigned to courses (CP-MK)
3. Course Learning Outcomes (CPMK)
4. Course description
5. Final capabilities planned at each learning stage to meet graduate learning outcomes (sub-CPMK)
6. Study materials related to the capabilities to be achieved;
7. Learning methods;
8. The time provided to achieve abilities at each stage of learning;
9. Student learning experience which is manifested in the description of tasks that must be done by students for one semester;
10. Criteria, indicators, and assessment weights
11. List of references used.

The MAE Study Program curriculum includes 14 courses (43 credits) that must be completed as a medium to fulfill the graduate learning outcomes (PLO) of the study program. The substance of the courses in the MAE Study Program and the method of implementation have been prepared in the form of a Semester Learning Plan (Appendix 1).

CLOSING

The curriculum of the Agroecotechnology Masters Study Program is expected to provide guidelines, especially to the academic community of the Agroecotechnology Masters Study Program to organize the learning process to achieve a graduate profile. The availability of curriculum documents is expected to make it easier for lecturers to carry out learning according to the curriculum. The development of the Agroecotechnology Masters Program Curriculum is carried out by taking into account the development of Government Policy, the Industrial Revolution 4.0, and changes in the Institutional Vision and Study Program Vision. Therefore, it is also hoped that the curriculum of the Agroecotechnology Masters Study Program can guarantee an increase in the quality of education (especially for graduates of the Agroecotechnology Masters Study Program, Faculty of Agriculture, University of Jambi.

Appendix 1. Linkage between Subject Specific Criteria SSC) and Graduate Learning Outcomes (PLO)

		PLO										
		S01	S02	P01	P02	P03	KU01	KU02	KU03	KK01	KK02	KK03
I	**Knowledge and Understanding**											
1.1	Have in-depth knowledge and understanding of their technical field, including specializations in engineering and a wider scientific context;			S	M							
1.2	Have developed distinct knowledge and a critical awareness of the latest findings in their discipline;				S							
1.3	Have a distinct and sophisticated knowledge of the relevant legal provisions for their professional field;			M		S						
1.4	Have advanced knowledge of quality standards and quality processes and their management.				M	S						
II	**Engineering Analysis (KU)**											
2.1	Have the qualifications to formulate and solve problems that arise in new and developing fields within their area of specialization;						S		M			
2.2	Able to use their knowledge and understanding to design scientific models, systems, strategies, and processes including engineering;						M	S				
2.3	Able to design and apply various methods - such as mathematical analysis, computer-aided model design, practical (laboratory) experiments, or plans;							S				
2.4	Be able to recognize the relevance of ecological and economic framework conditions related to social, health, and safety issues;						M		S			

2.5	The right to plan, carry out, and evaluate field and laboratory experiments.							M	S			
III	**Investigation (KK)**											
3.1	Have the qualifications to apply suitable methods to pursue detailed investigations or research on technical-scientific issues according to their status of knowledge and understanding;									S		M
3.2	Able to identify, find, and acquire the necessary information;									S	M	
3.3	Can define and conduct investigations using analytical, modeling, and experimental methods;										S	
3.4	Have the qualifications to critically assess data and conclude,									M	S	
3.5	Be able to investigate new emerging technological applications within their scientific discipline.											S
IV	**Engineering Design (KU)**											
4.1	Have the qualifications to solve problems that are not fully defined or unusual and exhibit conflicting targets or competing specifications;						S		M			
4.2	Able to analyze and assess system performance;							S				
4.3	Be able to use their knowledge and understanding to develop solutions to unfamiliar problems with the integration of other disciplines;						M		S			
4.4	Can apply their scientific abilities to judgment when working with complex, technically impure, and incomplete information;							M	S			

4.5	Have the qualifications to apply innovative methods to the problem-solving process.								S			
V	**Engineering Practice (KK)**											
5.1	Can combine theory and practice to achieve quality structures, processes, and results;									S	M	
5.2	Can deal with complex facts and combine knowledge from various fields;										S	M
5.3	Can develop and apply deductive and inductive methods;										S	
5.4	Have developed a comprehensive understanding of the theories, models, techniques, and methods that apply and their limitations;										S	
5.5	Recognize the social, economic, and ecological implications of practical engineering and be able to assess them.									M		S
VI	**Social Competence**											
6.1	Meet the requirements of a Master's program graduate with a view to key qualifications in a Doctoral program;	S										
6.2	Can work effectively as a team leader consisting of different disciplines and levels;		S									
6.3	Able to work and communicate in national and international contexts.		S									