

# Background, Current Status and Forecast of Structure and Curriculum for Environmental Education at Agricultural Universities in Korea

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### 국문요약

WTO체제에서 국제 경쟁력을 갖추기 위한 전략의 하나로 친환경농업을 추진해온 우리나라 농업은 환경오염의 경감과 농업의 다원적 가치의 실현을 위한 친환경농업 전문가 양성이 시급하며 이를 대학 교육에서 담당할 필요성이 높아지고 있다. 본 연구에서 4개 사례 대학의 교과과정 분석 결과 한국의 농학계 대학에서 이루어지고 있는 환경 교육은 대부분의 대학이 대학의 명칭이나 학과의 명칭을 변경하는 과정에서 생명, 자원, 환경을 포함시키고 교육 목표에서도

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환경과 관련된 내용이 제시되고 있으며, 교육과정에 환경오염방지 및 개선에 관계된 과목을 설강하여 학생들에게 수강하도록 하고 있다. 또한 농업의 위치와 사회적 역할로서 농업의 다원적 기능과 농업과 환경에 대한 강의가 일부 대학에서 이루어지고 있으며, 비농업 전공자들에게도 호응을 얻고 있다. 그러나 현재 이루어지고 있는 환경교육은 별도의 농업환경 교육과정이 마련되어 있지 않으며, 설강된 과목들도 연계성이 부족하고, 전공과목 우선으로 수강하게 되므로 그 비중이 매우 적은 실정이다. 따라서 농업환경 교과과정을 별도로 개발하여 학생들로 하여금 체계적인 교육을 받도록 할 필요가 있다. 앞으로 환경분야에 대한 사회적 직업 수요가 증가함에 따라 농학의 수요는 더욱 증가할 것이며 환경평가나 환경계획 관련 분야 및 영농현장이나 관련 기관에 종사할 인력들에게 있어서도 대학에서의 체계적인 교육이 필요하다.

## I . Introduction

One of the pressing challenges faced by agricultural colleges and universities in Korea is the need to move towards environment-friendly agriculture. This problem is very sensitive in the sense that many factors should be considered and balanced, e.g. need to meet food requirements of the growing population vs. limited production area ; or to increase agricultural productivity through the use of various chemical-based inputs vs. the need for employing environment-friendly farming technologies for a more sustainable agriculture ; the application of biotechnology and genetic modification of various crops and the uncertainty in its effects on the consumers, etc.. There is also a need to improve product quality for global competitiveness, produce better products at lower production cost, and in the soft sector, the concern for providing everyone a better quality of life in a clean and safe environment. Hence, agricultural universities should address problems brought about by rapid agro-industrialization and urbanization and its threat to environmental pollution and degradation. They also have to attend to the ever-changing needs of the people in an ailing economy, particularly ASEAN countries.

Several studies have been conducted in Korea related to agricultural education and environmental education. This paper, however, focuses on the assessment on the efforts of agricultural universities and colleges in policy, structural and curriculum reforms in response to the current and emerging challenges in agriculture, especially on environment management for sustainable agriculture. It aimed at identifying similarities and differences in the key roles that agricultural colleges and universities play in

environment education to ensure sustainable productivity while maintaining food self-sufficiency in the country.

## II. The Agro-Environmental Education at the University Level in Korea

1. The scope of agro-environmental education is very wide. It includes educational activities relating to environmental improvement in the agricultural sector. Therefore, analyzing the formal education conducted at the agricultural colleges is necessary.
2. In Korea, Agricultural science has many specialized areas for college students to choose from. These educational areas can be categorized as follows :
  - Areas relating to the production of special agricultural products : Agronomy, Horticulture, Animal Science, Forestry Science, etc.
  - Areas relating to the protection from agricultural pests and diseases : Agricultural Entomology, Plant Pathology, etc.
  - Areas relating to agricultural engineering and food processing : Agricultural Engineering, Agricultural Machinery, Food Science and Technology, etc.
  - Areas relating to farm management, policies and education : Agricultural Education, Agricultural Economics, Rural Sociology, etc.
3. The focus of agro-environmental education in Korea are as follows :
  - New method of farming : organic farming, low-input farming
  - Recycling of organic materials at farm or village level : mass production of compost using animal wastes, purification of polluted water due to commercial scale animal production
  - Less use of chemicals for plant nutrition and pest control : introduction of integrated nutrient management (INM) and integrated pest management (IPM) and its application at the farm level
  - Improving the environmental function of agriculture and forestry : sustainable agriculture, agro-forestry, sustainable rural construction
  - Sustainable agricultural development policies : environmental economics

### III. Brief History of Agro-Environmental Education at Agricultural Universities in Korea

Agro-environmental education started in the late 1970s. Development occurred in three phases :

1. The period of unconsciousness to the recognition of the importance of sustainable agriculture (before 1980)
2. The introduction period of agro-environmental education (1980-1990)
3. The period of consciously developing agro-environmental education (after 1990)

During the period of unconsciousness, most farmers, policy makers, and even university professors did not realize the possible effects of environmental degradation on the agriculture sector. Only few scholars, who are members of the environmental movement, pointed out the importance of protecting the environment. Very few professors published articles on agro-environmental issues. Less than three universities offered courses related to pest control with the use of natural enemies.

During the introductory period of agro-environmental education, some courses were offered in agricultural universities. The courses introduced to senior level university students were integrated pest management (IPM), animal waste treatment technologies and basic theory on environmental economics. Teaching of these courses was made possible by tapping local agricultural scientists.

The period of conscious development of environmental education for agriculture in the 1990s was characterized by strong manifestation of universities to support the endeavor through the offering of many educational courses. Moreover, some colleges or departments gave up the original course title and adopted the word environment / life in its new college or department name. At this period, the importance of sustainable agricultural development was already recognized by the Korean agricultural society. No one argues on the seriousness of environmental degradation in the agricultural sector. There were also some people who argued that in determining feasibility of a particular project, environmental criteria should be given more emphasis than increase in agricultural productivity.

**Contributory Factors to the Development of Environmental Education at Agricultural Universities**

### 1. The increase in public demand for sustainable agriculture.

- Increasing demand for food safety. As food safety problem becomes a social issue, especially on imported agricultural products and food materials, many consumers have demanded for safe agricultural products. As a result, the price of organic agricultural products is higher by 30-50% compared with the conventional products. Consequently, production acreage for organic agriculture also increased. This also increased the demand for formal education on sustainable or organic agriculture.
- As the environmental situation becomes serious, especially in the agricultural sector due to massive use of chemical inputs, and ineffective waste management system, the society as a whole required the agricultural sector to strive to become a clean industry, particularly in the animal industry.

### 2. The agricultural trade liberalization.

- Sustainable agriculture is considered as a means to overcome the disadvantages in operating small size farm. Organically produced agricultural crops are in demand throughout the world and command higher price in the market which can promise better economic returns even for small scale farmers.

### 3. Institutional factors

- In 1997, the Korean government enacted the "Sustainable Agriculture Promotion Act". The year 1998 was also declared as the first year of Korean Sustainable Agriculture.
- Certification program for green agricultural products (organic) was also introduced since 1997.
- Instituting government support program to farmers adopting sustainable agriculture. The government adopted direct payment to sustainable farms since 1999. Other support mechanisms were : giving of subsidies to environmentally sensitive areas, and subsidies for those who join the small and medium scale farm-promotion program, etc
- Strong regulation on animal waste management
- Establishment of many pilot villages for the implementation of IPM and INM practices.

#### 4. The need to supply resources for environment education

- Technology development in the field of sustainable agriculture
- Changes in the university educational system (based on the policy that courses which are already offered or departments that are already established should be closed when there are no more demands for them)
- Need to increase the number of environment education professionals

At the Korea National Agricultural College (KNAC) in particular, the students are educated and trained to become successful professional farmers. To train them along this line, the students undertake a curriculum consisting of two years of course work and one year of practice field training. The environment education concepts are studied in two courses, agricultural philosophy and sustainable agriculture.

### IV. Analysis of the Current Agro-Environmental Education at the Agricultural Colleges

#### A. Policy Reforms

Policies related to environment education in agricultural colleges were instituted since 1992. Reforms include adoption of new college names. In 1995, there was merging of departments to divisions and in 1996, changes in the curriculum to accommodate environment education were made. There were also changes in the college objectives, which generally states that colleges shall strive for national development toward strengthening international competitiveness and globalization. Education's aim was to create a new image for Korean agriculture, hence the policies enjoined the consumers to support activities in agriculture, recognize its multi-functions and conduct massive educational campaigns for environment friendly and sustainable agriculture.

#### B. Structural Reforms

Structural reforms since 1995 include merging of departments to divisions and institutionalization of interdisciplinary programs in agriculture education. In Korea, agricultural colleges include many academic fields. In environment education, courses offered were as varied as the specialized areas. There were more than 15 departments

in the agricultural colleges classified as basic science and applied science departments. As shown in Table 1, agricultural production technologies, agricultural processing, marketing, and farm management were taught in agricultural colleges. Moreover, agricultural chemicals, agricultural machinery, rural sociology, home economics, forestry, and landscaping were considered as important areas of agro-environmental education in Korea.

Table 1. Classification of departments based on specialization areas at agricultural colleges in Korea.

CRITERIA	CLASSIFICATION	NAME OF DEPARTMENT
Basic Applied	Biology	Agronomy, Horticultural Science, Agricultural Biology, Forest Resources, Animal science, Natural Fiber Science
	Chemistry	Agricultural Chemistry, Food Science and Technology, Forest Products, Natural Fiber Science
	Physics	Agricultural Engineering, Agricultural Machinery, Forest Products, Natural Fiber Science
	Economy/management /policy	Agricultural Economics, Agricultural Education
	The others	Landscape Architecture
3stage of agricultural production	1stage	Agronomy, Horticultural Science, Agricultural Biology, Forest Resources, Animal Science, Natural Fiber Science
	2stage(processing, usage)	Food Science and Technology, Agricultural Machinery, Forest Products, Natural Fiber Science
	Sub - product	Agricultural Chemistry, Agricultural Machinery, Agricultural Engineering
	Economy/management /policy	Agricultural Economics, Agricultural Education
Characteristics of agricultural production	agricultural products	Agronomy, Horticultural Science, Natural Fiber Science
	Forest products	Forest Products, Forest Resources
	Animal products	Animal Science, Natural Fiber Science
	Neutral	Agricultural Engineering, Agricultural Machinery, Agricultural Chemistry, Food Science and Technology, Landscape Architecture
Relationship with industry or farmers, by region	Regional characteristics	Agricultural Economics
	General	The others

Among the departments, the following are highly related to environment education : water resources and management, soil science, biotechnology, ecology, food science and environmental design. In providing education on pollution control technology in agriculture, it was considered more advantageous to offer the course in agricultural colleges than in engineering colleges, because of the wide range of biological science courses in the agricultural colleges.

### C. Curriculum Reforms

Curriculum reforms started in 1996 with the review and revision of existing curricular offerings in agriculture. In 1997, the revised curricula for agriculture education were implemented. More environment-related courses were added in the agriculture curriculum. During this period, the necessity for the integration of environment education concepts in agriculture subjects was also recognized.

On the analysis of courses for environment education, many of the course titles were added with the word environment. For example, pest management was changed to environmental pest management. This change resulted also in the expansion of the syllabus toward the integration of environment education concepts in pest management. In another case, the original course name was retained even though the course was included in the list of newly developed courses for environment education. Enrichment of content areas, however, were observed. In general, around 48% of the courses were newly changed but there were no systematic relationships among the newly developed courses. Hence, problems may arise if a student majoring in environmental agronomy transfers to another college because the same course may not be available. Though he may be allowed to make a special program for his purpose, finishing the course may take longer years because he has to take additional basic environmental courses, while some of his taken subjects may not be credited to his course.

An analysis of the environment-related courses that were developed recently at agricultural colleges in Korea showed that almost all of the courses do not aim at improving the status of the environment that had been seriously degraded. As shown in Table 2, there were 64 subjects designed to prevent environmental pollution, including environment and agriculture, sustainable agriculture, soil science, introduction to environmental toxicology and environmental engineering. The courses designed to reduce environmental pollution are those in engineering and microbiology.



Table 2. Subjects directly related to environment education in selected agricultural universities in Korea, 1995-2000.

DEPARTMENT	SUBJECT	SNU*	KNU*
Agronomy Plant Resources	Environment and Agriculture	✓	
	Sustainable Agriculture	✓	✓
	Soil Science	✓	
	Crop Ecology		
	Agricultural Environmental Ecology		
Horticulture	Environmental Horticulture	✓	✓
	Horticultural Ecology		
	Environmental Pollution	✓	
	Environmental Plant Physiology		✓
	Ecological Balanced Crop Product		
Agricultural Biology and Genetics	Biology, Chemistry and Environment	✓	
	Introduction to Bio-environment Science		✓
	Introduction to Ecology	✓	
	General Ecology		
	Integrated Pest Management		✓
	Insect Ecology	✓	✓
	Insect and Environment		✓
	Environmental Crops and Lab		
	Agricultural Environmental Biology		✓
	Introduction to Environmental Toxicology		✓
Biological Insecticide		✓	
Farm Machinery and Agricultural Construction	Rural Sanitary Engineering		
	Rural Settlement Planning		
	Rural Planning		
	Environmental Control Engineering for Agriculture and Lab	✓	
	Rural Environmental Engineering and Lab	✓	✓
	Biological Environmental Instrumentation and Practice	✓	
	Soil and Water Conservation Engineering Practice	✓	✓
	Treatment of Agricultural Wastes		
Agricultural Structure and Control	✓		
Agricultural Chemistry	Agricultural Environmental Chemistry and Lab		
	Soil Science	✓	
	Environmental Soil Science		✓
	Soil and Water Conservation	✓	✓
	Microbial Ecological Chemistry	✓	✓
	Introduction Environmental Toxicology		
	Environmental Engineering	✓	
	Environmental Chemistry		✓
Life Environment and Chemistry			

DEPARTMENT	SUBJECT	SNU*	KNU*
Food Science and Technology	Environmental Engineering Food Sanitation	✓	
Landscape	General Design Environmental Design Environmental Psychology Environmental Impact Assessment Human Behavior Analysis Park and Open Space Planning Land Use	✓  ✓ ✓	
Agricultural Economics	Environmental Economics Resources Environmental Economics	✓ ✓	✓ ✓
Forest Science	Forest and Man Forest Ecology Urban Environment Management and Practice Wildlife Science and Practice(Wildlife Management and Practice) Wildlife Ecology and Practice Environmental Forest Conservation Revegetation Engineering for Environmental Conservation Forest Environment Conservation Engineering and Practice Forest Environment Degradation Biological Insecticide	✓ ✓  ✓  ✓ ✓ ✓	✓       ✓ ✓
Animal Science	Environmental Hygiene Bioenvironmental and Structure System for Livestock Animal Waste Management Industry Environment	✓ ✓	✓ ✓ ✓ ✓

\* Seoul National University and Kangwon National University course offerings from 1999-2000.

## V. Comparative Analysis of Agro-Environmental Education in Selected Agricultural Universities and Colleges in Korea

To understand environment education in more detail, an analysis of the environment-related courses was done in four case study universities : the College of Agriculture and Life Science at Seoul National University, Kangwon University College of Agriculture and Life Sciences, Dan Kook University Division of Life Resource Science ; and Korea National Agricultural College.

Findings show that the environment and agriculture course is offered to students as

inter-department course. In addition to this, many environment-related courses are offered in each department.

At SNU, 17 compulsory subjects are offered in 4-year courses for college students. Three of these are directly related to environment and agriculture : forest and man, environmental education, and natural resources and practice. At the graduate level, four out of 13 courses are offered : pollution in agriculture environment, agricultural ecology, conservation biology, and environmental education for natural resources.

Every department in SNU offers four to five environment-related courses. In the Crop Science and Production Unit, among 45 subject offerings, four courses are highly related to environment : crop ecology, agricultural meteorology, environment and agriculture, and sustainable agriculture. In its Applied Biology and Chemistry Unit, 6 courses out of 34 courses are related to environment. These are biology, chemistry and environment, general ecology, environmental chemistry, microbial ecological chemistry, and introduction to natural product science. In case of the animal science department, animal production facilities and environment, and grass ecology are highly related to environment.

These curricular offerings at the SNU are almost similar to those in Kangwon University, however, there are more environment-related subjects offered in Kangwon University, especially in the Division of Resource Biology and Environment Science. Many of its subjects offerings carry the term environment in the course titles, e.g. environmental soil science 1 and 2, environmental chemistry in agriculture, etc.

In 1995, the Dan Kook University had developed a special program for environmental education in agriculture. The main purpose of this program is to educate agro-environment specialists. It offers two major areas : environmental sciences and landscaping design. In the environmental sciences course, environmental conservation and future agriculture, global environment and agriculture, plant nutrition, fertilizer and environment, eco-village, and organic agriculture are offered. In the landscaping design course, environment-friendly landscaping sciences and technologies are taught. This major aims at training students to be specialists in the field of environmental recovery, environmental protection, environmental evaluation and natural resources conservation.

Beside in Dan Kook University dealing with organic farming research and education they offers 7 organic lectures in PhD course and Master course of graduate school and there is a Research Institute of Organic Agriculture since April 1998 .

The Korea National Agricultural College is a especially unique college that was

established in 1997 through the initiative of the Rural Development Administration to train and develop professional farm managers who will manage agriculture in Korea in the near future. Its curricular offering emphasizes on the philosophy of agriculture and sustainable agriculture. The contents of subjects are interdisciplinary and integrative to make the future farmers understand the relationships between man, agriculture and the environment.

## VI. Current Issues in Agro-Environment Education at Agricultural Colleges and Universities.

### 1. Poorly designed agro-environment education programs for college students.

- Even though many departments develop some environment educational courses, very few students can take them due to overload in their required course work. Moreover, there is no independent department (or course) for training students in the field of specialized agro-environment job.
- Still, very few colleges offer a course that aims at educating students on the value of agriculture in rural areas. Multi-functionality of agriculture becomes very important recently. However, there is no systematic process in determining educational programs at agricultural colleges.
- There are not many agro-environment educational programs for students majoring in non-agricultural fields in other colleges. Although three local universities have succeeded in such program, most universities do not offer such program yet.

### 2. Lack of good textbooks or teaching materials for students to study the science of agro-environment.

- Not many researches have been conducted in the field of agro-environment.
- Limitation in new technologies to solve environmental problems in the agriculture sector.
- Lack of competent professionals at universities to teach the course.

### 3. Lack of job opportunities for college students who studied agro-environment areas.

- In many cases, the agricultural development programs designed by government or private sector do not consider much the environmental factors.
- No license system for the agro-environmental specialists.

## VII. Summary, Conclusions and Recommendations for Future Development of Environment Education at Agricultural Universities.

From the reviews of agro-environment educational system in Korea, the following summary and conclusions are derived :

- Almost all of the agricultural colleges have recognized the importance of environment education in agriculture. Policy, structural and curriculum reforms were instituted. Schools have changed the goals of college education and the name of major field areas. Terms such as life, resource and environment are found in many curricular programs. Courses on environmental protection and improvement were also opened to the students.
- The four universities and colleges in agriculture have similar and unique curricular offerings. They all offer agriculture and environment and sustainable agriculture. Seoul National University and Kangwon University have similar curricular offerings related to environment education. Dan Kook University and the Korea National Agricultural College have unique curricular programs on environment education in agriculture. Dan Kook University offers 7 lectures on organic farming in the PhD and Master course of graduate school and has a Research Institute of Organic Agriculture.

### Recommendations :

- Agro-environment educational courses emphasizing the roles of agriculture to the society and the value of multi-functions conducted by agriculture and rural sector are needed to educate agriculture majors as well as the non-agriculture major students.
- A special course designed for teaching agro-environment specialists is urgently needed.

- A special course is also required to change the farmer's attitude to environment at the field level.

Also, in order to improve the present system of agro-environmental education, following activities are necessary :

- Develop a new course work designed for training agro-environment specialists. To do this, teaching materials such as textbooks, videos, etc. should be developed.
- A license system should be introduced in the agricultural development project. It should include evaluation of environment, methods of sustainable development and the responsibilities and rights of the license owners.
- New technologies relating to environmental improvement should be developed continuously. More research funds should be allocated in the agro-environment area.
- An international cooperation among Asian countries is needed to develop agro-environment education at agricultural colleges. Since Asian agriculture is unique in its structure, particularly the rice-based small-size family farm structure in monsoon climate, special joint activities for developing curriculum and making network channels are needed.

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