

# ANALYZING THE ECOLOGY OF A CURRICULUM

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Socrates persistently needed discussants to define the terms they used. Curriculum is used in two senses — a fixed course of study toward a degree, or the whole body of courses offered in an educational institution or in a department thereof. Ecology means to me that study concerned with the interrelationships among organisms and their environments (1).

Organisms called students enter a college environment which includes other students of similar and dissimilar strains, courses of study, faculty organisms of various specialized adaptations, extra-curricular activities and many other environmental influences. All of these are interdependent and interact with each other.

The objective of curriculum is training of the student organisms for fitting into some part of the broader ecological system we call society.

The success of the curriculum should be determined by the competency with which the students fit into society. Thus curriculum is interrelated with the needs of firms, organizations, and social structures: it is a part of the total "Web of life" (2). The faculty organisms have traditionally constructed the nature of the curriculum. In recent years students and alumni have had more part in the consideration of the curriculum. Still the suspicion lingers that some of the faculty may have too little interaction with other faculty in the interrelating of courses and too little regard for how well the training fits the needs of society.

The key function of curriculum is teaching-learning. Here we need to remind ourselves of the root meanings of our terms:

educate — to lead out, i.e., to guide the student, or to draw his potential;

instruct — to build in, i.e., to create a structure of knowledge within the student;

edify — to make a fire, i.e., to kindle a flame within the student.

Teaching-learning is accomplished within the student, but as a colleague commented, "If we aren't successful in "kindling the flame", our attempt to "instruct" will not "educate".

One of the principles of human ecology is that of cumulative change, or the growth of the system resulting from increases in productivity in a key function. How can the curriculum be improved to provide increased productivity?

The curriculum is in itself an ecological subsystem of courses and instructors. Tyler (5) emphasizes the need for organization in such a system:

"In order for educational experiences to produce a cumulative effect, they must be so organized as to reinforce each other."

The criteria for effective organization, he lists, as "continuity, sequence and integration."

We may emphasize the words "reinforcement" and "integration". Learning must be reinforced or integrated within the curriculum, between the curriculum and society and within the student as he integrates concepts, skills, and values with his concept of needs.

The interest in curriculum planning may be indicated by two experiences this spring (1971).

First, our College of Agriculture Committee on Improved Instruction sent a questionnaire to each instructor asking for an indication of interest in a number of topics and of activities. Of the fifty-four returned, 21 indicated a high degree of interest in the topic "Coordinating core elements of all courses in a department." Of the 13 topics listed, this one ranked first in interest, (Exhibit 1).

Second, our departmental committee on Courses and Curriculum has been discussing how we might better update and coordinate our curriculum. We had made some changes five years ago as a part of a Long Range Planning endeavor. At that time we had used course titles and course descriptions as the basis of discussion of revision, (Exhibit 2). With new faculty members, changes in instructors and changes in text books in various courses, course titles and descriptions become very rough guides. The content of the course "all depends on who teaches the course and what textbook he chooses."

Our department chairman strongly suggested that in our curriculum we focus less on information and more on concepts.

In our management educational programs — both with classroom students and in our training programs for managers of ag-business firms — we emphasize principles, management concepts, ways of thinking and methods of solving problems. We emphasize tools rather than facts. We tell people to look on their minds as a workshop rather than a storage bin. We try to prepare people to deal with change, because change occurs with ever increasing rapidity.

Then, too, we had become concerned at how much repetition was actually necessary. Students indicated boredom at the repeated doses of production function analysis; instructors responded that the students gave evidence of not having grasped the concept. According to the course outlines, four courses in sequence each devoted considerable time to production functions and costs, (Exhibit 3).

I had been stimulated by the possibilities of preparing behavioral objectives for courses. I had read Mager's book "Preparing Instructional Objectives" (3). He prefaced the book with a delightful fable concluding with the statement:

The moral of this fable is that if you're not sure where you're going, you're liable to end up someplace else — and not even know it.

I had heard Dr. Postlethwaite discuss his "Audio-tutorial approach to learning" (4) and as a final stimulus a former student sent me a set of objectives he had prepared for a course he teaches. If he can do it, so can we, I reasoned.

Then in a flight of imagination I suggested to the committee that we get each instructor to prepare such a set of objectives for each of his courses. Then we could examine them and find where there were gaps or too much duplication, we could see whether we had the proper continuity, sequence and integration.

Having made such a brash proposal, I was immediately put "on the spot" by the committee. I should prepare a set of objectives for my course to show them what I meant.

I finally prepared 77 objectives centering on 12 major concepts, (Exhibits 4 and 5). In addition, economic principles and concepts are worked out in some social and economic environment, so 19 more objectives were outlined in four areas of factual background material. Then 4 more objectives related to skills. I have been told that the course has too many objectives; 50 or 60 is all that could reasonably be attained in a semester. Also, this was my first attempt; many need to be re-worded. But I did prove to myself that the job could be done if I were goaded long enough.

The Committee then, in open deliberation, voted down my proposal that they and all other instructors prepare similar lists of objectives for their examination.

"Why not?" I asked.

"Two reasons," they replied. "Philosophically it would make more sense to determine what objectives we wish our students to attain from the whole curriculum, to decide what sequence and continuity would best prepare them to attain those objectives, and then to construct our courses to fit that sequence and continuity."

"And the second reason is a pragmatic one but it leads to the same conclusion. If we examine courses as they now exist, we make the present instructors defensive, protective of their vested interests in those courses."

"Why not ask the department to agree that as of some future date all existing courses will be abolished? Then we can examine our ultimate objectives, work back through to gain the desired continuity, sequence, and integration . . . and then plan the courses to fit."

I bow to the wisdom of my colleagues, for this, too, is ecology — the mutual interrelationships among organisms called faculty and their environment.

## LITERATURE CITED

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5. Tyler, Ralph W. "Basic Principles of Curriculum and Instruction," Syllabus Division. The University of Chicago Press, Chicago, Illinois, 1950.

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**Rank Order of Interest in Topics for Inservice Training, Faculty of Agriculture WSU, Survey - 1971**

**Exhibit 1**

Rank	Topic	No. very Interested
1	Coordinating core elements of all courses offered in a department	21
2.5	Evaluation of instruction: Self	16
2.5	Educational resources available	15
4	Motivation for learning	17
5	Audio-visual aids in teaching	15
6	Course planning	16
7	Selection of methods and techniques	16
8	How people learn	14
9	Preparing and scoring exams	14
10	Grading	11
11	Evaluation of instruction: Faculty	9
12	Writing educational objectives	10
13	Evaluation of instruction: Student	8

**Description of Courses**

**Exhibit 2**

101	<b>Economic Organization of Agriculture</b> The place and role of agriculture in the economy; problems in planning for production and marketing of agriculture output.
201	<b>Economics for Management in Agriculture</b> General introduction to economics appropriate for managing firms in the agricultural economy.
301	<b>Structure and History of the American Agricultural Economy</b> Agriculture in evolution toward a modern economy; organizational nature of firms, land settlement, and farmer participation in national affairs.
340	<b>Farm Management</b> Appraisal, organization, and management of selected types of farms and ranches.
350	<b>Agricultural Supply and Marketing Business I: Internal Management Problems</b> Product combinations, resource allocations, personnel, finance, and related problems in the operation of agri-business firms.
351	<b>Agricultural Supply and Marketing Business II: Competitive Strategies</b> Alternatives in the market behavior of firms that handle, process, and trade in agricultural inputs and outputs.
370	<b>Agricultural Prices</b> Factors determining levels and movements of prices of agricultural commodities.
410	<b>Quantitative Methods in Agricultural Economics</b> Quantitative methods used by agricultural economists, including linear programming, multiple correlation, and time series.
420	<b>International Agriculture and Economic Development</b> Nature and roles of agricultural development, trade, and institutions.
430	<b>Financial Arrangements in Agriculture</b> Personal and business finance in the agricultural economy; insurance, retirement, amortization, and interest.
440	<b>Advanced Farm Management</b> Economic principles applied to organization and operation of farms and ranches.
450	<b>Agricultural Marketing</b> Institutions, practices, policies, and problems in agricultural input and output marketing.
460	<b>Cooperatives</b> History, principles, kinds, problems, organization, and operations of agricultural cooperatives; emphasis on Washington conditions.
480	<b>Resource Economics</b> Economic principles applied to problems of natural resource utilization, development, and conservation.
490	<b>Agricultural Policy</b> Public policy issues related to commercial agriculture and rural areas.
498	<b>Seminar</b> Current problems
499	<b>Special Problems</b>

**Exhibit 3**

**Ag Ec 101 Introduction to Economic Problems of Agriculture**

Text: Agriculture, Economics, and Growth by M. H. Snodgrass and L. T. Wallace, Appleton-Century-Crofts, New York, N. Y., 1964

**OBJECTIVES OF COURSE:**

- To acquaint student with the economic organization of agriculture and its relationship to the rest of the economy.
- To acquaint student with sources of information about agriculture, agri-business and agricultural economics.
- To introduce some basic methods of economic analysis of agricultural problems.
- To develop an understanding of the agricultural growth and of agricultural policy development in this country.

**LECTURE OUTLINE:**

No. of Lect.	Topic
2	Society's basic economic problems; economizing; economic growth; the three sectors of agriculture.
5	Development of economic life. Natural resources and population. Labor, capital and technology in relation to economic growth. Characteristics of farm production and of farm organization. The marketing sector. Consumption of farm products.
5	Principles of production, diminishing returns, production functions; factor-factor, factor-product and product-product decisions; specialization and diversification.
4	Production costs, supply response and elasticity, principles of profit maximization.

**Ag Ec 201 Economics for Management in Agriculture**

Prerequisites: None

**OBJECTIVES OF COURSE:**

- To provide a general introduction to economic principles appropriate for managing firms in the agricultural economy.
- To indicate how these principles may be used in practical managerial decision-making.
- To prepare students for advanced courses in management of firms and marketing of agricultural products.

**LECTURE OUTLINE:**

No. of Lect.	Topic
3	What is agricultural Economics? The Production Process. Economics and management. Economics and Goals.
3	The Concept of a Production Function. Total Product. Average Physical Product and Marginal Physical Product. The Law of Diminishing Returns. Economic Recommendations. Cost Curves. Allocating One Variable Input Amount Several Farm Enterprises.
3	The Production Function for Two Variable Inputs. The Least-Cost Criterion, Input Substitution.
2	Agricultural Land. Quantity and Value. Land Tenure. Capital and Credit. Technological Change.
2	The Production of Marketing Services. Procurement of Inputs. Vertical Integration.
3	The Theory of Markets. Competition Among the Many. Product Differentiation and Competition.

**Ag Econ 340 Farm Management**

Prerequisites: Ag Ec 201, or Econ 203

Text: Farm Business Management, by Emery N. Castle and Manning H. Becker. The Macmillan Company, New York, Collier-Macmillan, Canada, 1968. (8th edition)

**OBJECTIVES OF COURSE:**

This course is designed to teach students managerial concepts and tools of analysis, and their application to the solution of farm management problems. The focus is at the firm level, and from the decision-maker's point-of-view.

**LECTURE OUTLINE:**

No. of Min. Lect.	Topic
1	The Decision-Making Process, What makes a successful manager? A classification of decisions; Problems faced by the farm manager, tools of farm management.
5	Economic Principles and Farm Management Diminishing returns, marginal analysis, fixed and variable costs, average and marginal cost analysis, substitution principles, returns to size, equi-marginal returns and opportunity cost, inadequate information and economic principles.
2	Analysis of the Completed Record, Measures of financial success, measures of capital position, measures of size, measures of efficiency, analysis procedures, enterprise accounting, interpretation and use of enterprise accounts, enterprise records and decision-making.
2	The Farm Budget, The total farm budget, a budget comparison of farm organizations, the partial budget, partial budgeting, the use of budgets, budgeting and linear programming, linear programming, price and yield assumptions for budgeting and programming.
2	Risk and Uncertainty in Farming, Decision-making under risk and uncertainty, farmer defense against risk and uncertainty, uncertainty precautions, measures society can take against risk and uncertainty.
2	Mid-Semester Examination and Critique

**Ag Econ 440 Advanced Farm Management**

Prerequisites: Ag Ec 370 or Econ 301 and Math 201, 202.

Text: No required Text. Basic readings from Economics of Agricultural Production and Resource Use, by Earl O. Heady (Englewood Cliffs, Prentice Hall, 1952). Numerous assigned readings from texts, journals, etc.

**OBJECTIVES OF COURSE:**

- Develop a proficiency in the use of production theory as applied to farm firm management under conditions of certainty and uncertainty.
- Examine the role of management in the production process.

**LECTURE OUTLINE:**

No. of Lect.	Topic
1	The role of economics in the management of a farm firm and historical approaches to farm management research.
5	The concept of the production function, Factor (product), factor (factor), and product (product) relationships. Properties of various types of production functions.
4	The estimation and use of production functions in agriculture at the technical unit level. Application of economics to physical relationships under conditions of certainty.
3	Capital use under uncertainty. Analysis of conditions giving rise to internal and external capital rationing.
13	The role of management. Examination of the various schools of thought concerning the management function. Examine traditional and behavioristic approaches to management and how they apply to management of agricultural firms.
2	Farm management simulation game. A continuing game throughout the semester which provides an opportunity to utilize the subject matter.

44 lectures, 1 mid-term examination, term paper required of graduate students.

**Exhibit 4**

Agricultural Economics 101
Concept or Principle
Economizing
Economic Organization
Economic Growth and Development
The Economic Nature of Production
Production Function and Law of Diminishing Returns
Cost Relationships
Supply
Economics of Consumption

Demand  
Elasticity  
Exchange  
Economic Aspects of Policy  
Factual Background  
Farms and Farm Production  
Agribusiness  
Historical Developments  
Demographic Concepts  
Skills  
Index Numbers  
Elasticity Coefficients

Exhibit 5

Agricultural Economics 101  
Behavioral Objectives

- I. Economizing
  1. Explain economizing in terms of input-output relationship.
  2. Explain the meanings (in the study of economics) of scarcity, resource, allocation, and ends or goals.
  3. Explain a few simple applications of economizing by a farm manager, a consumer, a marketer.
- II. Economic Organization
  1. State the basic economic questions facing any society.
  2. Describe the three basic types of economic systems.
  3. Distinguish between private and collective (public) consumption.
  4. Describe the basic requirements of a "market" economy.
  5. Indicate some of the simple relationships of resource distribution to production and to consumption.



Editor recipient of Life Membership from Society – Thanks fellow NACTA members.

## EVALUATING TODAY'S AGRONOMY CURRICULUM

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Our universe is really six worlds according to Chemist and Dean Henry Eyring<sup>3</sup>:

the minute world of the atomic nucleus and atomic bomb . . . the world of chemistry made of atoms and molecules . . . the world of the living cell and biology . . . the world of everyday (of people, nations, and social problems; of plants, food, and production and distribution problems; of natural resources and ecological systems) . . . the world of stars extending millions of miles . . . the eternal world with neither beginning nor ending of space and time.

Faculties intensively trained in the worlds of chemistry and biology tend to forget that more than 80 percent of agriculture and agronomy graduates will serve primarily in the world of everyday. Few will work with the atoms and molecules of chemistry and cells of biology but all will live in the world of everyday.

The 21-year-old student of 1971 will be 50 years old in 2000 and in the prime of life and influence. Today's curriculums should prepare students to work, learn, recommend, influence, and legislate among the dilemmas and problems of the 21st century.

### Educational Objectives

Curriculums need to be living pathways in preparing the rising generation to serve individual and societal needs. Curriculum requirements and focal points should be regularly updated to meet human need and to insure reward for individual effort. Society's needs are not always clear but few will disagree that they include:

1) Increased food and fiber worldwide. Figure 1 shows that world population (3) is expected to rise from 3.5 to 6.1 billion between 1970 and 2000. Need for food should increase more dramatically because a larger percentage of the 21st century's people than of the 20th century's should be well fed.

2) Intensive use and protection of land, water, and natural resources. As population density increases, concern for water supply and water quality will equal concern for food. Wolman (6) predicts that water withdrawals in the United States will increase 3 fold between 1960 and 2000. Farmers and ranchers are the first proprietors of most rainfall, which also supplies urban citizens. Use of water may increase more rapidly in rural, agricultural states than in urban areas. In Kansas, withdrawal of water is expected to quadruple from 3.5 to 14.2 million acre feet between 1965 and 2000 with use by agriculture increasing at a rate double that of municipalities and industry (2). Where agriculture uses the lion's share of the water, farmers can expect increasing scrutiny as competition for water increases.

3) Ecological and environmental awareness and responsibility. Although agronomy graduates serve in each of Eyring's six areas, environmental quality demands immediate attention of the graduates and of those who plan curriculums leading to the baccalaureate degree. Public concern with the environment is heightened by high school biology courses, proposed governmental reorganization, new laws and regulations, and by intimate association with the out-of-doors most agricultural students experience. Such appreciation and concern can readily be developed

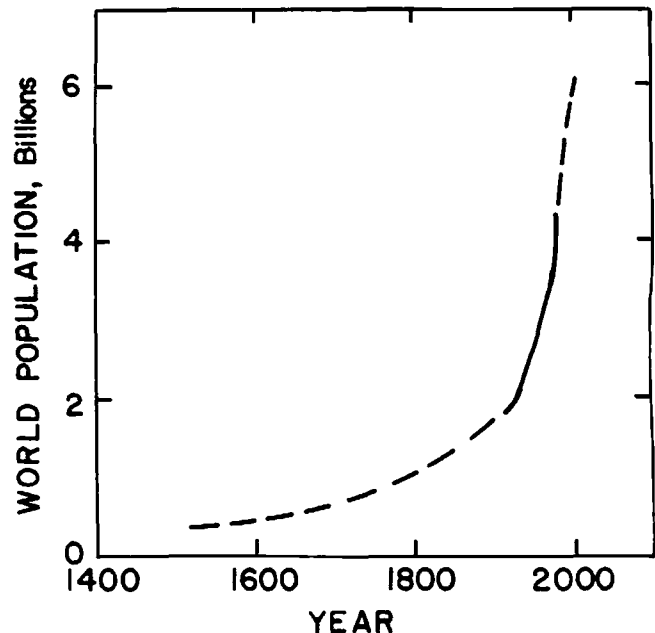


Fig. 1 World Population Estimates between 1500 and 2000 A.D.

through well designed curriculums and courses into both desire and ability to solve environmental problems. In some schools; e.g., Michigan State University, concern for the environment centers in the College of Agriculture. At others, emphasis on commodity production stifles such interest, and concern for "ecology, natural resources, and environment" is centered in biology and related departments and colleges.

Well known environmental problems such as excessive evapotranspiration, increased salinity in irrigation-return flows, non-polluting disposal of feedlot wastes, and possible contamination of ground and surface water by pesticides and agricultural chemicals will need additional attention.

Improved technologies for intensive resource use and food production will continue to be the central concern of agronomists on a global basis. However, in advanced countries practices to conserve environmental quality will become as common as fertilizer and pesticide applications.

Robert M. Alexander (1) believes "The critical issue today is the nature, speed, and extent to which the physical world is changed to suit man's purpose. Science is providing, at a rapidly accelerating rate, the knowledge base on which new technologies can be developed . . . The side effects no longer are . . . second-