Agriculture's impact on the living soil

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Agriculture's impact on the living soil

Abstract
Despite significant efforts to protect Iowa's greatest natural resource—its soil—conservation concerns now extend beyond depletion to concerns about how soil loss affects other aspects of the environment, such as water quality. Many educators in Iowa perceive that the most effective approach to designing education programs for environmental awareness in Iowa depends on channeling such programs through agriculture, specifically through farmers and future farmers.

Keywords
College of Education, Agricultural Education and Studies, Human systems, demographics and beginning farmer programs

Disciplines
Agricultural Education

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Agriculture's impact on the living soil: development of a curriculum

Background

Despite significant efforts to protect Iowa's greatest natural resource—its soil—conservation concerns now extend beyond depletion to concerns about how soil loss affects other aspects of the environment, such as water quality. Many educators in Iowa perceive that the most effective approach to designing education programs for environmental awareness in Iowa depends on channeling such programs through agriculture, specifically through farmers and future farmers.

A 1987 study of Iowa high school students revealed no significant difference between high school freshmen and seniors in their attitudes toward soil conservation and soil development. A lack of understanding among secondary school students in general was revealed in their responses of "undecided" or "slightly agreed" to the following fabricated statements:

2. Highly erodible land should be retired from crop production.
3. Most soil erosion is caused by forces beyond the farmer's control.
4. Row cropping is an effective conservation practice.

This project attempted to bridge the gap in Iowa's conservation education system by providing agriculture teachers with a dynamic instructional tool for instilling environmental concern in Iowa's youth.

This project tapped into the network of Iowa's agriculture teachers and students to increase awareness of soil's status as a natural resource. Designed to stimulate interest in analyzing tillage systems, chemical usage, and their effects on the soil environment, this curriculum featured the earthworm as the principal performer and integrated this concept into "hands-on" laboratory and field activities.

The project focused on four objectives:

1. To develop curriculum and teaching materials on the biological component of soils.
2. To develop classroom and laboratory teaching tools to illustrate activity in the soil.
3. To develop laboratory and field exercises for recording observations of life in the soil and analysis of the impact of cropping and tillage systems on the soil environment.
4. To conduct inservice for Iowa agriculture teachers to equip them with skills in using the educational materials and tools developed.

Approach and methods

A project advisory committee provided input and feedback. Serving on this committee were teachers Dale Gruis of St. Ansgar; Harold Woodard of Hartley/Melvin; Susan Gruebel of Chariton; Walter Reemtsma of Algona, Kim Coulter of the Iowa Department of Natural Resources (IDNR), Barbara Stewart of the U.S. Soil Conservation Service (SCS), and Alan O'Neal of the Iowa Department of Education. Representatives of the Leopold Center, Practical Farmers of Iowa (PFI), the IDE, and the SCS also reviewed drafts of the curriculum, and made recommendations.

In addition to the advisory committee, project personnel relied on consultants from Purdue University, the USDA's Agricultural Research...
Service in Ohio and the National Soil Tilth Laboratory in Iowa, and ISU’s Agronomy Department. The teachers who field-tested the curriculum also provided valuable feedback for making the curriculum more "user friendly" in practical application.

Unit I, which focused on the earthworm as the master builder within the living-soil community of organisms, was completed in the project's first year. Unit II, completed the following year, focused on the other major soil organisms. It featured "Willy," who served as a guide on an "interspace tour of underground livestock." The curriculum was supported by a videotape titled, "Agriculture's Impact on the Living Soil." This videotape was funded by Iowa's Resource Enhancement and Protection program. The videotape features interviews with experts who explain how earthworms help restore the soil and contribute to sustainable agriculture. It shows high school students and their teacher discussing soil quality and conservation. A song on the video emphasized earthworms' role in making soil more fertile.

Twenty ISU students assisted in various phases of the project. Their involvement provided the project with a student perspective. Graduate students conducted research and helped write the material. Teachers participated in inservices, workshops, and field testing to ensure that the materials were practical and user-friendly.

Teachers were given several opportunities to acquaint themselves with the curriculum:
- Fourteen Iowa agriculture teachers participated in a one-week workshop in June 1992 at Iowa State University. The workshop covered use of innovative techniques to teach sustainable agriculture concepts. Those teachers and project staff then conducted six one-day teacher inservice meetings around the state. The Living Soil video and basic earthworm activities were featured as one component of this inservice, which reached 98 agriculture teachers.
- Another inservice training session specifically designed for the Living Soil Curriculum was held in July 1993 in conjunction with the Iowa Agricultural Education Conference sponsored by the Iowa Department of Education.
- The curriculum was presented to science teachers at the Iowa Academy of Science Convention in Des Moines in 1993.
- The curriculum was presented at a winter workshop to teachers and naturalists at the Springbrook Conservation Education Center during winter 1993-1994.
- Unit II of the curriculum is included in the summer packets that went to a majority of the agriculture teachers in conjunction with the 1994 Iowa Agriculture Education Conference.

Findings

The "hands-on" curriculum, designed for both agriculture and science classes, provides students with exciting laboratory and field experiences to stimulate their interest in soil science and sustainable agriculture by featuring the earthworm as the "great performer" and microorganisms as a key link in the nutrient cycle. The curriculum is designed to change attitudes about soil as an inert, physical, chemically linked material to a more enlightened perception of soil as a world of symbiotic relationships among plants and animals. The curriculum vividly demonstrates the impacts of soil organisms on soil tilth (decomposition
of organic matter, forming of water-stable aggregates, increasing availability of nutrients to plants, increasing soil drainage, and improving aeration of the soil).

**Implications**

A majority of the 240 agriculture teachers involved are using some portion of the curriculum. Many have indicated that parts of the curriculum are especially adaptable to their existing units on soils and natural resources, and that they find the "hands-on" laboratory and field exercises especially useful. Because the curriculum includes adequate supporting materials, instructors need not do a great deal of research on their own to teach the subject successfully.

To build on the progress of this project, the Leopold Center has funded another project in ISU’s Agricultural Education and Studies Department to adapt the materials for team teaching as well as conduct a pilot study of high school students teaching middle school students.

Because the subject matter is relevant on a global scale, plans are under way to adapt the Living Soil curriculum for use internationally. The Agricultural Education and Studies Department now has an education materials distribution center that provides opportunities for further distribution of the curriculum.

The education program resulting from the projects exceeds the original project goals in a number of respects: in the number of teachers who participated in the "Teachers Teaching Teachers" workshops, in the number of field-testing teachers, and in the favorable responses from both students and teachers about the effectiveness of the materials developed.

This project benefited from cooperation among PFI; the U.S. Soil Conservation Service; the Iowa Department of Education; the Iowa Association of Soil and Water Conservation District Commissioners; the Iowa Vocational Agriculture Teachers Association; the National Soil Tilth Laboratory, Agricultural Research Service-USDA; ISU Extension, ISU Departments of Agronomy and Mass Communication, the College of Education, and the Agriculture Information Service in the College of Agriculture; and the Iowa Department of Natural Resources.

*The curriculum balances lively artwork and language with practical, scientific information.*

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