

AND REVOLUTIONARY WE MUST BE

Darrel S. Metcalfe*

If an Egyptian farmer of 5,000 years ago could have travelled through the time tunnel to Virginia in the year 1800 he would have found agricultural methods very similar to his own.

Move him to a Midwest farm 100 years later and he still would have recognized most of the basic farming techniques.

But, speed up his progress through time and bring him to a modern Arizona farm or ranch today and he would be a baffled man. Very likely he would stand in awe of such agricultural magic as herbicides, giant machines, and computers.

This illustrates the sudden revolution that has molded our lives during this Century. Yet, when the facts are brought into sharp focus, you literally "haven't seen anything yet." The progress coming in the immediate future and beyond is enough to stagger the imagination.

The last hundred years have seen agriculture revolutionized. From modest beginnings American agriculture has become a highly productive industrial complex. Astonishingly, much of this has come about in only the last two decades. Farmer ability to produce is unmatched in our history. Some six million workers, one-third fewer than 35 years ago, are producing bountifully on virtually the same amount of cropland for a population 55 per cent greater. Less than 8 per cent of the nation's work force is required to provide food and fiber for the other 92, including exports. In 1820, one farm worker could produce food and fiber for 4 people, in 1940, 10; in 1960, 25; in 1967, 31. One hundred years ago 75 per cent of agricultural production inputs was represented by labor and 25 per cent by capital, including land. Today, the reverse is true, with only 25 per cent of farm inputs charged to labor and 75 per cent to capital.

It has been suggested that there will be more technical developments in the next 34 years than all the years up to this time in the age of man.

Margaret Mead, noted anthropologist, has said very dramatically, "No one will live all of his life in the world in which he was born and no one will die in the world in which he worked in his maturity." She continued by saying, "For those who work on the growing edge of science, technology, or the arts, contemporary life changes at even shorter intervals. Often only a few months may elapse before something which previously was taken for granted must be unlearned or

* Darrel S. Metcalfe, Director, Resident Instruction, Assistant Director, Agricultural Experiment Station, College of Agriculture, The University of Arizona, Tucson, Arizona.

transformed to the new state of knowledge or practice." Change and adaptation are the order of the day. Today's needs may not be tomorrow's.

Undergraduate education in Colleges of Agriculture has been changing rapidly and the reasons are familiar: The advances of automation on all fronts -- business, industry, and agriculture; the disappearance of whole occupational categories; the increase of technical content in many surviving occupations; the obsolescence of skills within occupational categories; the increased interest in international obligations.

Last June a cartoon appeared in a newspaper in which several 1966 graduates in their black caps and gowns were feeding questions into a complex computer. Out came the answer: "Congratulations, you're obsolete, congratulations, you're obsolete."

Agriculture needs graduates who are equipped to adjust themselves, to cope with a great variety of problems, to meet many unpredictable situations; who are capable of practical thinking in the complex society of today. In educating students, agriculture must be considered in its present framework as a gigantic and complicated profession. Emphasis must shift to include the training of agricultural scientists, teachers, and specialists in related industries in the twentieth century. Agricultural Colleges must be concerned with every phase of the production welfare of the American people. They no longer can direct their courses toward production agriculture alone.

Colleges of Agriculture are alert to the need for change. Goals have been refined. Institutes have been organized, departments combined, areas unified for related teaching and research. Curricula have been revamped, obsolete courses deleted, new ones initiated, others combined in and between departments and colleges. Courses and course outlines have been modernized; new teaching techniques initiated.

The change in philosophy as to the goals of undergraduate education in agriculture has been characterized by the devotion of increasing proportions of the curricula to courses in the Social Sciences and Humanities and to courses in the Natural Sciences and Mathematics. A 1962 curriculum pattern study conducted by the U. S. Office of Education, under the direction of Dr. Henry S. Brunner, shows the typical pattern in agricultural curricula to be as follows:¹

Natural Sciences and Mathematics	27%
Humanities	10%
Social Sciences	12%
Agricultural Science and Technology	30%
Other Required Courses	5%
Electives	16%
Total	100%

¹Commission on Education in Agriculture and Natural Resources, National Academy of Sciences--National Research Council, Trends and Issues in Education in the Agricultural Sciences. BioScience 15:711-715. 1965.

In 1961, the Commission on Education in Agriculture and Natural Resources (formerly the Committee on Educational Policy in Agriculture), National Academy of Sciences--Natural Research Council, suggested the following curricula to be used as a basis for obtaining the status of Bachelor of Science in Agriculture:

Minimum requirements for Bachelor of Science in Agriculture, including Agricultural Sciences, Agricultural Production, and Agricultural Business

General Education (65 credits--50%)*

- 1) Communications - 12 credits
- 2) Humanities and Social Sciences - 18 credits
- 3) Mathematics and Statistics - 9 credits
- 4) Physical Sciences - 12 credits
- 5) Biological Sciences - 14 credits

Major Field (26 credits--20%)

Supporting Courses to Major Field (26 credits--20%)

Electives (13 credits--10%)

*Figure based on total of 130 credits required to graduate

Questions Asked

In today's "sophisticated" agriculture how can departments of Agricultural Education best train teachers to teach and to teach effectively? Some "pointed" questions are in order:

1. Is the day of the generalist past history? Are we teaching "more and more about less and less?" Do our majors graduate with too little depth in subject matter? Is this what we want or is this what is best for our graduates as they enter the teaching field or as they move into other areas of responsibilities? Are we "short-changing" our graduates?
2. Should a student concentrate on a major in another discipline and supplement it with education courses? Should this be the rule instead of the exception?
3. Is teaching in vocational agriculture still primarily geared too much to productive agriculture? Has our shift in emphasis been too slow?
4. Should the undergraduate receive more theory and less practice? A teacher's ability to teach depends heavily on his understanding of theories behind what he teaches. Is the objective to teach the answers to a thousand questions or to develop the thinking power of a student and to treat his mind as a workshop not a storehouse? Do we neglect theory and stress skills too much? Should these skills be classified as non-academic?
5. Are our graduates exposed to research? How can undergraduates be effective teachers if they are not acquainted with research--including the field of education? If they are exposed, can they interpret the research data intelligently?

Are they able to look into the future? Do they see the modern farmer as others do? Do they know that experts envision all the field work on farms carried out by automated machinery, directed by tape-controlled programs, and supervised by television scanners mounted on towers? Do they foresee virus-free plants, bred by geneticists to give higher yields in a much shorter growing period, to mature at the same time, the stalks on these to lend themselves more easily to mechanical harvesting? Do they have a knowledge of the pesticide-residue problem; perhaps, the difference between a methyl-carbamate and an organophosphate insecticide; acquainted with the term, spectrophotofluoremetry? Are they aware some predict that weather will no longer be the incalculable threat it remains in our time, for satellites will provide long-range forecasting--providing time to prepare for, divert or dissipate damaging storms?

6. Do teacher educators have sufficient background to make vocational-technical education relevant to the needs of the modern technological society? Can they cope with new programs? Do they know the jargon?
7. Are undergraduates aware of the world population food dilemma? Do they realize its magnitude and the role agriculture must play and the role they may play? Are they aware of the vital foreign aid programs; their scope, implications, and tangible results?
8. Is there a lack of communication skills in teaching?
9. What is the minimum of education courses absolutely necessary to be an effective teacher? Have we been realistic about the number of strictly "education" courses? Are our critics justified in thinking we have not been? Should we end the traditional separation between vocational and academic education and make both more meaningful, more accessible to more students?
10. Are departments of agriculture too compartmental? Do we disregard other departments and the value of such relationships in our teaching programs; our research?
11. Why are there shortages for vocational agriculture teachers? What is wrong? Whose fault is it? Why have we failed to teach the merits of this career to prospective majors? With such a shortage have agriculture administrators, teacher educators, or the agriculture instructors themselves sold the profession short? This problem has many facets. It's unrelated to the other items, or is it?

And, Finally

It would be unfair to say that agricultural educators are unaware of the concerns listed above or that they had not made any effort to "change with the times." However, the critics might say and, perhaps, with considerable merit, that changes have not been made fast enough in view of the rapid technological changes and philosophies in agricultural education.

Any questions raised have been done so before but are repeated here only for emphasis:

1. How can we possibly train vo-ag teachers in four years; do we need five years excluding experience; or if we adhere to four years should we avoid the "applied" or "skills" courses and emphasize only theory and research?

Commercial companies seek good men with B.S. degrees with the "basics." They invariably say, "We will train the man on the job ourselves." Training periods range from a few weeks to a year or even longer. Is this applicable to ag teachers?

2. Should skills be acquired outside scheduled classes during the college year or during the summers?
3. Should we avoid forcing specific course patterns on every student regardless of abilities, backgrounds, or aptitudes?
4. Could all phases of teaching be speeded up by an instructional media center; multi-media self-instructional materials, including single-concept films, programmed units, slides, and audio-tapes, to mention a few? Do we agree with the comments of an educator: "Be frank, basically, we haven't changed our teaching methods in a hundred years?"

It is ironical to suggest longer training period which is in direct conflict to the current desperate need of agricultural teachers on all levels here and overseas. Perhaps, we could revolutionize and do much more in four years. Perhaps, we should make more attempts to quickly and efficiently retrain majors from other areas.

Teacher trainers in Agricultural Education are sensitive to the dramatic changes taking place in both the technical fields of agriculture and professional areas of education. Changes and research in the profession are being reflected in curricula for prospective teachers of agriculture in an effort to produce quality teachers in this field. And revolutionary we must be!