

education while specializing in agriculture? Does our curriculum continue to be too proliferated and fragmented? What about agriculture in the first two years? What type courses do we need?

There are other areas where NACTA can contribute to the improvement of teaching. For example, the committee on teacher evaluation has made a fine start. This project can become a great contributing factor. I still like the idea of the "Academy of Agriculture" proposed in the June, 1963, *Journal*. Then what about a study of teaching techniques, such as the audiotutorial system of teaching? If we cease to improve, we cease to be good teachers.

Although time does not permit even a mention of all phases of our homework, I would not want to conclude without a mention of what our past president pursued so diligently last year — the NACTA *Journal*. No doubt all of you join me in a word of commendation to Dr. John Wright and the editorial board for the obvious improvement in the *Journal* during the past year. All of us recognize the great potential the *Journal* has for serving us in the carrying out of our objectives as an organization. What most of us have not realized, however, is the challenging opportunity we have for writing articles for publication.

It seems to me that the new plan for the *Journal* shows good judgment on the part of the editorial board. The fall issue is devoted to the teacher, the winter issue to the student, the spring issue to the administration as it relates to instruction, and the summer issue to the proceedings of the annual convention. This is a progressive step toward meeting the need suggested by Dr. Keith McFarland (4) at Wilmington last year:

There is a need for better communication in the entire field of agricultural higher education. There exists no single publication in the field that draws together materials relating to instruction, curriculum, and programs in agricultural education on the college level, or that presents these items in organized form. Much is being done in the way of individual effort and institutional research in instruction. The field would be benefited by having a journal or yearbook that would draw major movement materials together in unified form, for permanent reference. An additional committee of NACTA might well explore the development of a yearbook or publication that would serve the entire field.

During the first decade NACTA has contributed positively to the improved image of agriculture. Under capable and effective leader-

ship NACTA has accepted the challenge to reexamine its objectives, conditions for membership, and the convention programs in the interest of promoting a unified national organization dedicated to the improvement of teaching in agriculture.

To all of you — college or university, junior or senior, technical or liberal arts, land grant or non-land grant, private or public — we say: The ground has been prepared; the seed has been planted; workers and implements are needed to bring forth an abundant harvest.

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Vocational and Technical

Education

Now and in the Future*

by

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I appreciate this opportunity to share with you some insights and viewpoints on "Vocational and Technical Education Now and in the Future" with special attention to the implications for agricultural education. In attempting to cover the subject in the allotted time, I will not be able to exhaust the various ramifications of this topic. Hence, some areas, by necessity, will be touched only lightly, if at all. Please keep in mind that these comments primarily represent my personal judgment as an observer and participant.

In my preparation I have tried to

look at the central thrust of developments in vocational and technical education as I perceive their implications for your membership and institutions. In this presentation I would like to:

1. Review the broad setting and circumstances in which vocational education and agricultural education find themselves as a means of developing a perspective.
2. Review the specific thrusts of vocational education legislation.
3. Discuss trends in agricultural education.

4. Examine the implications for this group.

We currently are living in an educational revolution, a revolution which promises to parallel and perhaps exceed the impact of the agricultural revolution of recent decades. We are experiencing new forces, pressures, and alignments in all areas of education. The federal government, to a degree unpre-

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cedented in history, is bringing the full range of its influence and resources to focus directly and indirectly on problems of education, of which vocational and technical education is an important and essential part. We see a new social conscience emerging, coupled with new concepts of "economics", with attendant new roles for the federal government in improving and extending the benefits of science and modern technology to all citizens. This activist role of the federal government, the influence of educational foundations, and the prominent role being played by scholars of other disciplines in shaping educational policy — all point to an even more yeasty situation in the future.

As a result of recent federal acts, we have seen important transfers in the relative financial support of education. We have seen a realignment of power and authority. We are witnessing shifts in leadership and initiative. And the cycle has not yet run its course.

I believe that we could appropriately observe that America is literally rediscovering education. Traditionally, our nation has been committed to the ideal of the optimum development of each individual citizen. Beyond this, however, I believe we are experiencing an increased public acceptance and appreciation of the values and benefits of education in general and vocational and technical education in particular. Education is becoming recognized as an effective instrument of national policy. Currently, national governments are considering educational programs in revolutionary terms. They now realize that education is the responsible link between social needs and social improvements. Education is becoming recognized as an effective instrument of national policy. It is being viewed by some as the vehicle for sustained economic growth and national well-being.

There is, I believe, a new sense of urgency and perhaps an almost blind faith in the "powers" of education. For example, states and communities are becoming increasingly aware of the importance of vocational education to their economic growth and development.

Economists have indicated that the educational level of a nation's citizens constitutes an important part of the nation's capital. In brief, education is becoming identified not as an expense but as an investment in human capital. For example, in a recent article in the *Monthly Economic Letter* of the First National City Bank of New York, several sources were cited to indicate that the rising educational level of the nation's labor force was responsible for approximately 20% of the rise in national productivity and income between 1929 and 1957. This 20% contribution by human capital was in contrast to the contribution of

physical capital, which was only 15%.¹

Not only is there growing awareness that education is an investment rather than an expense, but when comparing the alternative costs to society between adequate vocational and technical education programs and institutional care, welfare, and unemployment, vocational education is the more desirable alternative—both economically and socially.

In one sense of the word, education has become one of our nation's greatest growth industries. "Total public and private expenditures for education have increased from \$14 billion in 1954 to \$34 billion in 1964. This represents an increase from just under 4% of GNP in 1954 to almost 5.5% of the larger GNP in 1964."²

Education is truly "big business". It also promises to remain as one of the most viable and significant segments of our society.

Clearly, the climate for education is good. What is the situation concerning agriculture? I don't have to remind this audience of the difficulties that the "agricultural image" has experienced in recent years. Unfortunately, there were a few who saw the rapid changes and progress in agriculture and concluded that research and educational programs were no longer needed. There were some who continued to think of our modern agricultural industry as only farming and ranching. I believe, however, that we may be "turning a corner". I sense from recent statements and attitudes a new appreciation for the ultimate role of American agriculture in a world burgeoning with population and in a nation whose industrial and urban expansions are eroding its agricultural resources.

The social, economic, and educational implications discussed earlier contributed to the passage of the National Vocational Education Act in December of 1963. However, this act was not funded until the fall of 1964. Because of this delay in funding and the lead time needed to develop adequate administrative procedures at the state and federal levels, the full impact of the act is just now beginning to be felt.

Perhaps the most far-reaching implication of the act is its emphasis in the Declaration of Purpose on serving all age groups in all communities, "to maintain, extend, and improve existing programs of vocational education, to develop new programs of vocational education . . . so that persons of all ages in all communities of the state . . . will have ready access to vocational training or retraining which is of high quality, which is realistic in light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training." There is a new man-

date, new opportunities, and new responsibilities to serve all age groups of varying levels of ability, irrespective of their place of residence.

Let me review rather quickly the significant aspects and intent of this far-reaching act.

1. Federal funds for vocational and technical education are provided in increasing amounts.
 2. Quality in vocational education is stressed.
 3. More emphasis is placed on post-high-school education and retraining.
 4. Special classes for those who can't succeed in the regular vocational program are to be instituted.
 5. Access to vocational education regardless of place of residence is a goal.
 6. Training for known or anticipated employment is emphasized.
 7. Funds are not earmarked by vocational services.
 8. Business and office education is now included among the reimbursable programs.
 9. Cooperation among vocational services and between vocational education and other agencies is not only implied but is practically mandated.
 10. Funds are provided for ancillary services.
 11. Provision is made for research, experimentation, and training.
 12. Evaluation is made part of the act.
 13. The terminology limiting vocational education to less than college grade has been changed to exclude only those programs generally considered professional or as requiring a baccalaureate or higher degree.
 14. Vocational agriculture is broadened.
- "Any amounts allotted or apportioned to such titles, act, or acts for agriculture may be used for vocational education in any occupation involving knowledge and skills in agricultural subjects whether or not such occupation involves work on the farm or of the farm home and such education may be provided without directed or super-

¹First National City Bank of New York, *Monthly Economic Letter*, August, 1965, p. 93.

²Dr. Leonard A. Lecht, Director, National Goals Project, National Planning Association, Washington, D.C., March, 1966.

vised practice on a farm."

Specifically, the bill has given increased prominence to and a broader franchise to serve the total agricultural industry. Agricultural educators have been challenged to extend and up-date programs to add breadth and depth while retaining and building on the proven features of their present program. To summarize to this point, there probably was never a better climate or perhaps greater urgency for replanning programs of agricultural education.

With this background of the major thrusts and areas of emphasis of the Vocational Education Act, let me proceed to the broad, emerging trends that I see in vocational education in agriculture.

1. New, broadened objectives have been adopted.
2. High-school curriculums are being reorganized.
3. In-service programs are being initiated.
4. Programs for special groups are being established.
5. Curriculum materials are being developed.
6. Multiple-teacher departments are increasing.
7. Area vocational schools are providing broadened and extended offerings.
8. Innovative approaches in teacher education are being undertaken.
9. Supervision and administrative procedures are being examined.
10. Post-high-school education in agriculture is being expanded.
11. New relationships and orientations are being established with key groups.
12. Increased special assistance is being provided for teachers.
13. Research and development are receiving new emphasis.

Probably the most pervasive trend is that multiple-teacher patterns of agricultural education are emerging. It appears that diversity, flexibility, and adaptability will characterize programs of the future.

In short, vocational education in agriculture is in a healthy state of ferment. Everywhere we turn we see new vigor and vitality, vigorous seeds of change, critical almost ruthless internal evaluation and appraisal, a willingness to kill some of the sacred cows, a new sense of urgency and commitment to meeting the agricultural occupation training needs of the nation.

It is obvious that if these occupational training needs are to be effectively and adequately met, increased involvement and participa-

tion will be required from all areas of the agricultural education community. I believe this to be especially true with reference to members of this association. I would hope that from my discussion to this point you have already identified some implications for your expanded involvement.

At the risk of being presumptuous, let me identify what appear to be some major implications for expanded participation on your part in this critical and growing arena of educational activity.

1. *Exert leadership to improve agricultural education.*

There is continued need for effective leadership from all quarters if the agricultural education community is to adequately redirect its programs to achieve greater congruency with labor market demands and exploit the implications of current research and technology in improving its economic position in both the farm and off-farm sectors.

We are entering one of the most competitive labor markets in history. All segments of the agricultural community must become increasingly articulate in portraying the advantages of career opportunities in the broad agricultural industry and in maintaining and further enhancing educational and research programs.

2. *Expand post-high-school technical education programs in agriculture.*

In my judgment, this area may have the greatest implications for members of your association. To meet the challenge of the future, post-high-school education in agriculture must be expanded and extended. (Secretary of Labor Wirtz has indicated that 14 years of education will be the normal expectancy in the future.) Perhaps greatest among the needs in the post-high-school area are in technical education. These programs, roughly equivalent to two years of post-high-school education, are needed to develop paraprofessionals to support senior scientists and to perform other technical tasks.

Industry, for example, has for a number of years identified a certain ratio between the number of professional workers and the number of technicians needed to support them. The normal range is from 1:1 to 1:5. Some space shots from Cape Kennedy have used a 1:3 ratio. In 1965 there were 6460 baccalaureate degrees in agricultural areas conferred by land-grant colleges alone. If we assume the 1:1 ratio between professionals and technicians, we see a need for well over 6460 agricultural technicians annually.

A draft of a position paper by the Committee on Educational Policies in Agriculture of the National Research Council of the National Acad-

emy of Sciences points out that there are more than 75,000 agricultural scientists and engineers working in the U.S., many of whom need support from agricultural technicians.

3. *Improve and extend teacher education programs.*

New types of agricultural teachers will be needed. One of the most urgent needs is to develop methods for recruiting and rapidly "retreading" graduates of subject-matter fields and for providing them with requisite professional skills, thereby enabling them to provide leadership in these emerging areas.

Increased emphasis also must be placed on in-service education activities. Special workshops and institutes are needed. Furthermore, funds are available to defray the costs of these institutes.

4. *Develop instructional materials.*

As new programs emerge and as technology changes existing programs, instructional materials must be continuously expanded and updated.

5. *Increase the emphasis on research.*

If we are to meet the challenge of the future we must rapidly expand our research and development efforts. Opportunities here might range from agricultural labor market projections to interdisciplinary and interinstitutional research on the learning process or new organizational and instructional approaches to meeting educational needs in this area. Pilot and/or demonstration efforts provide further opportunities for leadership and assistance.

6. *Assist in the continuous evaluation of programs.*

One of the most pressing needs is for assistance in developing mechanisms and procedures for achieving continuous appraisal and evaluation in agricultural education; to build the concept of self-renewal into the very heart of our programs.

7. *Improve and extend relationships.*

Relationships with new educational organizational structures, trade associations, unions, and all segments of agriculture, must be achieved if emerging programs are to succeed.

These are but a few of the implications for you and your association in the vocational and technical education programs of the future. I am sure that you, in consort with other members of your staffs and representatives of the agricultural industry, will perceive many others. Let me assure you of the continuing interest and willingness of our Center staff, and I know of the individual state staffs, in working with you and your association in develop-

ing activities in agriculture and other vocational fields. Our Center is comprehensive in its interest and commitment to vocational and technical education, interdisciplinary in its approach, and interinstitutional in its program. We hope you will look upon it as a potential resource.

What about the future of vocational and technical education? In my judgment, the biggest question is, "What kind of future do we want?" In the last few years a

number of organizations and government agencies have begun to anticipate or "invent" the future. Our achievements in defense and space endeavors may have given us the impression that we can literally invent the future if only we are willing to devote the necessary men and money. To achieve this Utopian concept in agriculture will demand the best thinking and efforts of all segments of the agricultural education community. Furthermore, it will necessitate improved coordina-

tion and cooperation among all relevant groups. The effectiveness of programs of the future can well hinge on the manner in which we perceive our present circumstances, identify long-range goals, consider alternatives, develop effective working relationships, and execute our plans and responsibilities.

I predict that we will not be content to merely keep up with change, which is the key to survival; rather, together, we will create change, which is the key to leadership.

"Our Brethren Are Already In The Field"

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"Our brethren are already in the field. Why stand we here idle?" With these words Patrick Henry spoke with alarm about the complacency of his fellow Virginians, while others, with no more at stake, were already at war. Perhaps the same words are appropriately directed at those of us in the field of education in agriculture.

Over the past ten years it has been popular to extoll the Colleges of Agriculture in the United States and to give them credit for almost single-handedly bringing about many of the desirable features of American life. We have heard that as a result of agricultural research, an ever decreasing percentage of the American public is needed for primary production, and that this in turn has released manpower to produce luxury items which contribute to the high standard of living we enjoy. We also hear that, to the credit of the agricultural colleges, the American workingman can buy a T-bone steak for a few minutes work while a Russian has to work long hours to obtain his tough little piece of boiling beef.

These ideas, no doubt, have had their place in boosting our morale in an era when agriculture was taken for granted and its image was at an all-time low. I wonder, however, if they have not had another, less desirable, effect — that of lulling us into complacency, into thinking that the organization and the system that have been so fruitful in the past can continue to serve

effectively without change in the years ahead.

Students entering our colleges this fall will graduate in 1970. They will be among the leaders in the field from perhaps the year 1980 to the year 2000. Is the training that they are now receiving that which they will need to fulfill the responsible roles awaiting them? Perhaps a quick look at the agriculture of the not-too-distant future will give us an insight into some of the questions and problems with which they will be faced.

Farming in the United States will be a corporate enterprise; the small farm probably can not persist. Cultural practices will be programmed by computer, perhaps not for maximum output, but for optimum efficiency in the utilization of water, land, labor, and capital investment. Ecosystems will be controlled and modified by chemical, physical, and biological means. New resource areas will be exploited including subpolar regions, arid lands, and, yes, even the seas and space. Marine agriculture and space agriculture are almost foregone conclusions. Who will manage the production of biological resources in the seas and who will be growing plants, and maybe animals, under pressurized, artificial environments on the moon? These possibilities are no more remote now than was the application of hydroponics to growing food on coral atolls in the Pacific at the beginning of World War II. If agriculturalists are not to do these things, who will? Who else is so well trained in the principles of management of biological commodities?

New concepts of the genetic potential of plant and animal species

will be developed. In a recent talk, Dr. James Bonner of the California Institute of Technology suggested one example. The succulent plants as a group are most efficient in the utilization of water per unit of dry matter produced. This results from their unique ability to fix carbon dioxide in the dark while their stomates are open; during the day while stomates are closed and water loss is minimized, this temporarily fixed carbon dioxide is used in photosynthesis. Dr. Bonner points out that only the pineapple among our cultivated plants has this singular type of metabolism. The agricultural and chemurgic potential of other succulents has not been assessed.

We may also expect that the metabolism, growth and development of both plants and animals will be more closely controlled by means of chemical regulators. Those who use them will have to understand their action.

Opportunities in foreign agriculture will expand for those who have the ability to adapt their knowledge to new problems and to different social and political environments.

Many of you will immediately agree that the agricultural research scientist of the future will have to be better and more broadly trained than his counterpart of yesteryear, but some of you are not willing to admit that the training program for the agricultural technologists will also have to be changed significantly. While I agree that there will continue to be jobs *not* greatly different from those of today, it is my firm belief that the training of the terminal B.S. will have to be modified drastically. The industry will demand personnel at all levels of