

## POTENTIAL LINKAGES IN AGRICULTURE'S EDUCATIONAL SYSTEM

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### Throughout human history, education has mirrored the state of civilization

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It *was* the intent of this article to report on the trends in agricultural higher education and how they impact on vocational agriculture programs. In studying the literature, however, it soon became apparent that a better title for a paper on the current relationship between secondary and tertiary agricultural education might be "the abyss between levels of agricultural education." To some, this may seem rather strong — considering that vocational agriculture teachers are trained in colleges of agriculture — but when one looks at the goals and purposes of both segments at the national level, one is immediately struck by the discontinuity.

The particularly disturbing point about this realization is that both levels of education supposedly draw their information from the same source: American agriculture. One suspects that we are like two of the set of blind men in the Indian fable who experience only one part of an elephant and so our perceptions of the beast are different. Possibly, if we communicate better, our picture of agriculture too will be clearer — and may amalgamate. As a beginning, I suggest some potential linkages based on the academic level's perceived view of the "elephant": American agriculture. Linkages are two-way, however, and in the conclusion of this article one such linkage is mentioned. Hopefully, others will expand on the linkages from vocational agriculture's viewpoint in the near future.

Curricula in academic agriculture are becoming more pragmatic and less discipline-based. Johnson reports this trend to be the result of a realization that "universities have disciplines, departments, department chairpersons,

deans, directors and professors, while farmers have problems."<sup>1</sup> Problems are rarely identified with one discipline and so need to be addressed through the use of a wider perspective. This has led to different reactions at the higher and secondary levels of education. Vocational agriculture has tended, like farmers, to remain at a very elementary and pragmatic level. That is, educators of vocational agriculture teach students to solve specific problems. In academic agriculture, a much broader approach is now being taken to problemsolving through a concept called the systems perspective.

Analyzing agriculture from a systems perspective is not a new technique. It is only new to agricultural instruction. In land-grant colleges, research and extension programs have long used this approach since the problems of production, processing, marketing, and consumption need to be addressed in a multidisciplinary and integrated manner. This is because agriculture is, by nature, a system which encompasses biological, physical, economic and social interactions. Agricultural systems education is an extension of this orientation and is designed to introduce students to a holistic way of thinking about agriculture.

There are other problems in agriculture which have led to changes in the curriculum. For example, the implications of the use of biotechnology and mechanization have resulted in political and legal problems for agriculture. It is uncertain, however, if vocational agriculture educators need to address these types of problems to the same intensity as academic agriculturalists need to, but they should be aware of them.

Another linkage between American agriculture and the higher education component which probably needs to be looked at by vocational agriculture is that of changing populations. Agriculture has been so successful in this country that only a few people produce enough food to meet the needs of everyone else. With such a small, on-farm population, the clientele (prospective students) for agricultural colleges has changed. This also means that fewer graduates will be needed in production fields; the

types of available jobs have changed. This has led to modifications in curricula in both content and expectations. It is likely that this change in impacted populations and resulting agricultural careers will have an effect on vocational education, too.

### Systems Perspective

A recent issue of the United Nations University *Newsletter* presented several papers from a symposium on managing complexity. The major theme was that the world is a very complex place — and that it is getting more complex. And, as one of the symposium's speakers noted: "Complexity is a very complex concept, which is not altogether surprising."<sup>2</sup> The editor of that newsletter went on to use the analogy that understanding complex systems can be likened to finding and following the single fragile thread that Theseus, in Greek mythology, used to guide himself out of the labyrinth.<sup>3</sup> The systems approach can be seen as the thread which permits us to find our way through the labyrinth of agriculture. The thread is not one that can be pulled out of the fabric as it is an integral component of the complex. Neither is the systems approach thread a simplification or a representation of the agriculture complex for it is part of the whole system. Rather, the systems approach provides a means to deal with and conceptualize complexity. Or, as Hagerstrand notes, it helps us get the message.<sup>4</sup> Recognition is half the battle of dealing with complexity.

When curricula are systems-oriented, students can be assisted to comprehend that agricultural complexity is made up of more than just biological interactions (subsystems) between plants, soils, and animals. They will be introduced to financial and resource management, to personal interrelations based on societal patterns, and to values, beliefs, and prejudices which all together go into the formation of agricultural systems. To better understand all these complex factors and to survive in agriculture as a career, students will soon realize that they need to be exposed to a multitude of educational experiences in diverse fields of agriculture and in the liberal arts, such as communication, mathematics, the humanities, and social sciences.<sup>5</sup>

Within the next several years it is expected that colleges of agriculture will be introducing systems-based course sequences into their curricula. The impetus which will lead to this is provided by a survey conducted in 1982-83 in agricultural colleges throughout the nation. Each was asked to identify and rate the ten most pressing instructional needs. These were ranked and, on a national scale, systems analysis was selected as the area which most felt required the greatest amount of effort. A small team of agricultural educators was created to develop curricular

materials in systems analysis.<sup>6</sup>

Educators of vocational agriculture should investigate the applicability of the systems perspective to secondary education. Components of systems are already present in the high school curriculum — they need only be addressed from a systems perspective. Problemsolving techniques used in vocational agriculture have tended to be specific — almost discipline specific. Possibly, students would be better prepared for agricultural employment or further education if they were provided the broader perspective of the systems approach.

### The Backlash of Success

Success is hard to argue with. The old adage "too much success may be a bad thing" is, in all probability, a truism as far as American agriculture is concerned. This is because we have been so successful in making agriculture blossom that we cannot readily appreciate the changes that have been wrought within our society. Some have gone so far as to say that "we have become victims of our own success."<sup>7</sup> In what has been subtitled *a revisionist look at agriculture*, Easterbrook writes that "Americans are inclined to think of a crisis as a shortage, but agriculture is in crisis because of surplus — too much of a good thing."<sup>8</sup>

Agriculture is big business in the United States. There are surpluses of dairy products, of grains, and other foods and fibers. Government intervenes through programs that provide price supports and import tariffs. We have been so successful at intensifying our efforts that less than three percent of our population can feed and clothe us — and much of the rest of the world.

This all sounds great and so we may ask where the problems are. An oversupply of food has caused questions to be raised as to the cost of storage and the necessity of food giveaways. Mechanization and efficiency have resulted in loss of employment and even, in the case of the tomato harvester in California, to legal actions.

American agriculture can justifiably be proud of its achievements. But just because we have been successful in the past in training young people to achieve this success, it does not hold true that those trained in the time-honored methods will continue to serve the needs of the profession. Because of its success, agriculture — and society, in turn — has changed from a rural to an urban one. Gordon argues ". . . that professions usually survive and prosper only if they serve the goals of the society of which they are a part."<sup>9</sup> If professional agriculture is to continue to be a part of academia and follow through on its land-grant mandate, it too will need to adjust to changes in society and agriculture.

Recently, the *Chronicle of Higher Education* ran a series

of articles on the socio-political dilemmas affecting agriculture's success.<sup>10</sup> In the pending lawsuit concerning the tomato harvester, the contention of labor is that this invention, at the University of California, Davis, has led to severe unemployment among field workers. These workers charge that agricultural scientists should have foreseen this, but since they did not the workers want compensation for this lack of foresight of the impact of mechanization on society. The University of California has countered with the defense that "there should be free opportunity for research, and then society can determine how the results of that research should be applied."<sup>11</sup>

The tomato harvester lawsuit illustrates that even the most innocuous development can have an impact on society. Other, more pervasive, cases of impingements of agriculture on society and the environment have been publicized, such as those involving pesticides and governmental programs like payment-in-kind (PIK).

While solutions to the backlash of success are difficult to find, we in education can at least become aware of the problems. The systems perspective should help us to better appreciate the problems, and to make students better aware of them. Even more important than just an appreciation or awareness is the recognition that societal reactions to advances in biotechnology and mechanization will increase. We in education need to prepare our students to face the dilemma of societal intervention into the agricultural sector.

### Nontraditional Students

The pool of traditional students for agricultural colleges have shrunk along with the rural agricultural population, so much so that nontraditional students now outnumber traditional students in US colleges of agriculture. There have been two groups of nontraditional students which have been recognized in agricultural colleges nationwide: urban students and women (obviously not exclusive groupings). The impact of these two groups has only been apparent in the past 25 years. In the case of women students, the increase can only be called dramatic.

It should not be really surprising that student bodies have changed over the past quarter century. The percentage of America's on-farm population in 1980 was only 2.8 percent.<sup>12</sup> This has meant that the pool of available students has shrunk. National<sup>13</sup> and regional<sup>14</sup> studies have consistently revealed that the nontraditional student has come to constitute from 60 to 70 percent of the undergraduate enrollment in agricultural colleges. Reaction to this change of clientele has varied. Some colleges have attempted to provide agricultural experiences to make up for the experiential "deficiency"<sup>15</sup> while other colleges

have adjusted their curricula to meet changing roles for graduates in agriculture.<sup>16</sup>

Women have moved into agricultural education very quickly. Twenty-five years ago women constituted less than two percent of the total agricultural undergraduate enrollment (this obviously excludes home economics).<sup>17</sup> At the University of Hawai'i, for example, it took 50 years from the University's founding for the first woman to graduate in agriculture. Enrollments of women in agriculture in Hawai'i did not pass above ten percent until 1970. In the decade 1970-80, there was a gradual increase from 13 to 16 percent; by 1985 women came to constitute over 35 percent of the undergraduate enrollment.

Collins and Pesek<sup>18</sup> found similar dramatic gains for women in graduate enrollment. It is, perhaps, interesting to note that a majority of these women tend to have some farm background (66 percent) which is directly converse to the total undergraduate enrollment.<sup>19</sup> This indicates that a very high percentage of male students must be from urban or at least non-farm backgrounds.

The change in the student body's composition would also seem to indicate that the linkages between vocational agriculture and academic agriculture are lessening. It was found that less than 25 percent of the students at southern land-grant colleges had taken agricultural courses in high school and only 30 percent had participated in 4-H and/or FFA activities.<sup>20</sup> This trend has also been recognized nationally. How might vocational agriculture benefit from this? Perhaps there should be a shift in emphasis from production to services, or from professional to recreational agriculture. The 4-H programs seem to have adjusted quickly, but this may be a reflection of the closer ties of 4-H programs to the land-grant colleges. Nevertheless, vocational agricultural educators should be thinking about the changes in student bodies in agricultural colleges because these reflect societal changes.

There are indications that the trend of increasing intakes of non-rural and female populations into agricultural colleges is also a reflection of the changes in available careers in agriculture itself. There are fewer opportunities for students in production agriculture and, therefore, agricultural colleges are preparing students for careers in sales, service, management, research, and government. The decline in this nation's rural population has meant that colleges need to restructure their curricula to attract students too.<sup>21</sup> Hasslen,<sup>22</sup> among others, has pointed out that higher education is lagging behind in making these changes to curriculum. It could be interpolated, too, that vocational agriculture is lagging even further behind due to its pragmatic approach to problemsolving.<sup>23</sup>



## Conclusion

American agriculture is in a state of flux. Less than three percent of the country's population is producing enough food and fiber to feed and clothe the rest of the nation, and much of the rest of the world. Yet the ethics of plenty and the technology we have used to get to this stage are now causing problems to agriculture itself and are impinging on agricultural education. Boyer and Kaplan<sup>24</sup> observed:

Throughout human history, education has mirrored the state of civilizations. The education of Americans — what is taught and what is learned — speaks to the conditions of our times.

The "conditions of our times" are to take a holistic approach to problemsolving, to humanize these problems, and to use an integrated perspective to study and improve on them. Agricultural higher education is attempting to mirror these conditions.

The linkages established between secondary and higher education can help to focus the reflection in the educational mirror. The National Center for Research in Vocational Education at Ohio State University has proposed, as a first step, the development of "2+2 programs."<sup>25</sup> The 2+2 program is a collaborative project whereby high schools and community colleges coordinate their vocational curricula so that students will be better prepared to enter the workforce. The model program is in agriculture and promises to be very successful. Academic agriculture should follow this experiment with interest for it may have aspects which could be utilized in creating viable linkages.

The trends in agricultural education are not crystal clear but they should be evident. Where agriculture goes from here is uncertain, the future is always so. It will certainly produce more — Johnson<sup>26</sup> predicts there will be a 70 percent increase over the next 50 years — and it is probable that a miniscule minority of our population will continue to produce it. To continue to grow, to produce more, will mean that there likely will be some environmental and socio-economic effects and these will feed back into the agricultural system. If agricultural education is to remain viable, it will need to reflect change too. The trends in higher education can be used as a guide to change; but it is up to vocational agricultural educators to evaluate their own mirror of the conditions of our times and implement their own reflection.

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## Footnotes

<sup>1</sup>Johnson, G.L. *Academia Needs A New Covenant For Serving Agriculture*, Special Publication, Mississippi Agricultural and Forestry Experiment Station, Mississippi State University, 1984, 11pp.

<sup>2</sup>Boulding, K.E. "Learning by simplifying complexity," in *United Nations University Newsletter*, 1985, vol. 8, no. 3, pg. 5.

<sup>3</sup>Fenton, J.M. "Threads through the labyrinth: managing complexity," in *United Nations University Newsletter*, 1985, vol. 8, no. 3, pp. 1 & 2.

<sup>4</sup>Hagerstrand, T. "Time-geography, man, society & environment," in *United Nations University Newsletter*, 1985, vol. 8, no. 3, pg. 3.

<sup>5</sup>Gordon, J.C. "Educating tomorrow's foresters," in *American Forests*, 1984, vol. 90, no. 4, pp. 10, 56, 61-63.

<sup>6</sup>Merritt, R.H. *Challenges for Undergraduate Education in Agricultural Sciences*, "California agriculture — now and the next quarter century," 75th Anniversary Celebration, 1983, University of California, Davis, 7 pp.

<sup>7</sup>Craig, H.B. "Re-tool for the future," in *NACTA Journal*, 1983, vol. 27, no. 3, pp. 6-7.

<sup>8</sup>Easterbrook, G. "Making sense of agriculture," in *Atlantic Monthly*, 1985, July, pp. 63-78.

<sup>9</sup>Gordon, *op. cit.*, pg. 10, see Footnote 5.

<sup>10</sup>Biemiller, L. "Social and political dilemmas hit agriculture research," in *Chronicle of Higher Education*, 1984, vol. 28, no. 19, pp. 1, 10-11.

<sup>11</sup>*Ibid.*, pg. 11.

<sup>12</sup>Craig, *op. cit.*, see Footnote 7.

<sup>13</sup>Hasslen, H. "How are agricultural colleges responding to needs of nonfarm students?" in *Journal of Agronomic Education*, 1983, vol. 12, pp. 4-5.

<sup>14</sup>Dunkelberger, J.E.; J.J. Molnar, C.R. Sollie, T.A. Lyson, G.W. Ohlendorf and A.L. Coleman. *Higher Education in Agriculture: Students at Southern Land-Grant Universities*, Southern Cooperative Bulletin 270, Alabama Agricultural Experiment Station, Auburn University, 1982, 47 pp.

<sup>15</sup>Hasslen, *op. cit.*, see Footnote 13. Also, Munson, R.A., "Agricultural internship program administration," in *NACTA Journal*, 1984, vol. 28, no. 1, pp. 28-30; and, Waldren, R.P., A.M. Parkhurst and J.K. Ward, "Differences between rural and urban students," in *NACTA Journal*, 1983, vol. 27, no. 4, pp. 8-13.

<sup>16</sup>Dunkelberger, et al, *op. cit.*, see Footnote 14.

<sup>17</sup>Collins, M.E. and J. Pesek. "Women in agricultural sciences," in *Journal of Agronomic Education*, 1983, vol. 12, pp. 87-91.

<sup>18</sup>*Ibid.*

<sup>19</sup>Waldren, *op. cit.*, see Footnote 15.

<sup>20</sup>Dunkelberger, *op. cit.*, see Footnote 14.

<sup>21</sup>Waldren, *op. cit.*, see Footnote 15.

<sup>22</sup>Hasslen, *op. cit.*, see Footnote 13.

<sup>23</sup>Johnson, *op. cit.*, see Footnote 1.

<sup>24</sup>Boyer, E.L. and M. Kaplan. "Educating for survival: a call for a core curriculum," in *Change*, 1977, vol. 9, no. 3, pp. 22-29.

<sup>25</sup>Centergram, National Center for Research in Vocational Education, Ohio State University, 1985, vol. 20, no. 9, 4 pp.

<sup>26</sup>Johnson, *op. cit.*, see Footnote 1.



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High school vocational agriculture students in Hawai'i participate in such varied activities as (above) visual crop inspection, (top, right) operating farm equipment, and (bottom, right) grafting and air-layering. Photos courtesy of Ken Kajihara, Hawai'i State Department of Education Vocational Agriculture Specialist.

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