Keynote Address

Barriers to Innovation for the Grower

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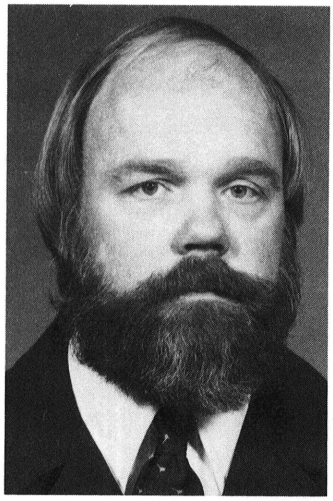

Growing crops is a business. For some growers it is, in addition, a way of life that transcends the principles of production and marketing. Successful growers strive to make a profit by which they gain satisfaction, respect, and status. To achieve success, growers must continuously overcome barriers imposed by such factors as lack of knowledge, economic constraints, unfavorable growing conditions, and personal limitations. The grower has only partial control over some of these barriers.

The role of farmers and growers in America has changed considerably throughout our history. The first settlers were farmers. "Cities grew around agricultural communities and the initial purpose of towns was to support farms, provide market centers for the produce, and services that individual farms couldn't maintain. Later, after the Industrial Revolution, roles were reversed, and then, as now, farms existed to support the huge, hungry pits of urban sprawl" (13). Today only about 4% of the U.S. population are farmers on 2.4 million farms. In 1934 there were 6.8 million farms (2,15).

Farms and individual growers must continue to change in order to survive in modern world agriculture. "New agricultural technology has developed as a consequence of economic factors beyond the control of the agricultural system" (7). Concern for the environment, increasing world populations, and the international balance of trade are three such factors. "Because of the necessity to remain competitive and market its products successfully, farming has evolved from relatively small vocational activities into business-like enterprises" (6). Some farms have become progressively larger or uniquely specialized (7) to maintain their marketplace advantage and to make a profit.

In view of these changes, we need to ask: Are the barriers to innovation and success the same as those of years past? Do farmers or growers respond to these barriers in any new ways? And, what can the plant pathologist do about understanding and/or solving problems affecting the growers in his or her state or province? The answers lie in the availability of new information and its acceptance and utilization.

Generation and Availability of Agricultural Research

Growers are as diverse as the farms and land on which they live and produce food or fiber. To understand them fully would require lessons in sociology, psychology, and anthropology. Some similarities may be found among this group, however, such as a willingness to share ideas for good farming practices, a propensity for cooperation and special effort with neighbors in time of need, the ability to thrive on hard work, and an inclination to be innovative and adaptive to new farming techniques that are compatible with their storehouse of knowledge, experience, and financial situation (15).

It was an innovative early American farmer who decided that four horses and a two-bottom plow would cover twice the land in the same time as two horses and the single-bladed plow that was traditional in Europe (13). Verticillium wilt, Phytophthora red stele, and an increasing shortage of suitable land forced innovative California strawberry growers to obtain help through research that led to the practice of soil fumigation. "The impact of soil fumigation in California is reflected in the common reference to distinct eras 'before fumigation' and 'after fumigation' among growers who remember the difficulties and frustrations of strawberry cultivation before the introduction of the soil treatments" (16). Yields ranged from below 10 to over 30 t/ha during the transition (1960–1980). What is now a standard practice for many strawberry farmers began as an obvious need for change.

The innovative farmer is typically described as being the first to adopt new ideas. This is possible partly because the innovator is well educated, usually quite successful and established, and, therefore, able to take the necessary risks involved in trying something new (14). People who are innovators may also have a strong desire for recognition and new experiences that predispose them to take action while others hold back. At the other extreme are the nonadopters who never try anything new or those who reject the new for equally valid reasons as those who accept. For example, a desirable new variety of disease-resistant strawberries may not be suitable for the climate of a certain region and therefore is not grown there. For agricultural innovators to persist, there has to be a constant supply of useful, new information based on research.

According to J. B. Kendrick, Jr., of the University of California, "Agriculture has changed dramatically in the past 25 years; the basic mission of agricultural research has not. Our fundamental purpose remains to improve productive efficiency of our farms (large or small), to conserve our resources and to protect the environment, in the interest of all citizens" (7).

Many growers actively participate in developing research decisions through involvement in grower associations, on farm research demonstrations, on university-sponsored committees, in consulting or scouting programs, or in agribusiness-related field plots. Extension plant pathologists frequently relay research needs to their colleagues as new problems are detected by their grower groups. Innovative growers take the responsibility for making their research needs known to the appropriate agencies. The North American Strawberry Growers Association (NASGA), for example, published volume 1 of *Advances in Strawberry Production* in the spring of 1982. This publication contains scientific articles and a production section describing research by university scientists or performed by the growers themselves. This research was sponsored in part or fully by grants from NASGA.

In the Agricultural Act of 1977, Congress authorized the U.S. Department of Agriculture (USDA) to spend $20 million to develop research for small farms (9). Agricultural research, however, has been available to all farmers since the USDA was established but has not been effectively utilized or understood by the so-called new small farmer. "A major reason for the belief that new technology in agriculture is designed primarily for the large operator is that such enterprises are more likely to seek out

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and adopt new information quickly. The small or part-time farmer is often unaware of what information is available or how to adapt that information for his or her own use" (6).

Of course, available research may not be disseminated. The reasons for this information shortfall might include any or all of the following: 1) Funds are limited for travel, meetings, or publications by extension specialists; 2) the research data are not provided to the extension specialist; 3) the information is available too early or too late for the grower to use it; and 4) the information is incomplete, ie, presented as a possibility for control without adequate testing under field conditions. Such situations as the latter are very frustrating to growers because they provide philosophy and hope without substance.

The following is an example of extremely important and interesting information that is of little direct value to a grower: "The older view toward pest control saw each pest as an invader into a harmonious and stable system, and of course the invader needed to be utterly thrown back in a way as dramatic and total as that in which it seemed to appear out of nowhere. By contrast, a contemporary view would be to regard the total system as an elaborate set of equilibria, which need to be understood and regulated to the best possible extent ahead of time and adjusted by appropriate means when one component of the equilibrium appears to be gaining a disproportionate hold" (12).

Innovative growers obtain information from publications to which they subscribe or have access. It doesn't usually take long to determine which can provide the most useful material. As a commercial strawberry grower, I read *Phytopathology,* PLANT DISEASE, *American Fruit Grower, American Agriculturalist,* and *Advances in Strawberry Production.* Making use of *Phytopathology* and PLANT DISEASE generally requires some specialized training in plant pathology. According to W. Merrill, "It is a rare and unusual grower who can gain anything worthwhile from a paper in *Phytopathology*" (11).

Phytopathology primarily contains basic research in plant pathology. PLANT DISEASE now contains the Growers Page (10). But the most useful information for me is in *American Agriculturalist.* The reason is easy to understand. The pertinent articles in *American Agriculturalist* are written by John P. Tomkins, small fruit specialist at Cornell University. He writes about New York problems, has been to my farm, and knows what I need to know. In addition, *Advances in Strawberry Production* brings research on strawberries from around the United States right to my kitchen table. My wife and I benefit directly from our support of research.

Growers of specialty crops often have special information needs. For example, I had to read extension bulletins on weed control from four different universities to fully comprehend two commonly used strawberry herbicides. The result was a detailed understanding of the proper use of these chemicals. The alternative was to risk substantial loss of production as a result of misapplication.

Those plant pathology specialists and consultants who work closely with growers know their research needs and try to obtain the latest data. The responsibility then falls on the farmer or grower to obtain and use the new information.

Acceptance and Utilization of Agricultural Research

Some growers simply do not accept or utilize agricultural research developments. This is due partly to lack of awareness of need, lack of knowledge of where to get help, and obstinacy and resistance to change. However, some people who regard themselves as innovative and progressive growers cannot or will not accept and utilize new research ideas. Why is this so?

Research on diffusion of innovative ideas has shown that the new concept or practice must: 1) be tangibly better than previous techniques, 2) have a degree of simplicity that makes it understandable to potential adopters, 3) be compatible with available machinery, tools, or essential production methods, 4) be available for a trial run on a small scale before total acceptance, and 5) have beneficial results that are clearly recognizable (14).

For example, ribbons of strawberry plants 3 in. apart on raised beds are currently advocated by many innovative strawberry growers. G. Acuff describes Dan and Karen Scheel's results at The Elegant Farmer farm in Mukwonago, Wisconsin (1): "That 7000 pounds per acre (or $3,500) of strawberries the initial year gives us enough money to cover all of our costs up to harvest, including the cost of additional plants, the cost of fumigation, the cost of fertilizers, the cost of planting labor and all other costs we have in that planting prior to picking. After the first year it's $15,000 per acre or about 28,000 pounds per acre." What the article fails to explain to potential innovators is that they'd better have ideal soil and climate, all the necessary equipment (tractors, planters, irrigation, etc.), and perfect weed control before even thinking about attempting to duplicate what the Scheels have accomplished. At Burns Berry Basket, we have not used the raised-bed technique because the cost is not justified by our limited population base in a remote rural area. Higher yields are possible with raised-bed culture, but the customers needed to harvest all those berries must be available, too.

The present economic situation in the United States is a severe limiting factor for many farmers today. Local papers announce that annual farm bankruptcies are the highest since 1934 (2). These farmers have not maintained an adequate cash flow and are trapped by rampant inflation and high interest rates. Gwen Bulman of Cash Farms in South Carolina has emphasized the need for constant financial monitoring; maintenance of good records; use of available IPM programs, scouting, and soil or leaf analysis; and a stringent grading and marketing program for their peaches (3): "The days of just getting up in the morning, running out on the farm and working hard all day and coming home that night and going to sleep are all in the past. You're not going to make money that way, and if you don't make money you're not going to survive." The costs of energy, equipment, labor, and chemicals have all increased while returns have generally declined. The net farm income for U.S. farmers has declined from $24.5 billion in 1975 to $22.9 billion in 1981 (2).

Each of us experiences a learning curve as we become interested in new ideas or practices. The initial exponential increase in knowledge levels off as we become saturated with information or reach the limit of application for a particular situation. For example, we have become more efficient at planting and soil fumigation after each use of the appropriate equipment. Equipment breakdowns or critical weather forces us to attain new levels of knowledge as we adjust our efforts to new problems. Available research may not be accepted or utilized by a grower because it is out of synchronization with his or her learning curve on a particular practice or idea.

In some cases, the amount of new information is overwhelming: new insects, herbicides, slug control, frost alarms, day neutral strawberries, plastic mulch, tissue culture, runnerless plants, genetic engineering. The successful grower has to get all the details and keep them organized in an efficient manner. Successful industries often have the depth of staff and financial support enabling them to invest venture capital in a potentially suitable and new market. Such ministart-ups on a farm are limited, on the other hand, by capital, personnel, routine procedures, and perhaps an inability to see the overall beneficial results.

Even if the new procedures are clearly beneficial, growers don't always accept the new information. W. H. Ko in Hawaii demonstrated the biological control of Phytophthora root rot of papaya by planting in pockets of virgin soil (8). Growers "were very impressed by what they saw but could not believe that such a simple treatment could solve their long-standing problem. Consequently, no grower was willing to give the technique a try" (8). After three "innovators" each accepted a subsidy of $900 from the County of Hawaii and planted papaya using the virgin soil technique, it became accepted as a standard practice among growers. The technique was relatively inexpensive, very effective, and nonhazardous, all of which contributed to its acceptance and utilization (8).

At Burns Berry Basket we have been the first in our area to: 1) use wax-coated cardboard trays for picking, 2) employ routine soil fumigation before planting, 3) provide customers with duplicate receipts (an easy way to keep production and financial records), 4) use an express lane (as in a grocery store) for speedy checkout with small quantities, 5) use radio advertisement with jingles and all, 6) carry out trays of berries for customers who pick large quantities, 7) use hairpins to set runners, 8) provide guided tours and talks to garden clubs, etc., 9) use business cards with maps on the reverse side, 10) provide caps for field supervisors and aprons with a strawberry appliqué for checkout stand workers, and 11) accept food stamps as payment. Many of these innovations have increased our profits. "Every successful grower has a plan, develops scheduling and mentally grows the plants prior to planting" (4).

When something goes wrong with the plants or the grower is unable to be innovative at least some of the time, one could place responsibility on the grower's knowledge, experience, or attitude. Will Carlson of Michigan State University has said that, "In all cases of investigating plant problems, the conclusion is that the plants aren't the problem—people are! Usually it boils down to someone not doing something or doing it improperly, causing the plant to perform abnormally" (4).

Plants, like people, respond to the way they are treated. Carlson places growers in four classes: 1) the NO-NO grower whose negativism stymies growth, 2) the YO-YO grower who is inconsistent and often forgets the basics, 3) the BLOW-BLOW grower who talks a good crop but can't produce it, and 4) the GO-GO grower who has his or her whole act together. These latter farmers and growers are the survivors and leaders in an increasingly competitive agricultural system (4). As leaders and innovators, they grow and develop themselves; they know what to do and when to do it, show others the way by their example, go directly to the sources of information they need, and bestow on others the benefits of their training and experience (4).

The future in agriculture will require increased knowledge, better management skills, and, possibly, increased specialization (5). The gap between the generation of new research data and its acceptance and utilization will probably continue. It appears the barriers to innovation are still there to confuse and frustrate the grower. Some of the barriers may have taken on different meanings or significance, but growers seem to respond to them in similar ways as in the past. Each grower struggles with problems to the best of his or her ability, given the knowledge, organization, and financial capacity that are available.

Farming provides the largest group of independent businessmen and businesswomen in America. "They provide their own labor, financial skills, marketing and management. The family lives at the business and shares the work. If they do well, they all prosper; if they fail, they all suffer. They seldom brag, because they know that things look great today and can look bad tomorrow as a result of weather, disease, insects or a falling market. Out of it comes a humility, a deep faith, a readiness to accept disappointment, and a reluctance to admit that things are going well" (15). External distractions, family problems, stress, and human nature add further barriers for our would-be innovator. Fortunately, most growers successfully overcome many of the barriers that confront them.

The function of the keynote address is to elucidate a governing principle or spirit that stimulates the audience to action. If I have done my job, you will see the farmer as a human being striving to succeed and survive in a modern agricultural system that presents many barriers to innovation and development. These barriers include the availability of knowledge, the quirks of machinery, the vicissitudes of weather, the burden of cash flow, and the perversity of the human personality. And, you, in your research, educational, or consulting programs, can help remove some of the significant barriers the grower faces, especially in the area of plant pathology. Those of you who work directly with growers will have the greatest impact and the opportunity to share in their concerns and successes.

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