allow consumers to take advantage of modern technology. Cassette tapes, floppy disc or disc storage also allow programs to be stored at county or areas offices for local use.

Other technologically advanced systems, such as those using fiber optics in information delivery, have the potential to reduce travel costs and provide very flexible systems that can deliver video, voice or computer information.

The future of information delivery will require a commitment of funds and personnel. New systems are expensive and their incorporation into current delivery systems must be done with an eye for expanded usage in the future. Decisions made on the types of equipment and systems to be adopted will require input from many disciplines.

The maintenance of a strong, effective and reliable information delivery system will require editorial control procedures; that is, information will have to be available in a specific presentation style and at the proper time. All phases of the delivery system will require the advice of communication experts in planning, development, and implementation.

An effective system fulfills 2 functions: it ensures that a high quality product is provided to our customer on a very timely basis, and it provides the opportunity for extraction of important information from specialists who sometimes are uncommunicative.

The development of an individualized information system will require a greater amount of cross-disciplinary interaction between research and extension personnel than exists now. We have to begin telling the entire story.

Literature Cited


RESEARCH REVIEW OF CONSUMER AND SMALL FARM HORTICULTURE

D. R. Bienz and Margaret Gurtel

Department of Horticulture,
Washington State University, Pullman, WA 99164

Those responsible for publicly sponsored agricultural research are frequently accused of serving only the interests of large-scale commercial agriculture and the agri-business and agri-chemical industries. Instead of denying this charge, spokesman for federal and state research institutions often express the opinion that we must concentrate our limited research resources on the primary source of our impressive food and fiber production, which is large-scale agriculture. This kind of rhetoric has nurtured the impression that very little agricultural research is applicable to small farm or garden enterprises, because administrators of agricultural research do not consider these enterprises important. It seemed to us, therefore, that the first requirement in assessing the research and research needs of consumer horticulture was to ascertain the numerical importance of the likely beneficiaries of small farm research and the potential contribution to human welfare of such research. We chose to consider research for all small agricultural enterprises, because the same technology should apply to small, intensively cultivated plots whether they are home gardens, small commercial farms with high value crops, or subsistence farms.

Within the United States and Canada, the largest group of small growers consists of home gardeners. The Associated Press earlier this year publicized a survey by “Gardens for All,” a Vermont based firm (1). That survey disclosed that 43% of American families grew vegetable gardens which produced crops worth nearly $10 billion in 1980; also, the number of gardens is expected to be even greater in 1981. If this survey is accurate, the value of home-grown vegetables is 40% of the value of all vegetables consumed in the United States. We did not find an estimate of the total families who grow no vegetables, but who do grow ornamental or fruit gardens; however, there must be many of these. Considering those who grow fruit, those who grow vegetables, and those who grow ornamentals, the total number of gardeners is obviously many times the number of commercial farmers.

A second group of small growers comprises those who grow specialty crops on a small acreage. A number of horticultural crops are so labor- and capital-intensive that an economic unit requires but a few acres. Nursery crops, bulbs, hybrid seed, cut flowers, wine grapes, forced rhubarb, hops, and many other specialty crops are produced on this kind of farm. In Washington, one of the leading fruit producing states, 60% of the more than 7,000 commercial orchards are smaller than 15 acres (11).

The third category consists of part-time growers. This includes those who own what were once viable farms that, with the present farm economic situation, are too small to produce sufficient income to meet all family needs. Therefore, these owners work in town and farm during off-hours. It also includes those who have invested in, and farm, a few acres as an escape from city problems or for spare-time income or as an inflation hedge or tax shelter. The more profitable of these kinds of farms are likely to be near the owner’s residence and main place of employment; however, they can be located near a vacation or summer home or near a winter or retirement home. Among part-time growers are also those who plan to be full-time farmers, but who have not yet acquired the necessary investment capital.

Other small growers are sometimes called the alternative agriculturists. These are people who are concerned by the consumption of non-renewable energy and by the negative impact of ever-increasing mechanization and farm expansion on rural communities. They are seeking a less complex farming system based on renewable resources. Most, but not all, profess to be organic or biologic growers. This category overlaps the first categories in that those professing to be alternative agriculturists may grow home gardens or specialty crops or be part-time farmers. Quite a few alternative agriculturists farm on a scale large enough to preclude their being considered small growers. The number of organic growers has been officially estimated at 20,000, but a Rodale Press survey of subscribers to their New Farm magazine estimates that 24,000 of their subscribers farm wholly or partially with organic methods. Since not all organic growers subscribe to New Farm, the number of organic farmers is assumed to be considerably greater than 24,000 (10).
The fifth, and most important, group of small farmers from a world viewpoint constitutes the subsistence growers of the Third World. These growers and their families comprise from 50 to 80% of the population of developing countries (8). Their farms are small and they are farmed with an intensity hardly imagined in this country. On the island of Java, for example, the average farm size is about 1/5 hectare. Taiwanese farms average less than a hectare in size, and yet the families who gain a livelihood from them live a life of relative comfort. They all have electricity and most have fairly nice homes with refrigerators and TV sets. Most have a motorcycle for transportation.

Considering these 5 categories worldwide, it seems likely that 80% of the world’s people are involved in one way or another with small farm agriculture and that small farms feed 65% of the world’s population. Perhaps 90% of growers (our own estimate, based on references 4 and 12) could be classed as small farm growers. Numerically, this is a politically potent force. No wonder politicians and research scientists are beginning to recognize the importance of investigations into agricultural technology suitable for small farms.

Sources of information on small farm and organic agriculture

Elliot Coleman, Executive Director of the International Federation of Organic Agricultural Movements, in speaking of research information on small farm agriculture, is reported to have said, “The information is already there; all anyone has to do is dig it out” (3). Indeed, with a small amount of sleuthing and some logical thinking, one quickly finds numerous research reports with useful information for small-scale agriculture. Much of the agricultural research reported in current scientific publications is applicable to small farm and organic agriculture. For example, almost all of the 36 papers that appear in the May 1981 Journal of the American Society for Horticultural Science would have as much or more interest for the small grower as for the large commercial producer. All but 8 would be applicable to the organic grower. In the July issue of the Journal all papers appear to have value for the small grower and all but 4 could be useful for the organic grower. The appropriate technology must, of course, be sifted from the scientific charts and tables and abridged and interpreted to meet the understanding and needs of the small growers before it will be of much value to them.

Some pertinent research is even less accessible than that reported in scientific journals. For example, a colleague in our Agricultural Chemistry Department is researching plant-produced chemicals that inhibit insect attack; however, the summarization of his work, which could explain the valid basis for companion planting, appears in a recent graduate level textbook as a chapter entitled “Proteinase inhibitors” (7). The claimed lack of information applicable to small growers is not always so much a matter of inappropriate current research as it is a shortage of useful specialists who have the training to work with small-scale growers and who are capable of interpreting the existing research as it relates to small farm agriculture.

Although some research findings may not get to all who could benefit from them, members of the state agricultural extension services have always worked with small growers of all kinds (9); today, according to state extension specialists, a large percentage of the time of many extension agents is devoted to this group (personal communication). In areas where part-time farming and gardening are popular, extension agents are usually hired to work exclusively with small growers, and numerous broadcasts, telecasts and publications are prepared primarily for these growers. Home garden and home beautification information has long been available in extension publications and, today, publications specifically for the small grower and part-time farmer are being published in several states (2, 5, 13, 14, 15).

Before the 1930s all farming, judged by today’s standards, was small-scale and organic. Admittedly, today’s organic growers use technology not available during the early part of this century, so that some research from that period is not applicable to conditions as they exist today. However, hundreds of papers relating to mulches, manures, rotation, intercropping and environmental/pest relationships have been published in scientific journals, such as the early Proceedings of the American Society of Horticultural Science, that are just as applicable today as they were when they were written.

Other sources of information available to small growers are the popular articles and documented experiences of other small growers as published in magazines that are written partly or wholly for gardeners and organic farmers — Sunset, American Horticulturist, Better Homes and Gardens, Country Living, Tilth, Organic Farming, Plants and Gardens — to mention just a few. Although these articles are often not based on replicated scientific experiments and although certain ideas they express are more enthusiastically promoted than they deserve to be, they still are interesting to read and the discerning grower can sift a wealth of information from them.

Starting about 15 years ago, international research centers such as the International Rice Research Institute in the Philippines and the International Center for Improvement of Maize and Wheat in Mexico began to focus serious attention on research specifically for the millions of “small farmers” around the world. The results of this research are now being published in their annual reports and elsewhere (8). Some of the papers dealing with exotic tropical crops may not be of value to North American growers and many of the reports are presently available only in foreign journals found in large libraries. However, technology for small growers is similar for all, no matter where they may reside. Consequently, much of what comes from this expanding field of research will have international application. Of as much, or more, potential value is the methodology that has been accumulated and passed down as oral tradition through generations of small growers. Proposals for compiling this information are only now being considered (8, 12).

Research needs of small growers

Many of the research needs of small farm agriculture are similar to the research needs of all other agriculture. Perhaps the research requisite of highest priority is to examine the “why” of practices that appear to be successful so that principles can be established which apply to a wide range of situations. For example, many organic growers rely on companion cropping to aid in the control of pests and agriculturists recognize that there is some scientific basis for this practice (6, 7). What is needed is a basic understanding of the chemical interactions in the complex resistance/susceptibility relationships among plants and between plants and pests. This knowledge could lead to the formulation of more species-specific herbicides for conventional growers and to the identification of pest resistant plants in a breeding program. In addition, it would permit organic growers to successfully prescribe companion plantings and it might also suggest cover crops and mulches that would discourage plant pests.

Similarly, a basic understanding of soil chemistry and of relationships among microorganisms in the breakdown of organic matter would not only permit more intelligent application of fertilizer but could also lead to composting methods that would result in decreased nutrient loss, could help explain the various effects of mulching, and might account for the apparent release of some "unavailable" soil nutrients with the organic system of production.

The study team that compiled the U.S. Department of Agriculture Report and Recommendations on Organic Farming (10) lists a number of research areas related to organic farming which it feels most urgently need attention. Many of these are areas about which small growers have repeatedly expressed concern. They include productivity and input comparisons between organic and conventional farming systems, soil nutrient availability, safe use and benefits of organic wastes (including sewage), non-chemical pest control techniques, health safety of foods, breeding of crops adapted to organic farming, economic and social impact of organic farming and many others. Since the specific recommendations are listed and described in the report, which is widely available, we will not list them here.

In a recent survey of the 12 northeastern states, small growers were asked to list “immediate research that might enhance small farms in their county” (5). Of the 133 suggestions from 69 respondents, 37 related to production and 21 of the 37 production requests pertained to horticultural crops. The 15 requests for vegetable research included new varieties for earlier production; tolerance to stress factors, such as light frost or cold weather, drought, pollution, and compacted soils; varieties with more flavor and more eye appeal; artificial media and fertilizers for growing transplants; intensive production systems with up to 4 crops per year; and nutrient film techniques for growing
vegetables indoors and outside. The 6 suggestions about growing berry and tree fruits included developing cultivars with improved flavor and eye appeal and research aimed at improving cultural practices to reduce labor requirements for small scale berry production and maintenance.

In this Northeastern Small Grower Survey (5), 70 of the suggestions related to marketing, management, or economics and many of these mentioned the marketing or management of horticultural crops. For the small grower seeking a profit, the identification of climatically adapted, high value products for which there is a market is a critical need. Marketing studies for the grower with a limited amount of in-season produce are badly needed in our era of demand for large quantities year-round. Pest control for horticultural crops was listed as a research need by 9 of the 69 respondents.

Of 105 responses to the question "What technological developments are most important for the enhancement of small farms?", 24 listed equipment, 18 energy, and 18 production. Our own observations lead to the conclusion that equipment somewhat larger and more versatile than the expensive estate tractors and garden tillers and somewhat smaller than the available farm machinery is the most pressing need of many small growers. Some small growers interviewed in the survey felt that they were being neglected by public research and extension personnel.

We made an attempt to ascertain the more critical research needs of home gardeners located in the Pacific Northwest, and to a lesser extent in other parts of the country, by informally polling extension personnel and others who answer questions posed by these growers. The 2 general areas of information that seem to be most frequently sought by home gardeners involved pest control and temperature relationships. Safe, reliable methods of dealing with weeds, diseases, and insects, including breeding for resistance, are as much a research need as ever. Easier ways of controlling perennial weeds was a frequent concern. Home gardeners in cooler parts of the country are seeking ways of extending their growing season on both ends, of enhancing the growth of warm season crops, and of preventing frost damage. In areas with hot summers, growers are looking for ways to grow heat-sensitive crops. In both regions, ways of creating year-round production and beauty are needed.

In many areas of the country, there has been little public research on ornamentals, especially shrubs and trees. Some nursery crop and floriculture research is being accomplished by private companies, but the scope of their developments is usually limited to short-term projects. There is potential need for wider environmental adaptability of many of the more desirable species of trees and shrubs. Also, the development of desirable clones of native species holds considerable promise in many areas of the country. The wide range of unexploited germ plasm in ornamental species and their high value, which makes it feasible to utilize clonal and other relatively expensive propagation techniques, should be enticing to plant breeders who could more easily contribute a new cultivar with ornamentals than with most other cultivated plants.

For the gardener who wants to grow fruit, there is still a need for dwarf fruit trees and for space-saving techniques of fruit tree training. Better and safer methods of pest control are almost universally requested by gardeners and small growers who produce tree fruits.

**Summary**

We emphasize again that much of the agricultural research that has been accomplished and is being accomplished is as applicable to the garden or small farm as it is to the large commercial agricultural enterprise; however, much of this research is not being interpreted or made available in publications which are understandable to the small grower. In the long term, the most profitable research for small growers, as well as for large commercial growers, is likely to be research into fundamental concepts that can solve a broad range of related problems.

It is important to recognize the tremendous contributions that large-scale agricultural technology has made to this country's abundance of good food and to our way of life. However, those who determine research priorities cannot ignore that small scale growers, including home gardeners, are a numerically potent political force, that small scale agriculture still furnishes more than half of the world's food, and that it also provides aesthetic satisfaction, physical recreation or the means of gaining a livelihood for a large majority of the world's growers.

**Literature Cited**