

Limited, specializes in fruit and berry fruit and the New Zealand Institute for Crop & Food Research specializes in vegetables, floriculture, fish, and other arable crops. Both organizations have a number of specialist research cells operating in various locations where crops applicable to their research activity are grown principally. These institutes have long-established international links from their previous structures and no doubt will continue to maintain international technology transfer links. A new relationship between the scientific community and the horticultural community is continuing to emerge as roles are defined on a more commercial basis: i.e., "user pays."

Research also is conducted by private companies in New Zealand. The export company Turners & Growers has conducted programs on specific breeding programs and, since World War II, has introduced a number of varieties of fruits to New Zealand, especially from California. Turners & Growers has a current scientific breeding program to produce firm, high-yielding crack-resistant high-sugar and -acid strawberry varieties. Recently released 'Orion' and 'Donna' strawberries are promising selections.

The academic community plays a major part in meeting the needs of an even more-discerning consumer who demands products that are grown from natural nutrients, are residue free, have a good shelf life, have high color and flavor quality, are new and interesting, and meet stringent hygiene requirements. The challenge to the New Zealand scientist is therefore to reduce synthetic chemicals in the produce, to develop new and better varieties especially tailored to New Zealand's growing conditions and international market demands, to improve postharvest techniques, to improve storage and transport, and to improve yield. All elements of the distribution and marketing system must be understood to determine how existing technology might be applied to changing horticultural marketing conditions, which change daily.

Researchers and educators who best understand the trends in marketing are positioned best to apply new technology to gain marketing advantages. Students' interests can be activated by having local trade leaders provide classroom guest lectures. Student field trips to local markets, leading growers, and export companies also show students current industry trends. Also, trade conferences give students insights to the markets. New Zealand has seen many successful examples of greater contact between students and industry leaders.

To ensure a return to the farmer, New Zealand's products must command a premium in the market place. With the emerging worldwide power of supermarkets, promotion, presentation, packaging, and pricing strategies require constant

tuning. For some products, name perceptions play a key role. For example, changing the marketing name of *Actinidia deliciosa* from Chinese gooseberry to kiwifruit has been credited as part of the reason for the success of kiwifruit.

Today, as the world becomes more conscious of health and the environment, production methods become more important than ever in the consumer's mind. New Zealand's unique topography and climate, its vast coastline free from pollution, abundant mountain streams that flow through native bush into fertile growing areas, devoid of many of the pests and disease prevalent in the other parts of the world, enhance this country's image as a clean, green producer.

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Global Horticulture and the Quest for Seed Varieties

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Summary. During the 1980s, the large consumer markets in the northern hemisphere came to expect a year-round supply of high-quality fresh vegetables. This has given farmers in many countries of the southern hemisphere and the tropics an opportunity to diversify into lucrative export crops. However, finding cultivars adapted to the local growing conditions is often difficult because commercial varieties usually are bred for highly specialized growing and farming conditions. As a result, local horticultural research institutes are playing a crucial role in the development of suitable genetic material.

We live in a world of *global horticulture*, where onions grown in southern Australia can be marketed halfway around the world in northern Europe, and where the Japanese market can source fresh fruits and vegetables in four continents. Many consumers have come to take it for granted that their favorite vegetables are available year-round at the local supermarket. This has been made possible by modern transportation and container technology, as well as by the diligent efforts of plant breeders.

Global supply is predicated on four important factors. There evidently is a direct correlation between *freight costs* and *crop value*, but both become less important as the *standard of living* increases. *Tourism* increasingly exposes consumers to new types of food and to new windows of produce availability, raising their expectations at home.

Initially, global horticulture meant that the main consumer markets in the northern hemisphere imported exotic produce. Then, during the past 20 years, these consumer markets have started exporting their own horticulture during the cold

SeedQuest, 1353 El Centro Ave., Oakland, CA 94602-1817.

season to areas of milder climates in order to ensure year-round supply of the familiar produce. Nowadays, consumers in Europe, Japan, and the United States have almost forgotten the scant vegetable displays of earlier winters. Indeed, the consumer markets in the Persian Gulf, Hong Kong, Singapore, and even Beijing now enjoy steady supplies of fresh vegetables throughout all four seasons.

From the point of view of the vegetable seed industry, global horticulture creates a major challenge: *varietal adaptation*. The consumers expect the same type and the same quality of produce, regardless of where it was grown. Therefore, plant breeders must try to reconcile the phenotypic requirements of the marketplace and the climatic and agronomic conditions of the new growing areas.

However, commercial varieties often are restricted in their climatic adaptation. In fact, the trend in many commercial research programs is to breed for increasingly narrow market segments and increasingly sophisticated growing practices. Even when substantial "aggregate markets" exist, seed companies are often unwilling to service these fragmented markets.

There are four main solutions to this problem:

1) Certain horticultural seed companies and vegetable processors with international activities have succeeded in selecting strains of commercial varieties for adaptation to new growing areas. In some cases, completely new cultivars have been developed to meet the requirements of long-distance transportation or heavy disease pressure.

2) In many countries, local seed companies are increasingly active and successful in developing cultivars that are well-adapted to both the local growing conditions and the demands of export markets. Taiwan, Thailand, and South Africa are three such examples.

3) Local horticultural research centers play a crucial role in selecting and breeding cultivars adapted to the local growing conditions. Two prominent examples come to mind: The Asian tropical tomato was developed in the 1970s at the Asian Vegetable Research & Development Center

(AVRDC) by Ruben Villareal and his team. No seed company had seriously ventured into this difficult area, despite the significant commercial potential. The AVRDC team sampled its many lines widely throughout tropical Asia and beyond. A number of lines have since found their way into the local markets, either in their original form or after further selection and breeding steps. Similarly, a team from the International Center for Potato (CIP) in Peru had considerable success in developing high-quality hybrid true potato seed varieties adapted to a number of developing countries. Breeding and development work was conducted in cooperation with local research centers in each target country. The resulting material became available to farmers several years ahead of competing commercial hybrid lines. The current initiative to develop a regional seed association for the Asia/Pacific area, sponsored by the Food and Agriculture Organization of the United Nations, will undoubtedly strengthen local efforts and help overcome many of the obstacles that still exist.

4) SeedQuest, a computerized data bank for the seed industry launched in Jan. 1992, provides another valuable tool. This data bank contains standardized descriptions of all commercial vegetable varieties available worldwide and the varietal requirements of the main vegetable seed markets. It has become a unique information hub serving a variety of purposes:

- it enables farmers and seed dealers to quickly and cost-efficiently identify and pre-select suitable cultivars, thus reducing size and cost of their variety trials;
- it enables plant breeders to quickly access all product and market information they need to accurately focus their research work and, conversely, to make sure that information about their cultivars reaches specifically the seed users who need it; and
- it provides plant breeders with a uniquely powerful tool to identify areas of breeding opportunity around the world.

Intellectual Property Rights in a Global Market

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This article presents a brief overview of current legal options for the protection of plants. Prior to 1930, plant research and breeding were dependent upon government funds to experiment stations. There was little or no incentive for private industry to spend money on plant research. In 1930, Congress enacted the Plant Patent Act to encourage the development of new asexually reproduced varieties. Luther Burbank and Stark Brothers Nursery were strong advocates for this Act.

Fifty years later, in 1970, the Plant Variety Protection Act (PVPA) was enacted to provide patent-like protection to sexually reproduced plant varieties. In 1980, the Supreme Court decided, in the *Chakrabarty* case, that microorganisms were patentable. In the 1985 *Hibberd* case, plants were held to be patentable by the Board of Patent Appeals and Interferences. Plant proprietary rights and ownership rights issues have become important issues for private industry, universities, and government, both in the United States and internationally.

There are five general legal categories of plant protection currently available in the United States:

- 1) trade secret law;
- 2) contract law;
- 3) plant patents for asexually reproduced plants (the 1930 Plant Patent Act);
- 4) PVP certificates; and
- 5) U.S. utility patents.

Trademarks, copyrights and design patents are additional types of intellectual property rights, but are not discussed here.

Utility patents, plant variety protection and breeders' rights, and trade secret law has been discussed previously (Jondle, 1993).

Contract law

Another type of protection often used in global markets is contract law, such as licenses, sales contracts, confidentiality agreements, and label licenses (or restrictive use labels) on seed bags. The effectiveness of a contract is dependent upon the type of contract. In addition, a contract is

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