



RAFI COMMUNIQUE

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Sixty-Five Years of the U.S. Plant Patent Act (PPA)

Issue: The General Agreement on Tariffs and Trade (GATT) obliges signatory countries to implement some form of intellectual property over plant varieties. The South has until 2000 to either adopt an existing international convention or develop *sui generis* alternatives. (Least Developed Countries have until 2004.) The World Trade Organization (WTO), which is now responsible for GATT, will review these provisions in 1999 and significant amendments could be achieved. The WTO intellectual property rights (IPR) review comes before any South government is required to enact legislation. By evaluating existing IPR regimes, governments can compare the benefits claimed by the commercial breeding industry with the reality of IPR impacts in countries with a history of IPR laws. While there is much discussion of utility patents and Plant Breeder's Rights (PBR) systems like those governed by the UPOV Conventions,¹ the 65 year history of the U.S. Plant Patent Act (PPA) - arguably the world's most extensive IPR regime for plant varieties - has gone strangely unnoticed.

Policy Implications: In evaluating the PPA, two questions must be answered: (1) has the act benefited society, and (2) is such an act a viable model for developing acceptable *sui generis* legislation in the South? The PPA warrants special attention since it is much less expensive, relatively easy to administer, and attractively "loose" in its criteria compared to utility patent and PBR regimes. It would be difficult for the U.S. and other Northern governments to argue that the South's adoption of a regime modeled on current U.S. law would not be "effective" according to GATT rules. As interesting as this possibility is, however, RAFI's study suggests that the PPA is hardly beneficial legislation. IPRs that confer monopoly control over plants purportedly increase agro-biodiversity and promote scientific research and market competition. In the U.S., where the PPA has allowed monopoly over asexually propagated (largely fruit and ornamental) plants for 65 years, there appears to be no empirical evidence to substantiate these claims. The PPA has neither helped breeding as a profession nor stimulated species, genetic, or even market diversification.

Economic Stakes: IPR systems for technology-importing countries can be extremely expensive since there is an inevitable outflow of foreign exchange for sales and royalties that might only never be offset by access to new technologies. The human resource costs of managing an IPR system are also very high for many poor countries. In covering fruits, flowers, and other ornamentals, the PPA addresses the high-end market which, in the U.S. alone, is worth more than US\$16.9 billion per annum. Since the South contains the vast majority of biodiversity in fruits, flowers and ornamentals, adopting a PPA-style system could have profound implications. Whether these would be entirely negative (only encouraging biopiracy) or could have some marginal benefit in the context of the WTO - is a matter for debate.

Introduction

This *RAFI Communique* examines the impact of the US Plant Patent Act (PPA). Passed by the US Congress in 1930, the PPA is the world's oldest *sui generis* intellectual property system designed for the patenting of life forms. RAFI's investigation tracks the PPA over its 65 year history and addresses claims of the PPA's proponents that, by providing a system of monopoly protection over plant varieties, the PPA

has promoted extensive innovations in plant breeding and encouraged the development of diverse species and useful plant varieties.

This is the second in a series of RAFI studies on plant patenting in the US. The first, "*Utility Plant Patents: A Review of the U.S. Experience*", was published in the July/August 1995 *RAFI Communique*. A third study on the U.S. Plant Variety Protection Act will be published later this year.

Background on US Plant Patent Laws

In the US there are three separate intellectual property systems covering plants:

- The 1930 Plant Patent Act (PPA)
- The 1970 Plant Variety Protection Act (PVPA)
- Utility (Industrial) plant patents (1985)

IPR holders to substantially constrain or even eliminate farmer's historic rights. (The PVPA will be the third and final part of RAFI's U.S. IPR study series.)

In 1985, the US Patent and Trademark Office (PTO) began to issue utility patents for all plants that meet the standard industrial patent criteria of novelty,

Comparing US Plant Patent Statutes

	Fees (US)	Number Issued	Duration (years)	Farmers Exemption	Research Exemption	Deposit Requirement	Typical Patent
PPA (1930)	\$825- 1,140	9,000+	17	Open for sexually- propagated offspring		None	Asexually reproduced fruit tree or flower, "sports"
PVPA (1970)	\$2,450	3,500	25(+)	Restricted	Threatened	Viable Planting Material	Sexually-reproduced agricultural variety
Plant Utility Patents (1985)	varies	350 (min.)	17	Restricted	Restricted	Cell lines, DNA, etc...	Biotechnology products, genetically-engineered cells, DNA, and plants

This Communiqué's focus is on the PPA, which provides 17 year patent monopoly (often described as "protection") for new varieties of asexually reproduced plants (mainly fruits, nuts, flowers, and other ornamentals). Almost all asexually propagated food crops such as potatoes and Jerusalem artichokes were intentionally excluded by the PPA on the grounds that food is too important to human well-being to permit monopolization. In effect, the PPA targets high-value flowers such as roses and begonias, as well as fruit trees, such as apples, peaches, and tangerines. The cost of applying for PPA protection is US \$490 plus (often substantial) preparation expenses and attorney's fees. Over the entire 65 years, the PPA has issued "protection" for 342 different plant species to 2,361 breeders, and 781 assignees (largely corporations).² Thus the PPA is the world's oldest and most extensive regime for the monopoly control of life forms.

The 1970 PVPA dramatically expanded plant-related intellectual property law, offering patent-like protection for sexually propagated plant varieties (principally food crops such as cereals and vegetables excluded from the PPA on moral grounds) which are new, distinct, uniform, and stable. Like the PPA, the PVPA originally allowed farmers and breeders to sell, exchange, and breed new varieties from "protected" planting material (i.e. seed). In 1994, however, PVPA legislation was amended to remove these farmers and breeders "exemptions", and allow

utility, and non-obviousness. Utility patents are the most powerful form of intellectual property over plants available. They are also the most expensive. Fees vary for different applications - at a minimum they entail several thousand dollars in PTO fees plus lawyer's costs to obtain. A utility patent costs an average of nearly US \$250,000 to get and maintain over its lifetime. Although more difficult to obtain than PPA or PVPA protection, because of their strength, utility patents - when possible - have become the mechanism of choice for patenting plants - especially for high-tech, genetically-engineered plants and plant parts. (See *RAFI Communiqué* July/August 1995 for an in depth study of US plant utility patents.)

In sum, the PPA has become only one of three types of US intellectual property protection over plants. Because PPA patents are limited to asexually-reproduced plants and there is no restriction on their use in breeding programs, the PPA's once formidable 17 year protection now pales in comparison to the heavy armour of PVPA and utility patents whose periods of monopoly run between 25 and 30 years. But the PPA's long history - reaching back before the days of the Great Depression, and even to the legendary horticulturist Luther Burbank - is unmatched in the world. Its time span encompasses the development of "scientific" breeding and genetic engineering, dramatic population growth and the development of large-scale industrial agriculture. The PPA is unique

in providing the opportunity to study the social, economic, and biological impacts of intellectual property protection on plants over time - crucial issues for the present, when countries throughout the world (in the South in particular) are being pressured by the WTO and UN Convention on Biological Diversity to implement IPR systems for life forms.

Despite being outgunned by more stringent forms of protection, the PPA has not fallen into disuse. The economic value of crops protected by the PPA is enormous and still growing. Retail receipts for ornamental plants and flowers in the US were, for example, \$16.9 billion in 1991 alone. Non-food horticultural products accounted for nearly 13% of all US farm receipts.³ Because of its relative simplicity and specificity, the PPA remains the protection of choice for many plant breeders and brokers - indeed, the number of new PPA patents issued annually continues to rise.

The nursery industry in particular depends on asexually-reproduced fruit trees and ornamentals with PPA protection (as well as variety name trademarks) to obtain exclusive rights to market varieties. In addition to the nursery trade, another not entirely separate class of "inventors" also depends on the PPA. These "inventors" find "sports"⁴ or interesting plants (perhaps in foreign fields or forests) and, often with little or no breeding work, monopolize "their" discovery using a PPA patent.

ONE: HAS THE PPA BENEFITED SOCIETY?

Historically, the US government's interest in plant breeding - even that of the Patent and Trademark Office itself - had been in collecting, developing, and freely distributing thousands of varieties of plants in order to encourage "informal" breeding by farmers, boost agricultural production, and develop plants suitable to the wide range of U.S. climates. In 1897, the US government distributed over 20 million packets of free seeds to farmers. In 1899, a U.S. Department of Agriculture official described the number of varieties in use by farmers as rising "with almost incredible rapidity."⁵ Until 1923, U.S. farmers were entitled to receive these free seed packets from their government as part of a national campaign to encourage agricultural productivity through experimentation.

Only 7 years after the termination of the free seed program in 1923, policy had come nearly full circle and, through the PPA, asserted that plants could be the exclusive property of individuals rather than a common good to be shared. Despite heated debate and opposition in the U.S. Congress, the PPA became law. The PPA's passage was a watershed event in rural US history. This dramatic shift in policy was largely

the result of a concerted effort by small groups of professional nurserymen and breeders (headed by the Stark family of Missouri) to enact a law that would give nurseries exclusive right to market their varieties.

In the early part of this century, the burgeoning US population and increased use of refrigerated railway cars made long distance transportation of fresh fruit and flowers to metropolitan areas commercially feasible. An increasingly urbanized population⁶ and larger middle class boosted demand for ornamental garden plants. Substantial hucksterism and exaggerated claims about fraudulent "miracle" plants, as the more reputable nurseries and seed houses often bemoaned, also threatened the nascent horticultural industry.

These trends created an atmosphere where professional horticulturists had strong incentive to establish proprietary rights over plants to capture parts of the growing market and distinguish themselves from less reputable operations. In a story well-documented in Cary Fowler's book Unnatural Selection, horticulturists argued, with the help of important allies in Congress, that plant intellectual property would be the salvation of "legitimate" and honest nurserymen and breeders. Washington, DC patent lawyer Harry C. Robb was retained by a nurseryman's committee (headed by a member of the Stark family), and with his assistance the legislation was drafted.⁷

"Scientific Breeding" and "Invention"

At that time and now, nursery varieties were generally thought to be the result of intensive, "scientific" research and breeding. In fact, evidence strongly suggests that many of the most important varieties of the day (and, perhaps, today) were actually "finds" or "sports" (especially in the case of fruit trees and flowers such as roses).

Acutely aware of long-standing intellectual property laws excluding products of nature from patentability, PPA proponents managed (with considerable opposition) to engineer wording into the PPA that effectively construed the clipping of a mutant bud (or collection of a mutant plant) and its culture in a nursery as the "inventive step" that distinguished a previously "wild" or "natural" plant from one that was patentable. One early PPA historian described such patent holders as "discoverer[s] of invention[s]" - begging the question "Who is the inventor?"⁸ According to the PPA, breeders did not need intellectual capacity in order to obtain intellectual property - what they did need was a pair of scissors, passport, and a backpack.

Like many others, U.S. breeder Quincy McKeen took advantage of the PPA's leniency on requiring patentors to actually breed the plants they patented. McKeen brought the "black prince" heliotrope (#559, 1942) from Guatemala to the U.S. in the 1930s and patented it, having - in his words - "destroyed" all the other plants he grew out from the Guatemalan seed.⁹

The simple protection that the PPA afforded the nursery industry from con artists and copycats marginally served the public interest and very visibly served the private interest of big nurseries. To overcome Congressional opposition to a law that so flatly contradicted the history of government agricultural policy and patent standards, PPA proponents identified a more pressing and beneficial public interest that the act would serve. They contended that the PPA, by better rewarding commercial breeders for their work, would dramatically increase private sector plant breeding and result in the development of scores of new and useful varieties: better yielding plants, heavier fruit, plants adapted to local climate conditions, disease resistance, etc.

The PPA, they argued, would provide the necessary incentive for the private sector to do this job, and to do it exceedingly well. The PPA, a US Senate Committee Report noted "will afford a sound basis for investing capital in plant breeding and consequently stimulate plant development through private funds."¹⁰

With well over a half-century of hindsight, can it be said that the PPA achieved these ends?

A Shaky Start

As cases like the "Black Prince" heliotrope illustrate, the notion that the PPA's effect would be to benefit scientific breeding was, if not stillborn, seriously compromised from the outset. The PPA muddled through its early years under the less-than-expert direction of the US Patent and Trademark Office's (PTO) section responsible for issuing patents for tractors, ploughs, and other farm machinery. From the outset, the PTO issued patents for varieties over 30 years old, for plants openly called "sports" in the application, and for plants bred or found by persons long since dead. 88 of the first 200 patents issued were on sports,¹¹ and almost two dozen were on plants discovered or developed by people who were dead and buried.¹²

Through the 30s and into the 40s, the "scientific breeding" that the PPA was designed to encourage looked like a scavenger hunt. As late as 1948, as in earlier years, the number of one-time plant patent

recipients outnumbered the breeders who worked on multiple varieties.

In the 1950s, the legality (if not morality) of patenting products of nature was raised again in the *Ex Parte Foster* case, when a US horticulturist sought patent protection for two naturally-occurring South American plants given to him by a Colombian gardener. When the appeals board of the PTO ruled against Foster's applications, Congress effectively overrode the decision by reiterating its intent to allow finds to be patented under the PPA. An amendment to the PPA was passed to specifically allow "cultivated sports, mutants, hybrids, and newly found seedlings" to be patented.

Commercial breeders, particularly of carnations and chrysanthemums, responded by institutionalizing the patenting of sports through "breeder-grower agreements". Under such agreements, nurseries that grow patented varieties are legally obliged to send sports of those varieties to the patent owner (in most cases another nursery), in return for a share of the royalties the breeder receives on sales of the sport.¹³

**You're Not Hallucinating....
....Unless You Paid at the Door.**

Loren Miller, head of the "International Plant Medicine Corporation" of California (USA) was featured in the September/October *RAFI Communiqué* for his proposal to use the Ecuadorean military to forcibly extract ethnobotanical information from indigenous people. In this issue Miller surfaces again, having been granted a PPA patent on *banisteriopsis caapi* (*ayahuasca*, patent #5751), a well-known medicinal (and hallucinogenic) vine developed and used by indigenous people for centuries across the Amazon. In many Amazonian cultures, alkaloid-rich *ayahuasca* is considered sacred and plays a pivotal role in activities as diverse as medicine, celebrations, hunting, and contacting the spiritual world. Carefully trained to garden trees and cultivated by families, for some indigenous peoples *ayahuasca* assumes a role nearly as important as a food staple. But sacred it is no more, at least according to the US Government - Miller's unnamed variety of *ayahuasca* is now his exclusive property.

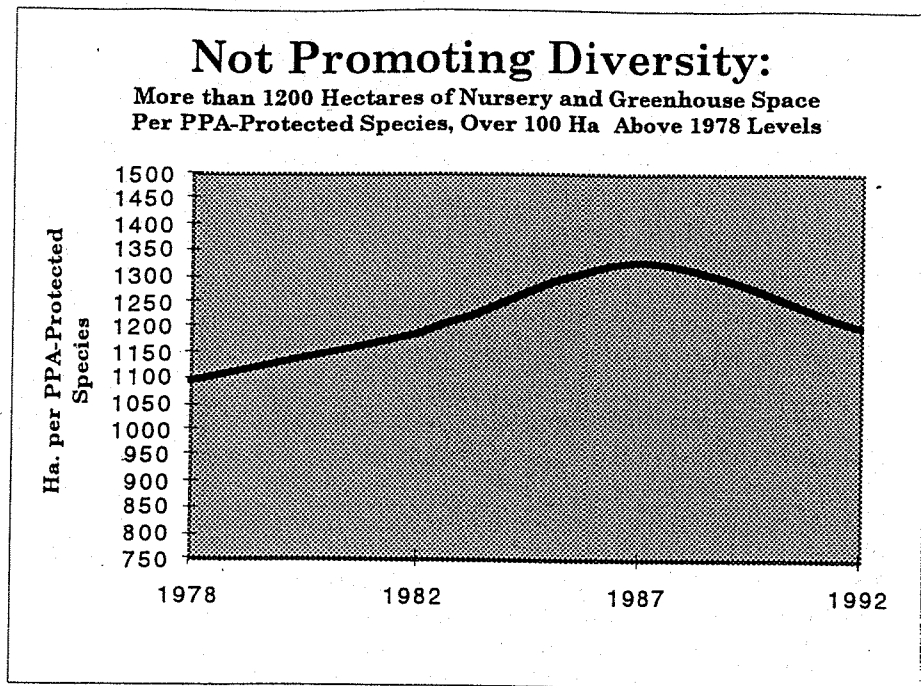
65 Years of the PPA

Has the PPA lived up to its promise and withstood the test of time, or is it time to retire a failed attempt to legislate nature? Superficial analysis of the PPA shows that the number of patents and plant breeders has increased over time - on the surface an indication of success. A closer look, however, yields a very different picture. When the increase in the number of plant patents is corrected to account for population

growth and changes in technology and agriculture, evidence shows that it has largely failed to increase useful species diversity or promote plant breeding. Instead, the PPA is dominated by a small group of highly specialized breeders and companies who work almost exclusively with a very small number of species. As ag-biotech and pharmaceutical companies move into the nursery and ornamental plant industry, it is unlikely that the narrow breadth of the PPA will expand.

Has the PPA encouraged species diversity?

Since 1931, plant patents have been issued on nearly 350 species. Patents range from intensely interbred species like roses and chrysanthemums to 142 species of which only one variety has ever been patented. The varieties of this latter group are not characteristically the result of scientific breeding programs; but rather more often plants simply found in nature (or stolen from farmers and indigenous people - see "You're Not Hallucinating" p. 4).



degree to which a very small number of species has always accounted for the majority of patents.

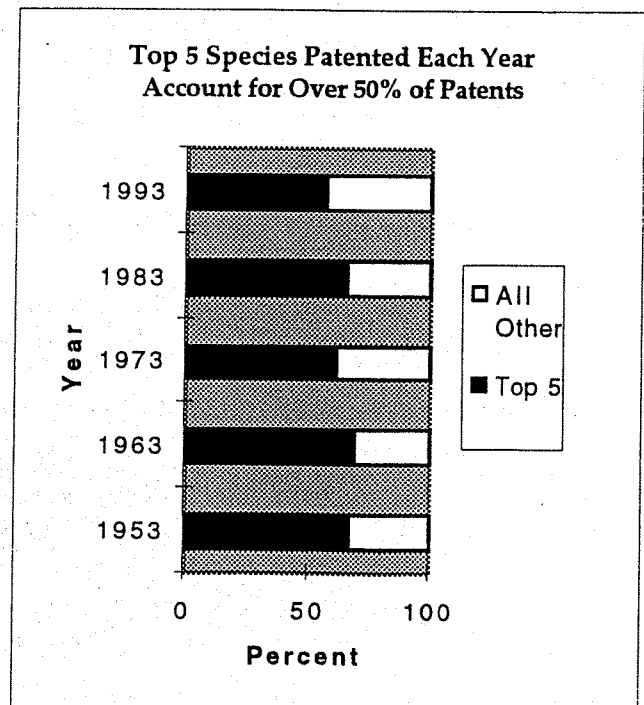
To the extent that nurseries and greenhouses depend upon patented varieties, this species uniformity is reflected in real conditions on U.S. farms. Although the gross number of species with varieties under PPA protection has risen in recent years, it has not kept pace with the expanding US nursery industry. In 1978, there were 1100 hectares of nursery space per unexpired PPA patent. By 1992 this ratio had fallen by nearly 10%, to just over 1200 hectares per PPA patent.

The Domesticated Dozen:

Twelve Species Take Over Two-Thirds of PPA Patents

Rose	2634	29.9%
Chrysanthemum	1001	11.4%
Peach	360	4.1%
Dianthus	354	4.0%
African Violet	324	3.7%
Apple	246	2.8%
Geranium	242	2.7%
Nectarine	231	2.6%
Azalea	167	1.9%
Poinsettia	160	1.8%
Plum	160	1.8%
Impatiens	155	1.8%
TOTAL	6034	68.5%

The PPA track record shows a strong tendency for patenting increasingly minute variations within species (i.e. hundreds, or thousands, of varieties of a single species with extreme similarity), rather than an expansion of serious breeding programs into a more diverse group of plants. In historical perspective the most striking aspect of diversity in the PPA is the



These figures suggest that the PPA is either contributing to genetic uniformity in U.S. nurseries or, that nurseries are growing unpatented varieties, and

that the PPA is of little relevance to the growth of the industry.

Growth in the number of varieties patented can also be attributed to technological change. In the early years of the PPA, plants were usually reproduced by grafting buds of patented plants to rootstock, resulting in a new plant identical (above the ground) to the one from which the bud was taken. The lengthy grafting process has recently been displaced by the widespread use of plants reproduced by tissue culture - a high-tech process whereby cells from a patented plant are stimulated and chemically-induced to create a new, genetically identical plant. Tissue culture, by reducing time and per plant cost of reproduction, has allowed industry to increase patenting activity as the mass production of more genetically-identical varieties has been made possible. Ultimately, this change is the result of technology developed in related industries (e.g commercial forestry companies with an expensive, legislated obligation to replant) and not the result of PPA intellectual property protection.

Endangered Species: PPA Plant Breeders

"Nothing that Congress could do to help farming would be of greater value and permanence than to give the plant breeder the same status as the mechanical and chemical inventors now have through patent law"

--Thomas Edison, 1930¹⁴

In part because of the large number of patents documented as involving one-time plant theft or "sports", RAFI's analysis draws a strong distinction between one-time patentors and breeders who patent twice or more. One-time patentors, especially those working with short-lived annuals, are not likely the professional breeders that the PPA's early advocates

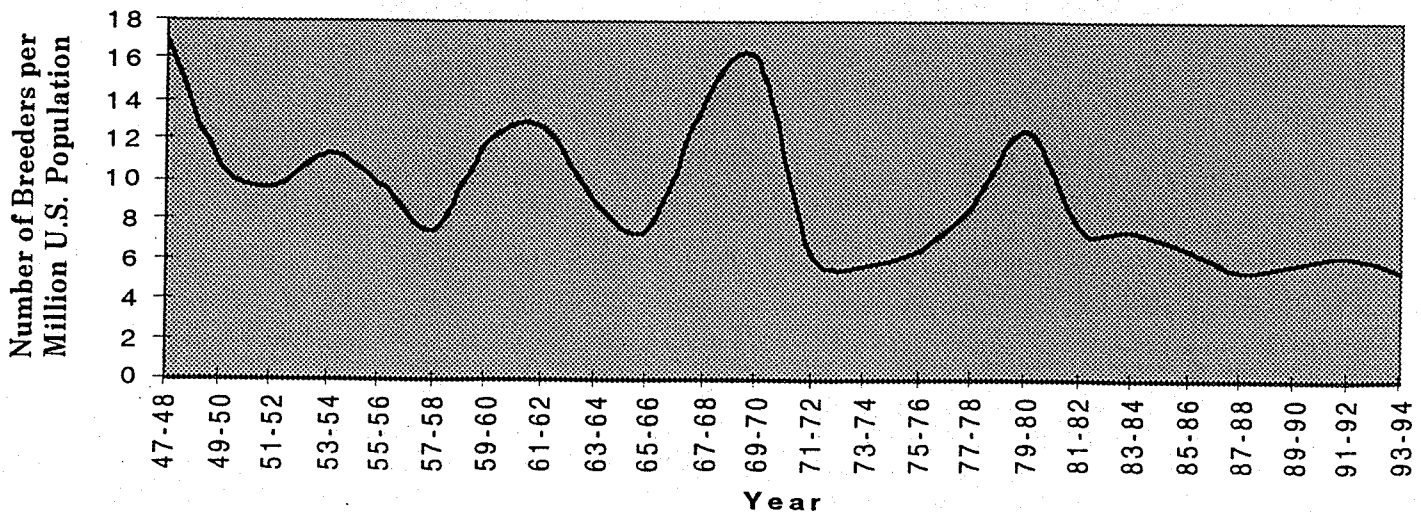
envisioned. Thus, in RAFI's consideration of the PPA's impact on breeders, reference is made only to those breeders who obtained more than one patent.

The number of breeders obtaining PPA protection has been slowly, relatively steadily increasing since 1931. At the same time, the US population has more than doubled. Since recovering from an understandable dip during the Second World War, active PPA plant breeders - despite intellectual property protection - have been in a slow decline relative to the U.S. population. From a postwar average of over 16 PPA breeders per million US population, by 1994 breeders had fallen by nearly two thirds, to 6 per million. Rather than an effective means to promote plant breeding, the PPA appears to have discouraged it.

Currently the most active plant breeders are those that focus on one species, sometimes to the complete exclusion of other plants. Specialty nurseries dominate PPA breeding, often with a majority share of patented varieties of a particular species. With a handful of breeders, Ecker Ranch of California owns the majority of patented poinsettias. 21 of 25 PPA patents on asparagus (a vegetable not excluded from PPA protection) are the result of the work of a single, publicly-supported breeder. The remaining four, all of which are over ten years old, are the work of another single, lonely, asparagus breeder.

With the rise of tissue culture and both breeders and diversity on the decline, the US' middle class housing subdivisions appear to be destined to fill up not only with identical, prefabricated homes, but with a diminishing variety of identical, prefabricated plants. And the breeder, who, it was claimed in 1930 could "recompensate himself through wide public

Breeders Declining Relative to U.S. Population



distribution by him during the life of the patent",¹⁵ is on a statistical decline.

Stimulating competition or carving turf?

While a wide range of commercial breeders employ the PPA, Ecke Ranch's use of plant patents to control poinsettias is not an isolated case. The Holtkamp nurseries, by almost exclusively breeding a single species, similarly dominate African Violets with nearly 80% of the patents issued since 1977. Rather than providing "protection" for small-scale innovators, the PPA - and breeder-grower agreements - allow companies to entrench as the predominant provider of a particular species, making commercially-viable use of the species by other breeders difficult.

Even in competitive markets, such as those for roses and chrysanthemums, discerning positive impacts of the PPA is difficult. Competition in markets such as roses has not grown in proportion to the number of patents issued over the PPA's history, suggesting that PPA monopoly has done little to broaden the base of commercial rose breeding nurseries.

While many PPA breeders and nurseries are smaller corporations and family operations, in recent years, the industry has increasingly interested large-scale, international biotechnology companies. Jackson & Perkins and Bear Creek Gardens, both venerable U.S. rose nurseries, were bought out by Japan's Yamanouchi Pharmaceuticals. Kirin Brewery, one of Japan's largest private corporations, has purchased Dutch chrysanthemum breeder Fides Beheer, as well as Twyford International, a gerbera breeder and biotech company in its own right, specializing in tissue culture. George W. Ball & Co., another PPA breeder with wider interests in agriculture, has acquired the Netherland's Royal Sluis and - as junior partner - tossed it into a major joint venture with Mexico's Empresas la Moderna. British food processing conglomerate Booker, plc. has acquired another Dutch breeder, Daenfeldt, Ltd. Despite being cash-strapped, U.S. genetic engineering firm Calgene (itself now 49% owned by Monsanto) made an aborted takeover attempt of U.S. rose breeder Melridge.

Given the growing use of tissue culture in the mass replication of PPA-protected varieties, and, unlike many sectors of agriculture, that the market for ornamental plants is growing, we may well see many more mergers in years ahead.

TWO: DOES THE PPA HAVE ANY RELEVANCE FOR WTO COMPLIANCE?

From our analysis of the empirical data, it seems clear that the PPA has not contributed in any discernible way to improved breeding or diversity in

the U.S. This is hardly a surprise as, in RAFI's view, this fate is shared by all monopoly IPR regimes. Except for external trade pressure through WTO, there appears to be no reason for the South to voluntarily adopt private monopoly legislation that fails to serve the public interest and actively siphons human and financial resources away from agricultural research and development.

It also bears repeating that the South is not under immediate pressure to comply with the WTO, since the IPR rules will be re-negotiated in 1999 and compliance is not mandatory until 1 to 5 years later. It is still appropriate, however, to evaluate the merits of the PPA as an IPR model should the 1999 review still oblige the South to adopt an "effective" legal instrument for plant varieties.

At least in comparison to Plant Breeders Rights or utility patents, the PPA model does offer some advantages:

- The application and approval procedure can be simple and inexpensive;
- There is no requirement to deposit a plant sample with patent authorities, meaning that costs are further reduced;
- "Protection" is granted on the basis of a drawing and a relatively simple description. The legislation reads: "as complete as is reasonably possible".¹⁶ This makes it feasible for farming communities and small breeding programs to meet description criteria;
- "Inventors" do not have to match the criteria for distinctiveness, uniformity, and stability, which are required under UPOV and which work against more variable farmers' varieties.
- In effect, patent criteria can be interpreted to meet the real agricultural needs of farming communities and national governments.
- Even if confined to asexually-propagated species, such a model would allow the South to cover major food and tuber crops (potatoes, sweet potatoes, yams, manioc, etc.); major export crops (tea, coffee, oil palm, coconut, etc.); and many commercially important cut flower and ornamental species (from African violets to zinnias); as well as major and potential fruit and nut crops (from citrus to grapes, cashews to Brazil nuts);
- It might also be possible for the PPA model to extend to sexually-propagated cereals and vegetables.
- The Farmer's Right to save, develop, and dispose of planting material as the farmer sees fit is not challenged under the PPA as it is under PBR and utility patent regimes.

- The breeders exemption for scientific research is clear and unchallenged under the PPA whereas it, too, is challenged under other systems.

Since the North has astutely avoided endorsing (or even referring to) PPA systems in the context of the WTO, one might wonder if adoption of such a model in the South would survive an inevitable hostile attack from the North before or after 1999. There are sound reasons to believe that it would. Even though PPA criteria are honoured more in breach than practice, the U.S. government continues to administer it and its use is even growing. Public and private sector breeders from several countries now have PPA patents in the US, signifying their acceptance of the system. Some governments (e.g. Belgium) even have similar legislation. Finally, to contest the South's right to use the PPA as a model for developing their own *sui generis* systems, the US would likely be forced to try to end the PPA and, in the process, encounter strong internal opposition from the nursery trade.

Possibly one of the major effects of such a *sui generis* system would be to confront the North with its own contradictions and to disable the entire life patenting process. There are, however, serious potential consequences that cannot be ignored:

- The PPA continues to confer monopoly over life forms and is subject to all the abuses that any system of greed can heap on systems of generosity.
- "Loose" patent criteria tend to benefit whoever gets to the patent office first. Farmers could find themselves queuing behind unscrupulous national entrepreneurs pirating community innovations.
- As with other IPR systems, the burden of defending patent claims rests with the patent holder. Communities and small national companies will be no more able to bear these costs under PPA-style legislation than under any other IPR system.

- Once adopted, it is in the interests of those with money and power to amend any IPR system to strengthen their monopoly, even if the original legislation is passed with the intent of defending farmers.

RAFI will continue to explore *sui generis* options and examine various aspects of IPR related to life forms. Look for the next study in his series to be published in a late 1996 edition of *RAFI Communiqué*.

¹ Union for the Protection of New Varieties of Plants

² The basic catalog of plant patents used in RAFI's study is kept by the American Association of Nurserymen in Washington, DC. AAN's database, as provided to RAFI covers 8,802 patents issued through mid-1994. Statistical analyses of the patent database in this *Communiqué* have been made by RAFI.

³ Johnson, Doyle C. and Tarra M. Johnson, "Financial Performance of U.S. Floriculture and Environmental Horticulture Farm Businesses, 1987-91", Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Statistical Bulletin No. 862. (These figures exclude income from fruit and nut trees. Horticultural production figures are from 1990.)

⁴ Sports are accidental mutations found either in nature or on a farm/nursery.

⁵ Fowler, Cary. *Unnatural Selection*. New York: Gordon and Breach, 1994, p. 19.

⁶ The 1920 U.S. Census recorded more urban than rural residents for the first time.

⁷ Fowler, p. 82.

⁸ Fowler, p. 88.

⁹ Kneen, Orville H. "Plant Patents Enrich Our Lives", in *National Geographic*, March 1948, p. 357.

¹⁰ Quoted in Lim, Phillip Wonhyuk, *The Privatization of Species*, PhD. Diss., Stanford University, 1993, p. 176.

¹¹ Lim, p. 184.

¹² PPA patents issued to dead people have not subsided in recent years, as illustrated by the case of recently deceased rose breeder Cecilia Bennett, who after being planted six feet underground herself, was awarded 57 patents in the late 1980s and early 90s for her varieties of rose plants.

¹³ Lim, p. 188.

¹⁴ Quoted in Lim, p. 178.

¹⁵ Quoted in Lim, p. 176.

¹⁶ Lim, p. 173.

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