Out of Brazil: A Peanut Worth Billions (to the US)

a special report from the **Edmonds Institute**

Background:

A disease-resistant peanut (groundnut) purchased at a Brazilian market has contributed billions of dollars to the US economy. The peanut is the primary source of resistance to tomato spotted wilt virus (TSWV) in US peanut varieties. The value of this resistance for the US peanut crop can be conservatively estimated at US $2 billion for the years 1996 through 2005. Because TSWV is spreading in the US and because the Brazilian gene continues to be used in new peanut varieties, with each new year the gene from Brazil is estimated to add another US $200 million (or more) to the US economy. (1)

The Brazilian peanut is an example of how, in the absence of effective access and benefit sharing (ABS) laws, genetic acquisition can make billions for the collector but little or nothing for those from whom the germplasm was taken.

The importance of access to germplasm for agriculture has been at the heart of many national debates over whether or not to ratify the Convention on Biological Diversity (CBD). Even in the United States, where the CBD is still not ratified, the importance of access to germplasm has always been acknowledged. In an August 16, 1994 letter addressed to US Senate leaders, the US Secretaries of the Interior, State, and Agriculture wrote:

> *The majority of important US agricultural crops and livestock originated in other parts of the world, and the major sources of variation essential to future improvements, through traditional breeding and biotechnology, are located outside US boundaries. Access to this germplasm is essential to continued improvement in the productivity of US crops.* (2)

Here's the story of how a peanut collected at a market in Porto Alegre, Brazil came to earn billions for US farmers:

Alan A. Beetle was an unlikely peanut collector. A New England native, Beetle was trained as a botanist in California. In 1946 he accepted a professorship at the University of Wyoming, where he studied rangelands. His work on sagebrush (*Artemisia* spp.) remains authoritative to this day; (3) but it was to be his collection of a very different sort of plant that would prove to be his most significant deed for US agriculture.

In 1952, Beetle went on a working mission to South America's southern cone. Like Wyoming, the southern cone had large ranches and grasslands. A rough outline of

Beetle's trip can be reconstructed from his collection records. His journey appears to have begun in Buenos Aires in early 1952. It was summer in Argentina and Beetle went deep into the country. He probably went as far south as the Cañadón León Experimental Station in Santa Cruz province, from which he obtained barley seeds.(4)

By June of 1952, Beetle was headed away from the Argentinean winter and towards more temperate lands. Passing through Uruguay, he picked up grass samples. He then crossed into Brazil's state of Rio Grande do Sul, where he made many stops, including visits to local markets.

Beetle was back in the US in December 1952. He deposited his collection of 94 seed samples, most of them grasses, with the US Department of Agriculture (USDA). (5) Among the samples were four peanuts that he had purchased at markets in Rio Grande do Sul in August 1952. Three were from Porto Alegre, the capitol city. (6) Beetle's motivation for collecting the peanuts is unclear. Peanut foliage can be used for animal forage, but cold and northerly Wyoming is not suitable for peanut crops.

Many years would pass before the full value of Beetle's collection would become apparent. In 1987, tomato spotted wilt virus (TSWV) was first detected in US peanuts.(7) The virus is transmitted by several species of thrips (insects from the Thysanoptera genus), and it severely injures or kills the peanut plants that it infects. (8) Since its appearance in US peanuts in the late 80s, TSWV has become a widespread problem, especially in the "Deep South" states of Georgia, Florida, Alabama, and South Carolina.

Faced with a serious threat, US peanut breeders sought TSWV resistance in US germplasm collections. Because it had been used in previous breeding programs, the researchers rather quickly recognized that a peanut called PI-203396 was resistant to TSWV. (9) PI-203396 was one of peanuts that Beetle had purchased at the Porto Alegre market.

To date, US breeders have used PI-203396 as the source of TSWV resistance in peanut types including Georgia Green, Florida MDR 98, C-99R, (10) Hull, DP-1, (11) GS-8, (12) and Andru II. (13) Most of these varieties have been developed by the Universities of Georgia and Florida and plant breeder's rights have been claimed over them under the US Plant Variety Protection Act. The University of Georgia has also claimed a variety (called Georgia 01R) bred from PI-203395, another of the peanuts that Beetle bought in Porto Alegre. (14)

The most important TSWV-resistant variety is Georgia Green, a "runner" (prostrate growth habit) peanut. Runner peanuts, often used for peanut butter and other processed foods, are the market type that is typically grown in the Deep South, the largest peanut-producing region in the US.

Georgia Green dominates US peanut fields. In 2003, it was sown on four fifths (79.2%) of the peanut acreage in the southeastern US. (15) That corresponds to half (49.3%) of the peanut acreage in the entire US. (16) Other varieties bred from PI-203396 are less popular, but still significant, such as C-99R, (17) which grows on 5.4% of US peanut

acreage. (18) It is not surprising that a recent article in the *Southeast Farm Press* declared: (19)

> *Varieties such as the tomato spotted wilt virus-resistant runner-type Georgia Green have been credited with rescuing peanut farmers from devastation in states such as Georgia, Alabama and Florida.*

According to the US Department of Agriculture's Peanut Crop Germplasm Committee, the Porto Alegre peanut has been worth billions of dollars to the United States: (20)

> *Under severe TSWV pressure, the additional economic return from growing* [Porto Alegre derived] *cultivars in comparison to previous susceptible cultivars is in excess of $500 per acre. Assuming that half of the peanut acreage in the Southeast has severe TSWV pressure, the economic impact of this resistance could be more than $200 million annually.*

Georgia Green was released in 1995. (21) It quickly came to dominate Southeast peanut acreage. Other varieties bred from the Porto Alegre peanut continue to be released, including several that were first sold in 2003. (22) It can thus be conservatively estimated that, for the growing seasons from 1996 through 2005, the Porto Alegre peanut was worth US $2,000,000,000. This value will continue to rise by $200 million or more per year for the foreseeable future, because PSRV is spreading and the Porto Alegre resistance trait continues to be used in new varieties.

Afterthoughts:

With hindsight, it seems easy to understand how peanuts casually purchased in a Brazilian marketplace turned out to be worth billions to farmers in the US. But it took decades and the attack of a devastating virus before the full "value" of the Brazilian peanuts became apparent to the breeders in the US.

Although it is clear that little or nothing was returned to Brazil in exchange for the great service performed by its peanut germplasm, no laws were transgressed. There apparently were no access and benefit sharing rules and regulations in place at the time that Beetle made his purchase. And yet, in hindsight, there was a sort of pre-CBD biopiracy. There was acquisition in the absence of prior informed consent and there was gain in the absence of any agreement about benefit sharing.

The case of the Brazilian peanut is not unique, but it is instructive. The value of germplasm may take decades and an unusual biological event to become apparent. The value may be entirely unknown to the initial collector and yet may turn out to be immense for subsequent generations in the country or company of the collector. Without effective ABS laws in place, the lopsided scenario of the Brazilian peanut is likely to be repeated in other places, by other collectors, gathering other germplasm.

Endnotes:

(1) Peanuts (*Arachis hypogaea*) are not among the crops included in the multilateral system established under the FAO International Treaty on Plant Genetic Resources for Food and Agriculture, which entered into force in June 2004.

(2) US Secretary of the Interior Bruce Babbitt, Secretary of State Warren Christopher, and Secretary of Agriculture Mike Espy, 16 August 1994 letter and Accompanying Memorandum of Record to George Mitchell, Senate Majority Leader, and Robert Dole, Senate Minority Leader. Cited in Kloppenberg, J. and B. Burrows. footnote 21, in Biotechnology to the Rescue? Twelve Reasons Why Biotechnology is Incompatible with Sustainable Agriculture, *The Ecologist*, 26: 2 , March/April 1996.

(3) See URL: http://www.habitat4wildlife.net/beetle.htm for a brief biography of Beetle.

(4) USDA Agricultural Research Service (ARS) Genetic Resources Information Network (GRIN) entry for PI-202035. URL: http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1169820

(5) A list of these 94 deposits can be found in the USDA GRIN database, URL: http://www.ars-grin.gov/cgi-bin/npgs/html/cno_acc.pl?69339

(6) The fourth was from a market in the city of Pelotas.

(7) As its name indicates, TSWV also infects tomatoes. It also causes losses in tobacco and peppers.

(8) The University of Georgia has a helpful page explaining TSWV in peanuts. URL: http://pubs.caes.uga.edu/caespubs/pubcd/b1165-w.html

(9) USDA GRIN database entry is at URL: http://www.ars-grin.gov/cgi-bin/npgs/acc/display.pl?1170633

(10) USDA Peanut Crop Germplasm Committee (2003). Report on the Status of Arachis Germplasm in the United States, URL: http://www.ars-grin.gov/npgs/cgc_reports/Status11.pdf

(11) Report of USDA Plant Genetic Resources Conservation Unit Project S-009, "Plant Genetic Resources Conservation and Utilization" for the period 08/2001 through 8/2002, 17 March 2003, URL: http://www.ars.usda.gov/SP2UserFiles/Place/66070000/S9annualreports/s9ar2002.pdf

(12) USDA. Plant Inventory No. 208 (1999), page 228, URL: http://www.ars. usda.gov/SP2UserFiles/ad_hoc/12751500PIBooks/pibooks/plinv99.pdf

(13) US Plant Variety Protection Certificate 20030179, issued to the University of Florida, http://www.ams.usda.gov/exppvpocerts/AdobeImages/200300179.pdf

(14) US Plant Variety Protection Certificate 200200171, issued to the University of Georgia, URL: http://www.ams.usda.gov/exppvpocerts/AdobeImages/200200171.pdf

(15) The southeastern region excludes North Carolina and Virginia, considered to be distinct because of the predominance of "Virginia" market type peanuts grown in those two states. "Spanish" market type peanuts are usually grown in Texas, Oklahoma, and New Mexico.

(16) USDA Peanut Crop Germplasm Committee (2003). (See note 10 above.)

(17) In addition to its Brazilian genes, C-99R incorporates germplasm from Malawi. For more information, see page 22 of Edmonds Institute/African Centre for Biosafety report, Out of Africa: Mysteries of Access and Benefit Sharing, URL: http://www.edmonds-institute.org/outofafrica.pdf

(18) USDA Peanut Crop Germplasm Committee (2003). (See note 10 above.)

(19) Muzzi, D. Improved varieties lead fight against peanut diseases, *Southeast Farm Press*, 23 March 2005, URL: http://southeastfarmpress.com/mag/farming_improved_varieties_lead/index.html

(20) USDA Peanut Crop Germplasm Committee (2003). (See note 10 above.)

(21) See the Georgia Green Peanut Variety summary, published by the Georgia Seed Development Commission, URL: http://www.gsdc.com/GA%20GREEN%20PEANUT.html

(22) See Martin, J. Abundance of New Varieties for 2003, *Peanut Grower*, February 2003, URL: http://www.peanutgrower.com/home/2003_FebNewVarieties.html

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