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The Life Industry

Issue: "The Life Industry" refers to the giant transnational enterprises that use, buy, sell and control an ever-growing market share of bio-industrial products relating to food, agriculture and health. The business of the life industry ranges from food processing, seed production, plant breeding and agrochemicals to pharmaceuticals and veterinary medicines.

Trends: It is impossible to talk about global trade or food and agricultural policy without taking into account the control and global reach of the life industry. Consolidation is nothing new; but the traditional lines between seed, agrochemical, biotechnology, drugs and food corporations are blurring--in some cases they are indistinguishable. The era of biotechnology "start-up" firms is over; large corporations now play a more direct and dominant role. The current round of mega-mergers and acquisitions is driven not only by frantic cost-cutting, but also by pursuit of new technology--as demonstrated by the rush to patent life forms.

Economic Stakes: The life industry yields extraordinary economic might; the power of many nation states pales in comparison to even a single enterprise. The global agrochemical market was (US) $29 billion in 1995; the top 10 agrochemical corporations accounted for 81% of the global market. The commercial seed industry is worth approximately $15 billion per annum; the top 10 enterprises account for 37% of the worldwide market. The world pharmaceutical market is an estimated $197 billion; the top 10 corporations account for 43% of the market. The global market for veterinary pharmaceuticals is almost $15 billion, the top 10 firms account for 43% of global sales. The top 10 food and drink corporations had combined annual sales of $211 billion in 1995.

Introduction

In preparation for FAO's World Food Summit in November, this issue of the RAFI Communique examines "The Life Industry." It is impossible to understand agriculture and food security without examing the power and global reach of "The Life Industry"-- the giant transnational enterprises that use, buy, sell and control an ever-growing market share of bio-industrial products ranging from seeds and agrochemicals to food, pharmaceuticals and veterinary medicines. Any realistic discussion of food security must go beyond questions of how to produce more food for hungry people in the South using "gene revolution" technologies. Simply put, the issue is one of control--not production. The South, in particular, now faces intense pressure to abandon food self-sufficiency policies in favour of agricultural trade liberalization. With all the emphasis on trade, there is virtually no discussion of the transnational enterprises who are dominant players in every aspect of commercial food, agriculture and health. Before surrendering national sovereignty and food security to the mega-corporations and the World Trade Organization, it is important to put a face on the economic powerhouses that control this arena--the life industry enterprises.

In the 1970s there was "agribusiness." In the 1980s came the "genetic supply industry" and today, the sweeping "life industry." Corporate concentration and vertical integration are not new. The 1970s and 80s saw a steady reduction in the number of companies dominating agribusiness and the pharmaceutical trade. But in recent years, the new biotechnologies have led to dramatic changes in the structure of these industries. The engine of the life industry is genetic technologies--and the strategic inputs are biological materials. Whether destined for agricultural, pharmaceutical or food processing products, living materials can be engineered and adapted to a wide range of end-uses. Scientists can transfer genes across species--from humans to microorganisms, from animals to plants, for instance. Just as biological barriers have been shattered, the distinctions between traditional industry sectors are blurred, or often indistinguishable.

The life industry is best exemplified by Novartis, the titanic corporation formed by the $27 billion merger of Swiss giants Sandoz and Ciba-Geigy announced in early 1996. It's difficult to typify Novartis as "a pharmaceutical firm" or an "agrochemical company." The fact is, Novartis is the world's number one agrocehmical corporation,[1] the 2nd largest seed

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firm, the 3rd largest pharmaceutical firm and the 4th largest veterinary medicine company. Novartis also contracts with human genomic companies in the quest to gain proprietary access to human "disease genes." Approximately 59% of the company's revenue comes from drugs, 27% from agricultural products, and 14% from food products.

Robert Fraley, president of Monsanto's Ceregen division, explains why a company like Monsanto (traditionally an agrochemical corporation) now has interests in seeds and food: "What you're seeing is not just a consolidation of seed companies, it's really a consolidation of the entire food chain. Companies like ours, who want to continue to be in the food and feed production business, are all trying to secure our spot along that chain."(Fraley was quoted in October, 1996 issue of *Farm Journal*).[2]

World's Top 10 Agrochemical Corporations

Company	1995 Sales (US) Millions	Comments
Novartis (Switzerland)	$4,410	combined CibaGeigy and Sandoz
Monsanto (USA)	$2,472	
Bayer (Germany)	$2,373	
Zeneca (UK)	$2,363	
AgrEvo (Germany)	$2,344	formerly Hoechst and Schering
DuPont (USA)	$2,322	
Rhone-Poulenc (France)	$2,068	
DowElanco (USA)	$1,962	
American Home Products/ American Cyanimid (USA)	$1,910	American Home Products acquired American Cyanamid
BASF (Germany)	$1,450	

Source: RAFI, based on AGROW, No. 253, March 29. 1996.

With the advent of new genetic technologies, the difference between "natural" and "synthetic" is also difficult to distinguish. For example:

Plant, Animal or Drug? Food or Pharmaceutical? Natural or Synthetic?

- Transgenic goats engineered by Genzyme Transgenics will soon be expressing human therapeutic proteins in their milk for pharmaceutical giant Bristol-Myers Squibb. The end-product is a proprietary drug delivered via a genetically engineered farm animal. The industry calls it "pharming."[3]
- A small biotech company, AgriStar Inc., is developing transgenic plants to express edible, oral vaccines. The company recently received a U.S. patent on its technology, which it says will provide a low-cost method for inoculating children and livestock, in the Third World.[4]
- Zeneca (UK) biosciences corporation manufactures a biodegradable plastic synthesized in fermentation vats by the bacterium *Alcaligenes eutrophus*.[5]
- US Army researchers are using bacteria to express artificial genes based on the ones that the orb-weaving spider uses to make its silk. If silk-like materials could be harvested from fermentation vats rather than the spiders themselves, these super-strong fibers could be used in industrial products ranging from aircraft engineering to bullet-proof vests.[6]

"What you're seeing is not just a consolidation of seed companies, it's really a consolidation of the entire food chain. Companies like ours, who want to continue to be in the food and feed production business, are all trying to secure our spot along that chain."

– Robert Fraley, Monsanto, quoted in *Farm Journal*

Bye-Bye Biotech Era?

Biotechnology research was initially conducted by small, specialized, industry "start-ups" whose research was supported by the big corporations on a contractual basis. But in recent years there has been a gradual shift. The giant corporations are now playing a more direct and dominant role in biotechnology, devoting more of their R & D to in-house biotech programmes.

Nature Bio/Technology journal estimates that the life industry spends as much as $7.5 billion per annum on their in-house biotechnology programs.[7] In 1995, pharmaceutical corporations spent approximately $3.5 billion acquiring biotech firms. That's on top of the $1.6 billion they paid to biotech companies in licensing agreements or R & D contracts.

The same is true of agricultural biotechnology firms. As Mycogen's Keith Walker puts it, "The agricultural biotechnology industry has already been consolidated, by and large, into Fortune 500 companies. Its entrepreneurial start-up is over." Bill Freiberg, the editor of *Biotech Reporter*, seconds this view. He refers to Monsanto's majority interest in Calgene as "one of the final nails in the coffin of the 'start-up' agbiotech era."[8] The major corporations he notes, "patiently waited in the wings for the dust to settle, and are now finally emerging with their deep pockets and extensive R & D to pick up the pieces."[9]

The following are just a few examples of buy-outs or equity investments in the agricultural biotech firms by major seed and agrochemical corporations:

Ag Biotech Companies: Where are they Now?

- **Agracetus** --Acquired by Monsanto for (US) $150 million in May, 1996.[10]
- **Agridyne Technologies** and **Crop Genetics International** -- Both companies merged with Biosys Inc., a plant biotech company.
- **Biosys Inc.** -- Files for bankruptcy in Sept. 1996.

- **Calgene** -- Monsanto now owns a controlling interest--54%--of the California-based plant biotech firm.[11]
- **DNA Plant Technology** -- Acquired by Empresas La Moderna (Mexico), one of the world's leading seed corporations in 1996.[12]
- **Ecogen** -- Major alliance with Monsanto in 1996.
- **Escagenetics** -- Filed for bankruptcy in 1995.
- **Mycogen** -- Dow Elanco currently owns 46% of Mycogen; Pioneer Hi-Bred owns 10%.[13]
- **Mogen International** -- The Dutch plant biotechnology company is for sale.[14]
- **Plant Genetic Systems Intl.** -- AgrEvo (Germany) purchases Belgian plant biotech company for $550 million in Sept. 1996.[15]

World's Top 10 Seed Corporations

Company	Est. 1995 Sales (US) Millions	Comment
Pioneer Hi-Bred Intl. (USA)	$1, 500	
Novartis (Switzerland)	$900	formerly Ciba Geigy and Sandoz
Limagrain (France)	$525	French cooperative
Seminis (Mexico)	$500	owned by Empresas La Moderna (Mexico) and George J. Ball (USA)
Zeneca/Van der Have (The Netherlands)	$460	pending merger
Takii (Japan)	$450	vegetable/flower/maize/ turfgrass
Dekalb Plant Genetics (USA)	$320	About 40% owned by Monsanto
KWS (Germany)	$315	
Sakata (Japan)	$300	vegetable/flower/turfgrass
Cargill (USA)	$250	privately-held

Source: RAFI, based on information provided by Kent Group Inc.

The biotechnology sector as a whole is losing money. Because they constantly struggle for capital to keep alive, biotech companies are easy targets for mergers, acquisitions and partial acquisitions. *Nature Biotechnology's* annual survey of over 230 public biotechnology companies in the US reveals that biotech companies were collectively more than $2 billion in the red during 1995. Nearly all of the companies invested more in R&D than they earned. Just 39 companies turned a profit in 1995 (about $1 billion collectively); but over half of the profit ($537 million)came from Amgen.[16]

Technology and Patent Power

According to seed industry consultant, James Kent, most of the recent mergers and acquisitions revolve around access to technology. "That's a critical difference from the 1970s and '80s when activity was mostly about market presence and distribution," Kent told *Farm Journal.*[17] Monsanto, a major agrochemical/plant biotechnology corporation, is a prime example. Over the past two years Monsanto spent over $500 million in strategic investments: $170 million to purchase a 40% stake in US-based seed company DeKalb; $150 million to buy plant biotech company Agracetus from W.R. Grace; around $200 million to acquire a controlling interest in Calgene; and another hefty investment in the biotech company Ecogen.[18] Buying-out the competition is clearly an effective way to avoid paying licensing fees, settle patent disputes and corner the market in a specialized field of technology.

Life patents--covering an ever-growing range of biological products and processes--have become like high-tech poker chips. Participation in the industry isn't possible unless a company holds patents or has money to license them. Consider, for example, that one genetically engineered, insect-resistant maize hybrid developed by Pioneer Hi-Bred requires access to 38 different patent claims involving 16 separate patent holders[19].

A striking example of the power of patents is the $295 million takeover of Genetic Therapy Inc. (Maryland, USA) by Sandoz (now Novartis) in July, 1995. The takeover was triggered in large part because Genetic Therapy Inc. held an exclusive license on a sweeping patent for *ex vivo* gene therapy. The patent covers the general technique of removing cells from a patient, altering their genetic make-up, and returning them to the patient's body. The takeover of GTI's sweeping patent by a Swiss corporation was especially controversial because NIH had been pressured to ensure that it was a US company that got the exclusive rights to exploit the government-funded

World's Top 10 Food and Beverage Corporations

Corporation	1995 Sales (food and drink) Millions	Food/drink as % of total sales
Nestle SA (Switzerland)	$46,400	99%
Philip Morris Inc. (USA)	$33,035	50%
Unilever PLC/NV (UK/Netherlands)	$25,300	56%
ConAgra, Inc. (USA)	$20,345	84%
Coca-Cola Co. (USA)	$18,018	100%
PepsiCo Inc. (USA)	$16,123	53%
Mars Inc. (USA)	$13,500	100%
Cargill Inc. (USA)	$12,929	28%
Archer Daniels Midland (USA)	$12,672	100%
Kirin Brewery Co. (Japan)	$12,626	97%

Source: DataMonitor

Top 10 Veterinary Medicine (Animal Health) Corporations

Corporation	1995 Sales (US) millions
Pfizer Inc. (US)	1,200
Merck Agvet (US)	830
Bayer (Germany)	775
Novartis (Switzerland)	750
Rhone Merieux, Inc. (France)	600
Hoechst roussell Vet (Germany)	520
Elanco Animal Health (US)	510
Mallinckrodt Veterinary Inc. (US)	460
Ft. Dodge Laboratories (US)	440
Pharmacia & Upjohn (Sweden)	380

Source: RAFI, based on Feedstuffs, 29 July 1996

research.[20] The patent is so broad that medical researchers claim it will "severely hamper" the commercial development of human gene therapies.[21] Today, Novartis has exclusive rights to the gene therapy patent and the economic muscle to defend it.

PHARMACEUTIAL INDUSTRY TRENDS

Even industry insiders were awed by what they describe as "upheavel" in the pharmaceutical industry in 1995.[22] Last year more than $70 billion changed hands in three drug company mergers and 20,000 jobs were subsequently eliminated. The mergers included: Pharmacia + Upjohn; Hoechst AG + Marion Merrell Dow; and Glaxo + Burroughs Wellcome. But the scale of the 1995 mergers pales in comparison to the $27 billion union of Sandoz and Ciba-Geigy to form Novartis in 1996. By nearly all accounts, the consolidation craze is not over; other top drug companies are expected to join forces to match the newly found powerhouses of GlaxoWellcome and Novartis.

RAFI's chart on page 5 provides an update on the link between the human genomic companies and the pharmaceutical giants. Through research agreements, equity investments and takeovers, virtually all major drug companies are buying access to human gene sequence databases and staking claims to the so-called human "disease genes."

In recent years, giant drug companies have charted new territory in vertical integration. Industry analysts politely describe this ominous trend as "a move by the pharmaceutical majors to become providers of healthcare rather than purveyors of pills."[23] In the United States, three major drug companies have recently bought out "pharmacy benefit management" (PBM) companies--the firms that manage the prescription drug components of health insurance plans for almost half of the US population.[24] PBMs maintain lists of preferred prescription drugs for insurance company patients and thus represent enormous buying power in the US market. According to *Multinational Monitor*, pharmaceutical giants have purchased three of the five largest PBMs in the US.[25] Eli Lilly acquired PCS Health Systems, Merck bought Medco, and SmithKline Beecham now owns Diversified Pharmaceutical Services.[26] The obvious concern is that decisions about "preferred" prescription drugs will favour the parent companies' brand-name drugs in an effort to boost market share and stifle competition, rather than protect the health interests of the patients.

World's Top 10 Pharmaceutical Corporations

COMPANY	1995 SALES (US) MILLIONS	COMMENT
Glaxo Wellcome (UK)	$11,800	Glaxo and Burroughs Wellcome's 1995 merger was worth $14 billion
Merck (USA)	$10,960	
Novartis (Switzerland)	$10,940	Ciba and Sandoz merged in 1996
Hoechst (German)	$9,420	acquired Marion Merrell Dow in 1995 for $7.1 billion
Roche (Switzerland)	$7,820	
Bristol-Myers Squibb (USA)	$7,810	
Pfizer (USA)	$7,070	
SmithKline Beecham (UK)	$6,600	
Johnson & Johnson (USA)	$6,300	
Pharmacia & Upjohn (Sweden)	$6,260	Merged in 1995

Source: RAFI, based on Wall St. Journal, 7 March 1996. Company sales exclude sales of nondrug products.

Pharmaceutical Industry Stakes Out Genetic Turf in Human Genomic Comanies:
Recent Alliances Between Human Gene Boutiques and Corporate Partners

Genomic Company	Corporate Partners	Comment
Canji Inc. (USA)	• Schering Plough	Schering Plough acquires Canji for $54.5 million in 1996
Darwin Molecular Corp. (USA) founded 1992	• William Gates and Paul Allen • Rhone Poulenc Rorer Inc.	Gates & Allen (founders of Microsoft) make $10 million equity investment.
GeneMedicine, Inc. (USA) founded 1992	• Corange Intl. Ltd. • Genentech, Inc. (Hoffman-La Roche)	Corange Intl. makes $100 million research agreement; Genentech makes equity investment.
Genetic Therapy Inc. (USA)	• Novartis	Sandoz (Novartis) acquires GTI for $295 million in 1995
Genome Therapeutics Corp. (USA) founded as Collaborative Research in 1961, changed name in 1994	• Astra AB • Boehringer Mannheim • Schering-Plough	
Genset (France) founded 1989	• Synthelabo (France)	Synethelabo (France) makes $69 million research agreement and equity investment of $9.7 million. Focus: prostate cancer
Human Genome Sciences Inc. (USA) founded 1992	• Genetic Therapy (Novartis) • ISIS Pharmaceuticals • Pioneer Hi-Bred Intl. • Hoffman-La Roche • SmithKline Beecham • Takeda	SmithKline Beecham made $125 million research agreement in 1995. Pioneer Hi-Bred has $16 million deal to map maize genes.
Incyte, Inc. (USA) founded 1991	• Abbott Labs • Hoechst Marion Roussel • Hoffman-La Roche • Johnson & Johnson • Novo Nordisk • Pfizer • Pharmacia & Upjohn • Zeneca	All subscribe to Incyte's proprietary gene sequence databases. Incyte claims its database contains partial sequences of nearly 100,000 genes (May, 1996). Pfizer and Pharmacia & Upjohn are major investors in the company.
Millennium Pharmaceuticals Inc. (USA) founded 1993	• Eli Lilly & Co. • Hoffman-LaRoche • Astra AB	Eli Lilly has 5-yr. agreement valued at $69 million related to atherosclerosis
Myriad Genetics Inc. (USA) founded 1991	• Bayer • Ciba-Geigy (Novartis) • Eli Lilly & Co.	Bayer - obesity, asthma and osteoporosis gene discovery; Novartis - cardiovascular drugs; Eli Lilly - license on breast cancer gene.
Sequana Therapeutcis founded 1993	• Boehringer Ingelheim • Corange Intl. • GlaxoWellcome • Genentech (Novartis)	Glaxo has 5-yr. R&D agreement on Type II diabetes and obesity genes.

source: RAFI

"Soon we will have all the instructions on how to make a human being–what thinking means and what memory means. It will totally transform how we view ourselves and disease. We can't anticipate all the ways it will impact us."

-- Alan Bernstein, director of the Samuel Luenfeld Research Institute of Mt. Sinai Hospital in Toronto, Quoted in BioWorld Today, 12 June 1996.

[1] On 27 September 1996 Sandoz (Novartis) announced that it would sell its maize herbicide market to BASF. Unless Novartis is forced to sell additional agrochemical holdings because of antitrust concerns, it will likely remain the top ranking agrochemical firm in the world.
[2] Horstmeier, Greg, "Strategic Bedfellows," *Farm Journal*, Oct. 1996.
[3] *Nature Biotechnology*, Vol. 14, May, 1996, p. 554.
[4] *Biotech Reporter*, March, 1996, p. 10.
[5] Ball, Philip, "Living Factories," in *New Scientist*, 3 February 1996,.
[6] Ball, Philip, in *New Scientist*, 3 February 1996,
[7] Davidson, Sylvia, "Hidden biotechnology worth over $7.5 billion a year," *Nature Biotechnology*, Vol. 14, May, 1996, p. 564.
[8] Freiberg, Bill, "The Passing of an Era," *Biotech* Reporter, Sept. 1996, p. 14.
[9] Freiberg, Bill, Biotech Reporter, Sept., 1996, p. 14.
[10] *Nature Biotechnology*, Vol. 14, May 1996, p. 554.
[11] *Biotech Reporter*, August, 1996, p. 8.
[12] *Biotech Reporter*, Feb. 1996, p. 8
[13] *Biotech Reporter*, Feb. 1996, p. 1
[14] *Biotech Reporter*, September, 1996, p. 15.
[15] *Biotech Reporter*, September, 1996, p. 2.
[16] *Nature Biotechnology*, Volume 14, May 1996, p. 560-561.
[17] Kent was interviewed by Greg D. Horstmeier in his article, "Cataloging the Seed Industry," *Farm Journal*, September, 1996.
[18] Horstmeier, Greg, "Cataloging the Seed Industry," *Farm Journal*, September, 1996.
[19] Horstmeier, Greg, *Farm Journal*, October, 1996.
[20] Johnson, Emma, "Gene Therapy Patent Challenge: Round One" *Nature Biotechnology*, Vol. 14, April, 1996.
[21] Coghlan, Andy, "Sweeping patent shocks gene therapists," *New Scientist*, v. 146, 1 April 1996.
[22] SCRIP Review of Pharmaceuticals, 1995. On the internet at: http://www.pjbpubs.co.uk/scrip/bullet.html
[23] SCRIP Review of Pharmaceuticals, 1995.
[24] Bond, Patrick and Weissman, Robert, "An Unhealthy Merger Policy," *Multinational Monitor*, June, 1996.
[25] Bond, P. and Weissman, R., *Multinational Monitor*, June, 1996.
[26] Bond, P. and Weissman, R., *Multinational Monitor*, June, 1996.

UPDATE

U.S. Equivocates on Hagahai Patent

The U.S. National Institutes of Health (NIH), owner of the infamous patent on the cell line of a Hagahai indigenous person from Papua New Guinea, is sending mixed signals about what it intends to do with the patent. NIH has been the subject of extreme criticism from governments, indigenous people, and NGOs for patenting the cells (see RAFI Communique March/April, 1996). Confusing and incomplete reports have emerged about the patent's status, including stories indicating it will be abandoned. But despite dozens of requests, NIH has produced no written confirmation that the patent has been abandoned as of 1 October 1996.

The uncertainty began in August when in Port Moresby, just prior to an important national conference on biomedical research, a report surfaced that NIH had given the patent to the Papua New Guinea government. ICRAF, a Port Moresby NGO, immediately forwarded the newspaper account to the U.S. for confirmation. RAFI contacted several NIH offices, including the International Relations and Technology Transfer Offices; but officials were curiously out to lunch, away at meetings, or on the phone for several weeks straight. No messages were returned.

Dr. Amar Bhat of NIH's International Relations Office finally offered comment while attending a meeting on the Human Genome Diversity Project in Washington on September 16. Bhat said that NIH first intended to place the patent in a trust for the Hagahai; but later decided it would abandon it altogether. Bhat said this would be done by the end of September.

> *"We were blindly patenting things that were patentable"*
> - NIH Source quoted in an AP wire story

On September 22, the Associated Press (AP) wire service circulated a story reporting that NIH had "quietly offered to abandon its rights" in the patent, and quoted a "well-placed source at NIH headquarters" as commenting "We were blindly patenting things that were patentable... The PNG cell line certainly fell within that category." The AP article repeated Bhat's story that the idea of a trust was initially entertained; but since NIH thought the patent is unlikely to make money, the costs of transfering the patent rights and creating the trust could not be justified. Neither Bhat or AP elaborated on who the proposed trustees are/were.

At the end of September, the AP story and the original Port Moresby report were widely circulated on the internet, leaving thousands across the world wondering what exactly NIH was up to. Critics of the patent pointed out the ironies of the Hagahai, through their trustees, having to pay thousands of dollars in order to get rights to their own cells back from NIH. Still, NIH maintained a vaccuum on official information and refused to confirm or deny the reports.

RAFI suspects that NIH intends to abandon the patent and that their refusal to comment or provide written confirmation is because they are desperately trying to concoct a coherent rationale for their plans. NIH is in the difficult position of trying to abandon the patent without prejudicing its continued open policy on patenting human tissues or appearing to cave in to pressure from indigenous people and NGOs. NIH may be sending out a trial balloon by citing an obscure and largely irrelevant modification to the laws governing technology transfer at NIH (made this year by the U.S. Congress) as the official pretext for the patent's potential abandonment.

Though the end of the Hagahai patent boondoggle is possibly at hand, indigenous people and NGOs are quick to point out that if NIH abandons the Hagahai patent, the controversy surrounding patenting of human tissues will be far from over. The U.S. Patent and Trademark Office, as well as the patent offices of most other Northen countries, are continuing to allow the patenting of human tissues, and NIH abandonment of a single patent will have no effect on the thousands of other patents and patent applications on human tissues.

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