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FEATURES

Biopiracy, the intellectual property regime and livelihoods in Africa

Oduor Ong'wen

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African countries suffer the most from the rapid trend towards the privatisation of African plants, writes Oduor Ong'wen. Even though the patented plant materials often originate in Africa, once they are patented by multinational corporations it becomes virtually impossible to access them for the public good.

Thousands of patents on African plants have been filed. These include brazzeine, a protein 500 times sweeter than sugar from a plant in Gabon; teff, the grain used in Ethiopia's flat 'injera' bread; and thaumatin, a natural sweetener from a plant in West Africa. The African soap berry, the Kunde Zulu cowpea and genetic material from the west African cocoa plant also make the list.

Increasingly, African countries are going to court over patents on their indigenous plants. The most celebrated case to date involves the Hoodia cactus from the Kalahari Desert. For centuries, the San people of southern Africa ate pieces of the cactus to stave off hunger and thirst. Analysing the cactus, the Council for Scientific and Industrial Research (CSIR) in South Africa found the molecule that curbs appetite and sold the rights to develop an anti-obesity drug to pharmaceutical company Pfizer. It could be worth billions.

The commercial development of naturally occurring biological materials, such as plant substances or genetic cell lines, by a technologically advanced country or transnational corporation without fair compensation to the peoples or nations of the developing world is one of the most serious cases of the externalisation of resources. The appropriation and patenting of nanotechnologies by corporations has more often than not worked against the best interests of humanity, especially in the less developed world.

BIOTECHNOLOGY AND INTELLECTUAL PROPERTY RIGHTS

Intellectual Property Rights (IPRs), as the term suggests, are meant to be rights to ideas and information, which are used in new inventions or processes. These rights enable the holder to exclude imitators from marketing such inventions or processes for a specified period of time. In exchange, the holder is required to disclose the formula or idea behind the product or process. Long before our time, Aristotle gave thought to ways of rewarding inventors. Although the origins of patents and other IPRs are not well known, in England the first patents can be traced back to the 15th century. Since then patent law has gone through several iterations, reflecting a continuous process of co-evolution with technology and society.

Globalization is leading to harmonised IPR regimes around the world, even in the face of stark contrasts in wealth between the highly developed and the least developed nations. The effect of IPRs is therefore to create a monopoly over commercial exploitation of an idea or information for a limited period.

While IPRs such as copyrights, patents, and trademarks are centuries old, the extension of IPRs to living beings and knowledge or technologies related to them is relatively recent. In 1930, the US Plant Patent Act was passed, which gave IPRs to asexually reproduced plant varieties. Several other countries subsequently extended such or other forms of protection to plant varieties, until in 1961 an International Convention for the Protection of New Varieties of Plants was signed. Most signatories were industrialised countries, who had also formed a Union for the Protection of New Varieties of Plants (UPOV). This treaty came into force in 1968.

Plant varieties or breeders' rights (PVRs/PBRs) give the right-holder limited regulatory powers over the marketing of 'their' varieties. Till recently, most countries allowed farmers and other breeders to be exempted from the provisions of such rights, as long as they did not indulge in branded commercial transactions of the varieties. Now, however, after an amendment in 1991, UPOV itself has tightened the monopolistic nature of PVRs/PBRs, and some countries have substantially removed the exemptions to farmers and breeders.

In addition, in many countries, patents with full monopolistic restrictions are now applicable to plant varieties, micro-organisms, and genetically modified animals. In 1972, the US Supreme Court ruled that microbiologist Ananda Chakrabarty's patent claim for a genetically engineered bacterial strain, was permissible. This legitimised the view that anything made by humans and not found in nature was patentable. Genetically altered animals, such as the infamous 'onco-mouse' of Harvard University (bred for cancer research), were also soon given patents.

Finally, several patent claims have been made, and some granted, on human genetic material, including on material that has hardly been altered from its natural state. Until very recently, these trends were restricted to isolated countries, which could not impose them on others. However, with the signing of the Trade Related Aspects of Intellectual Property Rights (TRIPs) agreement, this has changed. TRIPs requires that all signatory countries accept:

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* Patenting of micro-organisms and ‘microbiological processes’.
* Some ‘effective’ form of IPRs on plant varieties, either patents or some new version.

The agreement allows countries to exclude animals and plants per se from patentability. However, the provisions above have serious enough implications, for no longer are countries allowed to exclude patenting of life forms altogether (micro-organisms are be open for patenting).

BIOTECHNOLOGY, PATENTS AND BIODIVERSITY

Biodiversity underpins the economic, social, and cultural lives of billions of people globally, particularly indigenous communities. Needless to say, the preservation of biodiversity in the face of a variety of well-documented encroachments is more than an aesthetic or strictly environmental concern. Biodiversity also has a commercial attraction. Agriculture, pharmaceuticals, forestry, fisheries, and tourism, among others, are all major economic areas that are heavily dependent upon biodiversity, attracting the keen attention of industry researchers and investors. There is no gainsaying the fact that the management of biological resources has a profound effect, for better or worse, on biodiversity and the related ecological services that sustain life. Habitat destruction as a result of competing human needs has resulted in the loss of numerous species of flora and fauna, some known and others unknown. However, the recent unprecedented commercial interest can also play a role in preserving biodiversity. It can also irreparably destroy it.

The pertinent issues are embodied in both the Convention on Biodiversity (CBD), which seeks to conserve biodiversity and protect community rights, and the World Trade Organisation’s (WTO) TRIPS agreement, which emphasises private property rights over community rights. There are substantive conflicts between the goals of TRIPS and those of the CBD, reflecting the lack of international consensus on these difficult questions of rights and equity.

In 2002 Hoodia Gordonii rewrote a global history of the exploitation of indigenous peoples. For thousands of years, the San people of Namibia have eaten the Hoodia cactus - called ‘Xhoba’ in local dialect - to stave off hunger and thirst on long hunting trips. Besides alleviating hunger and thirst, Xhoba also provides a state of alertness but without the jittery feeling produced by the current Western diet remedy of caffeine. Thus it is an ideal choice for long hunts where prey is tracked over hundreds of miles.

In mid 1990s, South African scientists at the Council for Scientific and Industrial Research (CSIR) began studying the properties of Xhoba. Lab animals fed the flesh of the cactus lost weight, but otherwise suffered no ill effects. It was during these tests that CSIR researchers discovered the plant contained a previously unknown molecule, which has since been christened P57. CSIR, which patented the compound in 1997, sold the license to Phytopharm plc, which in 1998 subleased it and the marketing rights to US pharmaceutical giant Pfizer Corporation for US$32 million plus royalties from future sales. CSIR has been accused of selling something they did not own, although it claims to have the best interests of the San at heart. The San sued CSIR and will now get up to eight per cent of profits from a diet drug derived from the Hoodia, a plant they know well.

In the mid 1980s, Australian researchers led by Dr. John Frisch identified the need for the introduction of tropically adapted breeds that were unrelated to Brahman, and that would complement that breed's attributes. They turned to Africa. After careful evaluation, the most suitable candidates were found to be the Boran from Kenya and the Tuli from Zimbabwe. The most important factors in their favour were productivity, high fertility and adaptability to hotter regions. Both breeds have long histories as beef producers in a harsh environment and this fact, along with their extreme genetic differences from previously introduced breeds, lent weight to the project.

The Tuli has many prized attributes, including high fertility, superior beef quality and docile temperament. It also has proven resistance to environmental stresses. It is native to Zimbabwe and Zambia. In 1987, a joint venture between the Commonwealth Scientific and Industrial Research Organisation (CSIRO) - an Australian government agency - and the Boran and Tuli Producers Consortium, a consortium of Australian producers, surreptitiously collected Tuli and Boran embryos from Zimbabwe and Zambia respectively. The embryos were quietly taken to Cocos Island in August 1988 where they were implanted into surrogate cows. In March 1990, live calves - parading as ‘Aussies’ - landed in Australia. Since then the Tuli has largely been used as a crossbreed in Australia’s beef industry, estimated to be valued at US$6.47 billion.[1]

Increased earnings for the Australian livestock industry attributable to the introduction of the Tuli could be estimated at A$2 billion annually.[2] The Australian consortium is also selling the embryos on the Australian and world markets. In May of 1994, the second Boran and Tuli pure-bred embryo sale was held in Australia. The Tuli embryos were so much in demand that a new world-record price of $5,500 was set.

But Australia is not just selling the crossbreds. RAFI, a Canadian NGO, reveals that in 1994 during a sale of pure-bred two to three year old Tuli bulls offered for sale in Australia, the Consortium also revealed that: ‘Semen and embryo sales have exceeded expectations with heavy demand from the Americas.’ This is a pointer to the fact that the Australians are selling pure-bred embryos from Zimbabwe to countries in the Americas and appropriating all the proceeds.

In 2003, the Kenyan Government was locked in a less publicised altercation with one Jonathan Leakey over exports of products of a tree known as ‘mweri’ in the Gikuyu language. Mweri, otherwise known as the African Plum or Pygeum (‘Prunus Africana’ in the scientific world), is a multipurpose tree. The dark brown bark of the tree is used for treating many diseases, among them genito-urinary complications, allergies, inflammations, kidney disease, malaria, stomach ache and fever. It has also been used in the treatment of benign prostatic hyperplasia (BPH) and ‘old man’s disease’.

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Despite its well known indigenous origins, Mweri bark extract is patented by a French entrepreneur Dr. Jacques Debat. About 300 tons of the bark extract is exported every year. In Kenya, the price of mweri bark is US$2 per kilogramme, while capsules containing the bark extract are marketed in Europe for about US$8 for a 15-capsule packet. A kilo of bark, on conservative estimates, produces 100 such packets. Thus, the French pay Kenyans US$2 to earn US$800. Moreover, were Kenya to develop capacity to manufacture drugs from this bark, it would be required to pay hefty royalties to Jacques Debat, the patent holder.

Both the Nairobi-based World Agroforestry Centre (ICRAF) and Washington-based Future Harvest estimate that the world market for Prunus products currently stands at US$220 million annually. At least four European companies have interests in the tree. The product is 'bought' for a song in Africa and sold exorbitantly as the final product.

NANOTECH AND AGRI-BIODIVERSITY

Since the dawn of agriculture more than 10 millennia ago, humans have nurtured plants and animals to provide their main sources of food. Through diligent selection of the traits, tastes and textures to make good food, their endeavours have resulted in countless diversity of genetic resources, varieties, breeds and sub-species of the relatively few plants and animals humans use for food and agriculture - agricultural biodiversity.[3] Agricultural biodiversity also includes the diversity of species that support production such as soil biota, pollinators and predators.

These diverse varieties, breeds and systems underpin food security and provide insurance against future threats, adversity and ecological changes. Agricultural biodiversity is therefore the first link in the food chain, developed and safeguarded by indigenous peoples, and women and men farmers, forest dwellers, livestock keepers and fisherfolk throughout the world. It has developed as a result of the free-flow of genetic resources between food producers.

This agricultural biodiversity is now under threat - thanks to human advancement in science and technology. Animal breeds, plant varieties and the genetic resources they contain are being eroded at an alarming rate. It is estimated that more than 90 per cent of crop varieties have been lost from farmers' fields in the past century and livestock breeds are disappearing at the rate of five per cent per year. Soil biodiversity, including microbial diversity, and the diversity of pollinators and predators are also in grave danger.

Urgent actions are needed to reverse these trends. There is also an urgently felt need to initiate and promote actions to protect the genetic resources stored in ex situ public gene banks, which are often poorly maintained. Threats to these resources, both in situ and ex situ, also include pollution by genetically modified material and the increasing use of IPRs to claim sole ownership over varieties, breeds and genes, which thereby restricts access for farmers and other food producers. This loss of diversity is accelerating the slide of food insecurity that today sends close to two billion people to bed hungry.

Africa's most important and capable innovators are her small-scale farmers. In the Sahel, for example, farmers produce two to 10 times more animal protein per square kilometre than commercial farmers in Australia and the USA.[4]The innovation of African farmers is particularly important when it comes to plant breeding. It is estimated that African farmers depend on seeds cultivated within their own communities for as much as 90 per cent of their seed needs. Most of these seed breeders are women, as they produce 70 per cent of the food for use in the region. They meticulously select those seeds that respond to various soil types and growing conditions and that carry particular traits such as stability, disease resistance, drought tolerance, palatability, and storage quality.

Formal sector breeders, from the private and public sectors, remain relatively insignificant. In the Machakos area of Kenya, for example, commercial seed accounts for less than two per cent of the cowpea and pigeonpea seed used by the average farmer while neighbours and local markets supply more than 17 per cent.[5] In the southern African region, on-farm seed multiplication and farmer-saved seed constitutes 95 - 100 per cent of the seed used for sorghum, millet, food legumes, roots and tuber crops. In Zambia, 95 per cent of the millet crop is grown from farmers' seed. Even with a commercial crop like maize, small farmers are typically the main suppliers of seed. In Malawi, despite years of effort by the state seed company and private seed companies, hybrid maize covers no more than 30 per cent of the smallholder area. Small farmers constitute by far the largest sector of seed breeders in Africa and they have cultivated the abundant diversity that sustains the continent's food security.[6]

INNOVATION BY CORPORATE BREEDERS

Private sector breeding is mainly driven by biotechnology. Plant biotechnology took root in the 1980s with the first commercial releases of transgenic crops. Along with commercialisation came an increase in IPR protection. However, issues have been raised with regard to this development. Some are related to cultural values such as ancestral farmers' rights, traditional knowledge or food sovereignty, while others address such ethical issues as the patentability of life forms. What makes many people feel uncomfortable about IPR in agricultural biotech is that agriculture was perceived until now as 'the last stronghold of the free'. Farmers have had the freedom to replant their own seed and to sell it to other farmers since the dawn of agriculture.

With the exception of a few African-based seed companies, the private seed sector in Africa is dominated by a handful of transnational corporations (TNCs), as it is in the rest of the world. Just six TNCs control over 30 per cent of the global seed market. The same six corporations control over 70 per cent of the global pesticide market and over 98 per cent of the global market for patented genetically modified crops. The driving vision behind this integration of seeds, pesticides, and biotechnology industries is to develop transgenic seeds that are programmed to grow according to specification. Companies have used genetic engineering to develop crops that do not reproduce in subsequent generations, crops with resistance to their proprietary herbicides, and crops that will not grow properly unless sprayed with a patented chemical concoction. Although the research and development costs are high, the companies believe that they can recover these expenditures through monopoly rights and royalties.

Until recently, the transnational seed industry had little interest in Africa. Outside South Africa and Zimbabwe, the sub-Saharan seed market is worth only US$200 million - a paltry amount for these big companies. But with the advent of genetic engineering, these companies are beginning to take a more active interest in the African seed market. Industry analysts estimate that the introduction of genetically modified crops can increase the value of seed markets by 50 per cent, making even the relatively small African market quite valuable.

The multinational seed industry's expansion into Africa has come with intense pressure for developing IPRs. While the industry portrays itself as a benevolent source of technologies essential to African food security, such technologies come at a great cost. As part of their plans to expand markets in Africa, the seed TNCs have made it clear that they expect monopoly rights over their seeds. Peter Pickering, the manager of Pioneer South Africa, sums up the view of the multinational seed industry in Africa: 'We will not operate in any country that does not have IPRs.'[7]

ENTER BIOMEDICINE

In the medical sphere, nanotechnology has had a tremendous contribution to the manufacture of drugs that have been used to treat diseases and conditions whose cure has eluded medical practitioners. However, as with other bio-industrial innovations this benefit to humanity has not been equitably shared. Below are some highlights.

While many diabetic patients globally can thank a microbe from Kenya's Lake Ruiru for a drug that improves their lives, the Kenyan state or people have nothing to show for it. Type II diabetics frequently take acarbose, a drug commercialised by trade names Precose (in the US and Canada) and Glucobay (in Europe and elsewhere). In 2001, a group of scientists from the German pharmaceutical giant, Bayer, and German academics published an article in the Journal of Bacteriology, that a bacteria strain named SE 50 was being used to manufacture the diabetic drug, acarbose.[8] Acarbose is an 'alpha glucosidase inhibitor', meaning that it works by regulating absorption of glucose into the bloodstream, thereby preventing potentially dangerous spikes of glucose. In the article, they described manufacture of acarbose and related compounds.

Acarbose is widely sold by Bayer. In 2004, Bayer sales of acarbose totaled US$379 million.[9] How is it made? In 1995, five years after Glucobay was commercialised in Europe and one year before it was released in North America, Bayer filed for patent on a new way to manufacture the product. The patent application, which was subsequently issued in Europe, the US, and Australia, revealed that an Actinoplanes sp. bacteria strain called SE 50 had unique genes that enable the biosynthesis of acarbose in fermentors.[10] The strain comes from Kenya's Lake Ruiru.

Kenya is greatly challenged in meeting her obligations to provide healthcare to her 39-million people. In the 2010/2011 financial year, Kenya's medical services ministry was allocated only US$7.33 per person. However, there is no evidence of a benefit-sharing agreement between Bayer and the Kenyan people related to this extremely valuable microbe.

In the early 1970s, a Streptomyces sample, which a Canadian Medical Research Expedition collected at Easter Island (Rapa Nui) yielded an immunosuppressive drug called rapamycin, which is used in medicine to prevent the rejection of organ transplants. The discovery of rapamycin sparked a search for other Streptomyces that produce similar compounds.

SmithKline Beecham (now Glaxo SmithKline) has claimed ownership of a compound from a Streptomyces strain that, according to its patent, 'was isolated from a termite hill at Abuke, Gambia'. [11] The strain produces a rapamycin-related compound called 29-desmethylrapamycin and, according to the patent, it is useful both as an anti-fungal and as an immunosuppressant. It is unclear what research and development has been conducted by Glaxo on 29-desmethylrapamycin. The 2001 patent application indicates recent interest in the candidate drug. Generally, rapamycin and related compounds remain a subject of considerable scientific interest. However, there is no documented information about any benefit sharing arrangements between SmithKline Beecham and Gambia or between Glaxo and Gambia.

Impotency drugs have become a major hit for pharmaceuticals lately. In 2004, global sales of Viagra and other prescription treatments for erectile dysfunction (ED) topped US$2.5 billion. But according to the New York Times, sales have dipped in recent years. One of the main reasons why, according to the Times, is consumer doubt about drug companies. It says that 'many patients [are] angry about drug prices and worried that companies are playing down side-effects…'.[12]

Enter Canada's Option Biotech. The company, based in Montreal, has patented the seeds of Aframomum stipulatum, obtained from the Congo, for use in an anti-impotency drug it calls 'Biovigora'. [13] Option Biotech has extensively tried to exploit the side effect suspicions about Viagra reported by the New York Times, claiming that, 'Biovigora is not a chemical medication' and further noting that it 'was used centuries ago [and still is used] by certain African tribes without unfavourable side effects'. [sic] [14]

While Biovigora may never rival Viagra, Cialis and other ED drugs as a multi-billion dollar moneymaker, it is a patented Option Biotech property sold at more than 750 stores across Canada. A bottle of 24 capsules costs about US$30. Available information from Option Biotech does not show any benefit sharing agreement with the Congo or any other country where A. stipulatum is traditionally used.

CONCLUSION

Genetic technologies move knowledge from the public to the private domain. Therefore, increasing amounts of know-how, which would have been available freely for further innovation and product development, is either unavailable, if exclusive licenses were granted, or must be purchased. While research and development in all countries is affected by these changes, African countries suffer most, for four reasons. First, located in the periphery of research and development networks, their chance to obtain exclusive licenses first is very low. Second, TNCs have long entered the so-called 'knowledge economy' by creating huge patent portfolios for the sale and exchange of licenses and by creating knowledge monopolies and cross-licensing networks in which emerging industries in Africa can hardly participate. Third, while identifying and purchasing the necessary licenses is difficult and costly for any industry, African countries are particularly handicapped because they frequently have not the same informational and financial resources. Lastly, the increasing costs of patent filings and litigations required for new product developments pose a growing barrier to any research and development efforts in poor countries.

The appropriation of elements of this collective knowledge of societies into proprietary knowledge for the commercial profit of a few is one of the concerns of African communities. An urgent action is needed to protect these fragile knowledge systems through national policies and international understanding linked to IPR. The developed world wants to hear none of this.

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* Please send comments to editor@pambazuka.org or comment online at Pambazuka News.

NOTES:

[1] ABARE, Australian Commodity Statistics, 2008
[2] Ibid.
[3] Agricultural Biodiversity comprises the diversity of genetic resources, varieties, breeds, sub-species and species of crops, livestock, forestry, fisheries and micro-organisms used for food, fodder, fibre, fuel and pharmaceuticals. Agricultural biodiversity results from the interaction between the environment, genetic resources and the land and water resources management systems and practices used by culturally diverse peoples, for food production.
[4] http://www.grain.org/briefings/?id=3#ref
[5] Ibid.
[6] Ibid.
[7] Ibid.
[8] J Bacteriol. 2001 August; 183(15): 4484–4492.
[9] Bayer 2004 Annual Report, URL:
http://www.bayer.com/annualreport_2004_id0109/
[10] US Patent 5,753,501, EP0730029 (B1), and AU706116 (B2).
[11] US Patent 6,358.969, issued 19 March 2002. Also patented in Europe (EP0572454) and Japan (JP2001226380).
[12] New York Times, December 5, 2005.
[13] US Patent 5,879,682, issued 9 March 1999.
[14] See "Is Biovigora safe?", at the Option Biotech website, URL,
http://www.optionbiotech.com/en/securitaire.htm

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