

WIPO MAGAZINE

JUNE 2017

No. 3



Leveraging Malawi's
creative talent

p. 8



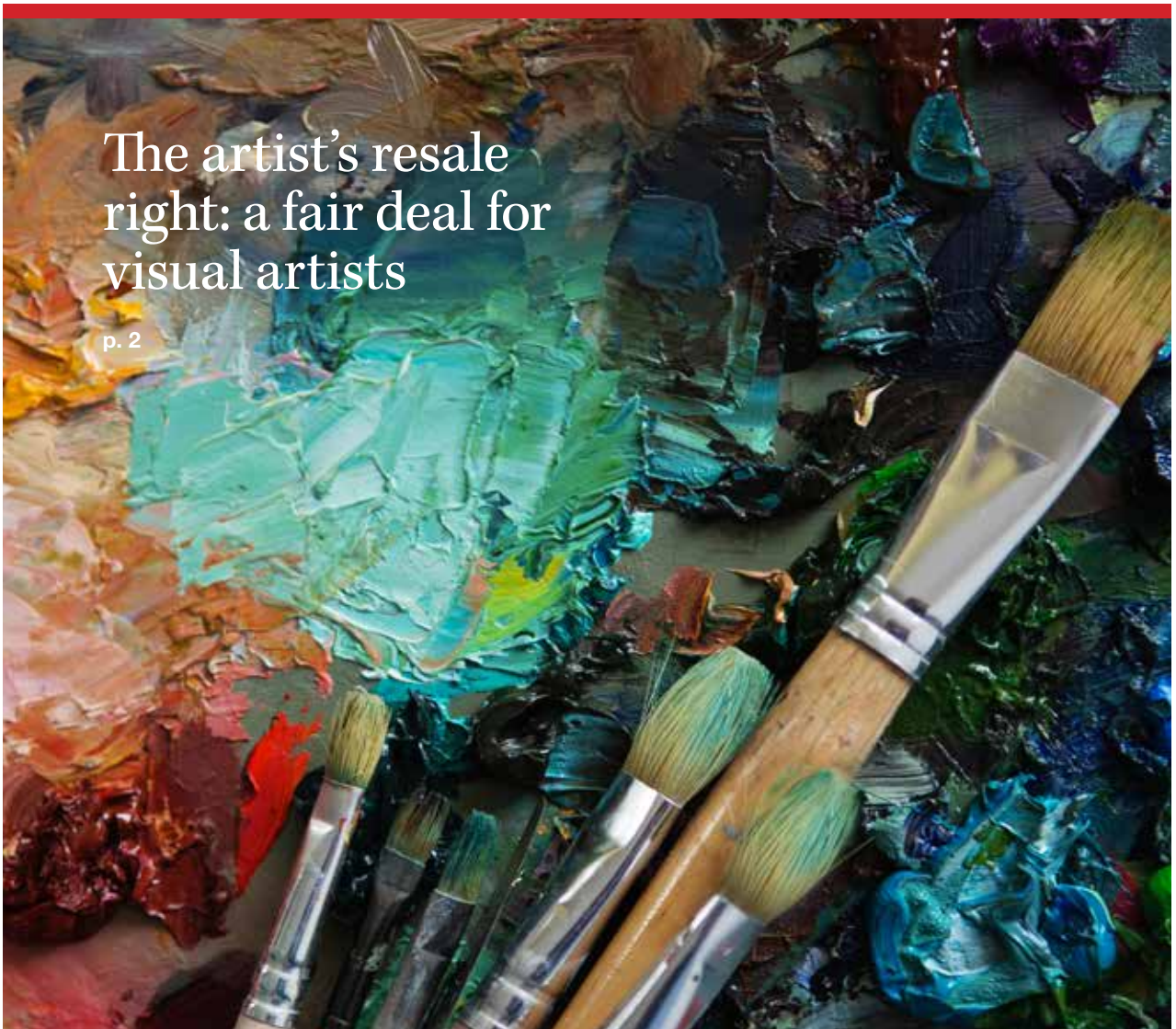
Global Innovation Index 2017:
innovation feeding the world

p. 18



Innovation and the informal
economy in developing countries

p. 30



The artist's resale
right: a fair deal for
visual artists

p. 2

Table of Contents

| | |
|----|--|
| 2 | The artist's resale right: a fair deal for visual artists |
| 8 | Leveraging Malawi's creative talent |
| 13 | Innovation: history's great free lunch |
| 18 | <i>Global Innovation Index 2017</i> : innovation feeding the world |
| 26 | Kenyan turn to drought-tolerant maize variety to fight poverty |
| 30 | The informal economy in developing nations: a hidden engine of growth |
| 37 | Supporting innovation in next-generation medicines |
| 44 | Yoga and copyright |

Editor: **Catherine Jewell**

© WIPO, 2017



Attribution 3.0 IGO
license (CC BY 3.0 IGO)

The user is allowed to reproduce, distribute, adapt, translate and publicly perform this publication, including for commercial purposes, without explicit permission, provided that the content is accompanied by an acknowledgement that WIPO is the source and that it is clearly indicated if changes were made to the original content.

Adaptation/translation/derivatives should not carry any official emblem or logo, unless they have been approved and validated by WIPO. Please contact us via the WIPO website to obtain permission.

When content published by WIPO, such as images, graphics, trademarks or logos, is attributed to a third party, the user of such content is solely responsible for clearing the rights with the right holder(s).

To view a copy of this license, please visit <https://creativecommons.org/licenses/by/3.0/igo>

Cover images:

Left to right: steve mcinerny/
Alamy Stock Photo; iStock.com/@
stevanovicigor; S. Daniels

Main image:

iStock.com/@ nata_zhekova

Acknowledgements:

| | |
|----|--|
| 2 | Carole Croella and Miyuki Monroig , Copyright Law Division, WIPO |
| 8 | Kevin Fitzgerald , Copyright Infrastructure Division, WIPO |
| 37 | Marco Aleman , Patent Law Division, WIPO |
| 44 | Paolo Lanteri , Copyright Law Division |



The artist's resale right: a fair deal for visual artists

By **Catherine Jewell**,
Communications Division, WIPO

“Artists do not live on thin air.” This simple statement by the late internationally acclaimed Senegalese sculptor Ousmane Sow is a stark reminder of the importance of the resale right for visual artists around the world.

Since 2014, the International Confederation of Societies of Authors and Composers (CISAC) and others have been actively campaigning to push the issue of the artist’s resale right up the international copyright agenda, calling for reform of the law so that visual artists benefit each time their work is resold.

ABOUT THE ARTIST’S RESELL RIGHT

Unlike novelists and musicians, visual artists such as painters and sculptors do not directly benefit from downstream payments when their works change hands in global markets and do not generate significant income from the reproduction and communication rights provided to other creators under copyright law. The artist’s resale right seeks to correct this imbalance by ensuring that artists receive a small percentage of the sale price of a work when it is resold. Just as the art market has become global, proponents argue, so the artist’s resale right should be global.

Although the right is recognized in the Berne Convention for the Protection of Literary and Artistic Works (Article 14*ter*), which sets minimum international copyright standards, it is optional. And while around 80 countries recognize the right, many others, including major art markets like the United States and China, do not.

Visual artists want a new treaty that makes the right mandatory, and their efforts are starting to pay off. With a mandate from WIPO’s Standing Committee on Copyright and Related Rights, WIPO hosted an international conference on the artist’s resale right in April 2017. Key actors from across the art market – artists, dealers, galleries, auction houses, academics and collective management organizations (CMOs) – exchanged views and experiences, shedding light on the various challenges associated with developing and applying resale royalty schemes that both benefit artists and support a robust and transparent global art market.

WHY NOW?

Opening the event, WIPO Director General Francis Gurry said: “The digital environment and the globalization of markets present both vulnerabilities and opportunities, and it is appropriate that we consider how we might address the gaps that exist in connection with the artist’s resale right.”

The artist’s resale right does not always work as well as it should for artists, Mr. Gurry said, pointing to the need to support the development of CMOs in the smooth and efficient running of resale royalty schemes.

The Minister of Culture and Communication from Senegal, Mr. Mbagnick Ndiaye, noted that while the value of the African art market has increased more than a thousand-fold since 2007, the artists responsible for these works rarely enjoy any of the benefits of their commercial success.

“Artists should
be treated
equally
wherever their
work is sold.
This is a plea
for artists’
futures.”

Mark Stephens, Chairman of the UK’s Design and Copyright Society (DACs)

The artist's resale right is a question of equity, he said. It ensures that artists are fairly compensated regardless of where their work is sold and establishes a balance between artists and those who trade in their works. He said the right also allows artists to maintain a permanent link with their work, which is of the utmost importance in an era of globalization marked by the increasing circulation of art works.

THE LEGAL LANDSCAPE

France was the first country to enact a law providing for the artist's resale right. In 1920, concerned about the welfare of artists and their families, lawmakers introduced the artist's resale right (or *droit de suite*) to ensure artists and their heirs received a share of the increasing commercial value of their artworks. The right's origins date back to the experiences of the family of French painter Jean-François Millet, who initially sold his painting *The Angelus* for around USD 100. Fifteen years after his death, *The Angelus* sold for around USD 150,000. The seller made a handsome profit but the artist's family was destitute, prompting lawmakers to act.

The right was incorporated into the Berne Convention in 1948, but on an optional basis (see box), and in 2001 was enshrined in European Union law with the Resale Rights Directive (2001/84/EC). EU-wide harmonization was achieved in January 2006.

Today, artists are calling for the mandatory and universal application of the right.

THE CASE FOR THE ARTIST'S RESELL RIGHT

Artists favor the artist's resale right for various reasons. The first is economic. The income of visual artists is lower than that of other creators. As a 2013 report by the United States Copyright Office notes, visual artists "are at a material disadvantage *vis-à-vis* other authors" and do not in general "share in the long-term financial success of their works", with any financial gains from resale going primarily to art professionals.

Hervé di Rosa, President of the International Council of Visual Artists (CIAGP), explains that the royalties flowing from the sale of works, many of which sell for under USD 10,000, provide artists and their heirs with a modest but vital source of income.

Resale royalties account for a fraction of the sales price of a work and are only payable under certain conditions. Under the EU Directive, for example, payment applies only to works sold by an art professional for more than EUR 3,000, although member states may opt to apply resale rights to sales of less than EUR 3,000 at a resale royalty of not less than 4 percent of the selling price. The EU Directive also introduces a tapering scale of rates across five bands of selling price. Each band establishes the percentage of

What the Berne Convention says about the Artist's Resale Right

Article 14^{ter} of the Berne Convention for the Protection of Literary and Artistic Works states:

"The author, or after his death the persons or institutions authorized by national legislation, shall, with respect to original works of art and original manuscripts of writers and composers, enjoy the inalienable right to an interest in any sale of the work subsequent to the first transfer by the author of the work."

It further states the artist's resale right "may be claimed in a country of the [Berne] Union only if legislation in the country to which the author belongs so permits, and to the extent permitted by the country where this protection is claimed."

Finally, it states that "the procedure for collection and the amounts shall be matters for determination by national legislation."

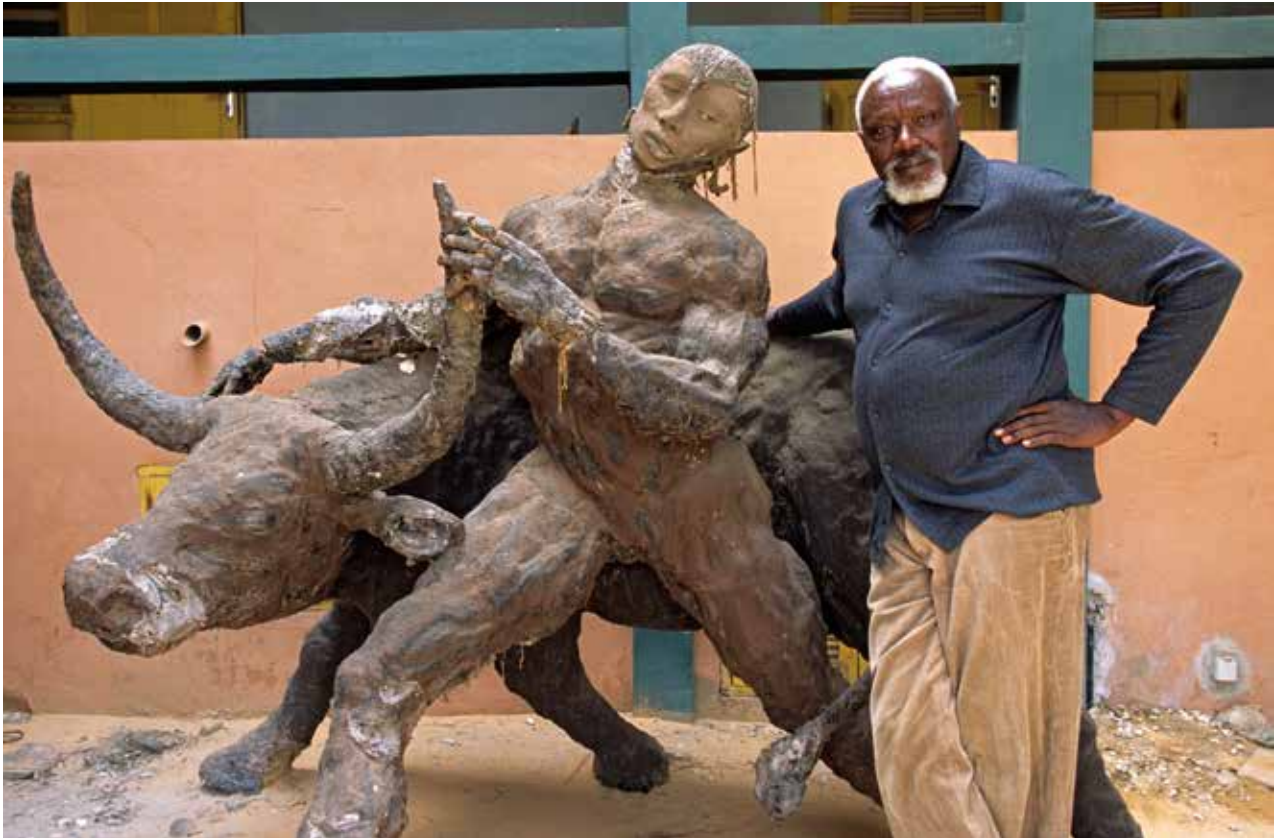


Photo: Hemis/Alamy Stock Photo

The late internationally acclaimed Senegalese sculptor Ousmane Sow with one of his works.

the resale price an artist will receive for the sale of their work, ranging from 4 percent for sales up to EUR 50,000 to 0.25 percent for sales of more than EUR 500,000. The royalty an artist can receive from a single sale is capped at EUR 12,500. The resale royalty is payable to living artists and for up to 70 years after their death.

The optional nature of the right and its fragmented international application means artists only benefit from it when their works are sold in countries where the right exists or where reciprocal artist's resale right arrangements are in place. This means that if works are sold in major art markets that do not recognize the right, artists and their heirs receive nothing at all. It also means that artists from those countries cannot benefit from the right in countries where it does exist.

Artists believe that in a globalized world, the right will highlight their contribution to a work's value, and will enable them to establish a permanent link with it. They argue that universal

application of the right would improve the traceability of artworks and the transparency of the global art market.

This is borne out in countries with established resale royalty schemes such as Australia, France, Sweden and the United Kingdom. "All parts of the market are seeing real value in the transparency and provenance that the scheme engenders," notes Judy Grady, manager of Visual Arts at the Copyright Agency of Australia, where the scheme has been running for six years. The scheme is significantly benefiting aboriginal artists and promoting a better understanding among artists of the market value of their work, which in turn is leading them to make better decisions about who to sell to and at what price, she explains.

Artists' heirs and estates also have an interest in the artist's resale right. Meret Meyer, granddaughter of Marc Chagall, highlights the "crucial importance" of the right in funding the work of the Marc Chagall Committee.



Photo: lyclose Images/Alamy Stock Photo

The Angelus by Jean-François Millet is closely linked to the origins of the resale right. After the artist's death the value of the work rose significantly and the seller of the work made a handsome profit. But the artist's heirs were destitute, prompting lawmakers to act. The artist's resale right is now recognized in around 80 countries. Visual artists are calling for its universal application.

Cataloguing an artist's work, authenticating it and tackling counterfeits are time-consuming and costly undertakings made possible by resale royalties. This work, she notes, contributes to the stability of the global art market and to our common artistic heritage. The "artworks we defend daily and of which we are only trustees... fundamentally nourish, over and over again, the vital tissue of our universal heritage."

OPPOSING ARGUMENTS

Arguments against the artist's resale right suggest it will have a detrimental effect on global art markets, lowering prices, reducing sales volumes and generally making markets less competitive. They also claim it places a heavy burden on art professionals. But is there any hard evidence to support this?

Various empirical studies, including an ongoing study by Professors Kathryn Graddy of Brandeis International Business School, USA, and Joëlle Farchy of the University Paris I in France, to be published later this year, show no demonstrable detrimental impact in terms of the price of artworks or the competitiveness of art markets. Indeed, quite the contrary. Mark Stephens, Chairman of the UK's Design and Artists Copyright Society (DACS), notes that since the artist's resale right took effect in the UK, the number of commercial galleries has grown five-fold and art prices have soared.

“It is hard to find where the economic arguments exist,” he says. “In the UK, artists and estates have received over GBP 50 million in resale royalties since it came into law in 2006. That money supports artists’ practices, estates and legacies, which in turn benefits the art market and the creative economy and our cultural heritage.”

And the impact on art professionals? French art dealer Jany Jansen says that despite initial fears of the artist’s resale right being “another tax”, its application is proving quite straightforward and even beneficial in that it enables dealers to establish the “pedigree” of works.

Data compiled by ADAGP, the French CMO for graphic and visual artists, show that the cost of managing the artist’s resale right is “relatively light”, representing around 0.027 percent of the turnover of galleries and auction houses. “The economic argument against the artist’s resale right is just a fallacy,” says Marie-Anne Ferry-Fall, ADAGP’s CEO.

CHALLENGES AND OPPORTUNITIES

How to establish effective systems for collecting resale royalties and remunerating artists is a challenge confronting policymakers in many countries. The experiences of countries with established schemes highlight the central role of CMOs. These organizations enable the smooth, transparent and efficient application of resale royalty schemes and “lift a heavy burden from the art market,” notes Mats Lindberg, CEO of Bildupphovsrätt, the Swedish CMO.

There is, however, a clear need to support countries in building the infrastructure they need to operate effective resale royalty schemes. “I think it is now time for us in the established collecting society community to support those in emerging communities and from the Global South to develop their own,” says Mark Stephens. “African, Chinese and South American art and artists being equally appreciated, we now have the opportunity to set up societies with knowledge sharing and a treaty where... practical support can be given to all those that might benefit.”

But what types of practical support will this entail?

DATA

Accurate data and honest reporting are the bedrock of an effective resale rights scheme. Estimates of the value of the global art market for 2016 range from USD 46 billion (Art Basel) to USD 56 billion (TEFAF), highlighting the difficulties associated with gathering reliable sales data.

Greater transparency in the art market would clearly help CMOs recoup the royalties due to artists and their heirs. Cost-effective online reporting procedures and systems that enable art professionals to easily upload their reports directly and artists to track the resale of their works will go a long way in helping to capture these data and support monitoring of market trends.

COMPLIANCE

Accurate reporting of sales and effective enforcement of the artist’s resale right are major issues that require attention. “So many of the people making secondary and tertiary sales do not make returns or honest returns to the collecting society, and there is no way that we are allowed to go in to audit their books and we need to do so,” says Mark Stephens.

Mats Lindberg agrees. “We need a strong position to be able to collect remuneration. It is not only about the artist’s’ right to remuneration, it is also about respect for the right and the system.”

But compliance also hinges on building awareness about the resale right among artists and art market professionals, especially in countries with nascent CMOs or where the right does not yet exist.

OTHER ISSUES

At present, the artist’s resale right, where it exists, is payable to living artists and usually for up to 70 years after their death. It is an “inalienable” right, meaning that it belongs to artists and their heirs and cannot be sold or waived. But are there circumstances under which it makes sense for an artist to be able to transfer the right to a third party, such as an art foundation? Who is responsible for paying the resale royalty – the buyer or the seller? What is an appropriate royalty rate? And what should be the basis for its calculation – the sales price or the auction price? These and many other legal issues will undoubtedly occupy the minds of international policymakers in years to come. As will the question of how, in practical terms, to support the development of the institutions, systems and procedures that ensure the easy, efficient and cost-effective application and management of resale royalty schemes in emerging economies.

Momentum is building, but there still some way to go. As Mark Stephens puts it, “we still have a great distance to go and we need to use the momentum here and from everyone involved in the worldwide market to actually make it over the finish line.”

Leveraging Malawi's creative talent

By **Catherine Jewell**,
Communications Division, WIPO

Malawi's Lake of Stars Music Festival, inspired by events like WOMAD and Glastonbury, gives a hint of the dynamism of Malawi's cultural scene and its economic potential. In 2015, the festival attracted 79 Malawian acts and generated nearly USD 1.5 million.

International award-winning figures such as hip-hop star Tay Grin, Afrobeat artist Dan Lu, film director Joyce Mhango Chavula and Shadreck Chikoti, one of Malawi's best known contemporary writers, highlight the breadth and depth of the country's creative talent.

Recognizing its huge potential, the Government of Malawi is galvanizing efforts to support the growth of the country's creative sector. And with good reason.

A 2013 WIPO study estimated that Malawi's creative sector contributes around 3.4 percent to the country's GDP, highlighting its importance and significant growth potential. On the strength of these findings national decision-makers are actively supporting efforts to build the nation's creative ecosystem. Fostering the conditions for Malawi's creators (visual artists, musicians, authors, filmmakers and more) to thrive, they believe, will support their drive to improve the country's economic outlook.

"The creative sector is an important asset for countries like Malawi that face low commodity prices in global markets and a host of technical barriers to trade in export markets," explains Ambassador Robert Salama, Permanent Representative of Malawi to the United Nations in Geneva. "Development of this sector is important for employment creation and for generating much-needed foreign exchange. It has the potential to generate thousands of jobs for young people and millions of dollars in revenue," he says, pointing to the experiences of Kenya, Nigeria and South Africa.

Kenya's creative sector, for example, accounts for 5.3 percent of GDP, twice the figure for agriculture. Similarly in Nigeria, Nollywood, the world's fastest-growing film industry, is responsible for creating more than a million jobs and has annual sales of some USD 5 billion.

"In Malawi, we have a wonderful creative sector which is playing a significant role in the creation of employment and generation of foreign exchange," Mr. Salama says.

"We believe strongly in the opportunity which the creative industries can deliver to our people, not only for economic growth and employment, but also for the promotion of our language and the preservation of our cultural heritage."



Photo: Simon Fawles/Alamy Stock Photo

Malawi's creative sector contributes around 3.4 percent to the country's GDP and plays a significant role in terms of creating employment and generating foreign exchange.



Photo: Ariadne Van Zandbergen / Alamy Stock Photo



Photo: steve mcinerny/Alamy Stock Photo

(Above) Musicians performing at Malawi's Lake of Stars Festival. In 2015, the festival attracted 79 Malawian acts and generated nearly USD 15 million, highlighting the dynamism of Malawi's cultural scene.

(Left) The Government of Malawi is helping to nurture the country's raw creative talent by funding the establishment of a School for the Arts

A COPYRIGHT LAW FIT FOR THE DIGITAL AGE

In 2016, Malawi's Government ramped up its drive to translate the promise of Malawi's creative wealth into concrete economic outcomes. In July 2016, Parliament passed a new copyright law which sets the scene for Malawi's creative sector to take full advantage of the opportunities of the digital age, bringing the country's copyright law into line with current international intellectual property (IP) standards.

"Malawi's new law makes it possible for us to better promote the economic rights of creators and to crack down on piracy," says Dora Makwinja-Salamba, Executive Director of the Copyright Society of Malawi (COSOMA). The law introduces new provisions on online licensing to ensure that artists are paid for the expanding use of their creative works, including, for example, in ringtones, and online platforms.

It also ensures easier access to copyright-protected works by people who are blind or visually impaired. "Malawi has a community of more than 10,000 people who are blind or visually impaired, so this new feature of our law means that these people, especially young people, will have a better chance to get an education, secure employment and live full and independent lives," notes Ms. Makwinja-Salamba. "In the longer term it will also make it easier for them to access works in the formats they require from other countries."

Further, in a move to ensure that researchers, teachers and students have access to the materials they need for educational and research purposes, the new law introduces a number of exceptions, specifically for schools and libraries. “These flexibilities mean that school children in Malawi will get the learning materials they need,” explains Ms. Makwinja-Salamba.

In response to calls from Malawi’s community of authors, the law also introduces a public lending right which will ensure authors receive a modest payment each time their works are loaned by libraries.

“It is self-evident that books borrowed from a library will diminish the sales of an author’s book, but paying the author for their expertise and time in writing the book is both morally and economically essential. We want to encourage our authors to write their next book,” Ambassador Salama explains.

Recognizing the need to safeguard the budgets of libraries and their ability to continue their valuable work in promoting literacy, lawmakers foresee that the payments associated with the public lending right will be covered by government funding.

“We have consulted extensively with authors and libraries when drafting the law and have made every effort to ensure that it supports authors’ interests without undermining those of our public libraries,” notes Ms. Makwinja-Salamba.

COSOMA: DRIVING CHANGE

Established in 1992, COSOMA is responsible for copyright matters in Malawi. It also serves as the country’s collective management organization and as such manages a wide range of rights to ensure creators and other rights holders are fairly remunerated for the use of their works. “We believe that collective management is an important tool to ensure creators receive a fair reward for the use of their works so they can continue to create year after year,” says Ambassador Salama.

COSOMA is at the forefront of efforts to develop Malawi’s creative sector. It also actively shares its copyright expertise with other countries in the region through its training programs. “We train policymakers from quite a number of African countries, but we want to do more. Our aim is to become a center of excellence for copyright in the region,” says Ms. Makwinja-Salamba.

TACKLING PIRACY

As in many countries, piracy remains a major challenge and continues to hamper the significant growth potential of Malawi’s creative sector.

“The creative sector is important to the future of our country. Our artists produce quality works but these are often sold through parallel markets. This means artists do not receive any of the revenue from the sale of their works,” explains Ms. Makwinja-Salamba.

For Ambassador Salama piracy is “the creative sector’s public enemy number one.” Malawi’s new copyright law takes a tough stance on it.

With the new copyright law fines have gone up significantly. They now range from USD 3000 to USD 15000 depending on the gravity of the offence, with prison terms of up to four years – up from USD 2 to USD 20 with a prison term of just one year under the 1989 copyright law.

“Malawi has good creative people but the sector’s development is hampered by piracy. These tougher measures mean that pirates will no longer undertake their operations openly. If one pirate is arrested, it will send a strong message to others,” notes Ms. Salamba.

But low levels of general copyright awareness mean that effective application of the measures also requires a focus on building awareness among policymakers, law enforcement authorities and the general public about why it is important to protect the rights of creators. To this end, COSOMA is also working closely with customs, the police and the judiciary.

“Beneficiaries of the new system are very happy, but those who have to pay, of course, are not. With all new systems, we expect that some people will react negatively, but these measures are an important step in the right direction. They will help build stronger awareness about the need to respect the rights of our creators and will enable them to earn a living from their work,” says Ms. Makwinja-Salamba.

PRACTICAL SUPPORT FOR MALAWI’S CREATORS

Beyond the modernization of Malawi’s legal infrastructure, the Government is also supporting various practical initiatives to strengthen Malawi’s creative economy.



Photo: Courtesy of COSOMA



Photo: Alan Gignoux / Alamy Stock Photo

(Top) Headquarters of COSOMA which is responsible for copyright matters in Malawi. COSOMA is at the forefront of efforts to develop Malawi's creative sector.

Malawi's government is supporting a range of practical initiatives to support the country's artists. These include a Copyright Fund, a Savings and Credit Cooperative for Artists and an Artists Production and Marketing Cooperative.

For example, a Copyright Fund is being set up to which artists can submit applications to fund their project proposals. The fund will be financed from various sources, including a levy on storage devices.

A Savings and Credit Cooperative for Artists has also been established to make it easier for creators to access funding. Many creators in Malawi do not have a bank account and find it difficult, if not impossible, to secure loans. The cooperative enables them to borrow against any savings accumulated from the sale of their work, among other things.

The absence of large music publishing and film production companies in Malawi means there are limited opportunities for creators to produce and successfully market their works. This, coupled with high levels of piracy, makes it difficult for creators to access legitimate markets, and for consumers to get hold of legitimate copies of works.

To address these gaps in the creative value chain, the Government is helping to set up an Artists Production and Marketing Cooperative. "The cooperative will produce music, films and other art forms and promote their sale, including online, in global markets," explains Ms. Makwinja-Salamba. This is a first for Malawi's creative sector.

With another eye on the future, the Government is also helping to nurture the country's raw creative talent by funding the establishment of a School for the Arts to enhance the creative skills of artists, many of whom have no formal education. The aim is to hone the artistic talents of creators and to enable them to develop and promote their works and effectively manage their IP rights. Construction of the first such school is expected to start in 2017.

THE STAGE IS SET

Convinced of the importance of supporting the development of its creative sector, Malawi is setting the stage for its creative sector to thrive in the years ahead. "Our aim is to support the development of the creative sector's economic value chain, and in particular creators, who are the first link in that chain," says Ambassador Salama. "We still have some distance to travel in Malawi in delivering to our people the numerous benefits of a well-remunerated creative sector, but we have made significant progress in setting the foundations and establishing the institutions required for the sector to continue to develop and thrive."

Innovation: history's great free lunch

Innovation as a concept suffers from the paradox of being both overexposed and underappreciated. Countries seek to build innovation economies, regions want to be innovation hubs, companies hope to be seen as innovators, and so on. People certainly see innovation as important and desirable, but they sometimes fail to recognize just how fundamentally important it is to the modern economy.

The role of innovation in driving economic growth is nothing short of astounding. For developed economies, most of today's economic output can be attributed to the technological innovations of the past 150 years. The world owes much to innovation, and to the intellectual property (IP) systems that secure investment in it.

DEFINING INNOVATION

The OECD defines innovation as “the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.”

Definitions vary, but this one is useful as it casts a wide net over new, economically beneficial activities. Human creativity is constantly seeking ways to improve economic activity, develop new business models and processes and provide us with new goods and services.

The breadth of activities covered by the concept of innovation is also reflected in the annual *Global Innovation Index (GII)* (see p. 20) produced by WIPO and its partners, which benchmarks the innovation performance of some 130 countries against more than 80 factors.

Innovation is more than just invention. People have great new ideas all the time, but creating a marketable product is the challenge. The economist Joseph Schumpeter famously observed that innovation happens when an invention is brought to market so people can enjoy its benefits. This distinction between invention and innovation helps to highlight the importance of IP as a means of securing the investment needed to develop and commercialize inventions so that they can indeed become innovations.

THREE KEY TYPES OF INNOVATION

There are many types of innovation, but let us take a look at three specific categories that attract a lot of attention in international policy circles.

By **Mark F. Schultz**

Director and Senior Scholar, Center for the Protection of Intellectual Property, Antonin Scalia Law School, George Mason University, Arlington, VA, and Professor of Law, Southern Illinois University, Carbondale, IL, United States of America



Photo: Courtesy of PEEK

The Portable Eye Examination Kit (PEEK) developed by Andrew Bastawrous and his team harnesses the versatility and power of smartphones by combining an app and a clip-on camera adaptor to create a portable eye exam clinic. An example of frugal innovation, the kit brings affordable and high-quality eye care to patients living in the most remote and resource-poor communities.

The first, *breakthrough innovations*, needs little explanation. These are game-changing technologies that transform society and business. They disrupt established practice and can spawn whole new industries. Examples include the internal combustion engine, antibiotics, and more recently the mobile telephone.

Before mobile telephony could take off, wireless networks needed an efficient and nimble way to manage a large number of signals sharing limited radio waves. The breakthrough came in the form of not one, but two, separate innovations. CDMA (Code Division Multiple Access) technology, widely used in the United States, was invented by Irwin Jacobs and commercialized by the company he founded, Qualcomm. And GSM (Global System for Mobiles) technology, widely used in Europe, was pioneered by a number of European institutions and businesses.

These mold-breaking technologies served as a platform for the development of what has become a near-ubiquitous technology that has wrought significant business and social changes.

By contrast, the second category, *incremental innovation*, covers marginal improvements to existing technology. Such innovations bring progress in many small steps rather than one great leap. Incremental innovations are sometimes regarded as unimportant. But in reality, most innovation is incremental, and the accumulation of these step-wise developments can bring about significant changes.

To continue with the example of mobile phones, every year smartphones get better, but only in small ways. Apple has made a tradition of dramatically unveiling each successive generation of its iPhone. Yet objectively, each generation differs only slightly from the one before. But today's smartphones differ dramatically from early models. That evolution has come about because of an accumulation of incremental innovations.

The third category, *frugal innovation*, has come to describe an approach to innovation that involves creating greater social value while stripping back the use of scarce resources. It often takes place in resource-constrained environments in response to the needs of low- and middle-income communities.

Interest in frugal innovation has grown in response to concerns that innovation should reach everyone, regardless of their location or means. In the long run, the enormous growth engendered by innovation makes everyone better off, as incomes in general rise, goods become less expensive and new medicines and conveniences improve living standards. But that can take a long time. For innovation to reach some communities, it may need to be tailored to the specific needs of people where they live. For example, for technologies to have any use or value to people living in many remote areas, they have to be adapted to an off-grid environment.

Frugal innovation is a response to the needs of those living in resource-constrained environments, but it is also increasingly recognized as an opportunity both to promote more efficient use of resources and to add value for customers. A growing number of actors are embracing it. Local entrepreneurs are responding to the needs of their communities; non-profit organizations are forming public-private partnerships to adapt technology to local needs, and multinational companies are recognizing the value of integrating frugal innovation into their production processes and breaking into these markets.

Frugal innovation is also evident in the area of mobile telephony. Take, for example, how Andrew Bastawrous and his team have harnessed the versatility and power of smartphones to develop their Portable Eye Examination Kit (PEEK). The kit combines an app and a clip-on camera adaptor to create a portable eye exam clinic. PEEK brings affordable, rapid and high-quality eye care to patients living in the most remote and resource-poor communities.

Regardless of how we describe it, innovation delivers huge benefits to society. That's the bottom line.

BREAKING THE LAW OF SCARCITY

Innovation is also a key driver of economic growth. Without innovation, we would live in a world defined by scarcity and constrained choices. The economist Paul Samuelson observed in his introductory textbook on economics that "in the world as it is, children learn that 'both' is not an admissible answer to a choice of 'which one?'"



Photo: iStock.com/© Neustockimages

Antibiotics, a game-changing technology that emerged from research into synthetic dyes in the 1930s, have revolutionized health, clinical practice and the pharmaceutical industry.

The law of scarcity – the fundamental economic problem of meeting human needs in a world of finite resources – is often stated in terms of trade-offs. If we want to produce more of one thing with currently available labor and capital then we will need to produce less of another. Put another way, *there's no such thing as a free lunch*.

As with most rules, however, there are exceptions, and innovation might just be history's most important exception. As economic historian Joel Mokyr observes in *The Lever of Riches*: "Technological progress has been one of the most potent forces in history in that it has provided society with what economists call a 'free lunch,' that is, an increase in output that is not commensurate with the increase in effort and cost necessary to bring it about."

Innovation breaks the scarcity rules by supplying humanity with one free lunch after another, allowing an economy to produce more using the same or fewer resources.

Consider the dramatic increase in agricultural productivity between 1830 and 1990. In 1830, it took a US farmer about 250–300 labor-hours and five acres of land to produce 100 bushels of wheat. By 1990, it took only three labor-hours and three acres of land to produce the same yield. This productivity gain is in large part due to innovation and the opportunities it created for farmers to replace their hand tools with machines and to use better seeds and fertilizers.

Innovation also creates new value for existing resources. Take sand, for example. Once it had little value, but over the centuries innovators have developed a wide range of high-value applications, including its use in the production of mortar, plaster, concrete, bricks and glass, and more recently for the silicon in computer chips.

Innovation results in better products and more efficient methods of production; it also creates entirely new categories of products. Take, for example, computers, mobile phones and electronic commerce. Each has created entirely new industries, business models and opportunities.

Innovation allows people to do more with less, to do new things with old resources, and to create entirely new products and industries. As a result, output increases, job opportunities, wages and the economy grow, and people have wider choices. Innovation enables us to enjoy and do entirely new and different things. Its importance in promoting economic and social development cannot be overstated.

MEASURING THE IMPACT OF INNOVATION

Just how much of a boost does innovation give to an economy? Economists have long credited innovation as the source of the United States' economic success. In 1957, Nobel Prize-winning economist Robert Solow credited innovation with nearly 90 percent of productivity growth in the United States in the first half of the 20th century. More recently, William Baumol estimated that in 2011 nearly 90 percent of the current economic output of the United States "was contributed by innovation carried out since 1870".





Innovation supplies humanity with one “free lunch” after another, making it possible to produce more using the same or fewer resources. Pioneering innovations in wireless networks allowed for the development of mobile telephony, the development of which is the result of an accumulation of incremental innovations. This near-ubiquitous technology has brought about significant business and social changes.

IP rights enable inventors and their investors to secure a proportion of the commercial value of their inventions. But the lion’s share of the benefits flowing from their innovations diffuses widely among the general population and throughout the economy. Baumol estimates that 90 percent or more of the benefits of innovation “spill over” to people who made no contribution to its development.

This is, in fact, exactly the outcome the IP system is designed to produce. IP rights enable inventors to protect the fruits of their labor and attract the investment needed to develop and commercialize a product. The IP system does not exist to provide them with the fruits of other people’s labor. The innovator who cures a disease can charge for the drugs used to treat it, but does not get the wages of the people whose lives the drugs save. Similarly, the smartphone has enabled the development and deployment of a vast number of apps that educate,

entertain and make us more productive. App developers, not smartphone manufacturers, benefit most from selling those apps. And as app users we retain the benefits that make our lives more productive, informed and enjoyable.

INNOVATION, THE GREAT FREE LUNCH

It really is hard to overstate the important, seemingly wondrous, role of innovation in economic development. As Morton Kamien and Nancy Schwartz observed, faith that beating the law of scarcity is “possible verges on belief in magic, on the plausibility of drawing rabbits out of an empty hat. And yet, bizarre as it may seem, the trick has been performed... through the magic of technology.”

Only innovation and IP rights that drive it can bring about the kind of outsized growth and widespread benefits that can improve the lives of the whole of humanity. Together, they can shape a sustainable future for all.

GII 2017: Innovation feeding the world

By **Catherine Jewell**, Communications
Division, and **Sacha Wunsch-Vincent**,
Economics and Statistics Division, WIPO



Our ability to enhance the performance and sustainability of agricultural food systems globally depends on a deeper understanding of the linkages between innovation inputs and outputs and diffusion pathways within the sector.

The 2017 edition of the *Global Innovation Index (GII 2017)*, published in June, comes at a time of renewed global economic momentum. But investment and productivity levels remain at historical lows. Laying the foundations for innovation-driven development is more important than ever. Only by sustaining investment in innovation will it be possible to turn the current cyclical upswing into sustained economic growth.

In the aftermath of the global financial crisis of 2009, global research and development (R&D) growth fell but its worst effects were successfully countered by effective innovation policies. However, with investment in public R&D flattening and growth in business R&D slowing, there is no room for complacency.

MEASURING INNOVATION PERFORMANCE

GII 2017 measures the innovation performance of 127 countries. It offers policymakers a snapshot of the strengths of national innovation ecosystems as well as areas where there is scope for improvement. Now in its 10th edition, the *GII* underlines the global nature of innovation and also demonstrates that its ability to support national economic development is often limited by weaknesses in, for example, human capital, infrastructure, or market sophistication.

GII 2017 once again highlights the persistent innovation divide between high-income and middle- and low-income economies but offers grounds for optimism. It shows that an expanding number of developing countries are performing significantly better on innovation than their current level of development would predict. Of these 17 “innovation achievers,” nine come from Sub-Saharan Africa. Low-income countries, led by Rwanda, Uganda and Malawi, are also continuing to gain ground on middle-income economies.

Innovation is a driver of growth, so policy action to foster R&D and other innovation inputs and outputs is essential. But innovation efforts are not and should not be confined to high-tech sectors. That is why *GII 2017* focuses on the many innovative advances taking place in the agricultural and food systems sector.

BOOSTING AGRICULTURE THROUGH INNOVATION

Agriculture is the backbone of many economies and unlocking its potential through innovation offers a promising pathway to economic development. Many factors are fuelling the innovation imperative within the sector.

Beyond growing consumer demand for sustainable products and the need for producers to drive down production costs, more global issues are at play. The world’s population is expanding. By 2050 global food demand is expected to be at least 60 percent higher than 2006 levels. And competition for natural resources is increasing, exacerbated by the effects of climate change.

The stakes are high, perhaps higher than in any other field, and the statistics are compelling. Around one in nine people in the world (795 million of them) suffers from hunger, with one in four living with chronic hunger in Sub-Saharan Africa according to the International Fund for Agricultural Development, World Food Programme, and Food and Agriculture Organization of the United Nations.

Against this backdrop it is more important than ever to support the development of sustainable and inclusive agri-food innovation systems.

Innovation can avert future global food crises, but feeding the world is an increasingly complex challenge. Policymakers need to confront slow growth in agricultural productivity and bottlenecks in agricultural innovation systems, especially in low- and middle-income economies.

Our ability to enhance the performance and sustainability of agricultural food production systems globally depends on developing a deeper understanding of the linkages between innovation inputs and outputs and diffusion pathways in the sector. Only then will it be possible to fully leverage the potential of agricultural innovation, reverse persistently low levels of agricultural productivity and ensure a sustainable global food supply.

A NEW WAVE OF INNOVATION IN AGRICULTURE

Notwithstanding the challenges, there is evidence of a wave of new innovative agricultural technologies spilling over from other sectors. An unprecedented convergence of biology, agronomy, plant and animal science, digitization and robotics is transforming the global agri-food value chain.

Advances in genetics, nanotechnology and biotechnology have demonstrated their ability to produce high-yielding, quality outputs and improve farm incomes. In India, for example, the adoption of genetically modified cotton (Bt cotton) resulted in production more than doubling between 2000 and 2015, with yields increasing from 278 kilograms to 511 kilograms per hectare and income from

LEADERS IN INNOVATION

Every year, the Global Innovation Index ranks the innovation performance of nearly 130 countries and economies around the world. Each country is scored according to 81 indicators.

Global

- 1 Switzerland
- 2 Sweden
- 3 Netherlands
- 4 USA
- 5 UK

Regional*

Northern America

- 1 USA
- 2 Canada

Europe

- 1 Switzerland
- 2 Sweden
- 3 Netherlands

South East Asia, East Asia, and Oceania

- 1 Singapore
- 2 Republic of Korea
- 3 Japan

Latin America and the Caribbean

- 1 Chile
- 2 Costa Rica
- 3 Mexico

Northern Africa and Western Asia

- 1 Israel
- 2 Cyprus
- 3 UAE

Central and Southern Asia

- 1 India
- 2 Iran
- 3 Kazakhstan

Sub-Saharan Africa

- 1 South Africa
- 2 Mauritius
- 3 Kenya

Income group*

High-income

- 1 Switzerland
- 2 Sweden
- 3 Netherlands

Upper-middle income

- 1 China
- 2 Bulgaria
- 3 Malaysia

Lower-middle income

- 1 Viet Nam
- 2 Ukraine
- 3 Mongolia

Low income

- 1 Tanzania
- 2 Rwanda
- 3 Senegal

* Only economies with a data coverage of more than 66% are considered.

The use of digital technologies in agriculture has huge potential to boost productivity, profitability and sustainability of all aspects of food production, but uptake of these powerful technologies is slow in wealthy countries and non-existent in many developing regions.



Photo: iStock.com/Onfokus

Bt cotton rising by USD 18.3 billion. However, the application of these new technologies remains controversial and their full impacts on health and the environment are not yet fully understood.

Digital technologies are also transforming the sector with huge potential to boost the productivity, profitability and sustainability of all aspects of agricultural production. They are wide-ranging and include drones, autonomous vehicles, remote sensing technologies, geographic information systems, radio frequency identification (RFID) chips to monitor animal health, automated milking and feeding systems, and sensors and robots for cultivation in controlled environments such as greenhouses. The data collected through these operations promise resource optimization and productivity gains.

But uptake of these powerful technologies remains at best slow in wealthy countries and is non-existent in many developing regions, particularly Sub-Saharan Africa. In those countries many farmers have yet to benefit from earlier waves of innovation. If the full potential of the latest ag-tech is to be realized, it needs to be rolled out globally.

OVERCOMING INNOVATION BOTTLENECKS

The agri-food value chain is multi-layered and complex, and includes many different actors. Innovation occurs

along the value chain, but much of it relates to improving processes and services. Strengthening the linkages at each stage of the value chain is critically important to improving productivity and efficiency. Typically, it involves a mix of both technological and non-technological innovation. Organizational innovations, such as life-long learning and the digitization of retail and logistics, can be as important as new products or processes.

But farmers and producers in many middle- and low-income economies face a host of problems that impede productivity gains. These include liquidity constraints, low-quality agricultural inputs, poor information about and awareness of available technologies, and inadequate or non-existent post-harvest and distribution infrastructure.

Rapid uptake of innovative approaches to agri-food production is often inhibited by a lack of information and training. Only if farmers and other agricultural operators see the benefits of a new approach and can afford it will they consider adopting it. Agricultural extension efforts therefore need to demonstrate the business case for a new technology and provide the necessary training.

There is huge scope for farmers in low- and middle-income countries to benefit from access to digital technology and new service platforms. But this involves reaching out to them and giving them the confidence to use these tools.

POLICIES TO FOSTER AGRICULTURAL INNOVATION

Public authorities have a critical role to play in stimulating innovation for the development of sustainable agricultural systems. The policies they implement set the rules of the game and shape the activities of producers and others in the value chain. But all too often, innovation policies neglect traditional or natural-resource-based industries like agriculture. This is a mistake. The agri-food sector should be at the heart of every country's national innovation strategy.

Public authorities can improve national legal and regulatory frameworks and reduce bureaucracy for farmers and producers. This streamlining process can also help to strengthen linkages between different institutional actors, and ensure greater coherence in the way policies are rolled out and government resources are deployed.

Public authorities also have a role in ensuring access to an effective IP system that encourages the uptake and use of IP rights, in support of innovation and business growth. Building greater awareness about how IP rights add value to new technologies and products is critical. Effective IP regimes allow inventors to generate a return on their investment in developing a technology or product, allowing them to invest in further innovation.

When markets are dysfunctional, it falls to policymakers to take remedial action, for example by establishing funding mechanisms to stimulate innovation in agriculture and food production. In Brazil, policymakers have created sectoral funds to foster technologies in agronomy, veterinary science, biotechnology and more, to great effect.

Agriculture is the backbone of many economies and unlocking its potential through innovation offers a promising pathway to economic development.



Photo: iStock.com/© rvmages



Photo: iStock.com/@nathanaparis

Better data on the gaps in agricultural capacity will improve understanding of the types of policies required to support the development of more productive, efficient and sustainable agricultural innovation ecosystems.

Produce: DARD & SONS

These funds keep key players up to speed with new ag-tech developments, expand investment in tropical agricultural biotech and promote the diffusion of new agricultural technologies. But in establishing such funds, policymakers need to work closely with research institutes to support domestic R&D and ensure that research priorities are in line with local needs and circumstances.

Promoting sustainability in the agri-food sector, however, is a delicate balancing act between promoting more intensive production on the one hand and, on the other, supporting agriculture practice such as the use of efficient irrigation systems and energy-efficient products to minimize environmental impact. Again, it falls to policymakers to create an environment that ensures an appropriate balance is maintained.

Preferential taxation schemes for farmers along with programs to improve access to land and market support for promising new techniques and technologies also offer interesting options to support agri-food innovation.

SUPPORTING AN ENTREPRENEURIAL APPROACH

Policymakers can improve agricultural output and more efficient performance by encouraging producers to adopt a more entrepreneurial approach to their operations. With the right policy support, it is possible to encourage producers across the value chain to view their operations as business enterprises that involve constant innovation to cater to dynamic market demand. This sets the scene for the emergence of new, more efficient business models and creates new pathways to commercialization.

Here again, building awareness about how IP can be used to add value to agricultural outputs is important. Government programs designed to foster business development, such as StartUp India, play a pivotal role in transforming the innovation landscape for agriculture. The Startup India program, launched in 2016, supports the formation of startups, including in the agricultural sector, by facilitating access to funding, incubation and other business support services. The aim is to make the sector more profitable and exciting for future generations.

Thanks to these and other government initiatives, India's agricultural landscape is proving fertile ground for innovators, who are coming up with a range of solutions that enable farmers to save water and energy, reduce agro-chemical usage, improve farm management

systems and strengthen farmer-market linkages. Examples include ITC's e-Choupal platform, which serves as a "digital knowledge hub" for more than four million farmers across India. And the Trringo mobile app developed by Mahindra and Mahindra, one of India's agricultural machinery producers, enables smallholders to rent farm machinery that would not otherwise be available to them (see *GII 2017*, Chapter 5).

STRENGTHENING UNIVERSITY-INDUSTRY LINKS

A great deal of innovation occurs at the farm level and with the right support can be scaled up. Stronger links between public research institutions, entrepreneurs and local farmers can support the broad diffusion of at least the most effective grassroots innovations. Such linkages are also important in responding to demand for innovation from farmers and other agricultural operators. Strengthening university-industry partnerships will help reduce the time it takes for a new technology to move from the laboratory to the farm gate. Underpinned by clear rules on technology transfer, including the commercialization of IP outputs, these partnerships can help accelerate the transfer and uptake of new agricultural technologies.

MORE DATA REQUIRED TO SUPPORT DECISION-MAKERS

Agricultural food production systems are far smarter and more integrated than ever before. But many developing countries still lag behind. Finding appropriate solutions requires better data on the gaps in agricultural capacity and opportunities to bridge them. Such data will make it possible to monitor and evaluate agricultural innovation systems and thereby improve understanding of the types of policy initiatives required to support the development of the more productive, efficient and sustainable agricultural innovation ecosystems that we all need to feed the world in the years ahead. *GII 2017* is a small step in the right direction.

Kenyans turn to drought-tolerant maize variety to fight poverty

By **Evelyn Situma**, Communications Officer, African Agricultural Technology Foundation (AATF)

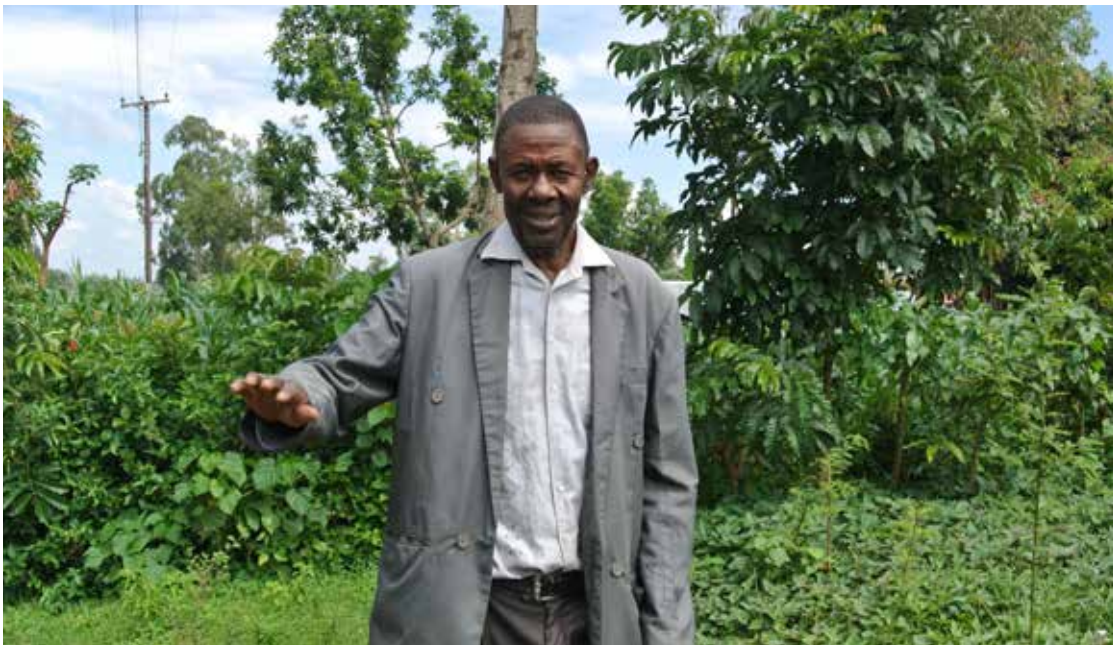


Photo: Courtesy of AATF

After years of poor harvests, Jotham Apamo (above) switched to DroughtTEGO®, a new hybrid maize variety. Yields went up, along with his income. He can now feed and educate his family.

Maize farming was becoming a source of major frustration for 61-year-old Jotham Apamo. Despite his best efforts, his small quarter-acre farm yielded just 10 kilograms of maize each harvest, and then only if he was lucky and there were no pests or drought.

“There was hardly any gain for me. I was pushed into debt. I couldn’t feed my family or pay school fees for my children,” he recalls.

Mr. Apamo’s attempts to switch to higher-yielding maize varieties did little to improve the situation. After seven fruitless years he was on the point of giving up when he learned about a new hybrid seed called DroughtTEGO®.

“I got to know about DroughtTEGO® maize through a local nonprofit organization called Rural Outreach Programme (ROP). They offered to do a demonstration on my field in 2014,” he explains. Curious, Mr. Apamo willingly agreed to set aside a portion of his farm for the trial. Could these seeds change his fortunes?

At harvest time all his hopes came true. “I was truly amazed. I harvested 110 kilograms from the tiny demonstration plot of 0.025 acres,” he says with a wide grin. Inspired by these results, the following year he planted TEGO maize on half an acre. The outcome was equally encouraging.

“I have come to realize that DroughtTEGO® is a quality seed. It can withstand drought and strong wind,” says Mr. Apamo. Even when termites threatened to damage his second-season (short rainy season) crop in 2015, he still harvested nine bags of maize each weighing 90 kilograms from the half-acre of land – a total of 810 kilograms, just two bags less than his 2014 harvest. “I can now feed and educate my family,” he says.

ABOUT DroughtTEGO®

DroughtTEGO® is a drought-tolerant white maize variety developed and deployed by the Water Efficient Maize for Africa (WEMA) Project coordinated by the African Agricultural Technology Foundation (AATF). This climate-smart variety can produce a substantial grain yield even under moderate drought conditions.

Sylvester Oikeh, WEMA project manager, says that under moderate drought conditions, WEMA’s drought-tolerant maize can increase yields by 20 to 35 percent compared with varieties developed in 2008 when the project started.

WEMA has developed more than 80 drought-tolerant (climate-smart) maize varieties adapted to the prevailing weather conditions and diseases of different regions. In 2016, the WE2109 variety was launched in Tanzania, and WE3127 and WE3128 hybrids were released in South Africa.

DroughtTEGO® produces high yields even in tough conditions, with average yields of 4.5 tons per hectare compared to local varieties which yield around 1.8 tons per hectare. Little surprise, then, that DroughtTEGO® maize is becoming a popular choice among smallholder farmers in western Kenya.

Mr. Apamo has already convinced 20 other local farmers to plant TEGO maize. Having seen the benefits of using the seed with their own eyes – higher yields, better living standards – they were easily persuaded.

One of his neighbors, Grace Omulanda, who began planting TEGO maize in 2015, has also inspired 40 other women farmers in the Joywo Women’s Group to follow suit.

DroughtTEGO® is a drought-tolerant white maize variety developed and deployed by the Water Efficient Maize for Africa (WEMA) Project. WEMA has developed more than 80 drought-tolerant (climate-smart) maize varieties adapted to the prevailing weather conditions and diseases of different regions.



Photo: Courtesy of AATF

Photos: Courtesy of AATF



Adoption of DroughtTEGO® is transforming the fortunes of local farmers in Kenya, enabling them to build new dwellings with proceeds from their harvest.

True to its name – “TEGO” means “to protect” in Latin – the varieties are helping to fight poverty and to protect the livelihoods of smallholders in Kenya and beyond.

ABOUT WEMA

WEMA is a public-private partnership launched by the AATF in 2008 with financial support from the Bill and Melinda Gates Foundation, the United States Agency for International Development (USAID) and the Howard G. Buffett Foundation. Its aim is to develop and deploy drought-tolerant and insect/pest-protected (climate-smart) technologies to farmers in Sub-Saharan Africa.

WEMA uses the expertise and support of the US-based agrochemical and agricultural biotechnology corporation Monsanto Company, the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, and national agricultural research systems of Kenya, Mozambique, South Africa, Uganda and the United Republic of Tanzania. Community-based farmers groups and local nonprofit organizations help distribute WEMA products to farmers and encourage their use. Maize is a staple food in Kenya, and many smallholder farmers have proven highly receptive to adopting new higher-yielding and resilient varieties.

REACHING OUT TO FARMERS AT THE GRASSROOTS

The AATF is partnering with grassroots organizations to promote WEMA maize hybrids among farmers.

“Farmer-based organizations have done good work in offering their support to farmers. We thank them for their considerable efforts and acknowledge that it is very difficult for the government to achieve such success on its own,” said Titus Muganda, Senior Assistant Chief of West Butsotso, speaking at a meeting of farmers in the nearby town of Kakamega in western Kenya.

“It is through farming technologies such as TEGO that we will be able to fight poverty and hunger,” Wycliffe Kombo, Chief of North Butsotso, told farmers during a field day. “Blue-collar jobs are fading away and farming is what we are left with.”

In December 2015, the Rural Outreach Program of western Kenya held a series of field days to introduce DroughtTEGO® varieties to farmers in the region. These were very popular events attracting over 1,000 people, including many government officials.

“I am delighted that TEGO has transformed farmers’ lives. ROP is stopping at nothing to spread the good news,” says Doris Anjawa, ROP Coordinator in western Kenya.

After just two seasons of planting TEGO in western Kenya, she has seen a transformation in the fortunes of local farmers. Her father was able to build a new house with proceeds from his TEGO harvest. Others have been able to extend their homes in the same way.

Through its outreach partners, WEMA is continuing to organize field trials with farmers in the five project countries – Kenya, Mozambique, South Africa, Uganda and the United Republic of Tanzania – to create awareness and uptake of this life-changing technology.

“I knew maize as any other grain, but now I am mindful that there are new high-yielding varieties I can farm,” says Grace Omulanda.

Thanks to these types of outreach initiatives, the demand for TEGO maize has shot up since 2015, when farmers began ordering the maize from agricultural suppliers.

As a consequence, a growing number of seed companies are licensing the seed from WEMA to supply local markets. The project has made 21 inbred lines available to seed companies for license, and so far seven seed companies in Kenya, including Elgon Kenya Ltd, Olerai Seeds Ltd and Ultravetis East Africa Ltd, are selling DroughtTEGO® maize to farmers.

“The WEMA project has successfully established the biggest maize-breeding pipeline in Africa. There were 17,269 hybrids and over 19,000 parental lines under various stages of development and testing in 2015 across five WEMA Project countries,” notes Sylvester Oikeh.

THE ECONOMIC IMPORTANCE OF AGRICULTURE IN KENYA

Kenya’s agricultural sector accounts for 24 percent of the country’s GDP, but all too often, poor agronomic practices, use of low-yielding varieties, drought, pest and disease result in poor yields, with the country falling short of its full agricultural potential.

The 2016 Economic Survey by the Kenya National Bureau of Statistics shows a nine percent annual rise in national maize production, from 39.0 million bags in 2014 to 42.5 million bags in 2015 against a total consumption of 48 million bags. The shortfall was made up by informal cross-border trade between Kenya and Uganda, according to data from the 2015 Economic Survey.

Only by adopting good farming practices and facilitating access to and uptake of new high-yielding, drought- and disease-resistant varieties will it be possible to boost productivity and incomes and sustain the livelihoods of farmers in Kenya and beyond. High-yielding, drought-tolerant maize varieties like TEGO are part of that solution. That is why the WEMA deployment team is busy liaising with seed companies to ensure that the WEMA drought-tolerant varieties are available for more and more farmers to benefit from the technology and improve their livelihoods.



The informal economy in developing nations: a hidden engine of growth

By **Toby Boyd**, Communications
Division, WIPO



Photo: © S. Daniels

Animal sculpture produced by metalworkers in the Racecourse cluster of Nairobi which specializes in art objects for middle- and high-income consumers.

Innovation is happening everywhere, including in many small and informal businesses in developing countries. A new WIPO book explains how. Sacha Wunsch-Vincent and Erika Kraemer-Mbula, who edited it, talked to *WIPO Magazine* about the project.

Your book examines innovation and intellectual property (IP) in the informal economy. What do you mean by “informal economy” and why did you want to study it?

Erika Kraemer-Mbula: Definitions vary, but essentially the informal economy means economic activity that takes place outside formally regulated structures. Typically, informal economic enterprises are small, often based around families. Workers probably do not pay income taxes, nor do they enjoy social protections. While their activities are not necessarily illegal, they are not covered by the framework of national laws in a given country.

Importantly, there is not always a clear divide between formal and informal economies; for example, sometimes people may work cash in hand for formal, registered businesses. So defining informal economic activity can be difficult.

Sacha Wunsch-Vincent: And if the informal economy is hard to define, it is even harder to measure. But we do know that it is very big, especially in developing countries [see box]. That is why we wanted to study it. Our research was mandated by WIPO’s member states, who recognize that the informal economy is enormously important in many countries and that we cannot support innovation in those countries if we do not understand how innovation works in the informal economy.

Since the informal economy is hard to define and measure, does that mean it is also hard to research?

Erika Kraemer-Mbula: Yes, absolutely. Quite a few people have studied the informal economy, but very few have looked specifically at innovation in the informal economy. Much of that research has been anecdotal and rather one-dimensional. It tends to give the impression that any innovation that takes places in the informal economy is done by poor people working in poor countries, and is fairly basic and just a matter of them coping with the difficulties of their daily lives.

Sacha Wunsch-Vincent: We already knew from the best previous research that the reality is far more complex. Informal work covers a vast spectrum of activities, ranging from fairly basic survivalist labor to really sophisticated and skilled craft work. We wanted to capture that richness and complexity within a single analytical framework. And as this was a WIPO project, naturally we chose to focus on the role of IP, which no one had really done before.

How big is the informal economy?

The Informal Economy in Developing Nations: Hidden Engine of Innovation? includes one of the most complete and up-to-date analyses of the informal economy in developing countries.

Detailed statistical analysis by Professor Jacques Charmes on the size of the informal economy in terms of its contribution to employment and to gross domestic product (GDP) suggests that:

- more than half of all non-agricultural employment in most middle- and low-income economies is informal, reaching over 80 percent in Central Africa;
- the proportion of informal employment has risen in many regions over recent decades; and
- the informal economy accounts for nearly a third of GDP in Latin America, more than half in India and well over 60 percent of the total GDP of Sub-Saharan Africa.



Kenya's informal sector is a vital engine of job creation. Metalworkers in the informal Kamukunji cluster in Nairobi produce a range of commodities including wheelbarrows, cookstoves, pots and pans. These are sold to low-income populations who cannot afford or choose not to buy similar imported items.



Photos: © S. Daniels





Photo: © B. Hazelline

Typical cookstoves, known as *jikos*. One type of jiko is made of sheet metal (right), the other comes with a ceramic lining to the fuel box (left).

That sounds like a real challenge. How did you go about it?

Sacha Wunsch-Vincent: We tackled the project from several angles. Our book includes contributions from many leading authorities in the field, both academics and policymakers. While it includes some quantitative analysis, most of the research is qualitative. A literary review enabled us to construct an analytical framework which was then used by three different research teams for case studies on three very different types of informal economic activity in Africa.

What was the focus of the case studies?

Sacha Wunsch-Vincent: Our aim was to enrich our understanding of how innovation takes place in specific areas of the informal economy. That is why we chose three really different examples of activity and then tried to identify similarities in terms of innovation and IP.

One research team focused on informal metalworkers in Nairobi, Kenya. There is a whole sector of craft workers there who produce a range of metal goods. The sheer variety of their work is really impressive, with products ranging from useful household goods like packing cases and wheelbarrows to sophisticated sculptures that find their way into luxury hotels. We used a picture of one such sculpture, a beautiful metal giraffe, on the cover of the book (see p.30).

Erika Kraemer-Mbula: Another case study looked at traditional herbal medicine in Ghana. Herbal medical treatments have been around for centuries, long before the formal economy. What is interesting is how the Government of Ghana is now trying to leverage that traditional knowledge and its credibility among local people to enhance its national health strategy. For example, it is now possible to obtain a university degree in herbal medicine and some hospitals are prescribing traditional herbal treatments.

As for the third case study, on the production of home and personal care products in South Africa, that was my responsibility. Although South Africa is one of the better-off countries in Sub-Saharan Africa, there is a great deal of inequality, with many people surviving on very low incomes, so there is a very important informal sector that caters to their needs. Among other things, that includes people producing low-cost products such as soap, washing-up liquid and cosmetics.

And what conclusions did you reach? Was there innovation in those three different activities, and if so did it have any common features?

Erika Kraemer-Mbula: There is certainly lots of innovation going on, and it takes many different forms. For the metalworkers in Nairobi, it is often a case of reverse engineering products sold by formal businesses and working out how to make cheaper alternatives from available materials. But as Sacha said, there is also some brilliant high-end creative work.

In South Africa, the informal manufacturers are innovative not only in terms of the new products they come up with but also in the way they market those products – through attractive, distinctive packaging and other types of branding.

As for herbal medicine in Ghana, the drive to make it part of mainstream healthcare is innovative in itself and there are also attempts to encourage innovation, for example using modern production processes to create herbal treatments in easy-to-store forms such as tablets.

Sacha Wunsch-Vincent: While we saw a diverse range of innovation, we also identified some important common points. First, we found, as in the formal economy, that geographical concentration is very noticeable. Activities tend to focus in certain areas so you get innovation clusters. Indeed, there is often some overlap between formal businesses and informal businesses or workers within a cluster.

Second, we found that there are usually ways of regulating knowledge flows and intellectual property in the informal sector. While these are not the same as formal IP mechanisms, they show some quite similar features. For example, if a worker within a cluster invents a new product or a new way of doing something, they can enjoy a competitive advantage for a while by being the first to produce or use it, but they will be expected to share it

Machines to cut potatoes into chips. Imported model (right). An informal adaptation (left) uses sheet metal instead of aluminum and includes a return spring mechanism. Innovation in the informal economy is often a matter of adaptation.



Photo: © C. Buji

with their peers in due course. That sort of period of near-monopoly followed by the mandatory sharing of knowledge is essentially the same idea that underlies patent system and other IP systems. So there is a real sense that informal workers often have their own informal IP rules.

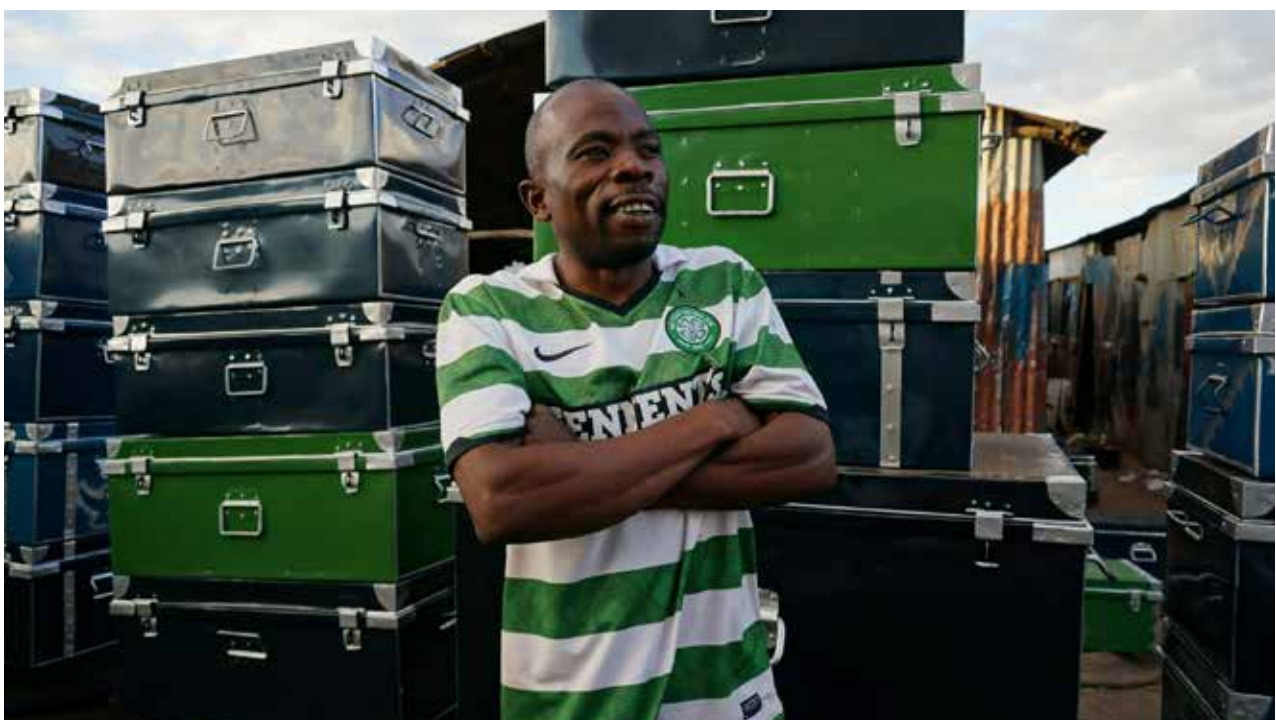
Does that mean formal IP systems are irrelevant to the informal economy?

Erika Kraemer-Mbula: Not necessarily. We wanted to examine whether there might be scope to use the IP system to help innovators in the informal economy. If just some of the enormous innovation going on there could be scaled up then potentially it could be a significant source of economic growth and development. We think there may be some scope to do that through well-designed innovation policies. For example, trademarks can be a very cost-effective way of adding value to a small business by building up a recognizable brand. But some other types of IP, such as patents, might be less well suited to a lot of informal innovation because it is often a matter of adaptation rather than truly novel technical invention.

Sacha Wunsch-Vincent: What is clear is that informal economic activities are highly diverse and there is no one-size-fits-all policy to support the development of informal businesses. But we need more research to inform policymaking. We hope our book will stimulate a lot more work in this fascinating area. People in developing countries are natural innovators in lots of different ways. We need to understand that and help them make the most of it.

The Informal Economy in Developing Nations: Hidden Engine of Innovation? is published by Cambridge University Press, ISBN 9781107157545.

Using available materials and tools, many metalworkers in the Kamukunji cluster produce metal boxes which resemble those produced in the formal sector.



Supporting innovation in next-generation medicines

By **Jack Ellis**, Associate
Researcher, Geneva Network*

In medicine, the dominance of small-molecule drugs is coming to an end. In future more treatments will be biologic – complex drugs with molecular structures many times larger, manufactured inside living structures such as animal cells or bacteria.

The new era of biotechnology promises a revolution in how doctors manage disease, offering hope to patients with conditions for which there is currently no treatment. Advances in gene therapy, the development of safer vaccines, precision medicine and superior diagnostics stand to benefit millions.

Despite its transformative potential, research and development (R&D) in medical biotechnology remains concentrated in a handful of countries. The United States is the world leader by far in biotechnological output, followed by the United Kingdom, Switzerland, Germany, France and Japan. Some emerging markets like China have nascent biotech industries, but medical biotech R&D is far from global.

Those countries with strong industries have a robust regulatory environment, adequate R&D infrastructure and an effective intellectual property (IP) system to mobilize the large investment needed to fund risky biotech ventures.

To promote innovation in biologic medicines the key IP right is not patents but regulatory data protection. For a limited period, regulatory data protection prevents competitors from exploiting the data generated in clinical trials by the original drug developer. The most innovative countries in biotechnology all have clear, legally binding rules to protect these data.

REGULATORY DATA PROTECTION EXPLAINED

Regulatory authorities require data from preclinical and clinical trials to be able to approve and certify that a pharmaceutical technology is safe and effective for consumer use before market entry. Clinical trials are painstaking and expensive and add significantly to the cost of developing a new medicine, estimates for which range from USD 1.2 billion (Office of Health Economics, United Kingdom) to USD 2.6 billion (Tufts University, United States).

*Jack Ellis is a freelance journalist and was previously Asia-Pacific editor of *Intellectual Asset Management* magazine covering intellectual property and the legal services market.

In most sectors companies can protect commercially sensitive data through trade secrecy laws, but the requirement for biotech companies to disclose data to regulators puts them at a competitive disadvantage, according to Susan Finston, co-founder of Indian biomedicine startup Amrita Therapeutics.

“A typical food and beverage company can hold trade secrets on their recipes and so forth, and they can do that in perpetuity. But if you are a biopharma innovator, you have to disclose to regulators what your ‘cookbook’ is,” she says.

Regulatory data protection is critical for biopharma innovators because it ensures that competitors cannot gain regulatory approval and enter the market on the back of an innovator’s test data before the innovator has had a fair opportunity to recoup the costs of compiling it.

“In industries like biopharma or agritech, there is a compelling public interest in regulators having access to the innovators’ test data,” notes Ms. Finston, highlighting the importance of data exclusivity to innovators. “Regulatory data protection arrangements allow regulators to access those data on the understanding that they will not disclose it.”

THE INTERNATIONAL LANDSCAPE

At the international level, regulatory data protection is governed by the Agreement on Trade-Related Aspects

of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO). Article 39.3 of TRIPS requires WTO members to protect test data submitted to regulatory authorities against unfair commercial use and disclosure, except when the public interest so requires or when the data is otherwise protected against unfair commercial use. Protection of proprietary rights to drug registration data became a requirement for all WTO members, with the exception of least developed countries, from January 1, 2000, but many countries have yet to implement it.

CLINICAL TEST DATA AND BIOSIMILARS

One important reason regulators want access to innovators’ test data is to be able to assess follow-on versions of proprietary drugs produced by competitor companies. Just as originators of small-molecule pharmaceuticals face follow-on competition from generics manufacturers, biologic innovators face competition from producers of biosimilars – but with an important twist.

The structure of biologics is far more complex than “traditional” chemically-synthesized drugs, making it impossible to replicate an original biologic precisely. The best competitors can achieve is a biosimilar, a product that is similar in structure and effect. To obtain regulatory authorization for a biosimilar, a company must demonstrate to regulators via clinical trials that its efficacy, quality and safety are comparable to the innovator’s original product. Regulatory authorities can only grant approval if they have access to the innovator’s test data.

BIOLOGICS: BIGGER AND MORE COMPLEX MOLECULES

SMALL MOLECULE
ACETYSALICYLIC ACID
(ASPIRIN)

21 ATOMS



BIOLOGICALLY
ENGINEERED ANTIBODY

> 20,000 ATOMS

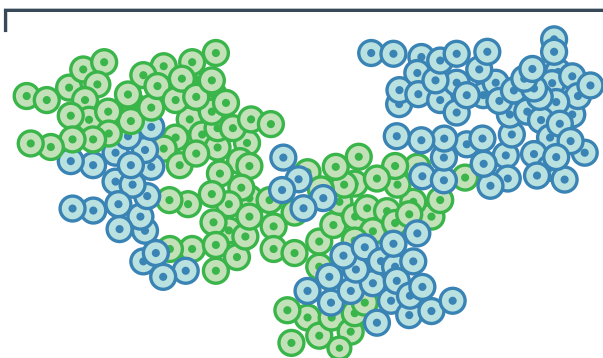


Figure 1
Adapted from: Amgen Inc. Biologics
and Biosimilars: An Overview
March 2014

The international regulatory data protection landscape

The United States offers a 12-year term for regulatory data protection.

The European Union provides for up to 11 years of regulatory exclusivity protection in certain circumstances (regulatory data protection for eight years, followed by two years of marketing exclusivity, and where the right holder is granted marketing authorization for a significant new indication, a further one year of regulatory data protection is available – see figure 2.

Canada and Japan each offer eight years of regulatory data protection for biologics, while many other jurisdictions offer between five and six years of protection.

Many developing countries lack a clearly defined period of regulatory data protection for biologics.

WHY PATENTS ARE NOT ENOUGH

Regulatory data protection grants biologics innovators some much-needed security, notes Dr. Kristina Lybecker, an associate professor at Colorado College specializing in pharmaceutical IP rights.

“Patent protection and data exclusivity are complementary forms of IP protection that both serve to incentivize the tremendous investments required for the development of biologic medicines,” she says.

Critics argue that regulatory data protection is a step too far, effectively extending protection after patent expiry and delaying the development of cheaper biosimilars to the detriment of healthcare providers and patients. Advocates, however, argue that it is critical to secure sustained investment in biotech innovation.

“Patent laws give you protection up to a point, but not completely,” explains Jack Lasersohn, general partner at the Vertical Group, a healthcare-focused venture capital firm based in the United States. “It is more difficult to protect a biologic from a biosimilar than it is to protect a small molecule from a generic that is chemically identical. Patent laws simply do not afford the same level of protection if you are going to allow similar drugs to be approved using the same data.”

In 2010, with strong support from the National Venture Capital Association, the United States enacted the Biologics Price Competition and Innovation Act, ushering in a 12-year period of regulatory exclusivity for new biologics from the date of first approval by the U.S. regulator.

Mr. Lasersohn welcomed this development. “Property rights, including patents and regulatory data protection, are the foundation of investment,” he says. “No one wants to invest in something that they don’t own a part of. Patents and regulatory data protection give you a form of ownership, and therefore make it possible to invest.

“When venture capitalists look to make an investment, they need to justify it on the rate of return over time. The return you get is directly a function of the durability of the

8+2(+1) EXCLUSIVITY FORMULA

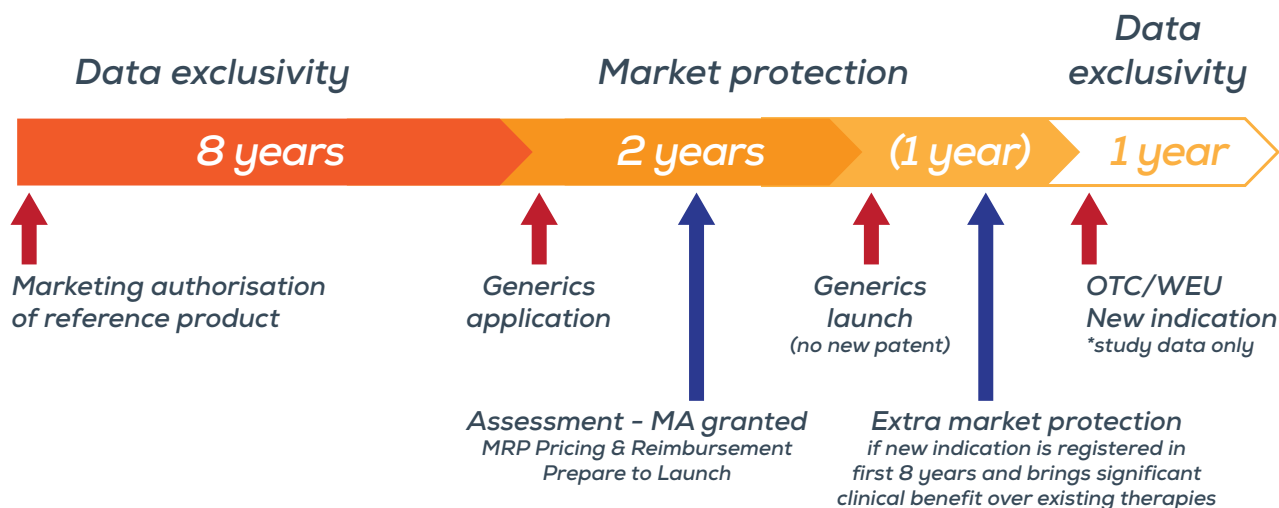


Figure 2
How regulatory data protection works in the European Union

MA = marketing authorization / MRP = mutual recognition procedure / OTC = over the counter / WEU = well-established use

Source: Zaide Frias, Head of Regulatory Affairs, European Medicines Agency (EMA), presented at SME Workshop, EMA, April 2013

investment – in other words, how long it will produce cash flows and profit. The shorter the period of durability, the less profit that can be made and the smaller the investment that can be justified. For biotech, that durability is associated with data exclusivity.”

Without the promise of a return on their investment, venture capitalists have little reason to invest in such a high-cost, high-risk sector – putting billions of dollars in funding for cutting-edge medicines at risk.

In 2015, venture capitalists in the United States pumped a record USD 8.95 billion into biotech startups.

Producing test data is costly. That, coupled with uncertainty over the patentability of biotech inventions in the wake of US Supreme Court decisions in, for example, *eBay v. MercExchange* (2006), *Mayo v. Prometheus* (2012) and *Association for Molecular Pathology v. Myriad* (2014), and the challenges of enforcing patent rights, further highlight the importance of RDP as a means of sustaining investment in medical biotech.

EMERGING MARKETS

While RDP is well established in Canada, Europe, Japan and the United States (see p.39), it is absent in many developing countries. India, for example, an active player in the global pharmaceutical industry, still has some way to go to catch up with the United States and Japan despite active support for regulatory data protection from local investors.

Anil Joshi, managing partner of Unicorn Ventures, a Mumbai-based venture capital firm, believes regulatory data protection would have a positive impact on biotech investment in India. “For biotech, investors would prefer exclusivity as it is important to protect the investment. I would like to see more refined and clear guidelines in protecting IP not only for biotech but for all innovation,” he says.

Amrita’s Susan Finston agrees. “You need incentives for primary research. It needs to be a holistic environment. In that context regulatory data protection is very important – particularly for small companies that don’t have deep pockets for patent litigation,” she explains.

DOES REGULATORY DATA PROTECTION UNDERMINE ACCESS TO MEDICINES?

In an attempt to strengthen protection for biologics manufacturers, the Biotechnology Regulation Bill was introduced to the Indian Parliament in April 2013, but it was rejected following objections from various lawmakers, activists and civil society groups.

Critics of the bill claimed that regulatory data protection simply enables large pharmaceutical corporations to extend protection of their proprietary drugs after patent expiry, increasing the price of medicines and undermining access.

Research from Geneva Network suggests that such fears are ungrounded. Canada and Japan have recently extended the period for regulatory data protection with no significant impact on state expenditure on pharmaceuticals as a percentage of GDP, which remained essentially flat in the years before and following these changes (see Figures 3 and 4).

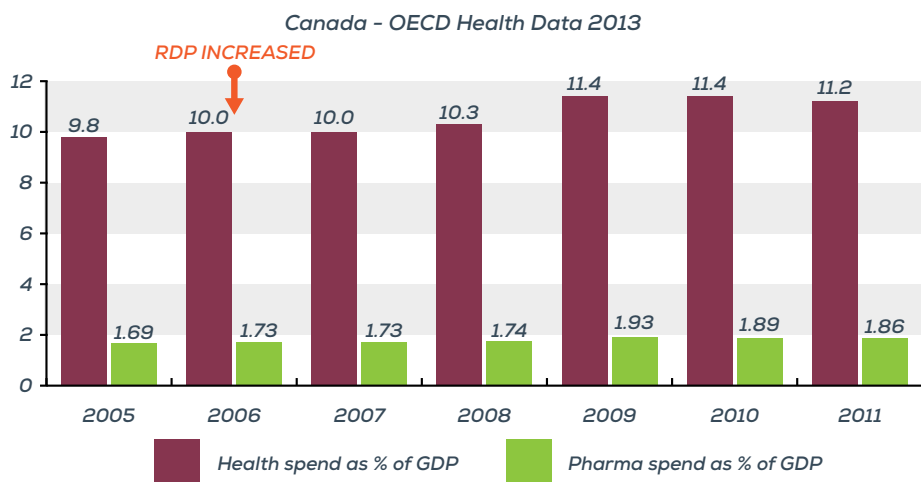


Figure 3
Health and pharmaceutical expenditure as a percentage of Canada's GDP (2005-2011)

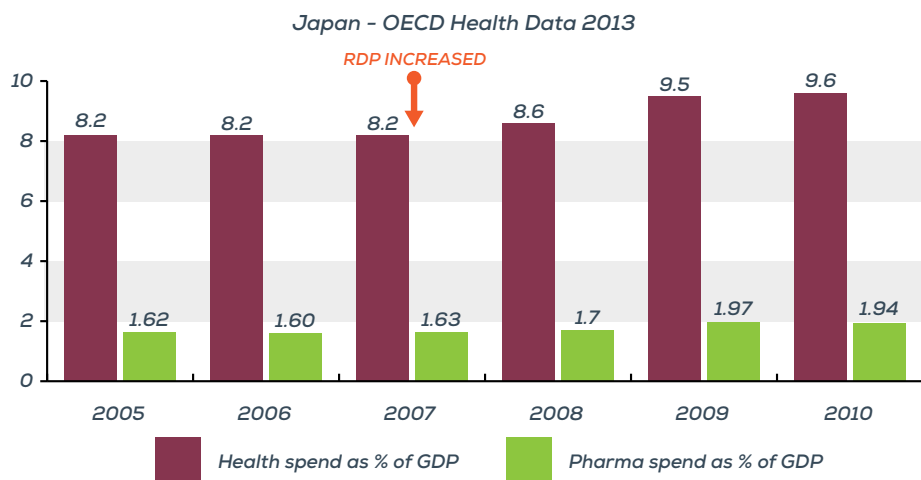


Figure 4
Health and pharmaceutical expenditure as a percentage of Japan's GDP (2005-2011)

Source: "Will increasing the term of data exclusivity for biologic drugs in the TPP reduce access to medicines?" Philip Stevens, Geneva Network, July 2015



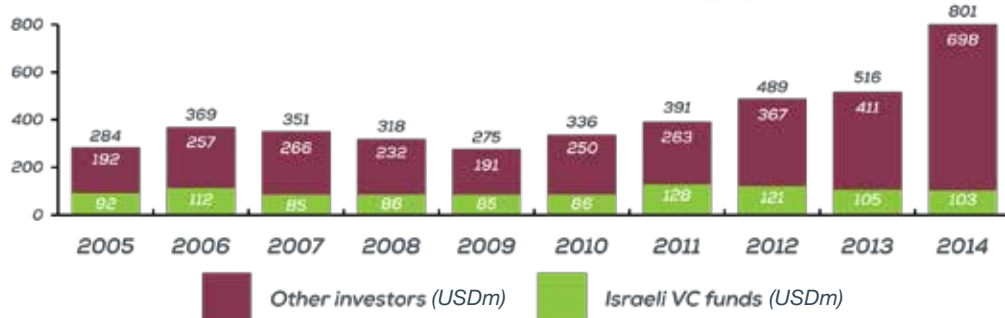


Figure 5
Capital invested by Israeli VC funds vs. other investors in life sciences, 2005-2014 (USDm)

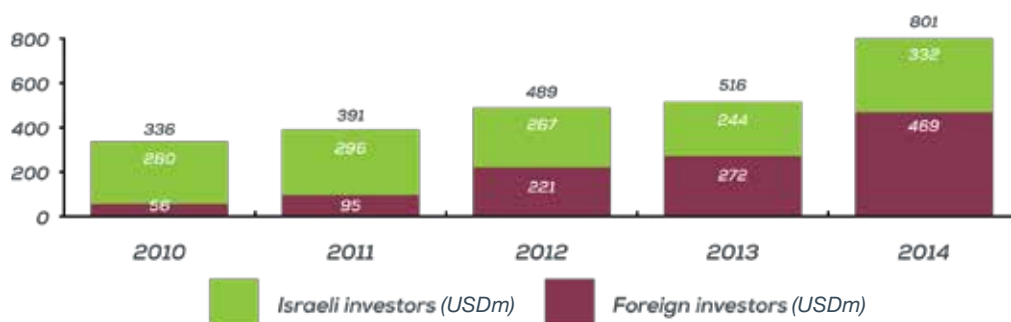
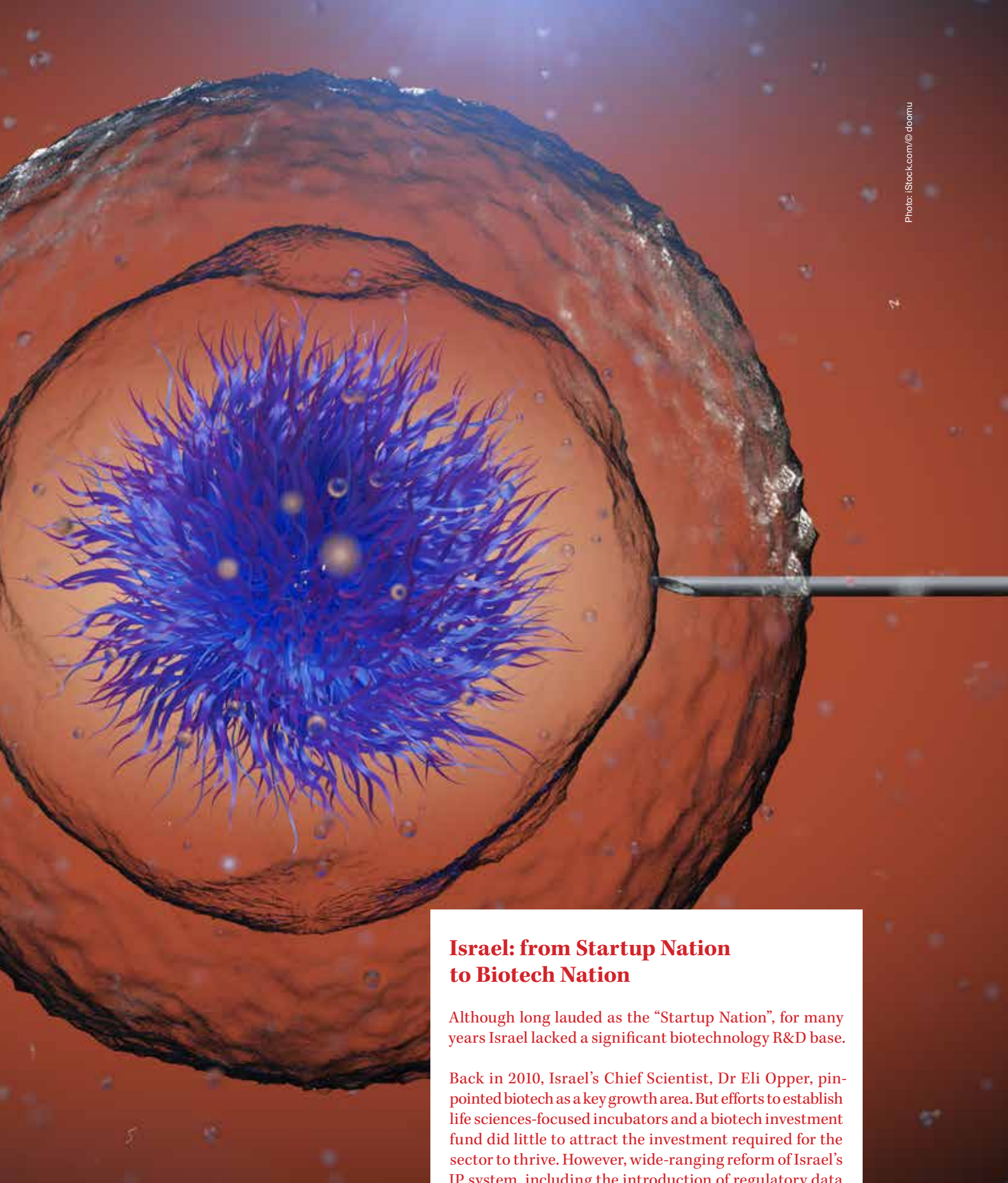


Figure 6
Capital invested in Israeli life sciences companies by investor: Israeli vs. foreign investors, 2010-2014 (USDm)

Considerations of the cost of regulatory data protection must also be weighed against the benefits that new medicines can bring. While regulatory data protection shields biologics manufacturers from biosimilar competition for a limited period, it also “incentivizes innovation, which results in the development of biologic treatments and cures that might not otherwise come into existence,” notes Dr. Lybecker. “These medicines benefit patients, and improve and extend lives. The result is healthier individuals and cost savings to healthcare systems.”

While depriving biologics innovators of regulatory data protection may seem an attractive option in the short term and may lead to more rapid commercialization of biosimilars, what impact will this have on the biologics pipeline in the long term?

“The reality is that venture capitalists are not required by law to invest in biotech,” explains Jack Lasersohn. “We could invest in social media and smartphone apps instead. But as a society, it is probably more important that we are able to fund the next Herceptin, rather than the next WhatsApp.”



Israel: from Startup Nation to Biotech Nation

Although long lauded as the “Startup Nation”, for many years Israel lacked a significant biotechnology R&D base.

Back in 2010, Israel’s Chief Scientist, Dr Eli Opper, pinpointed biotech as a key growth area. But efforts to establish life sciences-focused incubators and a biotech investment fund did little to attract the investment required for the sector to thrive. However, wide-ranging reform of Israel’s IP system, including the introduction of regulatory data protection for chemical drugs for up to six years, has triggered a boom in life sciences investment. Between 2010 and 2014, foreign capital investment in the sector rose from USD 56 million to USD 469 million, with the latter representing 59 percent of USD 801 million total capital investment in the life sciences in Israel.



The question of whether yoga poses can be copyrighted has occupied the attention of international courts, scholars and copyright offices for some time. What can be protected under copyright law essentially remains a matter of national law.

Yoga and copyright

By **Benjamin Beck** and **Konstantin von Werder**,
Mayer Brown, Frankfurt am Main, Germany

Can a sequence of movements such as yoga poses or dance steps be copyrighted?

It is a question that has occupied the attention of international courts, scholars and copyright offices for some time. In late 2015, it attracted media attention when yoga guru Bikram Choudhury tried to copyright a signature sequence of yoga poses in the United States, but failed before the Court of Appeals for the Ninth Circuit. Despite various international copyright treaties, the question of what is protectable under copyright law essentially remains a matter of national law.

On February 2, 2007, the Higher Regional Court of Cologne (Case 6 U 117/06), Germany, ruled that an acrobatic dance performance could, in principle, be considered a “work of dance art” subject to copyright protection under the German Copyright Act (Sec. 2, para. 1, No. 3). The required threshold of originality could, however, only be achieved if the performance went beyond a sequence of physical movements and conveyed a particular artistic message. Whether this ruling can be extended to yoga and exercise routines by analogy is not clear, but simple routines are not likely to constitute “personal intellectual creations” within the meaning of the German Copyright Act (Sec. 2, para. 2).

AN INTEGRATED, COHERENT, AND EXPRESSIVE WHOLE

In a further example, the United States Copyright Office, in a Statement of Policy from June 18, 2012, took the position that “a selection, coordination, or arrangement of functional physical movements such as sports movements, exercises, and other ordinary motor activities” did not represent the type of authorship intended to be protected as choreographic works under the US Copyright Act. However, a “composition and arrangement of a related series of dance movements and patterns organized into an integrated, coherent, and expressive whole” could rise to the level of original choreographic authorship.

OTHER IP OPTIONS

Even if simple yoga or exercise routines are unlikely to meet the minimum threshold of originality in most jurisdictions, a film or description of such a routine may qualify for copyright protection, as may a compilation of photographs of the routine’s individual movements. Additionally, exercise brands can leverage the value of their trademarks and make a profit from teaching their routines to others (through “train the trainer” programs) or from licensing their brand to fitness centers so that people familiar with a particular program know what to expect from the centers’ workout sessions.

This article was originally published on AllAboutIP, Mayer Brown’s blog on relevant developments in the fields of intellectual property and unfair competition law. Mayer Brown also has an educational YouTube series called CL-IPs to help online content producers understand IP issues.



34, chemin des Colombettes
P.O. Box 18
CH-1211 Geneva 20
Switzerland

Tel: +41 22 338 91 11
Fax: +41 22 733 54 28

For contact details of WIPO's External Offices
visit: www.wipo.int/about-wipo/en/offices/

WIPO Magazine is published bimonthly and distributed free of charge by the World Intellectual Property Organization (WIPO), Geneva, Switzerland. It is intended to help broaden public understanding of intellectual property and of WIPO's work, and is not an official document of WIPO.

The designations employed and the presentation of material throughout this publication do not imply the expression of any opinion whatsoever on the part of WIPO concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This publication is not intended to reflect the views of the Member States or the WIPO Secretariat.

The mention of specific companies or products of manufacturers does not imply that they are endorsed or recommended by WIPO in preference to others of a similar nature that are not mentioned.

For comments or questions, contact The Editor at WipoMagazine@wipo.int.

To order a print version of the WIPO Magazine, contact publications.mail@wipo.int.

WIPO Publication No. 121(E)
ISSN 1020-7074 (print)
ISSN 1564-7854 (online)