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Burning questions left unanswered about gene drives?

Trudi Zundel, ETC Group

On Thursday, the *Civil Society Working Group on Synthetic Biology* circulated a short fact sheet to help clear up four of the most common questions arising about gene drives. The answers to "Are all gene drives synthetic biology?", "Can gene drives be managed within one country under national biosafety frameworks?" and "Why is it important that the CBD act now?" are online at http://etcgroup.org/content/cop-13-gene-drives-faq.

Are gene drives naturally occurring?

In brief: The engineered gene drives discussed at COP13 are NOT naturally occurring elements.

The idea and concept of a gene drive derives from the observation that certain genes in nature persist and spread more aggressively than others. These more persistent genes generally are referred to as 'selfish' genes. However, to equal these 'selfish' elements with 'gene drives' is not accurate. Though they are to an extent based on naturally occurring systems, **CRISPR-Cas9 and/or other engineered gene drives are very different than these naturally occurring selfish genes. They are all strongly redesigned and engineered in order to alter or eradicate whole populations or entire species.**

Introducing CRISPR-Cas9 into an organism requires genetic engineering, and establishes a unique "cut-copy-paste" mechanism inside the organism that can replace, edit or alter a specific section of an organism's genome. This causes the organism to behave differently and to pass this difference to all their offspring. CRISPR-Cas9 gene drives do this cut-copy-paste during the reproductive cycle to make sure they are present in all reproductive cells (e.g. sperm or egg cells) and are thus always passed down to offspring - so if you engineer the expression of a specific trait through a gene drive, all future generations of the organism should express that trait as well as the CRISPR-Cas9 system.[1]

CRISPR-Cas9 imitates the way some bacteria defend themselves against invading viruses, just as the first generation of transgenics came from observing the way that *agrobacterium* infects plants. It is as wrong to call engineered gene drives natural as it is to call transgenic plants natural: they are both deliberately engineered.

Genetically engineering an entire species by releasing an engineered gene drive would be deliberate wide-spread human interventions in organisms and ecosystems, at a scale, scope and manner that has not been attainable before.

1 For more information, see Champer, Jackson, Anna Buchman, and Omar S. Akbari. "Cheating evolution: engineering gene drives to manipulate the fate of wild populations."Nature Reviews Genetics 17, no. 3 (2016): 146-159

Global targets: national action?

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Almost everyone is bottom of the class when it comes to complying with the Aichi Biodiversity Targets. Reports such as the one presented at this COP 13 by five major conservation organizations[1] and the last *Global Biodiversity Outlook 4*[2] indicate that efforts are not enough to tackle the environmental, extinction crisis we are going through. By now countries should have already developed, adopted as a policy instrument, and commenced implementing an effective, participatory and updated national biodiversity strategy and action plan (NBSAP); but only half have done so. Worse yet, 90% of these NBSAPs set targets that fall short of 20 global benchmarks. ./..

As a civil society organization, we have followed the NBSAP process in Argentina which has been far fromhaving an effective civic participation nor enriching, strategic discussions. The NBSAP, still an advance draft, is a simple conservation document of good wishes, with too vague goals, lacking ambition and harmony. It even sets national targets that fall short of the global ones (p.e. Argentina aims at protecting 4% of the sea and 13% of terrestrial and inland water, instead of 10% and 17% by 2020).

It has also little chance of becoming a reality on the ground as no first line decision makers from key state agencies such as Mining, Energy, Industry, Finance and others have committed to contributing to the achievement of the NBSAP. On the other hand, and in this line, the *Native Forest Law* - which created the first payment for ecosystem services system in the country - has been systematically under-financed by the Executive Power since its passing (2007), undermining its implementation. Recently, at the Argentine Senate, the agricultural and real estate development lobby has achieved lowering the environmental standards of a draft law that aims at preserving wetlands, ecosystems in serious retreat in the country.

Besides, the Strategic Plan of the Ministry of Agribusiness for 2020 states sectorial goals without pondering their environmental impact. Only a recent agreement between the Argentine Ministries of Agribusiness and Environment for the development of silvopastoral systems (cattle and forest) as a sustainable activity in areas where deforestation is prohibited -thanks to the referred Native Forest Law- emerges as some sort of mainstreaming; two conflicting agencies working together on an issue though, that sparks concern as its implementation can be tricky and end up in the degradation of forests.

Recently in a formal meeting, we asked to authorities in charge of the NBSAP process among other things: which topics will be your priorities? What commitments have you achieved from other state agencies? Have you identified incentives/subsidies harmful to biodiversity as to eliminate them or reform them? Have you developed a strategy for the mobilization of financial resources for effectively implementing the NBSAP given so far, the country has depended on international aid for this respect? The answer was no, that such a thing is a challenge and that we (civil society organizations) are very welcomed to tell them how and bring ideas.

It is almost 2017. Some countries might be able to tick the boxes “Country with developed or revised NBSAPs” or “Country with NBSAPs adopted as policy instruments”, but that does mean they are towards a real change for better for biodiversity at a national and regional scale, through ambitious, strategic and operative goals and targets, and an active citizenship? Just guess.

1 https://thought-leadership-production.s3.amazonaws.com/2016/12/07/15/33/12/1119cbd0-b781-4c44-b2b6-cc686af6e8f1/CBD-Aichi-Targets-Progress-Dec2016.pdf
2 https://www.cbd.int/gbo/gbo4/publication/gbo4-en.pdf

Which policy for which environmental issue?

Dominique Bikaba, Strong Roots Congo

Since its inception, CBD COPs have consumed great amounts of energy and resources producing policy documents but have not really accomplished the concrete implementation of measures to ensure the objectives of the Convention.

Lacking an assessment tool to estimate the linkage between the adoption of policies and recommendations and their implementation, produces a a considerable gap on how indigenous peoples and local communities are affected either by these policies or by the lack of their implementation in some regions covered by the CBD scheme.

The adoption of the Cartagena and Nagoya Protocols took a long time and required a lot of effort. Now we have to assess if this effort was worth it in order to perceive at least some changes on the ground.

As we look at local and global environmental governance, we see that key hotspots of biodiversity - including for indigenous peoples and local communities living in them - continue to be threatened by other “sister-conventions” and agreements.

In Congo (DRC) for example, the Eastern lowland gorilla that is endemic for eastern region of the country, has dramatically declined from about 17,000 individuals in 1998 to less than 4000 today. This 77% decline in less then 20 years has been driven mostly by mining on this landscape which constitutes their sole natural habitat worldwide. If nothing is done to slow down this decline, then this gorilla subspecies could go extinct in a few years. Minerals are for

gorillas in DRC, what palm oil is for Orangutan in Indonesia!

Still in the 1970s, my family and the members of my indigenous community (Batwa) and other local communities (Bashi and Batembo) were forcefully expelled from these forests - our traditional lands – because of our efforts to protect the Eastern lowland gorillas!

Looking back to the 70s when I was born, I can see these changes in biodiversity despite all the investment made in international conventions. We have enough evidence to question the way we see "biodiversity conservation" and the kind of policies should apply in this field. When sharing with my brothers and sisters from other regions of the world, I realize the case in DRC is not an isolated case.

I come from remote lands that are affected by the decisions taken at international "conventions and treaties." I came to Cancun to follow a negotiation process that intends to regulate our ways of living and our connections with nature. I am surprised to realize that after so many years, some people still have not learned the important role and contribution of all stakeholders. The concept of "free, prior and informed consent" is a historical matter that should not be under discussion any more.

We question the direction the CBD is taking towards the protection of the interests of big companies and governmental allies in detriment of the rights of indigenous peoples and local communities.

Jeopardizing biodiversity

Flexible environmental licensing in Brazil and the disconnect with the COP

Marcela Vecchione, Grupo Carta de Belem/Federal University of the State of Para

We all know that a play performed once and in one place is never the same when showcased to a different audience. When it comes to Brazilian *National Biodiversity Strategy and Action Plan* (NBSAP) and how environmental policy and legislation has (not) been taken care in the country, the inconsistency is sad as much as it is hazardous to biodiversity.

While Brazilian negotiators talks evolve based on the NBSAP which involves millions of hectares in conservation areas (including Indigenous Territories) and 22 million hectares of restoration - a much contested one as of these 10 million ha relies on degraded pasture lands - a law project is fast approaching its approval in the National Congress. Bill 3729/2004 proposes that the three stage environmental licensing process, including the previous license, the installation license and the operation license, turn into a fast track process based on self-declaration. It means, for example, that if Fibria, a big company in the tree plantations (*Eucaliptum*) sector processessing tree for celuloses production wish to have an area licensed, it may pay and organize the *Environmental Impact Assessment* (EIA) as wished, apply on a database to register the EIA for evaluation and, finally, have an expedite review of the process leading to approval; all electronically. Once everything is registered and cleared, the activity may initiate with no further verification after the project installation. The actual second and third stages (the installation and operational licensing, respectively), that verify if the company is abide by the environmental and socio-economic conditionals pointed out at the first stage, would simply be eliminated. In this case, the continuous contamination by pesticides, herbicides and fungicides, the cumulative effects on soil and ecosystems as a whole would just be put aside. As the country is allegedly on an economic (they rarely mention the political) crises, and we need to improve the balance in our accounts, the disparate finds justification and, more frightening, corroboration in the possibility of connecting the new model with environmental protection.

Incompatibility is evident. In a country where megadams and other huge development projects abound, such flexibilization, a clear reflection of ruralists interests associated with big agricultural companies as well as those in the mining, civil construction and logging sector, the flexibilization of the Environmental Licensing, the main instrument to implement the right to a healthy and balanced environment as guaranteed by Article 225 of the Brazilian Constitution, is a threat to millions of species and the six biomes present in the country. Moreover, it puts at risk the ability of the

social-environmental functions to recover and be recreated by indigenous peoples, traditional communities and smallholder farmers that make most of it possible. Biodiversity as an expression of diversities of ways of living in harmony with earth is thus at profound jeopardy. It is urgent the attention to the connection between this law project and the need of Brazil, as a party, to have a position internationally that truly reflects the sovereignty of a plural and megabiodiverse country and not just an under-represented national interest as it is in the actual Brazilian National Congress.

The cynical 17%

Why we should conserve biodiversity for people and by people instead of protecting it from people

Simone Lovera, Global Forest Coalition

COP13 is almost over, and especially if we succeed to get some last minute breakthroughs in the application of the precautionary approach to gene drives and synthetic biology, and the acceptance that true consent can only be free, we can look back on a pretty successful conference. One of the most important successes of the conference will hopefully be the explicit recognition, in many decisions, of the important role of community conservation initiatives like Indigenous Peoples and community conserved territories and areas and related traditional knowledge and customary practices in biodiversity conservation. The Parties to the CBD have also started to pay greater respect to the role, and rights, of women related to such initiatives, and biodiversity conservation in general, and committed themselves to more systematically mainstream gender in National Biodiversity Strategies and Action Plans.

Yet, there is still a long way to go, as one of the outcomes of the first round of *Community Conservation Resilience Assessments* that took place in 10 different countries in the course of 2015 was that community conservation initiatives are under serious threat by the trends that happen outside the areas that they protect, including climate change caused by tourism-related aviation to destinations like Cancun (one of the most rapidly expanding sources of greenhouse gas emissions), the expansion of monocultures of trees and other crops, unsustainable livestock production and extractive industries. One of the discussions at COP13 focused on "mainstreaming" biodiversity into these destructive sectors. But this term risks becoming a euphemism for planting a couple of trees back into an area where the forests was raged down for cattle ranching, or - worse - as compensation for the polluting flights that brought people to Cancun. Rather than mainstreaming biodiversity, we should mainstream community conservation, and make it the rule, rather than the exception. All over the world, community conservation initiatives have demonstrated that sustainable livelihoods can be developed in true harmony with nature. So why are they still seen as an exception? Why do we still take the cynical approach of protecting only 17% of our planet through protected areas and other effective area-based conservation measures, instead of striving for 100% conservation by people, and for people?

Let us look at this 17% target from a forest perspective.

According the 2015 Forest Resources Assessment (FRA), almost 60 countries in the world still have a natural forest cover left that covers more than 50% of their territory. Allowing these countries to “protect” 17% of their territory only would imply a significant forest loss, with devastating impacts on forest biodiversity. Moreover, *Sustainable Development Goal 15.2* calls for halting all deforestation and forest degradation by 2020. And the good news is that 129 countries have already succeeded to halt forest cover loss according to the same FRA 2015. Admittedly these FRA data are quite heavily disputed, also because there is an ongoing direct and indirect replacement of forests by monoculture tree plantations in many of these countries. Yet, the remarkable diversity of the list of countries that truly succeeded to halt forest cover loss, which includes countries from all continents and all levels of development, makes it clear deforestation is neither necessary nor desirable for development. Forests can easily be conserved, provided they can still be used in a sustainable manner by the communities that inhabit them.

So let us please reject the cynical 17% approach and go for the 100% forest conservation, and biodiversity conservation, that is mandated by both the Sustainable Development Goals and the CBD Aichi Targets. Provided conservation is done in harmony with communities, this can easily be done.