TEMPLATE FOR PEER REVIEW COMMENTS
TECHNICAL SERIES ON SYNTHETIC BIOLOGY

Contact information	
Surname:	Wiechert, Wolfgang; Zurbriggen, Matias
Given Name:	
Government	
(if applicable):	
Organization:	German Joint Study Group on Synthetic Biology of Society for Chemical Engineering and Biotechnology (DECHEMA), German Botanical Society (DBG), Society for Biochemistry and Molecular Biology (GBM), and German Chemical Society (GDCh) represented by Wolfgang Wiechert (on behalf of DECHEMA e.V.), Götz Hensel, Alain Tissier (on behalf of DBG), Matias Zurbriggen, Hanna Wagner, Gil Westmeyer (on behalf of GBM), and Christina Weinberg (on behalf of GDCh)
E-mail:	w.wiechert@fz-juelich.de; matias.zurbriggen@hhu.de

Comments on the Technical Series on Synthetic Biology		
Page #	**Line #**	**Comment**
0	0	The entire document suffers and loses credibility through the lack of a clear definition of what is considered synthetic biology. This leads to a confusion of synthetic biology applications with classical GMOs and with conventional genetic engineering. Overall, the document mostly ignores the fact that synthetic biology applications can overcome limitations of classical agriculture and GMOs with respect to invasiveness and potential harm. The rational design phase inherent to synthetic biology contributes to a tighter control over the product organism. It is possible to establish reliable containment strategies. In many passages the tone of the document implies that synthetic biology organisms would principally carry a higher risk than, for instance, introducing whatever non-GMO or GMO organism in each environment. It is hence not sensible to evaluate them on different grounds. The document misleadingly confuses gene editing with gene drives; the underlying agenda is apparently to discredit gene editing as a method. The apparent intention is to counter a regulatory approach that considers the product and not the process or means involved in generating such organism, for instance in regulatory frameworks for feedstock/foods (EFSA, USDA/FDA). If the product of an edited organism (plant) is not

		different (environmental risk, nutritional aspects) from a corresponding wild type, naturally occurring or randomly induced mutants, or a conventionally bread organisms, then there are no scientific grounds for considering or regulating it differently.
8	6-8 & 15-20	In principle a potential risk to biodiversity would only arise from an organism that is released to the environment (in the sense of an unmanaged or wild setting). The remainder is just carried out comparable to normal agriculture, animal production. As a general thing and given that by definition one knows the produce in principle perfectly or better (synbio) than when making (natural) hybrids, etc, the guidelines to be applied in all three contexts, should by no means be harsher than those applied to any other modified or unmodified organism.
8	13-15	CRISPR/Cas9 and other genome-editing approaches that do not transfer foreign DNA into genomes hardly meet the criteria of a "synthetic" biology. In a number of countries, the resulting products do not fall under GMO legislation at all.
8	32-34	Synthetic biology products are rationally designed products whose genetic modifications are precisely known which is the basis of evaluations by some regulatory bodies.
8-9	42-2	Synthetic biology tools allow for the rational, targeted design of production organisms, including plant cells and plants, far exceeding the precision of traditional breeding and genetic engineering methods. Given the various options of controlling the emergence of unwanted traits, regulatory oversight of synthetic biology in agriculture shall at least not be more restrictive than it is for conventional breeding.
9	3-11	This holds and is inherent for any economic or technological activity. It is unfounded to single out synthetic biology in this context.
9	28	Gene drives targeting disease vectors or invasive species are potentially harmful to biodiversity due to their capacity to propagate through populations. With the exemption of this application, products of gene-editing do not differ from other "conventional" GMOs.
9	34-49	Gene-drives are special applications of gene-editing and cannot be regarded representative of all synthetic biology applications, as the text suggests. Synthetic biology allows for the production of pharmaceutically active natural products by engineered microorganisms – independent from natural sources (plants) and thus preserving valuable eco-systems and biodiversity.
10	1-9	Most of what is described here cannot be considered synthetic biology products
10	26	Synthetic biology has been recognized as a discipline in life sciences since the turn of the century.
10	44	Genome-edited crops are not products of synthetic biology.
10	45	Genome editing serves for targeted mutagenesis, gene drives is only a very small niche application.
11	11-26	This is a general effect of any human interference with ecosystems (e.g. introduction of novel crops or livestock). Why regulate synthetic biology any differently? In contrast, the modifications of engineered organism are perfectly tractable, thoroughly described, and allow for efficient control.
11	24	The "complex web of potential interactions" is not exclusively typical of synthetic biology – it rather is a definition of any economic activity,
12	12-15	Compliance with biosecurity guidelines and expertise in biosafety and biocontainment practices must be demanded from professional scientists and amateurs.
13	18-21	There is no need to expand the mandate of CBD into regulation of SynBio. General regulation of products from synthetic biology likely is an obstacle for the transition from fossil to renewable ressources (bio-economy) as it favours traditional chemical production of the same products. It should be noted that the traditional production of natural product-derived pharmaceuticals or fine chemicals and solvents requires ressourcing largely from plants thus exerting tremendous stress on natural ressources and ecosystems.

14	Table, 2nd row	Genome-edited plants cannot be considered synthetic biology products, not even GMOs. The examples are classical genetically engineered products. The lack of a sound definition of a synthetic biology product is obvious.
15	13-16	Biotechnology based on traditional genetic engineering is not synthetic biology. The latter rather is a suite of very efficient and precise tools allowing for precisely constructing biosynthetic pathways.
16	26-28	Almost all examples are from classical genetic engineering (Sections C and D).
17	1-3	This actually leads to safer products
17	9	Synthetic biology emerged later, around 2000 when reports on the de novo construction of genetic circuits were published.
24	37-42	A matter of definition: Usually, protein engineering is not subsumed by synthetic biology
27	1-5	Protocells and minimal cells in are, with regard to their dependence on other cells and cell components, non-living systems as stated in the text.
27	29	Xenobiotic strains will be orthogonal organisms not posing any ecological threat.
28-29	28-10	Cell-free technologies provide non-living systems, unable to replicate and thus not relevant in the context of regulation.
31	24-26	Certainly not an example for synthetic biology (point mutations, no foreign DNA etc). An identical trait achieved by selection for naturally occurring mutations is marketed by BASF.
31-32	34-4	Most crop plant examples listed here should not be considered "synthetic biology", most carry single base mutations or small deletions/insertions. Products "made with CRISPR/Cas9" would not be regulated as GMOs in several major markets.
32-33	39-2	Targeted mutagenesis is confused with synthetic biology throughout the document: The knockout of a particular gene can also be achieved by random mutagenesis, however, with less precision and more potential risk. The resulting cultivar neither is a GMO nor a synthetic biology product.
33	13-16	"Synthetic beneficial microbiota" usually means consortia of naturally-occurring bacterial strains (synthetic microbial community). It has nothing to do with genetic engineering or synthetic biology, despite the use of the word "synthetic".
34	8	These are transient, non-inheritable modifications.
34-37	34-19	Many of the examples are the result of typical classical genetic engineering/biotechnological approaches. Most of these products should not fall into CDB mandate, as they are indistinguishable from the natural or chemically synthesised compounds.
38	22	Protocells are not living organisms (see above).
38	36-41	A virus is not a microorganism.
36	16	There is no need to extend the CBD mandate to DNA synthesized *in vitro*.
40	5-17	Regulation of products from synthetic biology approaches is pointless as they are no different from chemically synthesized compounds; biotechnologically produced vanillin is a prime example.
57-60	Section 6	The lack of a clear definition of synthetic biology leads to confusing synthetic biology applications with classical conventional genetic engineering.
69	21-30	We support the view that "most synthetic biology approaches result in GMOs that can be assessed according to the existing (national) regulatory frameworks, the applicable European Directives (2001/18/EC and 2009/41/EC), and the Cartagena Protocol."
129	34-37	This knowledge gap affects all approaches of breeding and engineering organisms. However, the DBTL cycle of synthetic biology achieves the highest levels of understanding of a GMO and its properties, thus minimizing potential side-effects.
134	29-32	Engineered organisms produced by synthetic biology methods represent no further risks when introduced into the environment than a given non-GMO or GMO organism. Therefore, it is not appliable to evaluate them on different grounds. Gene drives require regulatory oversight.

Please submit your comments to secretariat@cbd.int.