# How Has Science come to be Recognised and Institutionalised as a Public Policy Resource in the Past (~)Eighty Years?

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***Science and Policy in Times of Multicrisis and Dissent: Issues of framing, authority, evidence – and political-economic power***

# This Talk: an outline

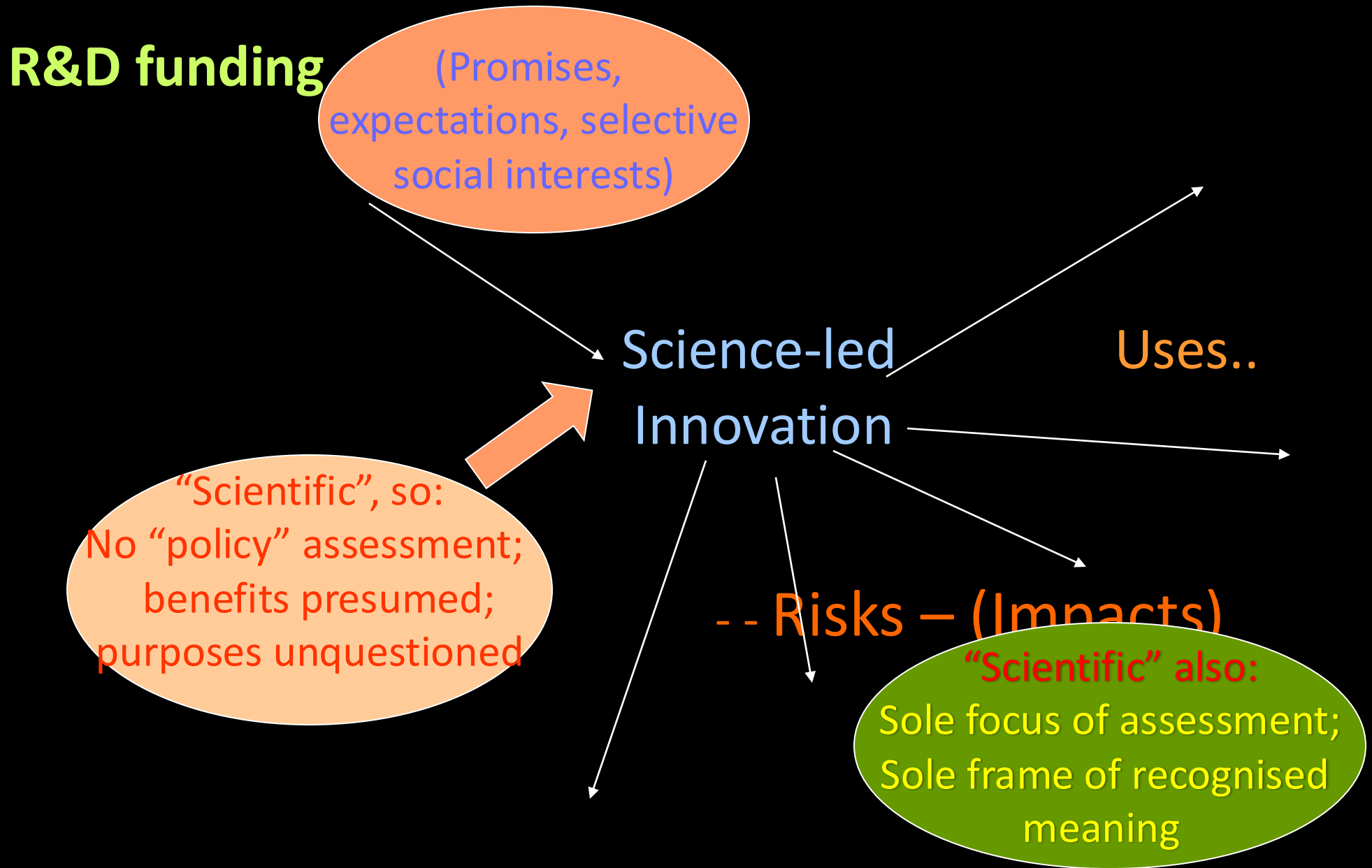
A cultural perspective is essential, especially on science, for understanding the mess we are in - (scientism as political solace?)

1. The *different* versions of 'science' and 'policy' in play, and the *confusions* across and between them. Where is "*the* interface"?)
2. From **risk** alone as the issue-question, *to promised innovations. Rational need, but ignored.*
3. Via the Qs over so-called "uncertainty", to *Upstream* Qs, about purposes, need, etc
4. Thus, from science for policy, to *include* policy(ies) for science and innovation.
5. These, essentially social-political issues, are now under private control
6. What is 'science' as if 'just knowledge', actually covering? public policy issues then being hidden as if just 'nature speaking' (policy, & **POLICY**)
7. From RA focus (DOWNSTREAM), to Qs re benefits, alternatives (UPSTREAM) – Need much wider framework than just RA, with wider and deeper (upstream) Questions.
8. "Scientific" authorities declare TINA. (Legally, they are not allowed to ask about alternatives)
9. Yet, Scientific reasoning and research is flexible! In *mutual* relationships with new stakeholders, it can explore new questions, in new ways; and thus provide new innovation trajectories not yet imagined or tried… Eg, participatory plant breeding for sustainability
10. "Science and Policy" cannot capture the post 1980s political-economic issues pervading - and reshaping – both…

# My Underlying Concerns…

- To explain why we need fundamentally different terms for describing "Science and Policy..". Existing language rests on normative ideas that are misleading, unjust and unsustainable;
- We are missing some essential historical angles. So I review developments over the period in which "science" has become a dominant force in "policy decision-making" –approx. 1945-2025…
- - and show at least some of what has been left out of this framing of the descriptive language of modern Science and Policy – "***science informs; policy decides",*** or - ***Facts first; then (& only then) social values***;
- Erik will explain this next, for the pervasive and defining domain of "Risk";
- I will complement this by addressing the implications of the dominant neglect of, almost taboo on, deeper values-questions which are central to democratic politics, but which are silenced by the exercise of private values as if they were '***only nature (ie, science) speaking***'
- The excessive purification of "nature (science)" from human (values) has granted political authority ("legitimation") for 'science-informed policy' over several decades. Yet post-war history shows both science and policy have become dominated silently by global private-corporate and 'philanthropic' interests, which define both ends & means, by controlling scientific knowledge, research, & investment;
- "Science" as "understanding better" has been usurped by instrumentalist prediction-control, then further, by commercial imaginaries of scientific knowledge-markets, IPR assets, where hype and promise are central; evidence disciplines little; and democratic influence over 'policy' or (techno)'science' is declining alarmingly, while private technoscientific empires grow virtually unregulated.

# Knowledge and Innovation Life-Cycles



# Scientific-technological innovations have shaped society more than democratic elections. Yet the only part of the full(schematic) innovation life-cycle where questions are asked about tech-scientific innovations, is at the most downstream - RA for regulation.

For the upstream parts, decisions about what R&D to fund (or not) , and which innovation-trajectories to aim to develop, are private to select groups. R&D choices usually narrow what innovations are even possible, but R&D may also generate unimagined innovations. There has been endless policy conflict about ”managing” research, or leaving it to free scientific unpredictability.

Not only for technical reasons, but also for ‘system-inertial’ ones, upstream commitments constrain downstream freedoms in many ways, but still remain open to surprise new, perhaps user-led innovations. As I suggest here, ‘science’ is increasingly integrated with varieties of economic, organizational, technical, material and practical drives, where boundaries btw those different components become unclear. Over the last ca 25 yrs, a recognised momentum has built, though unevenly, towards more socially responsive forms of UPSTREAM choices and trajectories, even in research. However a corollary has also been a problematic reduction of public engagement only to the most downstream issues of risk and security, when social research and public debate shows repeatedly that typical publics have far broader legitimate concerns about innovations, that is about the very upstream processes and actors, which the focus only on downstream risk assessment excludes from social accountability!

A key point from this schematic figure, is that in the world of public debate and policy, the *public meaning* of issues of new technologies, often on the edge, if not already in the fire, of intense public controversy, has been reduced to the single dimension of RISK, and its attendant uncertainties (also reduced to “imprecision”, as the up-coming “Conventional Wisdom” of Science and Policy slide explains: see Wynne, 1992; Stirling, 1997). This reductive and false framing also blanks out the whole series of more difficult but crucial political issues as to what social and economic life is for – what does it mean to us, beyond the relatively clear issues of safety, or risk?

This reductionist ‘downstream’ framing of such typical public issues is I argue, seriously unjust and unsustainable, with a corresponding pressure to promising short-term benefits which may never arrive, and only generate yet-more public mistrust. This becomes an issue of how we understand the best way of doing “science” for “policy”

# So what of Policy for Science?

- Which 'Science'?

- Production-oriented (innovation-) science?
- Or protection-oriented science?
- If protection-oriented, do we mean *research*? or *advice*?
- "At a UK Advisory Committee on Toxicology (CoT) meeting in London 28 March 2006, in a discussion of evidence indicating that a group of compounds might exert a human carcinogenic effect, a member of the committee said: "We [i.e. The members of CoT] have a particular responsibility to seek to avoid false positives". None of the other committee members contested this remark; none suggested that avoiding false negatives was equally, or at least as, important" Millstone *et al*, 2008

So the norms of production-science ("no false positives") also define the norms of so-called protection-oriented science. This was not decided in any overt 'policy decision' – the highly normative, *unscientific, policy-loaded* comment was treated as (privileged: independent, objective) Science

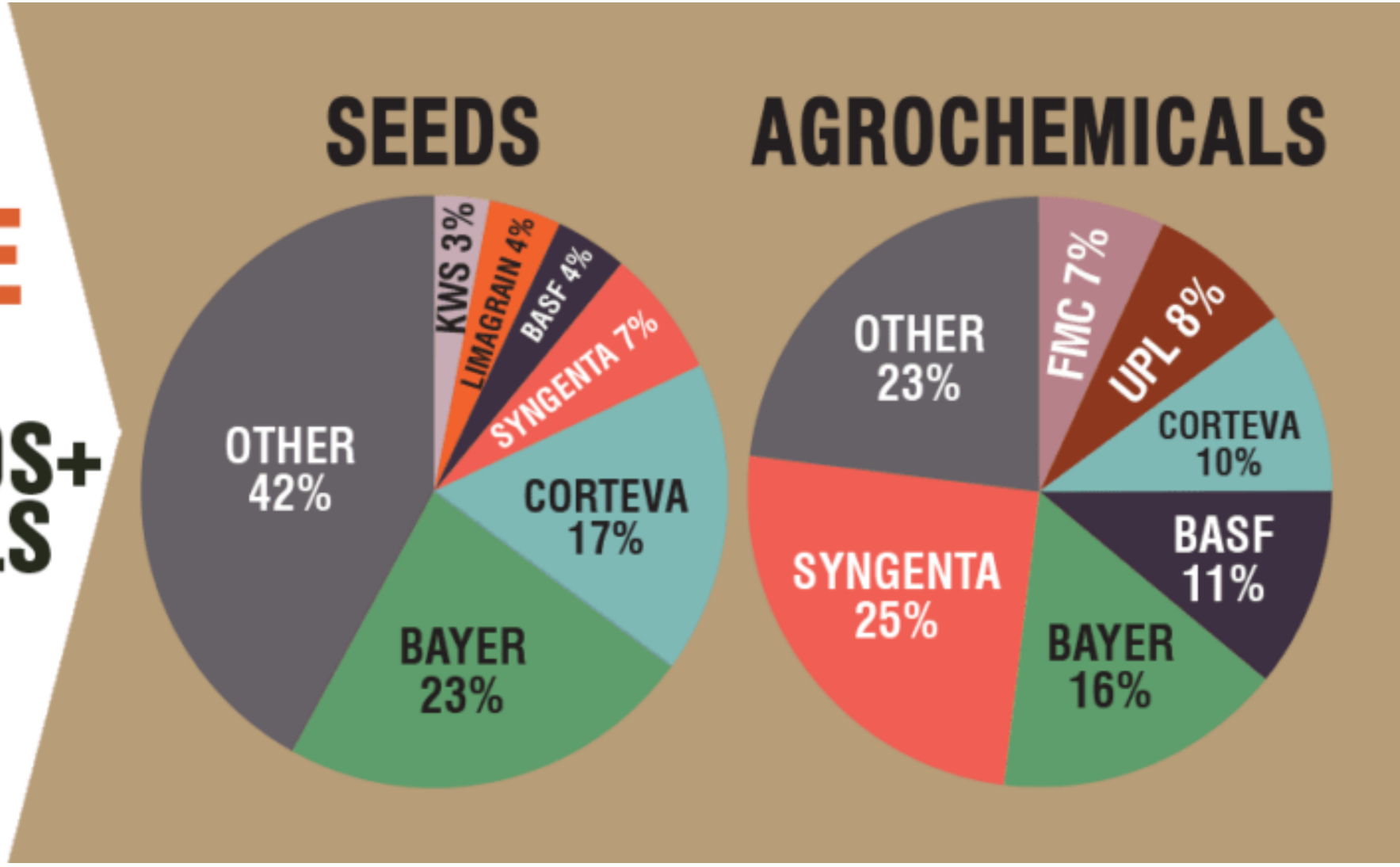
# From Risk to Innovation

- When we examine RA *rigorously*, including its *inherent* limitations as well as its *induced* limitations, logic entails that we address the upstream questions of innovation –
- which trajectories?
- What purposes?
- Whose needs?
- Whose benefits, if these ensue?
- What  better alternatives might be foregone?

Need to expand, from Risk-Governance, to Innovation-Governance.

These Qs included in Norwegian Gene Technology  Act of 1996, nowhere else

# CORPORATE CONTROL IN GLOBAL SEEDS+ AGROCHEMICALS




These mergers, takeovers, and concentrations, with intersections btw seeds and agrochemicals technologies and markets, mean that R&D investments focus more on creating larger IPR portfolios than on better crop-traits. Science is thus directed more into private commercial interests, before public needs for seed-diversity, less contaminated food, and greater biodiversity/sustainability

# Social Assessment of Innovations, Technologies

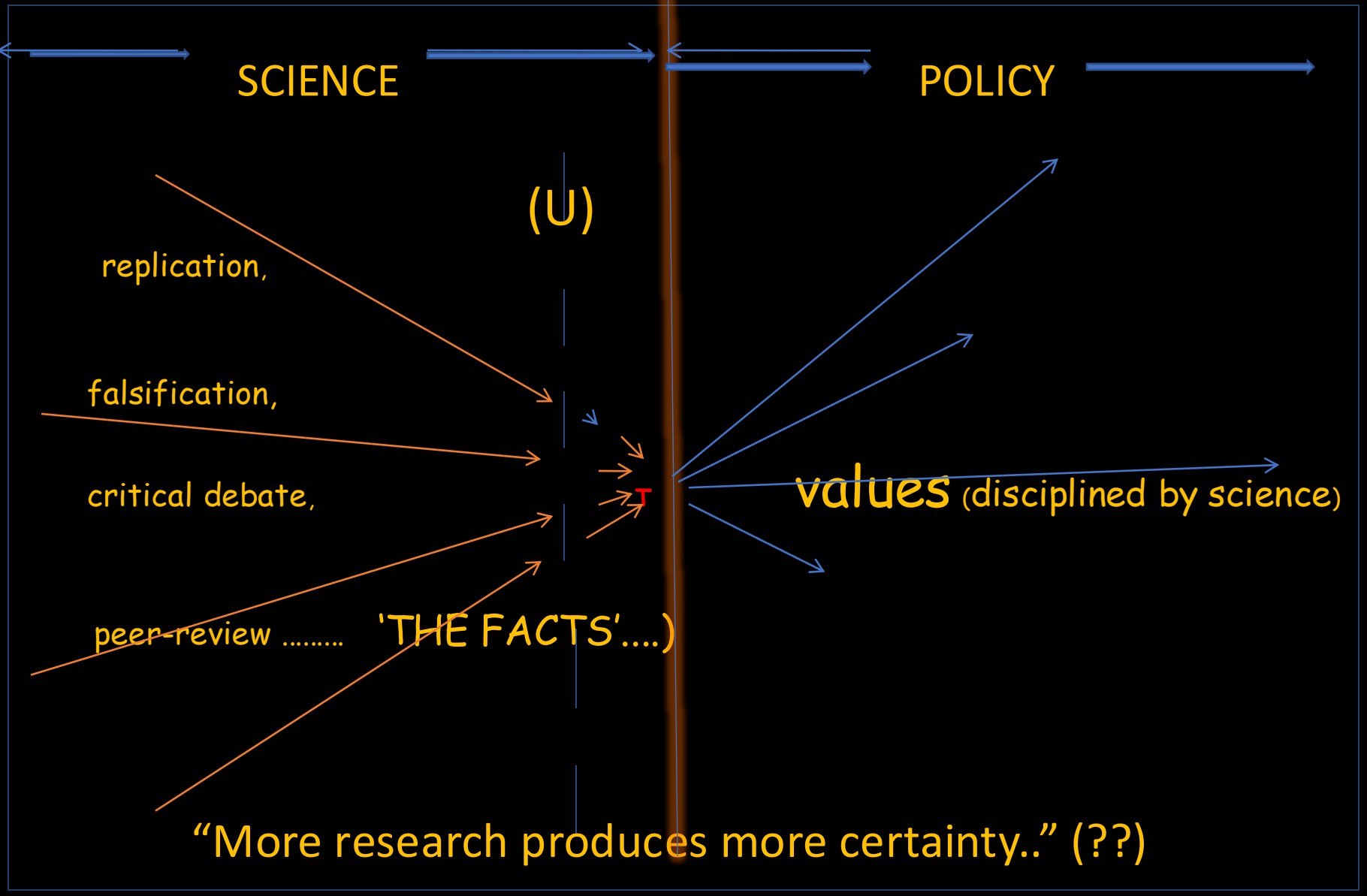
- Until ca 2000, and continuing predominantly, all government (public) appraisal of tech innovations was *solely Risk Assessment, ie totally downstream,* too late properly to assess equally, maybe more important issues like what benefits?, or alternative possibilities.
- Public controversies, as "uninvited" social interventions (Wynne, 2007), did attempt to pose such broader and less scientifically defined issues
- After ca 2000, policy bodies began to recognize the need to address more "*Upstream*" issues; but they still attempted this only using familiar, scientific, methods, which left them still imposing on publics, the false idea from five decades earlier (nuclear), that their issue-meanings could only be "Risk".
- Next slide gives EU and UK examples:

# Innovation concerns and questions, translated to Risk concerns only:

- the EC Communication on nanotechnology (April 2004) highlights the need for upstream two-way public dialogue, **"to identify and address safety concerns (real or perceived) at the earliest possible stage"**.
- The London Royal Society July 2004 report on nanotechnology, emphasising the need for ***upstream*** public engagement, but then repeats the same assumption re *earlier prediction of impacts*, nearly ten times in one chapter!
- **This "enlightened" policy-shift completely misses the "upstream" point**
- **Many similar examples from GMOs and other issues ('risk only')**

**(In the 1950s, when local concerns about nuclear power stations were mobilised into protests, the only official understanding of such publics was that they were exaggerating the real risks (as "known" by official science, to be "acceptable"). Other legitimate public concerns, eg about nuclear weapons connections, blanket secrecy and utter arrogance, unexplained need, were thereby deleted from policy-responsibility…). This "policy" blindness about typical publics continues….**

# "The" Science-Policy Interface:
## the conventional wisdom




"More research produces more certainty.." (??)

# Scientific knowledge for policy, eg regulation (RA) is:

(i) pre-framed to selective questions only, by law and policy (yet still called “science”)

(ii) necessarily synthesised, from several or more specialist research knowledge-domains → (MacKenzie, 1989: Certainty Troughs)

(iii) The knowledge is interpretively-directed and controlled, by factors outside science

(iv) uncertainties are treated in ways totally different from *research* science

(v) yet regulatory science trades for public authority on the false image of *independent* science – as if it were the same “science”

# Basic science as completely detached?

"Interventionist goals [and visions] shape representational strategies, and…from its very inception around 1930 the molecular biology scientific programme was defined and conceptualised in terms of technological capabilities and social possibilities.. the ends and means of biological engineering were inscribed into the molecular biology research programme at its outset"

Lily Kay, 1998

# The Values of Molecular Biology II

"Scientists and patrons came to share a molecular vision of life. As such they became co-producers of a discourse that represented organisms as the genetically directed activity of molecules and viewed the study of microorganisms and proteins as the surest path to controlling human physiology. Though not an applied science, molecular biology in the 1930s and 1940s was mission-oriented"

Lily Kay 1998

The "molecular vision of life" was what STS and HofS scholars call a socio-technical imaginary (Jasanoff and Kim, 2009), combining technical with social ideas, normative and propositional together. Yet this molecular biology was defined as '*pure science*'…

# The Values of Molecular Biology III

"the underlying epistemic commitments of molecular biology survived the paradigm shift from a protein base to a DNA base – and survived the change in patronage (from private charitable foundations like Rockefeller, to public and industrial funding). The premise that the soma and psyche are essentially the outcome of the genetically determined activity of macromolecules, and that these mechanisms of upward causation (from gene as molecules, to whole organisms) should be the principal basis for intervening in higher order life processes, has acquired even greater intellectual vigour and social legitimacy, braced by institutional and commercial interests which dwarf the millions of dollars of the Rockefeller Foundation"

Kay, 1998

# Science as *Techno*-science:

- *Representing* is intervening (Hacking, 1992)
- Intervention as *programmed* extraction

"With the possibility of manipulating the genetic production program of an organism by its own, unmodified and modified components, the molecular biologist as engineer abandons the working paradigm of the classical biochemist or geneticist. He no longer constructs test-tube conditions under which the molecules and reactions occurring in the organism are analysed. Just the other way round: ….. he uses the milieu of the cell as their proper technical embedding. The intact organism itself is turned into a laboratory. It is no longer the extra-cellular representation of intra-cellular processes, ie the understanding of 'life' that matters, but rather the intra-cellular representation of an extra-cellular project, the deliberate 'rewriting' of life…This intervention aims at *reprogramming* molecular actions, not just interfering with them" (Rheinberger, 1999)

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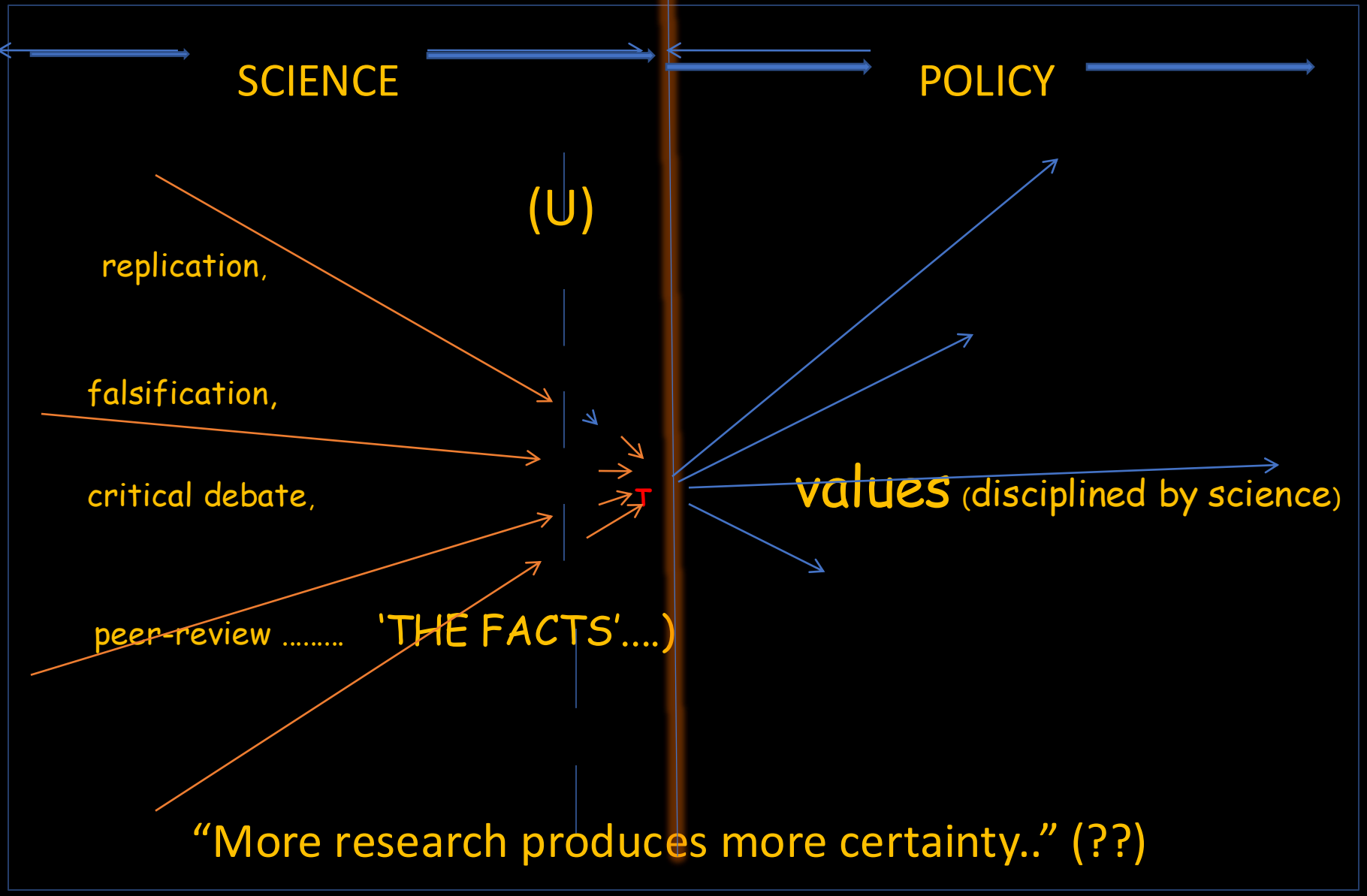



“More research produces more certainty..” (??)

# Previous slide, the dominant conventional wisdom – "TRUTH" as we know it?

## "MORE RESEARCH PRODUCES MORE CONSENSUS"..??

But in public controversies involving science (misnamed "scientific controversies"), as Nelkin and coworkers found (1979, confirmed endlessly since), more research+'debate' only *elaborates/extends* such conflicts. This shocks scientists, policy actors, everyone, because they are deeply sunk in the conventional wisdom – but the contending sciences are in reality, also driven by (tacit) prior *values*-differences.

# Policy for Science: what ?

- Science Policy, as traditionally known; that is, policy about what fields, or trajectories of scientific research should be invested in, *by governments, influenced supposedly by democratic concerns and priorities* - "POLICY".
- During WWII & after (Cold War, 1947-1991), military ("defence") R&D dominated govt. funding of science globally, but overall scientific R&D funding has been increasingly dominated by private industry, including military. In the UK for example, government funded little more than 10% of private industry's share of a GBP44.4bn total in 2020.
- Moreover, internationally, government R&D funding is directed by "scientific committees" containing private industry scientists, and "independent" scientists some with industrial grants and consultancies, thus conflicts of interest.
- "Science Policy" as organised in practice thus also protects from accountability private corporate influences silently shaping the "independent" R&D which receives funding, at the expense of alternatives which may be socially more beneficial, even if less profitable for private corporations.

# The Post-WWII shift from public to private science

Several illustrations, following slides…

- all sectors affected, differentially; but same overall direction – maximizing (what social good?)

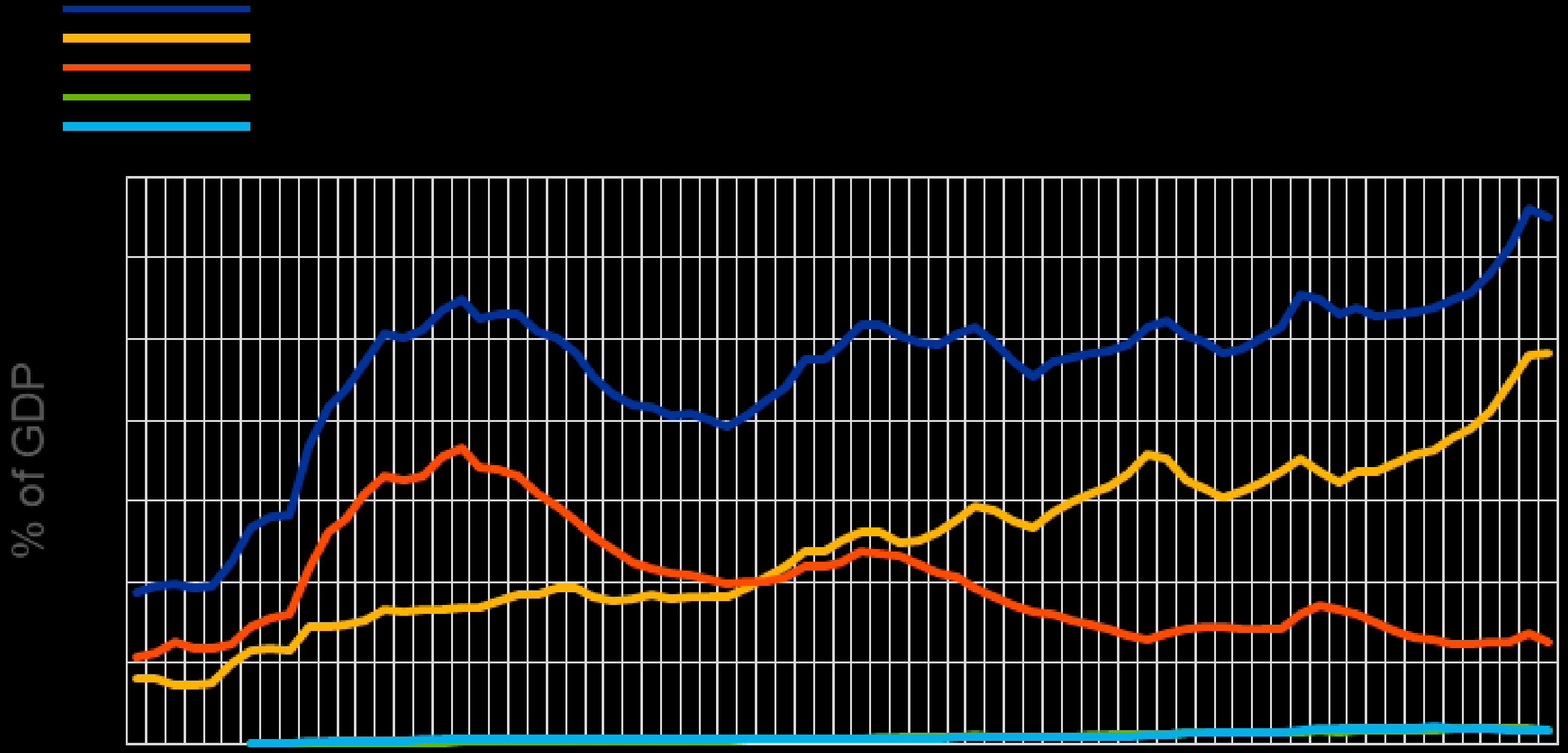
- intellectual property rights (IPRs), crucial: private ownership/control of IPRs becomes *business model* for multinational corps, eg Bayer-Monsanto R&D devoted to extending Round-Up IPR (glyphosate herbicide-tolerance), innovation only *legal-commercial* value for corporation, but even as failed product in agric. terms, commercial corporate success.

- digital "precision" farming innovations elaborate 'legal' IPR-monopolies further, through *novel (IPR) algorithms* – for sale or licensing…

- Sunk commitments in the overall trajectory includes: R&D&I (plus eg legal sunk costs too);

- R&D&I is increasingly conducted through (and within) *agglomerations* of 'components' – science; commercial market-creation; coordinated services-technologies; societal 'lab' experiments (Krohn and Weyer, 1988: MacKenzie 1989), including eg Israeli military testing of US commercial AI experimental 'precision-targeting' of missiles in Gaza - *huge* complex networks.

- Difficult to define boundaries within such networks – epistemic, economic, organizational, material, normative, and so on - Which is "the science"? Which is "the policy"? What or who is intersecting with, influencing, or being influenced by, what or whom? If governments are beholden to global private corporations, which also control science, & communications, a more realistic, inclusive - and more complex - language than "science and policy" is urgently needed.


% of GDP

# The Case of Global Food, in Outline

(Recall - *Distribution* is main problem, still enough food *produced*, if only…)

| | Est.(~)Annual Cost |
|---|---|
| • 2bn people globally, starving, under- and mal-nourished | 2.43 $Tr |
| • 2bn overweight and obese; | 1.62 $Tr |
| • One third agricultural prod$^{n}$ lost or wasted, annual cost | 1.1 $Tr |
| • Land-use change/degradation – food-prod$^{n}$ loss, annual cost | 0.53 $Tr |
| (this not including agric. $CO_2$ emissions, est. annual cost. | 0.27 $Tr |

Yet to be accounted for: (i) Biodiversity losses beyond land-use change, eg loss of pollination-services; lost wetlands; (ii) health-costs of chemicals, water-degradation; (iii) growing anti-microbials resistance… (van Nieuwkoop, 2019)

On current trajectories of "science" and "policy", the increasingly extreme inequities of *access* to adequate food will only get worse. The real question I suggest, is whether existing and increasingly dominant modes of production – not just the **technology, but the agglomeration of which it is an "essential" part (a particular global economic, technoscientific and political system) – should be fundamentally changed, and available but neglected alternatives supported instead. Is such radical change even imaginable, now ?**

**By *us*, maybe not**

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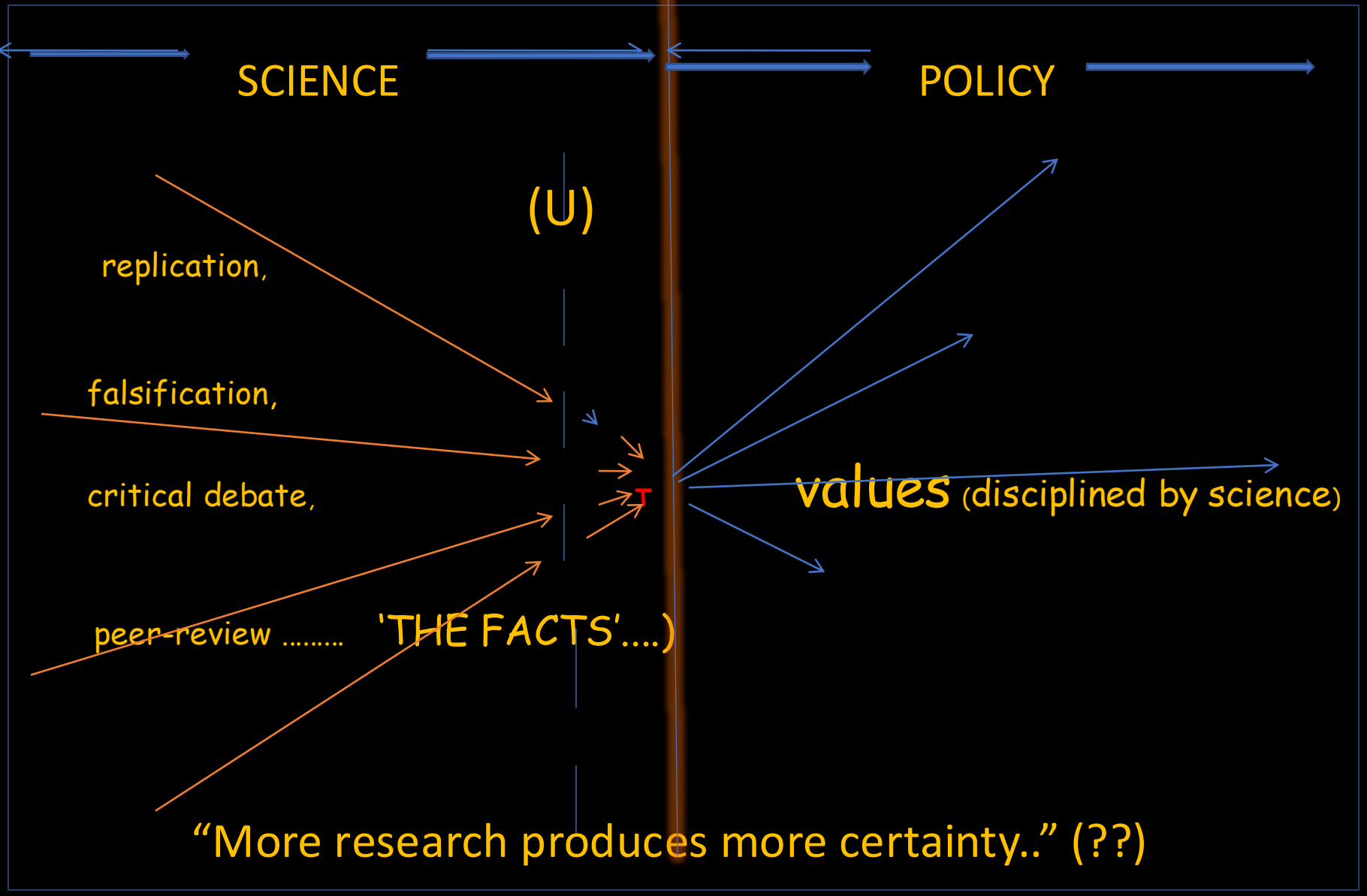



"More research produces more certainty.." (??)

# *Drilling* for Knowledge – postgenomics, systems biology, and the ends of knowledge

"With a top-down approach which characterises much of today's system's biology - focusing on pathways studies because the number of molecular development pathways is more manageable with perhaps 150 at most, versus the unwieldy numbers of 30,000 genes and 250,000 proteins - researchers start at the phenotypic or event level of a disease and drill down through functional pathways to only what is important in a specific disorder, because that disease phenotype is what they want to change"

J. Mack, "Can complexity be commercialised?" *Nature Biotech*. Oct 2004

# Extractive Epistemics, continued…

*"..to speed up drug discovery and development and to make it much more efficient"* and *"to use information from disparate data-sets to create computational models that can describe and predict phenotype at the cell, tissue or organismal level [so as to assist commercial drug-development]"* - for *"systems biologists to come up with tangible results* ***to show investors.*** *"* **– *pure <u>science</u>* ???)**

(Mack, *Nature Biotech,* 2004)

# Can anyone cite a "*policy*" decision to do this?

- 'Policy' is a mysteriously complex and shifting thing;
- 'Decisions' are only one element of 'policy';
- 'Commitments' is maybe a better description; but specific imaginaries are also in play, shaping conscious framings;
- Many important issues and commitments are, deliberately or unknowingly, *kept off* overt policy agendas;
- This occurs incessantly in science (risk assessment) for policy: in the front-end framing of the 'RAP' – Millstone later – mandates for the RA science; in its conduct and judgements; and in its uses as justification-authority; As Latour-Woolgar note (1979), even in lab micro-deliberations, scientists (like policy actors, and most others), are always preoccupied over their 'credibility/ authority' with multiple audiences; and this shapes the knowledge they authorise collectively, as Science.

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

# Putting the New Vision for Agriculture into Action: A Transformation Is Happening

A report by the World Economic Forum's New Vision for Agriculture initiative, 2010-2030

Prepared in collaboration with McKinsey & Company, 2012

"The Food System: A Major Economic Development Opportunity at a Time of Crisis" (echoing Klein, *The Shock Doctrine:* The Rise of *Disaster Capitalism,* 2007) "The New Vision for Agriculture sets goals of 20% improvement per decade on each of its three goals: economic growth and opportunity; food security and nutrition; and environmental sustainability" (p.3)

(Also, "a new investment opportunity…)

The Report lists the stakeholders who are to be enlisted and engaged in this radically ambitious, "transformative global programme":

- international, national and regional policy agencies/governments;
- funding and investment partners;
- food, agriculture, land-use, development and trade economics R&D experts;
- nutritional science, especially developing country expertise

Farmers are simply *excluded as stakeholders from* WEF's vision, of its salvationary "Transformation of Global Agriculture`"

“The New Vision for Agriculture initiative: 2010-2030; is led by 26 Global Partner companies that span the full food value chain and beyond, including: AgCo, Archer Daniels Midland, BASF, Bayer CropScience, Bunge, The Coca-Cola Company, Diageo, DuPont, General Mills, Heineken, Kraft Foods, Metro, Monsanto Company, Maersk, Mosaic, Nestlé, PepsiCo, Rabobank International, SABMiller, Swiss Re, Syngenta, Teck Resources, Unilever, **Vodafone**, Wal-Mart Stores and Yara International” (WEF, 2012)

The McKinsey-led project management group includes senior directors of these corporates from all over the developing world as well as rich-world countries - “Drivers and levers of the New Vision for Agriculture” (WEF, 2012, p.23)

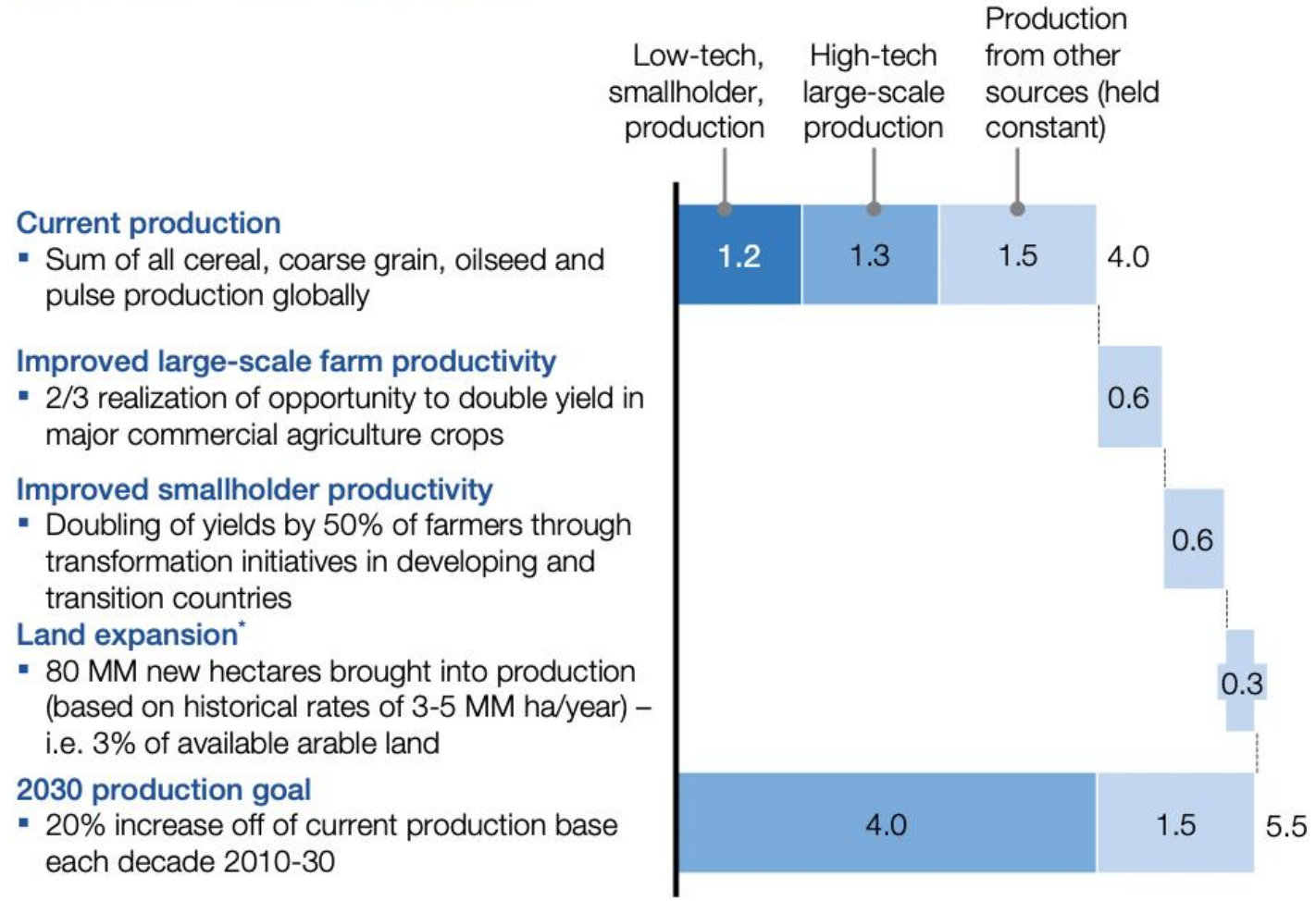
# “Stakeholders” ? ?

“A Lasting agricultural transformation is one that is ultimately supported by real market forces. Bringing new and existing innovations into the system requires **market stimulus to induce potential entrepreneurs and investors to take on a defined set of initiatives…..**

**“**Transformation leaders **need to define “bankable” investment opportunities across the value chain….** Best practice **transformations** engage **the right groups and organisations to participate in these opportunities**…” (emphasis in original, WEF 2012, p.13)

# Given current projections, it is feasible to achieve 20% production improvement each decade until 2030

*Billions of mt of production*




**Current production**
- Sum of all cereal, coarse grain, oilseed and pulse production globally

**Improved large-scale farm productivity**
- 2/3 realization of opportunity to double yield in major commercial agriculture crops

**Improved smallholder productivity**
- Doubling of yields by 50% of farmers through transformation initiatives in developing and transition countries

**Land expansion***
- 80 MM new hectares brought into production (based on historical rates of 3-5 MM ha/year) – i.e. 3% of available arable land

**2030 production goal**
- 20% increase off of current production base each decade 2010-30

* Referring to arable lands with low environmental cost of converting into cultivable land

Source: FAO; FAOSTAT; McKinsey analysis

This projected disappearance of *all* smallholder, often informal, non-monetary exchange farming by 2030 is ***not even mentioned in the 45-page "New Vision…" Report,*** **let alone discussed for its implications, eg for justice, or environmental sustainability.**

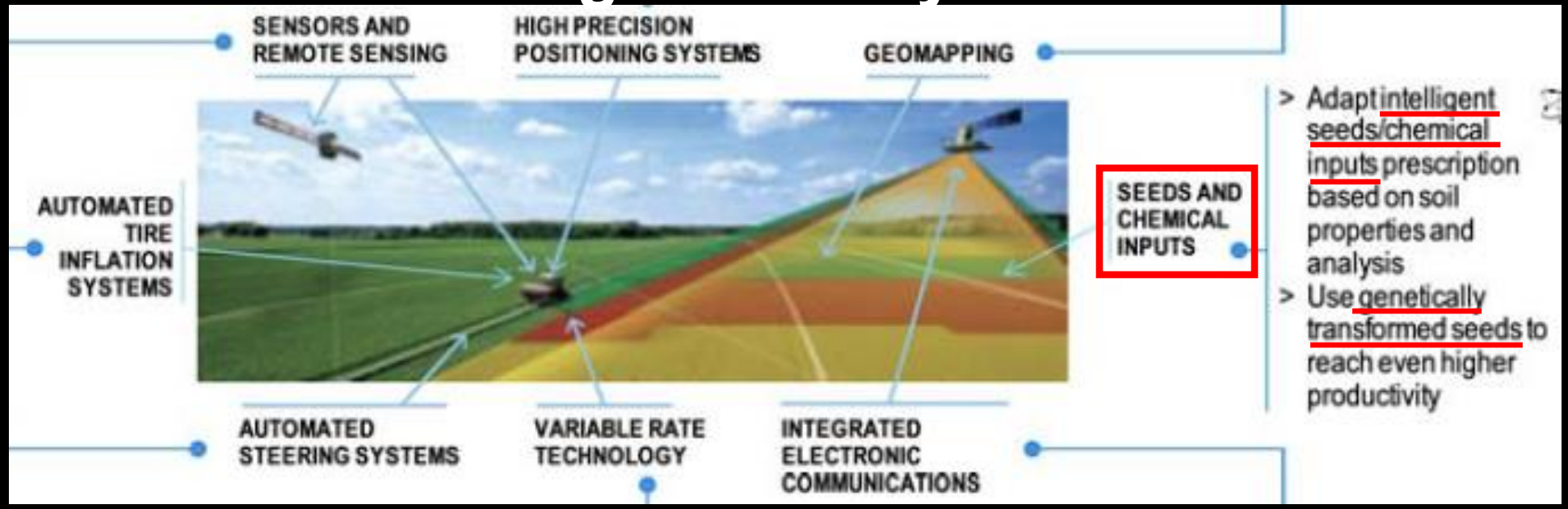
Moreover, as an imaginary – a "New **Vision** for Agriculture" – it is also (supported by the political-economic power of the stakeholder collective) ***performative***, and ***normative;*** **a *power-driven objective* of this collective Vision.**

Amongst all the worthy New Vision language, of "leadership', 'sustainability', 'partnership',

"leaders…will need to navigate and find solutions to complex and sometimes controversial issues such as….**Biotechnology –** utilization and regulation of genetically modified seed varieties to increase productivity" (Ibid, p.16)

These cannot be described as "policy decisions"; and if they are informed by science, it is a highly partial "science" which is integrated into a very particular collective of political and economic interests, like the listed Stakeholders for this global "Vision", while it completely excludes, indeed aims to eliminate the world's mainstream ways of feeding the poor.

# The digital capture of the entire agro-food system

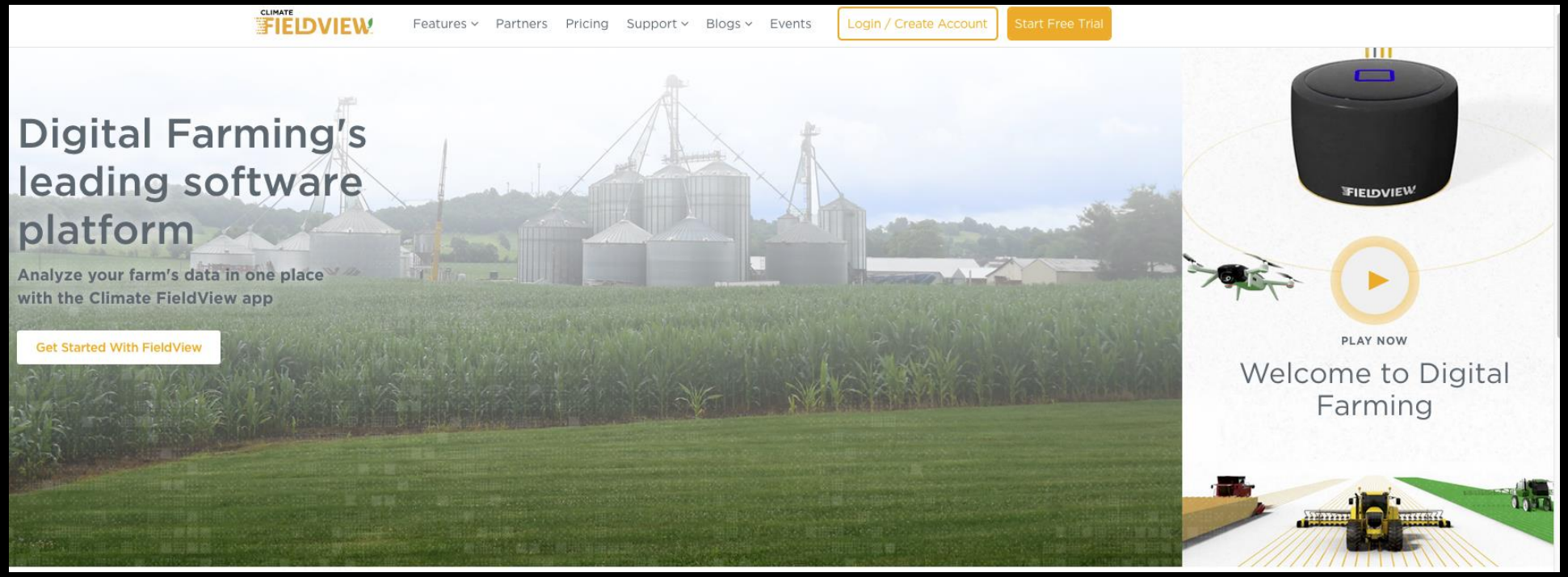



**Robotics and automation technology:** Autonomous operations are enabled by automated steering technology and high precision positioning systems as well as integrated electronic communication systems

**Imagery and sensors:** Data for evaluation purposes of soil and crop health, etc. is collected via sensors, remote sensing systems and geo-mapping

**Digitization and big data analysis:** Data is analyzed in order to improve climate and soil predictions, performance optimization of equipment as well as remote control in field monitoring

**Bio-engineering:** Seeds and chemicals are selected based on external conditions and evolution of seeds to enforce resistance to specific farm and/or climate conditions

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# Imaginaries (may) become truth….

- through coordinated political-economic-epistemic POWER

# Is public science self-consistent? The EU and GMOs:

→ EC 2001/18 GM Release Regulation requires a single ERA, assumed valid EU-wide. Uncertainties & differences meant to be documented and explained (EC 2002/178, Art. 30),
→ YET, in EC (confidential) evidence vs US/Canada, to WTO Disputes Panel, 2005:
"*It is not scientifically reasonable to simply translate and extrapolate the limited risk assessment results on the toxicity of Bt maize to human and non-target organisms from USA, Australia or some other non-European countries because the*

- *regional growing environments;*
- *scales of farm fields;*
- *crop management practices;*
- *local/regional target and non-target species considered most important in the agri-ecosystem;*
- *interactions between cultivated crops & surrounding biodiversity*

*could each differ from published non-European studies, and could differ substantially between regions and countries within the EC*"

But in EU regulatory/policy practice itself, and the July 2010 EU Legislative Proposal on M-S *autonomy* for GM cultivation, these EU-generated observations are ignored, & one standard *EU-wide* ERA defined as sound science.(For the 2015 Directive, this was overruled by EP vote, and by EU Council of Ministers)

In the EU 2000 Precautionary Principle Communication as grounds for possible legal intervention to situations:

*"where preliminary objective scientific evaluation indicates that there are reasonable grounds for concern that the potentially dangerous effects on the environment, human, animal or plant health may be inconsistent with the high level of protection chosen for the [European] Community"*

Furthermore, again echoing the US Red Book approach,

*"The precautionary principle should be considered within a structured approach to the analysis of risk which comprises three elements: risk assessment, risk management, risk communication. The precautionary principle is particularly relevant to the management of risk."* (RA itself – science - is in EC view, ***intrinsically*** precautionary. This is **NOT TRUE** ! !)

# A Historical Comparator: Risk Assessment 'Policy', from 1970s: ICRP

- (for ICRP, *Justification* - benefits, needs Qs, *UPSTREAM* – is ***in law*** a primary step, *before getting to* RA!). No such thing for GMOs, chemicals, and anything, other than radioactivity.
- Then also, For ICRP:
- With three scientific options for low-dose risks, from only high-dose data (d-r linear; threshold; quadratic), ICRP chose the most precautionary scientific option, ie linear dose-response
- So some harm, right down to zero dose (this becomes significant, for *population* risks)
- Any RA science which fails to do this, cannot call itself precautionary
- For GMOs (1990s→) "precaution" is defined only by the fact of RA before evident harm emerges! The RA itself is not required to be P, as it is presumed *a priori,* or *declared* to be so!
- More recently, for nGMOs, even RA is dropped….

Thus the PP is described in formal legal terms by the EC (2000) as a science-guided *policy* measure, and not a scientific risk assessment measure. Thus scientific risk assessment knowledge itself is exempted from scrutiny with respect to its own detailed framing questions, protection-goals, end-points, definitions of harm, comparators, practical epistemic criteria, and interpretive judgements. In this way, risk assessment science is supposedly 'protected' from any imagined policy or other *normative influence. BUT IN REALITY THESE NORMATIVE JUDGEMENTS - POLICY SUBSTANTIVE – ARE BEING MADE UNACCOUNTABLY, DRESSED IN THE NAME OF SCIENCE.*

This EU statement is thus a normative declaration of (a desired) 'reality', not an empirically-observed account of reality.

*"The precautionary principle, which is essentially used by decision-makers in the management of risk, should not be confused with the element of caution that scientists apply in their assessment of scientific data."* (EC 2000)

# In Concluding:

“Over the last three years, recognition that there are a limited number of quality seed and agricultural biotechnology assets, combined with many companies' desires to create pre-emptive positions, have resulted in a corporate gold rush to develop long-term strategic positions around broad agricultural biotechnology platforms. Major linkages of biotechnology assets and seed companies with leading agricultural chemical companies through strategic alliances and equity ownership positions, as well as outright acquisitions, have changed the corporate landscape of the seed, agricultural biotechnology, and crop protection industries almost overnight” **Sano Shimoda, US Investment Banker, “Agricultural Biotechnology - Master Of The Universe?”, *AgBioForum*, 1(1), 1998, 62-68**

# This process frames, in a tacit, unspoken way, the **UPSTREAM** system of innovation, and it also frames the **DOWNSTREAM** assessment and regulation of risks and impacts

Thus we should note:

- The UPSTREAM imaginaries, "visions", (including the imagined, recognised actors and agents), are taken for granted, and not questioned;
- (Remember the WEF Programme 2010-2030 for Global Agricultural Transformation's unspoken *total exclusion/deletion* of small farmers by 2030 – and this is a normative, but unaccountable, political aim)
- This has been constructed through mutual alignment and mutual construction of science-political-economic power together, in seamless form
- Epistemic reductionism in science/knowledge reinforces neoliberal "free" market exclusion, and vice-versa.

# Reductionism: political & epistemic together

- Innovation protected from social-democratic accountability
- Only the very downstream parts of this (schematic) process are opened (recent past, ~post-20$^{th}$ C) to public input, and very limited.
- Upstream scientific R&D&I processes remain exclusive, unaccountable, and self-reinforcing without critical struggle, including critical science and democratized innovation processes

# Michael Taussig on (scientistic) fetishism

For Taussig, the (Bogota) Gold Museum, fetishises its objects, and thus deletes the tangled and exploitative, tortuous human histories which brought those objects into being. Coca and its contemporary history is entangled with gold. We suggest that public policy (CBD, IPBES…..) fetishises science, and risk as almost the only allowed *public* meaning:

"Phrases such as "species diversity" belong to a strain of rhetoric more suited to stock market portfolios than the play of light and water across the rippling rapids of a coastal river. Meant to marshal science in the fight to redeem fallen nature, such phrases actually give a further twist to its destruction. As such, this language takes its place alongside the rhetoric of 'human capital'" ……

"***What then, of Frederic Jameson's notion, that it is easier to imagine the end of the planet, than it is to imagine the end of capitalism***?"

**Taussig, *My Cocaine Museum*, (2005) *p.*311**

Legg T, Taggart J, and A. Gilmore, 2021, "The Science for Profit Model—How and why corporations influence science and the use of science in policy and practice",*PLoS One*,16(6): e0253272. https://doi.org/10.1371/journal.pone.0253

"We identified *eight corporate sectors* repeatedly engaging in activities to influence science, including: manipulation of scientific methods; reshaping of criteria for establishing scientific "proof"; threats against scientists; and clandestine promotion of policy reforms that increase reliance on industry evidence. The typology identifies five macro-level strategies used consistently across the eight industries, comprising 19 meso-level strategies. The model shows how these strategies work to maximise the volume, credibility, reach, and use of industry-favourable science, while minimising these same aspects of industry-unfavourable science. This creates doubt about harms of industry products/practices or efficacy of policies affecting industry; promotes industry-favoured policy responses and industry products as solutions; and legitimises industry's role as scientific stakeholder. These efforts ultimately serve to weaken policy, prevent litigation, and maximise use of industry products/practices—maximising corporate profitability".

See also, Robert Procter (Big Tobacco); David Michaels (various); Sergio Sismondo (Big Pharma);