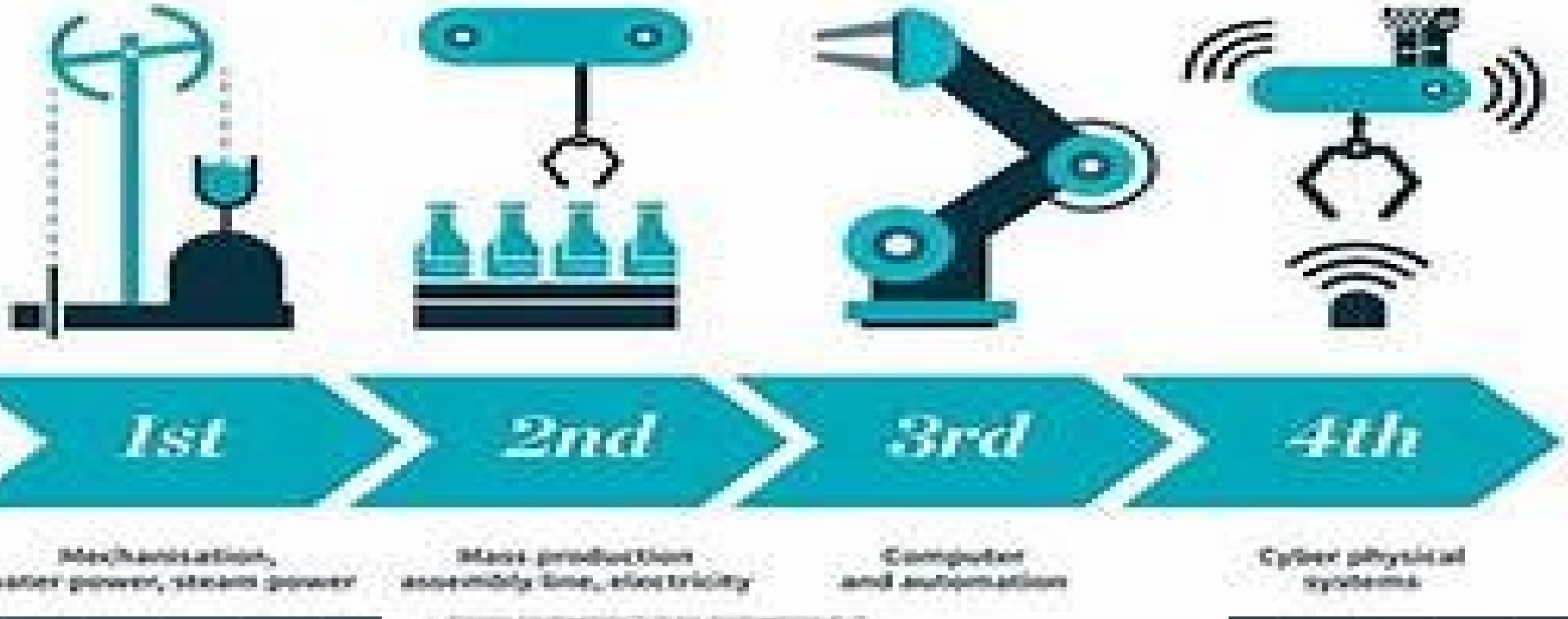
New Agricultural Technologies: Reinforcing Corporate Concentration

Action Group on Erosion, Technology and Concentration (ETC Group)

The Fourth Industrial Revolution



high tech

medium tech

low tech/no tech

Impacting Food, Agriculture and Nutrition

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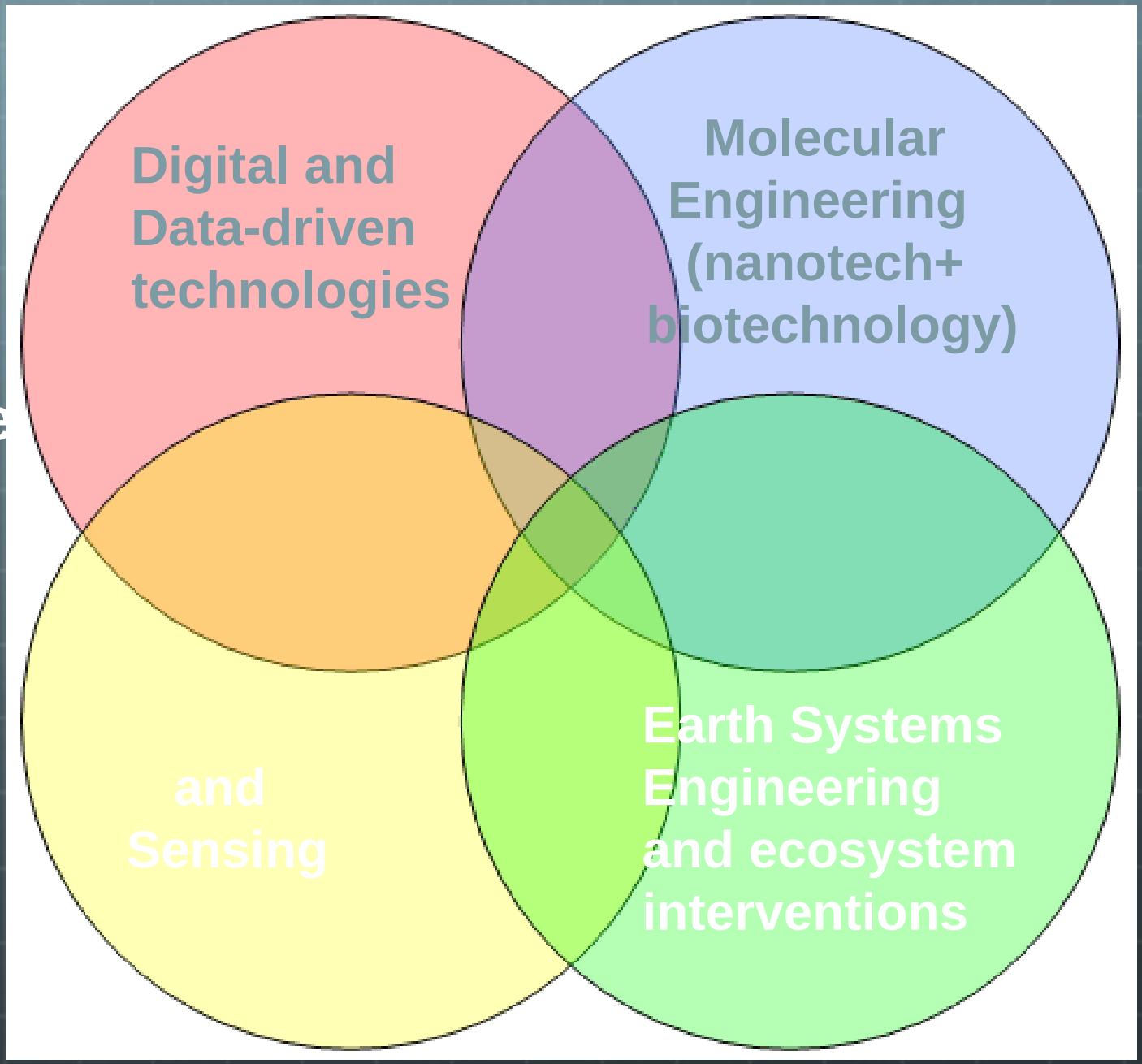


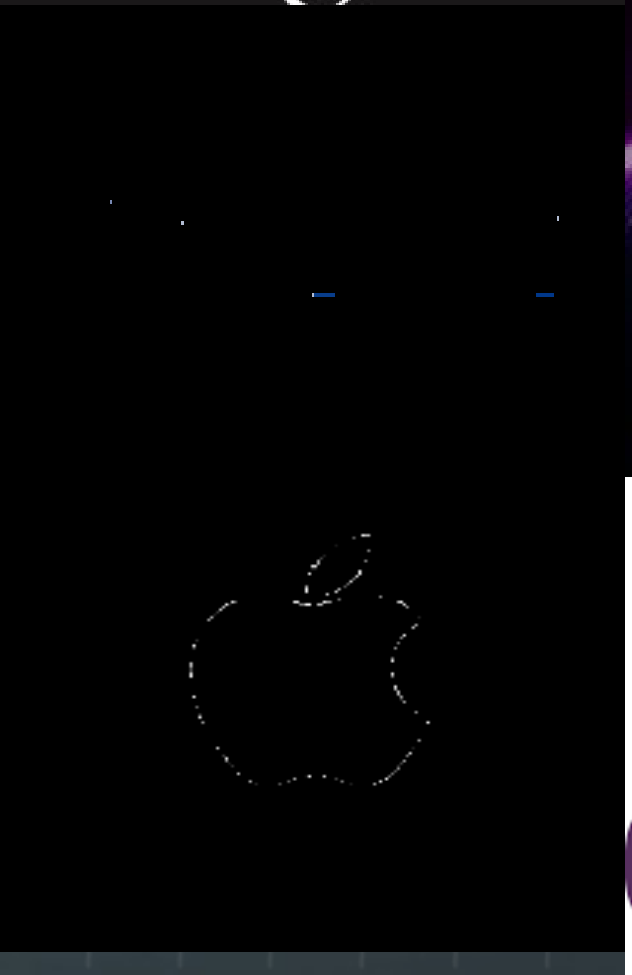
Digital and Data-driven Technologies

- Artificial Intelligence/ Machine Learning
- Computer Assisted Organic Synthesis (CAOS) ,
- Internet of Things
- Synthetic Biology/cell factories,
- Online markets and online delivery,
- Blockchain and financial technology tools
- Algorithmic trading
- Molecular communication

Impacting Food, Agriculture and Nutrition


Google DeepMind


Google
Artificial Intelligence




Microsoft Research


Baidu


OpenAI

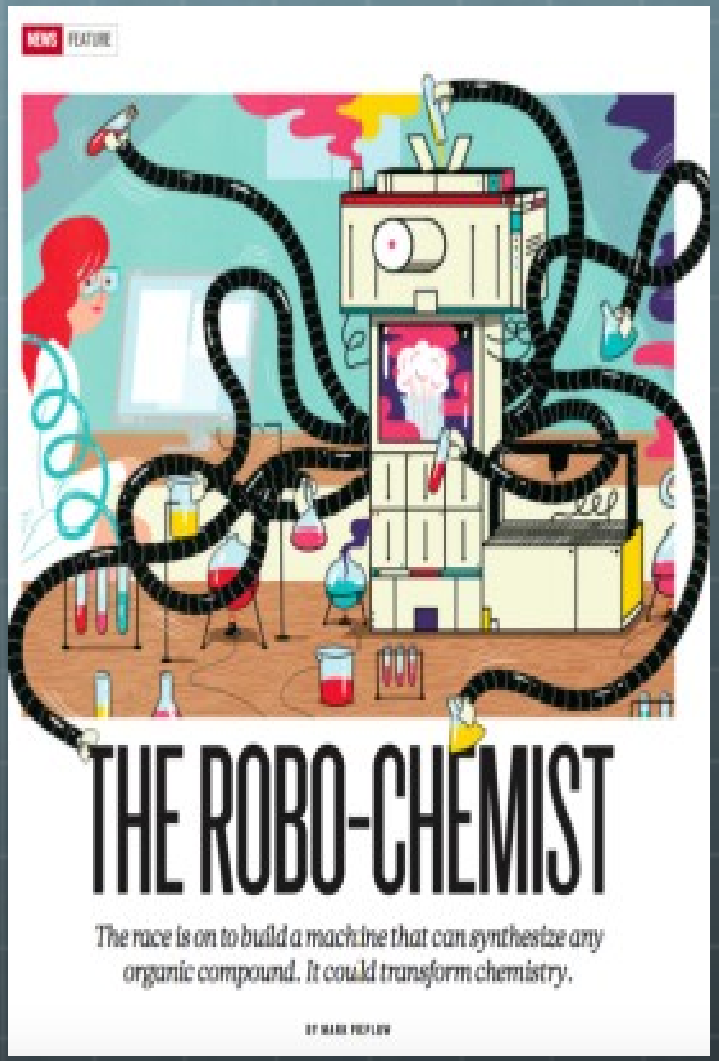
“AI – driven Synthetic Biology ”

“Zymergen’s algprithms suggest making

1,000 or so changes to the microbe’s genetic material . Then the robots take over, injecting the suggested DNA snippets into the specimens, testing their properties, collecting data and feeding that information back into the data trove.”

- Bloomberg

Computer Assisted Organic Synthesis (CAOS)



"A SYNTHESIS MACHINE COULD MAKE ANY OF A BILLION DEFINED SMALL MOLECULES ON DEMAND."

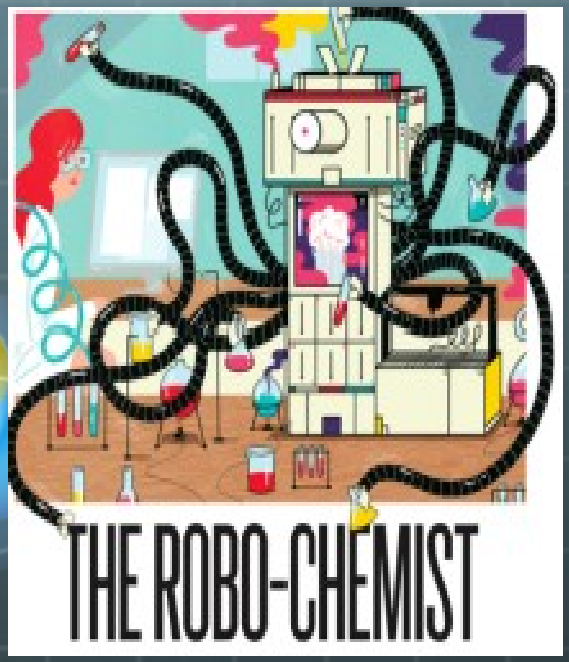
"A growing band of chemists is now trying to free the field from its artisanal roots by creating a device with the ability to fabricate any organic molecule automatically …

… Such a device could thus offer an astonishing diversity of compounds for investigation by researchers developing drugs, agrochemicals or materials. "


Algo-
Trading


BLOCKCHAIN

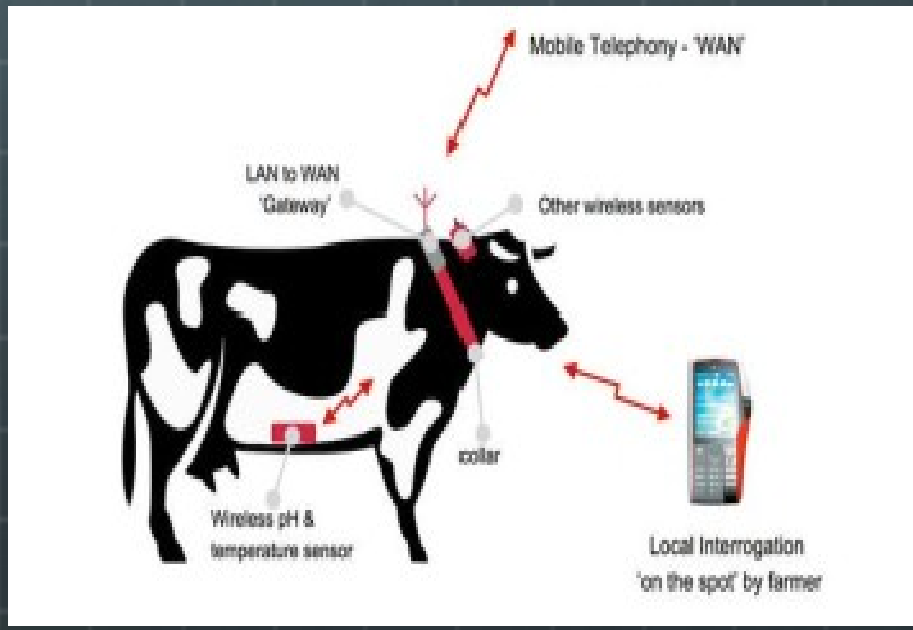
REPLACED



Automation and Sensing

Impacting Food, Agriculture and Nutrition

- Precision agriculture applications
- Drones , robotics (on the field, processing and in food service)
- Sensors and remote sensing technologies
- LIDAR
- 3d printing/additive manufacturing of food,
- Animal and crop health sensors
- Hydroponics and ‘vertical farming’


Mobile Telephony - 'WAN'
LAN to WAN
'Gateway'
Other wireless sensors
collar
Wireless pH &
temperature sensor
Local Interrogation
'on the spot' by farmer

“Molecular Communication”

The Internet of nano-bio things:

information transmitted by artificial systems has largely been through media such as wave modulation (electromagnetic / acoustic) and particle/wave modulation (optical) while in Biology much communication is through molecules – e.g. pheromones, DNA etc. Molecular communication can be defined as a measurable information exchange process between networked artificial or biological entities through the use of molecules. (Inscribed matter)

DIGITAL FARMING: PRECISION AGRICULTURE

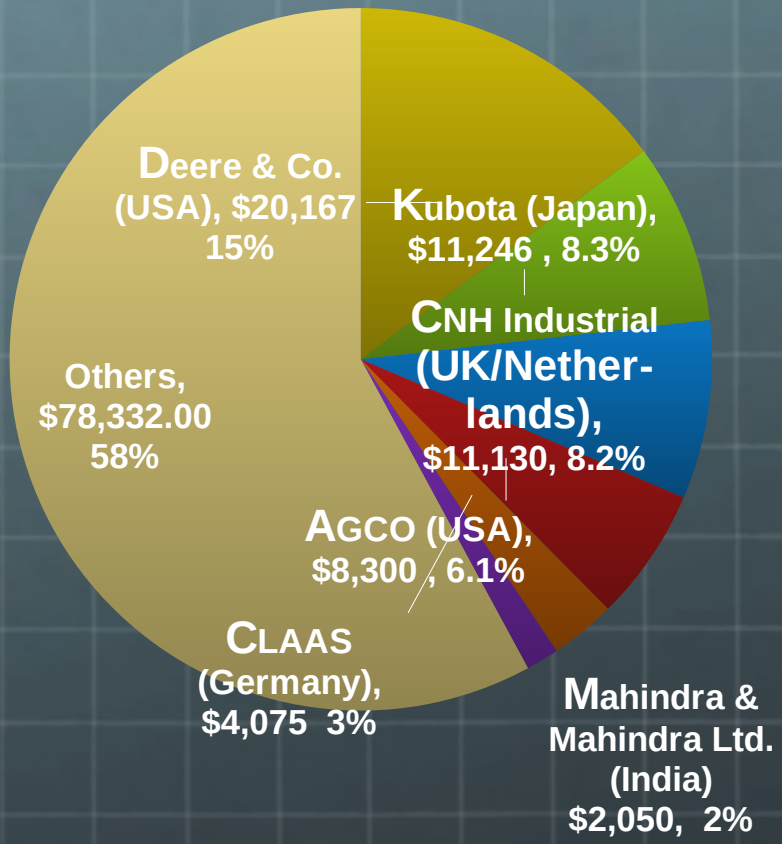
Farm Machineries: Market Size (2017)

Ag Equipment

$135 billion

etc GROUP

Top 6 Farm Machinery Companies, 2017
Estimated Worldwide Sales of $ 135,300 million



etc GROUP
monitoring power
tracking technology
strengthening diversity


REPLACED

(

Molecular Engineering

biotechnology)

- Nanomaterials,nanofoods, nanocoatings, nanopesticides,
- Taste/sensory modification technologies,
- Synthetic biology /Gene-editing,
- In situ genome engineering
- Gene drives
- Molecular communication
- Metabolic engineering
- Cell culture engineering of food
- Epigenetic engineering
- RNAI sprays
- Microbiome engineering
- Photosynthesis engineering
- Nutrigenetics/nutrigenomics
- animal vaccines

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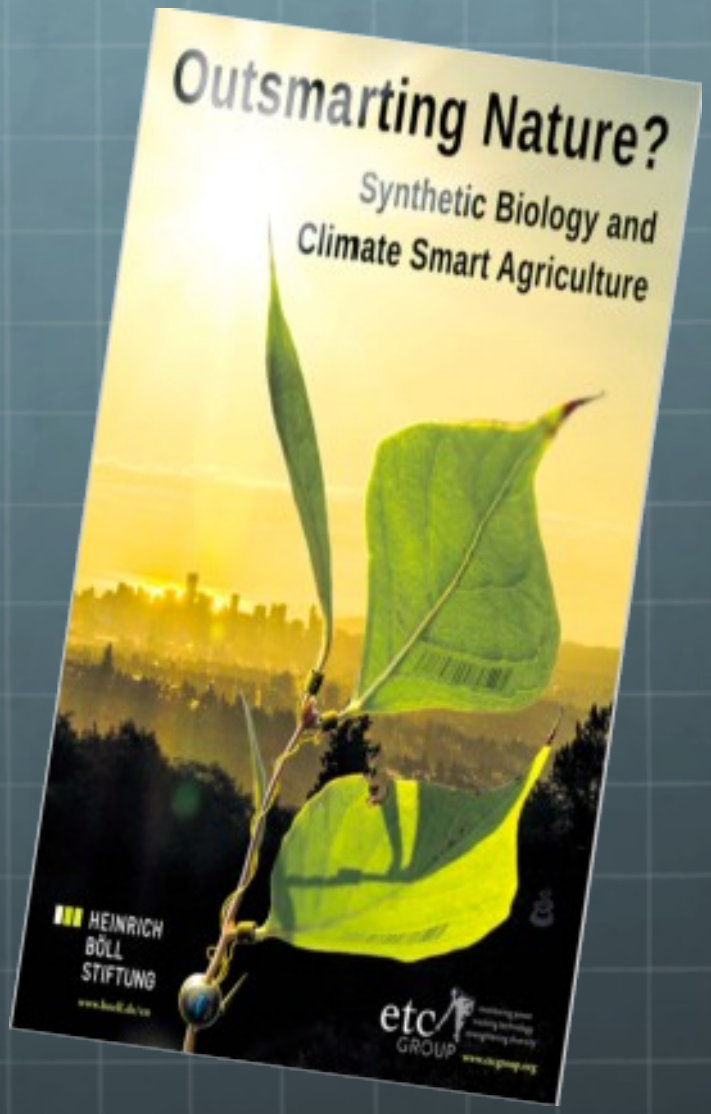
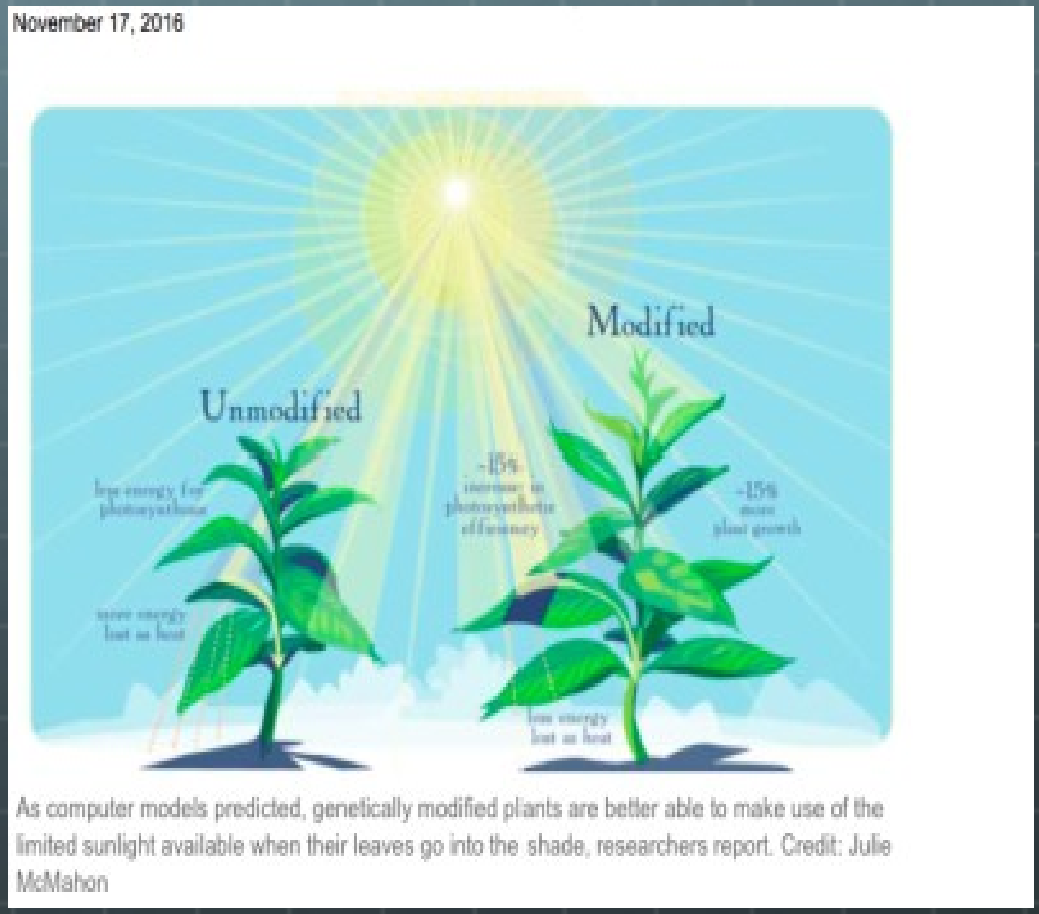
Photosynthesis Engineering





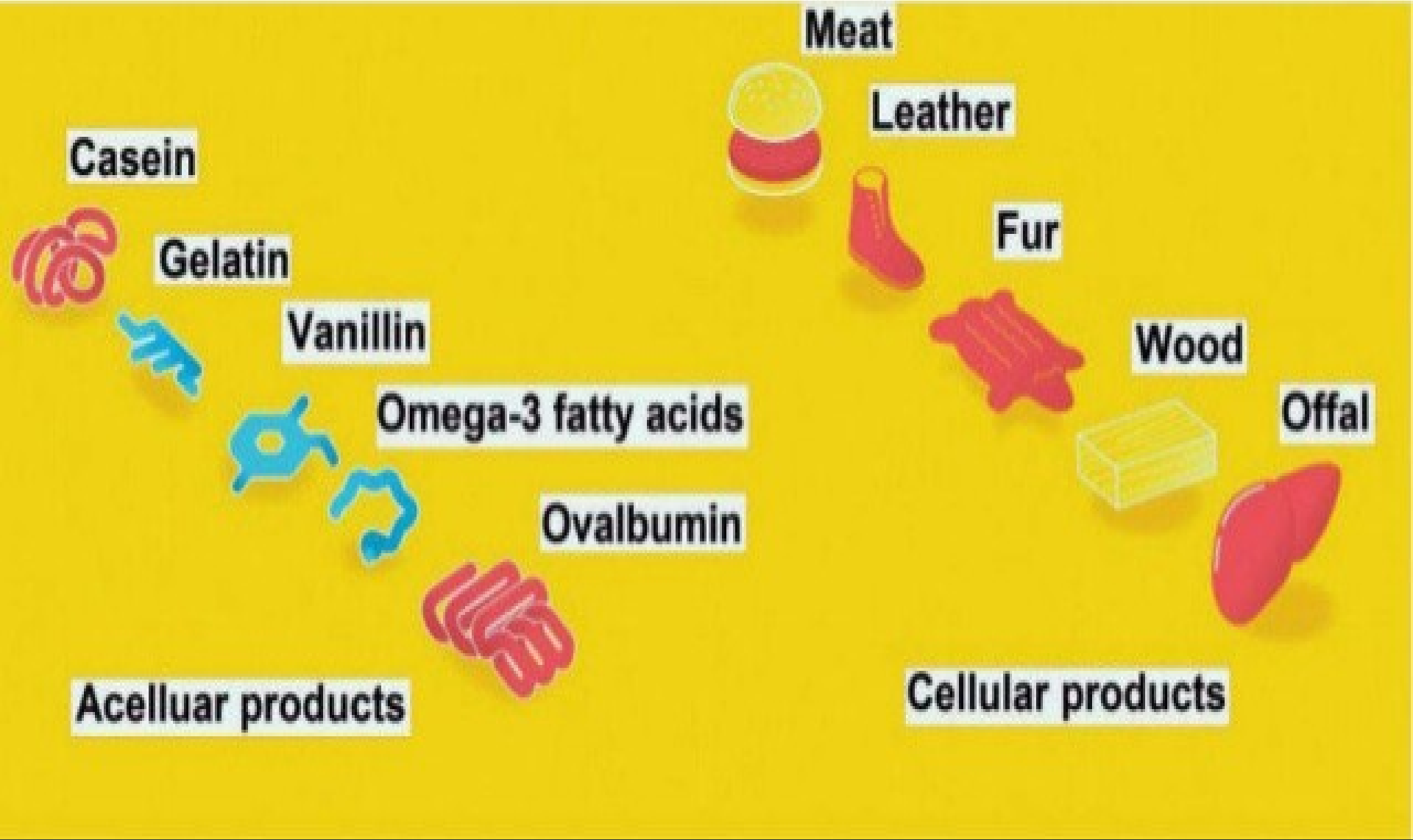
14-20 increase in biomass from modifed plans in Tobacco field trials

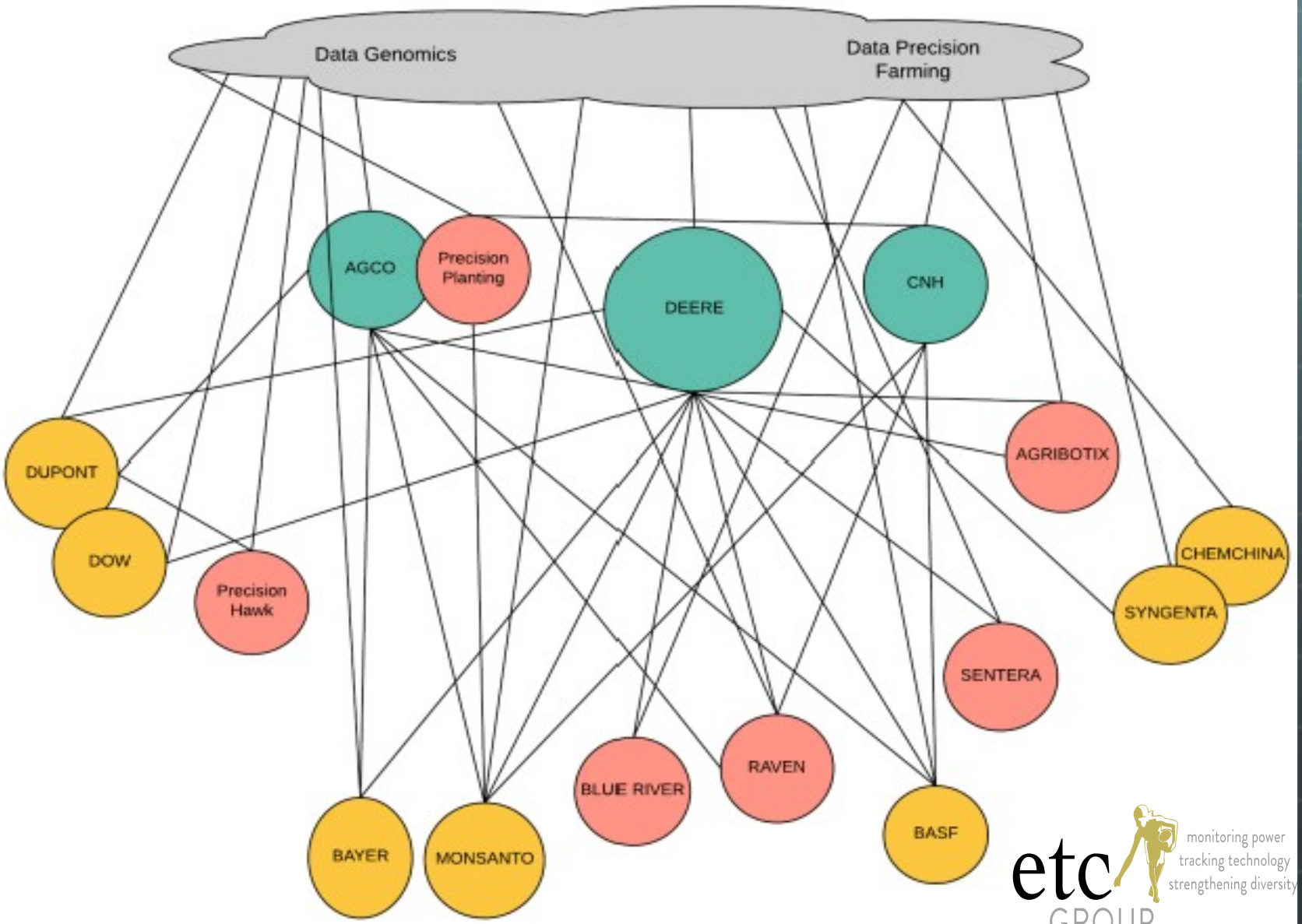
In-Situ Genome Engineering

Cellular Agriculture

Agricultural products by cell culture

Medical technology,
Agricultural application




Data Genomics
Data Precision Farming
AGCO
Precision Planting
DEERE
CNH
DUPONT
DOW
Precision Hawk
AGRIBOTIX
CHEMCHINA
SYNGENTA
SENTERA
BLUE RIVER
RAVEN
BASF
BAYER
MONSANTO
etc GROUP
monitoring power
tracking technology
strengthening diversity

IMPACTS OF TECHNOLOGY

- Society
- Culture
- Economy
- Environmental
- Politics
- Ethical Considerations

Systemic Issues around Technologies

1. **Alienation** (*Technology by whom?*)**:** Top-down decisions on technology, absence of democratic governance of tech
2. **High-tech fixation** (*Which technologies?*): lack of recognition and support for indigenous knowledge systems and local innovations
3. **Technology for Control** (*Technology for whom?*)**:** as a means to assert and reinforce control over resources and peoples
4. **Corporate Concentration** (*through which means?*)**:** enabled by intellectual property rights (IPR), trade rules, standards
5. **Myth: Technology as "neutral"**

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