

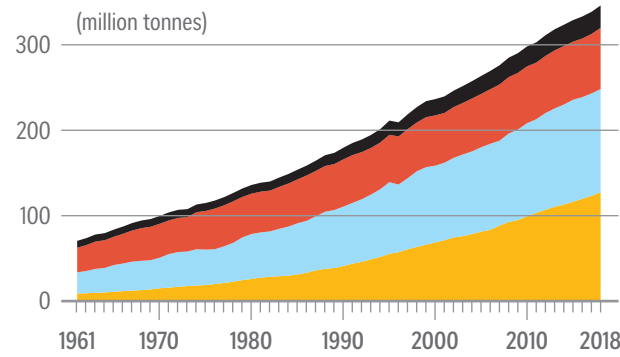
Meat the alternatives

The production of meat, especially beef, is having a detrimental impact on the earth. However, scientists and researchers are coming up with meat alternatives to lead the world towards a more sustainable future. **THE STRAITS TIMES** takes a look at some sustainable options to the farmed meat.

CONCERNS AROUND LIVESTOCK PRODUCTION

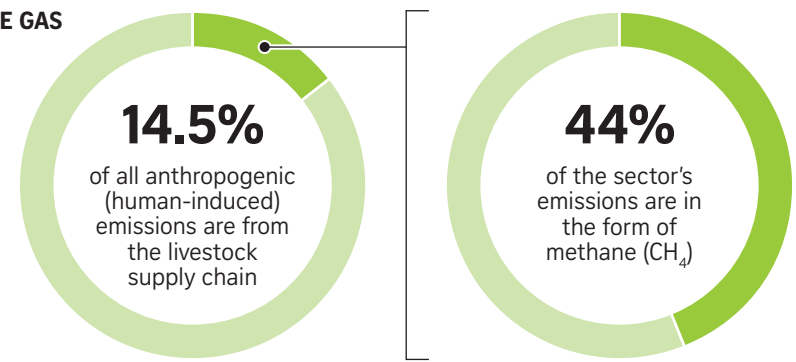
INCREASING PRODUCTION

- The global demand for meat has increased rapidly over the past 50 years.
- To match this, total production has more than quadrupled since 1961 but needs to increase even further to meet the rising demand.



GREENHOUSE GAS EMISSIONS

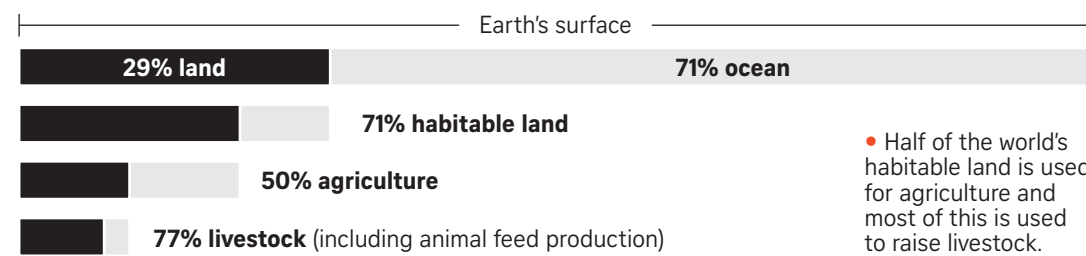
- The life cycle of meat production contributes to global warming.



Potent greenhouse gas

- Cows have to digest food that most animals cannot do as well.
- The by-product of this digestion is methane – which is **28 times more powerful than carbon dioxide in warming.**

LAND USE BY LIVESTOCK PRODUCTION



- Half of the world's habitable land is used for agriculture and most of this is used to raise livestock.

Drivers of deforestation

- The expansion of pasture land to raise cattle is a huge driver of deforestation.
- The second largest driver – oilseeds – is also mostly used for livestock feed.



2005 - 2013

- Beef**: 41% of deforestation (2.1 million ha per year)
- Oilseeds**: 18.4% of deforestation (0.95 million ha per year)
- Other drivers**: Includes forestry, cereals, and other crops

ZOOONOTIC DISEASES

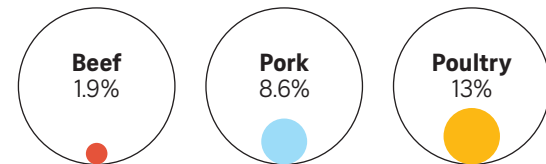
- The close proximity in which animals are kept at industrial farms presents concerns about zoonotic diseases and the stability of the meat supply chain.

ANTIBIOTIC RESISTANCE

- To aid weight gain, antibiotics are routinely mixed into animal feed.
- This overuse of antibiotics creates a rising threat of superbugs.

ENERGY EFFICIENCY

- Animals convert feed into high-quality protein sources but a lot of energy is wasted in the process.
- Energy efficiency is the percentage of energy (caloric) inputs as feed effectively converted to animal product.



THE ALTERNATIVES

LAB-GROWN SUBSTITUTES

Cultured meat, also known as lab-grown meat, in vitro meat, or synthetic meat, is made by growing muscle cells in a nutrient serum and forming muscle like fibres.

COLOUR

Supplementation of extracellular heme proteins (eg. myoglobin) is used to regulate colour.

STRUCTURE

Muscle fibre structure can be controlled during the differentiation process and using scaffolding materials.

TEXTURE

Cell-based fats can be produced by culturing and differentiating fat cells.

APPEARANCE

WATER USE PER KG PRODUCED



LAND USE PER KG PRODUCED



GREENHOUSE GAS EMISSION PER KG PRODUCED



PLANT-BASED SUBSTITUTES

Plant-based substitutes are products made from plants. However, unlike veggie burgers, they are meant to taste like meat and marketed to meat-eating customers.

COLOUR

Fruits and vegetable extracts (eg. apple, beet) or recombinant heme proteins (eg. leghaemoglobin) are used as colour additives.

STRUCTURE

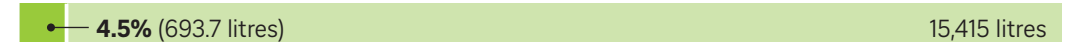
Fungi-based products can have inherent fibrous structure.

TEXTURE

Plant-based fats (eg. coconut oil, cocoa butter) are used to emulate animal-based fat marbling.

EMISSION & USE OF RESOURCES IN COMPARISON WITH CONVENTIONAL MEAT

WATER USE PER KG PRODUCED



LAND USE PER KG PRODUCED



GREENHOUSE GAS EMISSION PER KG PRODUCED



WHAT'S AVAILABLE IN SINGAPORE?

NOTE: This list is non-exhaustive.



GOOD MEAT

- Good Meat is cultured chicken, the first-ever cultured meat product approved for sale.

TINDLE

- TINDLE is a plant-based chicken alternative started in Singapore. It is certified as a Healthier Choice option by the Health Promotion Board.



NEXT MEATS

- Next Meats is a plant-based yakiniku meat created from soy proteins.

IMPOSSIBLE FOODS

- Impossible Foods creates plant-based meat alternatives. In 2016, it launched the first Impossible burger, a soy-based patty that tastes and bleeds like a beef patty.

BEYOND MEAT

- Beyond Meat creates a wide range of plant-based meat alternatives using a variety of plant proteins.

QUORN

- Quorn creates plant-based meat alternatives using a fungus known as *Fusarium venenatum*.