



Food & Agriculture Technologies



Technology Innovation for Sustainable Development

Hello. Today, according to the United Nations Food and Agricultural Organization, about 1/3 of all food produced for human consumption is lost or wasted. At the same time almost 800 million people in the world haven't got enough food to lead a healthy active life. According to current estimates the human population will grow from 7.2 billion today to 9 billion in 2040. And this increasing population will need to be fed. 200 years ago British economist Thomas Malthus had predicted that population growth would be limited by our ability to produce enough food. This prediction turned out to be partially wrong so far due to the invention of chemical fertilizers and a variety of other technologies, which allow to radically increase agricultural yield. However, the Malthusian challenge didn't go away completely. And a global food security remains a challenge. However, this is only one side of the problem. Industrial era agriculture involving intensive use of pesticides and fertilizers as well as deforestation have a severe impact on climate and the environment. The paradox is that these technologies, while they increase immediate agricultural output, also tend to jeopardize the future capacity to generate food.

Notes

Summary



0m 20s



Malnutrition:

- Undernourishment
- Micronutrient deficiency
- Obesity

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Sustainable agriculture requires innovative solutions to improve efficacy while preserving the assets for future production, for example, by minimizing loss of soils, loss of biodiversity or pollution of water and air. Yet another important fact is that agriculture is the single largest employer in the world, providing livelihoods for 40 % of today's global population. As a consequence, the link with economic developmental poverty is obvious. In order to understand the influence of technology in this field we need to explain the food value chain framework. But before we get there, let me give you some important definitions. Inadequate nutrition in general is called malnutrition. It is a pervasive problem as around 40 % of the world's population is malnourished in one way or another. Ending malnutrition is our sustainable goal #2. Malnutrition comes in 3 different manifestations. First, we have undernourishment, which is insufficient access to calories and proteins. It is also called chronic hunger. Effects of undernourishment include stunting and wasting in children. Stunting is when children are shorter than they should be due to food deprivation. Wasting is when the child's weight is too low for their height.

Notes

Summary



1m 45s



Malnutrition:

- Undernourishment
- Micronutrient deficiency
- Obesity

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The second manifestation is micronutrient deficiency. Which is sometimes called hidden hunger. It is a condition arising when calories and proteins may be sufficient, but where essential micronutrients, such as vitamin A, Iron or Iodine are missing. Finally, obesity is a condition affecting not only the rich countries, but also increasingly people in developing countries as a consequence of the poor moving to urban areas and adopting more sedentary lifestyles. Now, let us look in more details at the food value chain, in order to understand where technologies could be put to use for reducing malnutrition.

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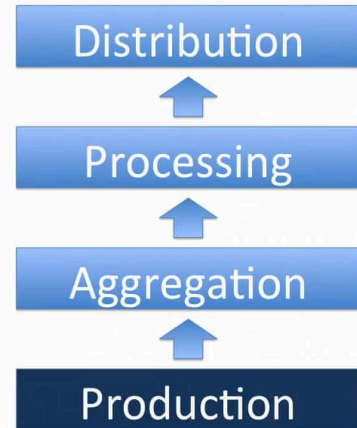
Summary



3m 14s



Food Value Chain



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The value chain is shown here. It starts at the bottom with producers, who can be farmers or grow crops, or cattle. Or fishermen who exploit the sea or lakes. These producers need inputs such as tools, machinery, fertilizers, and seeds to be able to grow their product. For example, recent technologies have allowed to make seeds resistant to pests or drought. Which is a great advantage in an industry that is very exposed to such threats. However, the cost of those seeds is also a growing financial burden for small farmers who have no real alternative, but to purchase them annually. There are, of course, legitimate ethical concerns about genetic manipulation of crops or cattle, which we don't want to discuss here. As I have mentioned, fertilizers, and pesticides have had a huge effect on the productivity. And have been a cornerstone of the green revolution in the 20th century. Unfortunately, these technologies also come with a downside. Which is their negative impact on ecosystems and biodiversity. For example, through the increasing use of Nitrogen fertilizer, Nitrous Oxide, which is a greenhouse gas that is released and contributes heavily to global warming.

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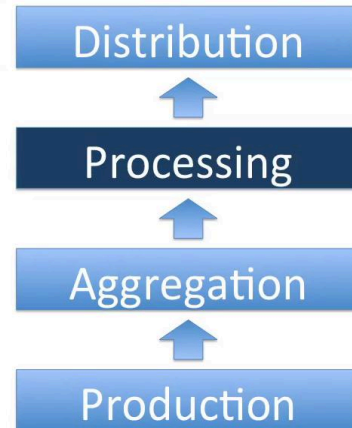
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3m 54s



Food Value Chain



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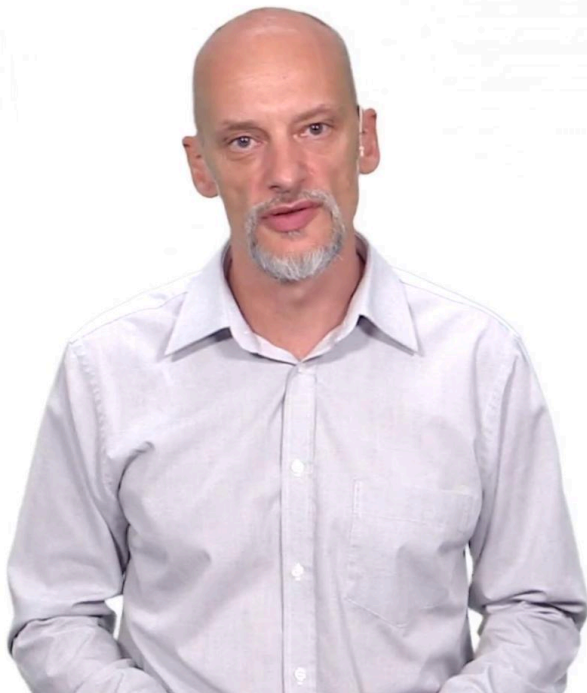
Producers use a variety of other important technologies, such as harvesting machines, and irrigation technologies. We will discuss one of these later in this video. Yet, another domain is related to veterinarian technology such as vaccines and various drugs which are also very important to maintain the livestock healthy and productive. The next step is aggregation. According United Nations, there are 500 million small farms worldwide. Which provide up to 80% of the food consumed in a large part of the developing world. The produce of those small farms is either consumed directly, or sold on markets or to aggregators. The high fragmentation and dispersion of small holder producers makes the aggregation step especially challenging in developing countries. The aggregation function can be taken on by producer groups such as cooperatives, by intermediaries specialized in aggregation, or by food processors themselves. At this stage technologies related to adequately packaging, transporting and storing the food are especially important. Processors are involved in both the preparation of fresh food as well as prepared food. Such food processing is composed of a variety of companies, which process products at different stages.

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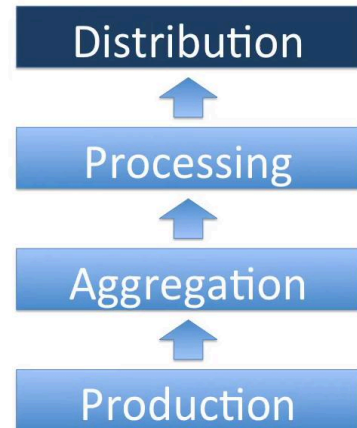
Summary



5m 14s



Food Value Chain



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For example, slaughtering and meat processing, fruit and vegetable preservation, grain and oil seed milling, seafood product preparation, sugar and confectionary bakery, dairy and other food product manufacturing. Each of these will use specific technologies, such as milling machines, cooking ovens, presses and so forth. For food processors, food quality is crucial and any failure in these regards will have severe consequences. There's a variety of technologies which allow to assess food quality and monitor safety all along the complete value chain. Food preservation methods and technologies are also very important for processors. These sometimes involve chemical compounds which may have a negative impact on consumer health. Sustainable product packaging is a challenge which is intimately connected to the generation of waste and product conservation, of course. The level of food waste in this processing step is more than 30% and thus any new technology which can reduce it is essential. Distribution is usually assured by wholesalers and retailers. This is a highly competitive industry in both mature and developing markets. Quality, especially of fresh food, plays a key role in consumer choice.

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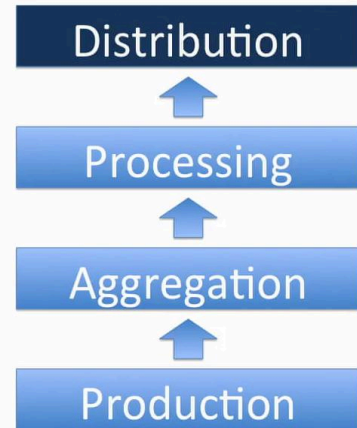
Summary



6m 38s



Food Value Chain



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Distributors are thus extremely sensitive to this aspect of quality and the look of the product. Stock management solutions and technologies are especially important here, in order to minimize surplus or out of stock situations. For example, active product labels based on regular frequency identification or simply barcodes are of key importance. Not only for stock management, but also for product traceability. Packaging is also of utmost importance, as it has been shown to have a large influence on purchase decision by customers. Unfortunately, packaging is also a great contributor to the waste generation, which brings us back to the sustainability and environmental issues already mentioned. One should also mention some recent technological progress whereby consumers can now order food through the internet. Some retailers are even considering drones for for delivering the products to their customers. At the end of the day, we as consumers have a huge influence on the whole chain. And our purchase decisions influence which technologies can or cannot be proposed as the part of the value chain. Now that we have seen the food value chain, let us have a look at how efficient it is currently at providing global access to food for everyone.

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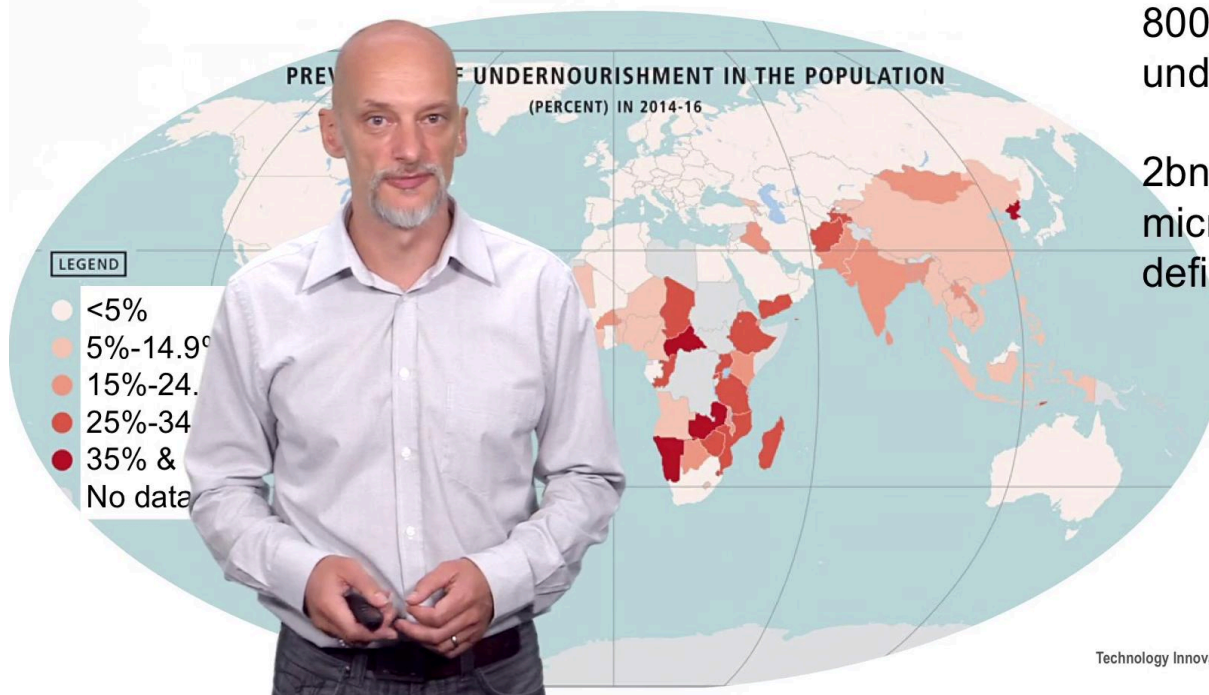
Summary



8m 03s



Food & Agriculture Technologies: Access



800 million
undernourished

2bn affected by
micronutrient
deficiency

[1]

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Sadly, as we can see on this map, there's a great problem with global malnutrition. Strangely, as it might appear, often times it is not so much the quantity of food produced which is the problem, but rather the access to it. Take, for example, the well-known link between war and famine. Conflict is a feature of many famines worldwide. It prevents access to food and causes long term devastation of vital agricultural assets. It is also quite evident from this map that there's a link between hunger and politics. Under dictatorial regimes the countries tend to fall into protracted hunger crises as a consequence of corruption, lack of accountability, mismanagement and international isolation. It is today widely accepted that all contemporary famines are political. This, of course, shall not discourage us from trying to come up with more efficient and more sustainable food and agriculture technologies. The good news is that undernourishment has fallen globally in the last two decades. By contrast, however, micronutrient deficiency has not fallen at all. Today about 2 billion people suffer from micronutrient deficiency. As we can see, there's a great need for new solutions to fight malnutrition while preserving the planet. Let us look at one such innovative technology.

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9m 23s

Food & Agriculture : Info 4 Dourou 2.0



There is a project called Info 4 Dourou 2.0 which aims to help small farmers to secure crops and improve irrigation in dry areas. The project involves measuring the soil humidity, temperature and other climatic parameters. The technology then gives the farmer realtime information via an alarm sent by text messaging concerning the need for irrigation. This helps to make sure that plants get water at the exact moment when it's needed. The technology improves the chances of having a successful harvest, which is vital for the farmer. It provides also an important contribution to sustainable water use, as it avoids useless watering. A series of successful experiments were conducted in Burkina Faso. In one case, it was shown that the crop yield was improved by up to 37%, while the water consumption was reduced by as much as 20%. The system developed at EPFL's cooperation and development center is solar powered and has a rugged design. It is intended as a solution for cooperatives and individual farms. Currently, the technology is being transferred to the local private sector. In particular, local manufacturing solutions will be implemented to reduce costs and to provide sustainable access to the technology for local producers. We hope that you will now have plenty of new project ideas in this very important essential technology domain. Goodbye.

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10m 46s