

Short Communication: Agriculture in the age of awareness: land use dilemma

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Thesis:

Over the past 50 years, the population has grown significantly, but the expansion of cropland has not kept pace. Instead, the main increase in food production has come from impressive improvements in yields and productivity driven by intensive agricultural practices. However, it now seems that the potential for further increases in food production productivity is limited, while the population continues to grow rapidly. Projections suggest that by 2030, an additional 100+ million hectares of cropland may be needed to feed the growing population. Meeting this demand poses a high risk of further deforestation in regions such as South America, Africa and Oceania, jeopardizing initiatives aimed at zero deforestation by 2030. This presents a major dilemma for the sector: how to sustainably feed the growing population while mitigating and possibly reversing the environmental impacts caused by agricultural practices.

The article

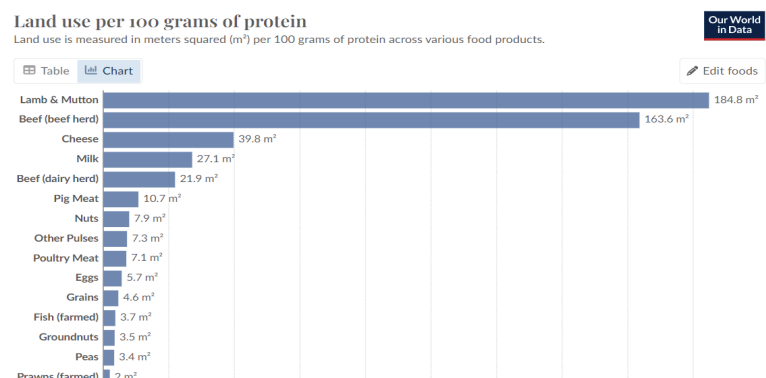
According to United Nations the world population more than doubled in the last 50 years, from 3.7 billion people in 1970 to 8.1 billion people today. It is projected that the growth will continue in the future, though at a lower rate. By 2030 the world population is expected to reach 8.6 billion people and by 2050 it will reach an astonishing 9.8 billion people (1).

The growth in population and hence the growth in food demand was accompanied over the years by the growth in agricultural production. It is interesting to note though that this growth was not proportionate in terms of land use. From 1961 to 2000 the amount of land used for agriculture increased by only 7% compared to approximately 150% increase in the global population (2). A good chunk of growth in food production was technology driven, the focus areas being intensive use of fertilizers, plant protection and genetics. A significant increase in yields allowed excess harvest to boost meat production and even biofuel production.

The extensive report on land use by Hannah Ritchie and Max Roser first published in September 2019, summarizes land use information per categories and contribution towards production of calorie supply and protein supply for growing population. Today over 80% of agricultural land is used to feed livestock and grow textiles and only 16% of it is used to grow crops for food. Interestingly, 83% of global calorie supplies and 62% of global protein supply for human nutrition come from crops and only 17% and 38% respectively come from meat and dairy (2).

This point is reinforced by a chart from the same report, detailing the land use per 100 gr of protein (2).

Chart 1



The scarcity of agricultural land triggered by growing population and the disproportionate amount of land used to produce meat and dairy, particularly lamb and beef, call for action and present an opportunity to feed the world without a significant increase in agricultural land. It may be an organic way to address the issue of land use in the long run, unfortunately it looks unachievable in the short run, as meat consumption increased 5 times in the second half of 20th century and according to OECD-FAO Agricultural Outlook will continue growing 10% to 15% by 2032. Nonetheless, we already observe certain changes in consumer preferences in developed countries aiming to minimize consumption of meat and dairy in favor of a plant-based diet, such is increase in vegan food offering, production of cultured meat and success of plant-based substitutes of dairy

products. Even though these trends will not have an immediate effect they are important and are taken seriously both by environmental communities and by major meat producers, who support innovations in cultured meat production to be a part of a new growing market.

According to McKinsey Insights (3), humanity may need over 100 mln hectares of cropland for food production by 2030. I assume that the cropland in the report is equivalent to agricultural land. To avoid confusion in definitions I refer to standardized definitions of land use provided by the United Nations Food and Agriculture Organization (FAO), which were conveniently summarized by Hannah Ritchie and Max Roser in their report (2).

Chart 2



In a free economy the economic decisions are taken by participants to their direct benefit rather than to the benefit of society or any other third party. For various reasons, mostly such decisions are rather short-term than long-term oriented. Coming back to our dilemma, it means that there is a high risk that the need of additional 100 mln hectares of agricultural land by 2030 will be sourced from forests rather than from barren lands. The reasoning behind this scenario is simple – people historically used to convert forests to agricultural land. It is more justified economically, otherwise all suited barren lands would have been used by now. According to World Wildlife Fund (WWF) expanding agriculture is responsible for most of the world's deforestation (4).

Forests are natural carbon sinks, sometimes ingeniously called the lungs of the planet. Only tropical forests alone hold more than seven times the amount of CO2 emitted by human activities annually (5). Let alone other benefits of forests, like biodiversity, land preservation, serving home to indigenous people, forests are essential to survival of our civilization playing primary role in carbon and water cycles. Regardless of that, the deforestation continues throughout the world, the most acute 'deforestation fronts', as labeled by WWF, take place in South America, Sub-Saharan Africa and Oceania with an overall 95% estimated deforestation happening in tropical forests. Two countries, Brazil and Indonesia, account for approximately half of it. Both these countries are major agricultural exporters, Brazil ranked 3d and Indonesia ranked 11th in 2020 (6) and they have all economic

incentives to continue increasing the agricultural land at expense of tropical forests to satisfy their economic ambitions.

Studies show that most nations go through deforestation while developing and growing. As societies mature, people start addressing environmental concerns, including deforestation. For instance, most developed countries today are contributors to net forest growth. Does it or can it compensate for deforestation in tropics? The answer is no for several reasons. First, most developed countries are geographically located in northern regions with tempered forests, which cannot substitute dense tropical forests. Second, the rate of deforestation in tropics is much higher today than reforestation in developed countries. And the last, probably most important, developed countries continue to contribute to deforestation in tropics by engaging in international trade and buying agricultural produce from countries practicing deforestation, thus creating economic stimulus to continue such practices. What is more important, as soft commodities markets are truly global, the mere refusal by developed countries to import agricultural commodities from Brazil and Indonesia will not put sufficient pressure on these countries to discontinue deforestation. There will always be a buyer from a developing nation, who just cannot afford to adhere to such environmental standards and consider the future of the planet at the expense of its starving population.

The question of how to reconcile the need to feed the growing population with the environmental agenda is at the core of

discussions at global forums and meet-ups. There is a consensus that the solution can be found only through cooperation. Below I summarized currently discussed scenarios with an understanding that the final solution is a combination of several of the discussed options, which would invite a coordinated response from a global community:

1. Opportunity cost compensation. As the beneficiary of carbon retention by tropical forests is the world population at large, it is only fair to share globally the cost of preserving these forests with tropical countries. Here we talk about assessing and compensating the opportunity costs of abandoning deforestation practices by developing countries. For that purpose, could be used the existing carbon management mechanisms or it could be a completely new globally approved and accepted approach.

2. Cost allocation mechanisms. As demonstrated by Chart 1 the size of land needed to produce 100 gr of protein significantly differs depending on whether it is a plant-based or animal protein. The more efficient use of agricultural land is possible. Animal protein needs to bear the cost of extensive land use. It is possible that the current price difference between the plant-based and the animal protein is not sufficient. For example, lamb and beef production could be taxed to channel a part of price to cover the cost of other environmental actions aimed at effective use of the agricultural land. The applicable mechanisms should be fair and transparent.

3. Food preferences. Reduction in consumption of lamb and beef could be achieved through changes in customer preferences triggered by media campaigns on responsible consumption, awareness, etc.

4. Barren land conversion to agricultural land. The needed 100 mln hectares could be sourced from suitable barren lands. It is a sustainable though more costly way to serve global demand for agricultural land. The issue with this approach is that barren land suited for agricultural use is found in different geographies across the globe, less in tropical countries facing the deforestation issue. The economic competition between countries does not account for opportunities present in other countries. Therefore, the only way to convert barren land is through globally managed economic stimulus. Not a single country can implement this initiative alone.

5. Sharing yield-improving technologies. It is a known fact that crop yields vary greatly across the world the difference in yields reaching 2-3x between developed countries heavily investing in agricultural technologies, like USA or Western Europe, and the poorest developing countries in Africa and Asia. Sharing yield-improving technologies would increase the agricultural output from the same amount of agricultural land globally. Having agreed on that, we still understand that sharing any technology should bring economic benefits to its owners. Often the poorest countries cannot afford to purchase such technologies and the only solution here would be the deployment of supranational agreements.

6. Sustainable agricultural practices. Mature societies evolve to reach the stage of awareness about major aspects of life, such as social inequalities, sustainability, environmental agenda. Western corporations embraced this trend expanding their regular reporting to include ESG agenda. Environmental, Sustainability and Governance influence consumer choices. Attention to sustainability agenda made possible the success of organic labeling in the food industry, which is strongly supported by price differentials. It is my expectation that this trend will continue and end customers, first in developed countries followed by the entire global

population, will pay more attention to source of their food and the impact their choices make on the environment, including land use and agricultural practices. Developing technologies allowing traceability and validation of data, eventually will lead to full transparency of food production and supply chain. In this context, a relatively new trend focusing on reversing climate change, combining various practices commonly referred to as regenerative agriculture is gaining traction and is hoped to address many of the issues summarized in this article. Regenerative agriculture is about soil health, biodiversity, water cycles and ultimately about farmers productivity and profitability. In January 2024 regenerative agriculture was discussed at Davos forum as a solution to sustainability transition with the estimated annual budget of USD 300 bn. It is the acknowledgement of the size and importance of the issue of agricultural land use and acceptance that it should be a supranational effort. Wishing them good luck and waiting for long overdue actions.

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