

Overcoming limits set by scarce resources – role of local food production and food imports

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There is a fundamental tension between population growth and carrying capacity, i.e. the population that could potentially be supported using the resources and technologies available at a given time. This makes the assessments of resource use and agricultural productivity central to the debate on future food security. Local carrying capacity can be increased by expanding (e.g. through land conversion and irrigation infrastructure) or intensifying (e.g. through technologies and practices that increase efficiency) the resource use in agriculture. Food imports can be considered another way of overcoming current local limits and continuing growth beyond the local human-carrying capacity.

Focusing on water as the key limiting resource, we performed a global assessment of the capacity for food self-sufficiency at sub-national and national scale for 1961–2009, taking into account the availability of both green and blue water as well as technology and management practices affecting water productivity at a given time, and using the hydrology and agriculture model LPJmL as our primary tool. Furthermore, we examined the use of food imports as a strategy to increase carrying capacity in regions where the potential for food self-sufficiency was limited by water availability and productivity.

We found that the capacity for food self-sufficiency reduced notably during the study period due to the rapid population growth that outpaced the substantial improvements in water productivity. In 2009 more than a third (2.2 billion people) of the world's population lived in areas where sufficient food production to meet the needs of the population was not possible, and some 800 million people more were approaching this threshold. Food imports have nearly universally been used to overcome these local limits to growth, though the success of this strategy has been highly dependent on economic purchasing power. In the unsuccessful cases, increases in imports and local productivity have not kept pace with population growth, leaving 460 million people with insufficient food. Where the strategy has been successful, food security of 1.4 billion people has become dependent on imports. Whether or not this dependence on imports is considered desirable, it has policy implications that need to be taken into account.