

Carrying capacity is defined as the environment's maximal load, or the maximum number of individuals of a given species that an area's resources can sustain indefinitely without significantly depleting or degrading those resources. When discussing agriculture, carrying capacity refers to the amount of land that is available in a given state or region that is suitable for farming. For more information on land availability and its capacity to produce food, check out the [limited land fact sheet](#).

The model developed in "Testing a complete-diet model for estimating the land requirements of food consumption and agriculture carrying capacity: The New York state example" (NYS study) serves as an example of a methodology designed to determine how diets differ in their land use and the correlation between diets and land availability.¹

METHODOLOGY

In the NYS study, the potential carrying capacity — the maximum number of people that the available land in New York state can feed — was derived from recent estimates of quality and quantity of available agricultural land. These estimates of carrying capacity were used to examine the interaction between the quality of the land and the diet needed to support the largest population center, or city, within the state.

The study analyzed 42 diets based on 2,300 calories per day and consisting of products grown and sourced within the boundaries of New York state. The content of grains, fruits and vegetables generally complied with the recommendations of the U.S. Department of Agriculture's Food Guide Pyramid, though small changes were made in some cases to keep total calories the same across all diets. The amount of dairy in each diet was constant. The diet variables analyzed included the amount of meat, as well as the amount of energy supplied by fats.

During the analysis, land was divided into three quality categories: cropland useable for all crops, cropland limited to perennial crops and pasture, and land limited to pasture. Carrying capacity was then determined using a conditional (if/then) equation, which compared the per capita, or per person, requirements for each type of land.

RESULTS

Calculation of the potential carrying capacity of New York state demonstrates the correlation between land and diet. Overall, meat appears to be the primary basis of increasing land use. The findings suggest that the least land-intensive diet would feed five times the number of people as the most land-intensive diet.

The study discovered that the carrying capacity of New York state is not adequate to support the resident population, largely due to the significant size of New York City. While it could feed a significant proportion of the population, it will ultimately remain a net food importer, getting most of its food from outside of the state. All results support the assertion that diets should be considered in entirety when assessing environmental impact of food choice and land use.

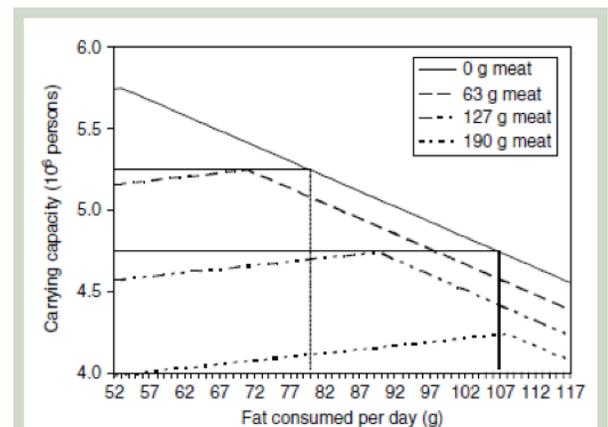


Figure 3. Carrying capacity of NYS agricultural land as a function of diet according to the coefficient values of the MAD (meat, added fat, discarded fat) multiple linear regression model. Lines parallel to the axes indicate where some lower-fat omnivore diets feed as many, or more, people than higher-fat vegetarian diets.

Source: Testing a complete-diet model for estimating the land resource requirements of food consumption and agricultural carrying capacity: The New York state example.

¹ Peters, C. J., Wilkins, J. L., & Fick, G. W. (2007). Testing a complete-diet model for estimating the land resource requirements of food consumption and agricultural carrying capacity: The New York state example. *Renewable Agriculture and Food Systems*, 22(2), 145–153.