

UAA Professional Development Seminar Series

Engineering in Food Security

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There are several threats to global food security, some of which include nuclear winter, abrupt climate change, or super volcanic eruption. These disasters, referred to as global catastrophic risks (GCRs), may prevent conventional agriculture by obscuring the sun, reducing global temperatures, or inhibiting rainfall. Apparent solutions are to store food or grow food using artificial light photosynthesis, which are not cost effective, and would cause billions of people to starve. Alternative foods are designed to be cost effective and energy efficient to feed everyone on Earth. Some alternative foods include low-tech greenhouse crops, seaweed, single cell protein, or non-biologically synthesized carbs. Alternative foods are designed to utilize global markets to scale them quickly enough to feed the global population. Combining alternative foods provides nutrient diversity. Some alternative foods can be used in isolated refuges, or similarly to reduce the cost of space missions. A method for reducing the cost of a space mission is to comparatively lower the mass of current food supply, i.e., dehydrated prepackaged food. This is achieved by using a lower weight food production setup to produce alternative food. Currently, the most competitive alternative food that may be used to feed the Earth during a GCR is methane-digesting single cell protein, which would have a retail cost of \$1.10/kg dry. The most competitive space food is hydrogen-oxidizing single cell protein, which would have a total system mass, proportional to cost, of at least 2.8x less than prepackaged food.

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pursuing a doctorate at UAF. His current research affiliations are the Alliance to Feed the Earth in Disasters and the Alaska Space Grant Program. Kyle works with scientists around the world to design alternative food