

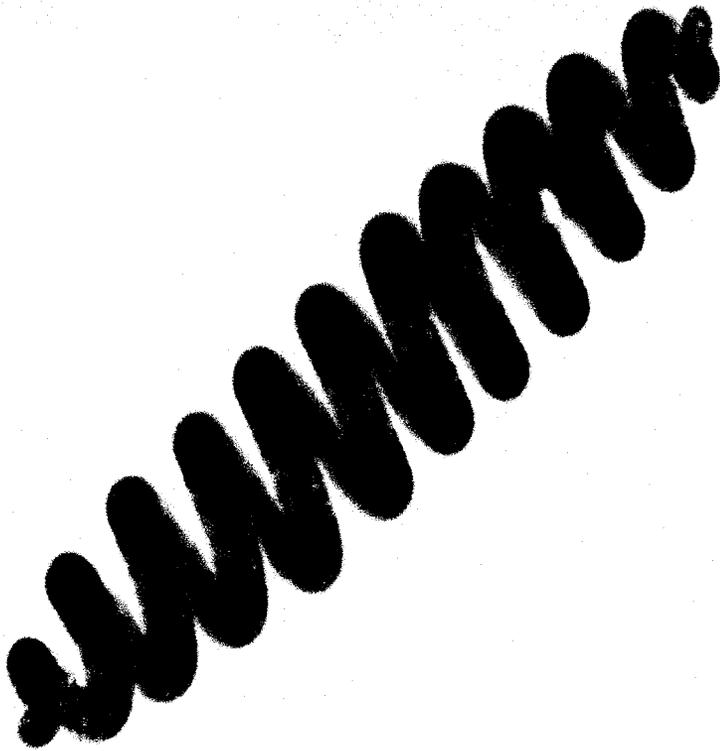
**Unique Features of Microalgae Culture Systems:
organic *Spirulina* production**

NOSB Meeting
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Earthrise Nutritionals Inc.

Unique Features of Microalgae Culture Systems: organic *Spirulina* production

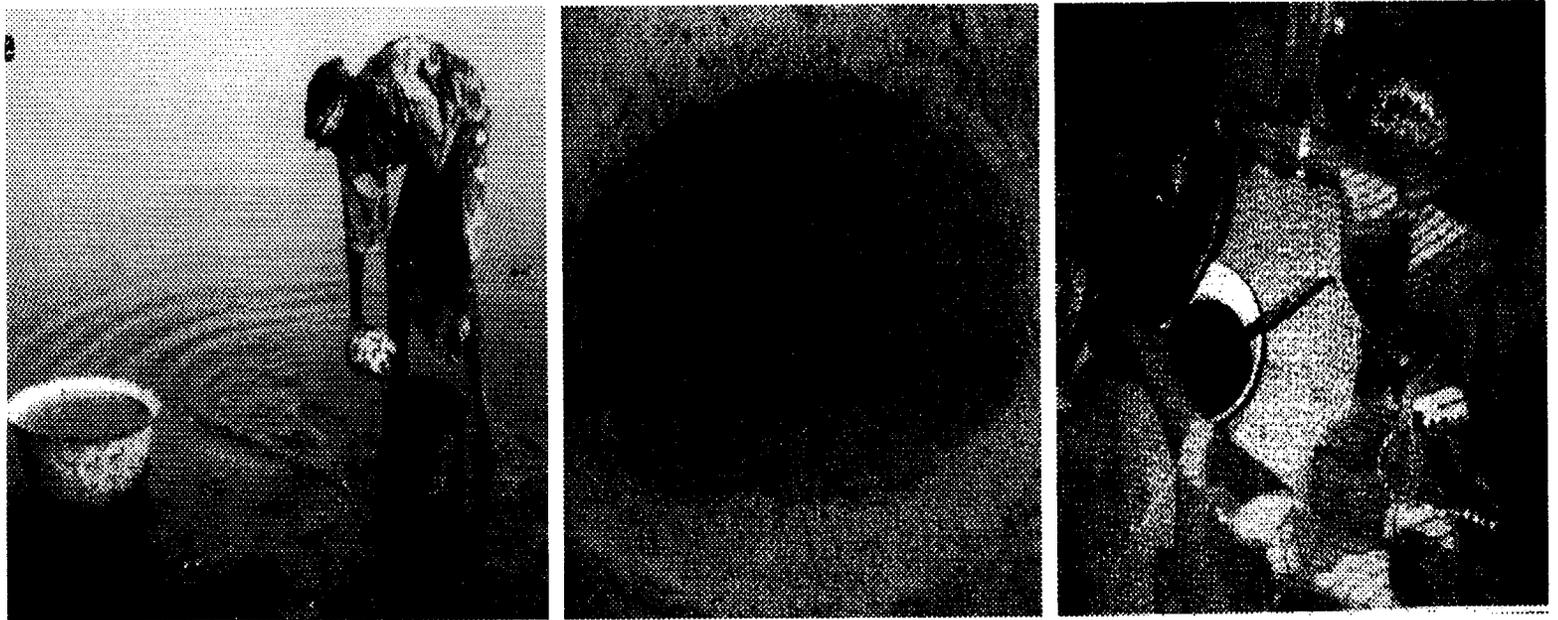


***Spirulina*: a cyanobacterium with a long history of human use**



- **It is a microscopic alga that has been used for food for centuries in two countries thousands of miles apart: Mexico and Chad.**
- **It has been in commercial production for the last 20 years.**
- **It is a rich source of protein, vitamins, essential amino acids, essential fatty acids, minerals and phytochemicals with potential therapeutic applications.**

History of Human Use as Food



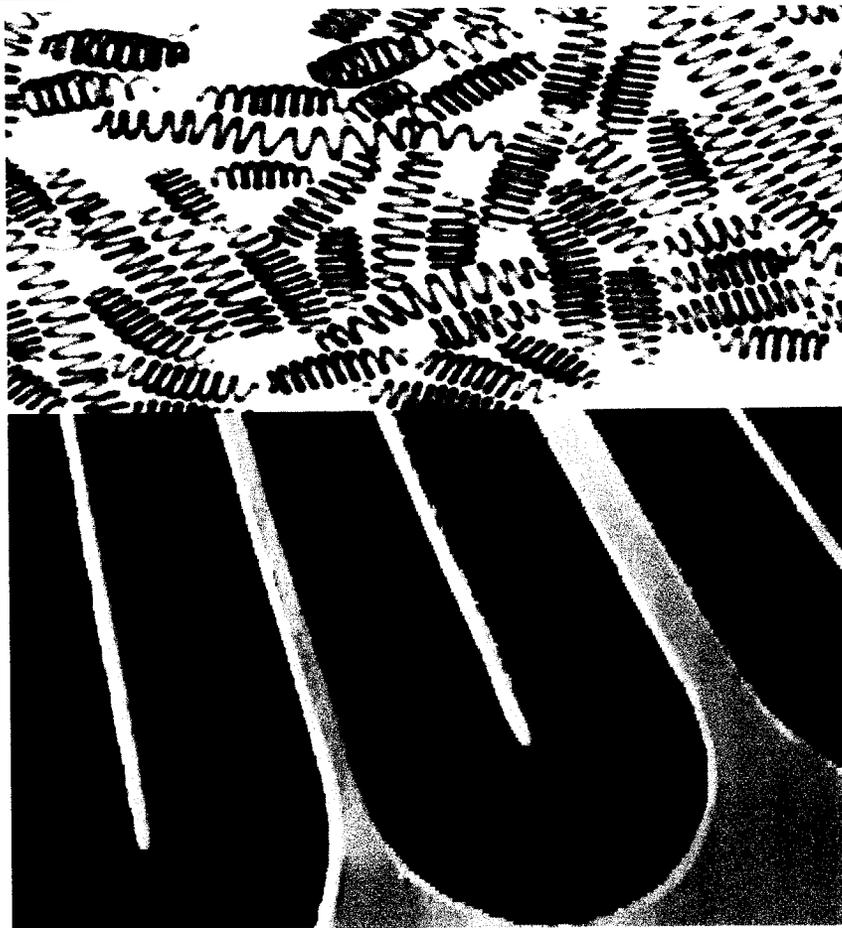
Harvesting of *Spirulina*, and drying and cooking of “dihe” around Lake Kossorom, Chad.

The Natural Setting for Growth



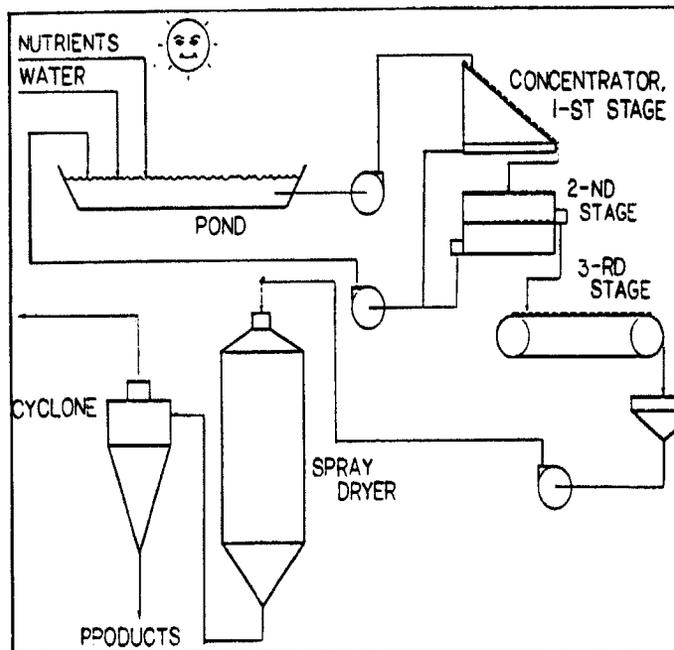
- Hot Arid areas of the tropics and subtropics; marginal land unsuitable for conventional agriculture
- Highly alkaline water with pH up to 11; a must have for *Spirulina* but not for other algae
- Soluble NPK and trace elements from runoff and recycling
- Shallow and mixed by wind

The Outdoor Culture Setting



- **Mimics the natural environment**
 - Hot and dry area
 - Man-made lined ponds
 - High alkalinity
 - High pH
 - Highly soluble nutrients
 - Paddle wheel mixing
- **However more control over growth conditions**

Unique Features of Organic *Spirulina* Production



- **Ponds are lined - no contact with the soil thus minimizing ground water contamination**
- **Nutrient utilization by the algae is fast and complete**
- **Nutrients are recycled completely**
- **No discharge outside the system**

The Petition

- **The petition refers to the use of the following inputs that are either not in the list or restricted:**
 1. **Sodium carbonate/bicarbonate as a source of CO₂ and a pH regulator – not in the national list**
 2. **Chilean nitrate restricted to < 20%**
 3. **Carbon dioxide as a source of carbon and pH buffer – not in the national list**
 4. **Some trace elements – not in the national list**
 5. **Other soluble salts on a case by case basis**

Justification for the Petition

Environmental Aspects

- **Our culture system is a closed-loop system where the nutrients are recycled completely. Very little, if any, nutrient-laden water is discharged to the environment.**
- **Growth ponds are completely lined with Hypalon such that there is no contact of the medium or the algae with the soil thus minimizing ground water contamination.**
- **No use of pesticides or herbicides and none (over 40 different types) have ever been detected in the product in almost 20 years of regular production and 4 years of organic production.**
- **Efficiencies of energy utilization, land and water use are much higher than conventional crops.**

Recommendation for Immediate Action

- 1. Microalgae production systems address the organic philosophy that “soil and groundwater management practices should prevent pollution by nitrates, phosphates and salts”**
- 2. Microalgae production systems have some unique features that are not accommodated by the final rules. We recommend that urgent revisions be made to the rules to accommodate these unique features of microalgae production. In the long run we recommend the creation of a new category for microalgae production, separate from land crops and livestock.**