ANTENNA
Research for progress

Spirulina :
a sustainable solution against malnutrition and a development tool







Presentation to I DREAM - 14th of June 2014

Plan

1. **Antenna, who are we ?**
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   - History / Vision
   - Antenna France
   - Antenna's spirulina programs in the world
   - A few figures / Success and failures

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   - Composition / How to use it
   - Scientific research / Worldwide recognition

3. **Spirulina growing process**

4. **Spirulina against malnutrition**

5. **Spirulina, a development tool**
   - An attractive product
   - Business model
   - Somme examples

1. Antenna, Who are we ?

Under development

In operation















1. Fields

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ANTENNA NUTRITION
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Local cultivation and dissemination of spirulina, a microalga with exceptional nutritional value, offer a solution to malnutrition.

ANTENNA WATER
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The WATA device and the WATASOL approach offer a local solution for safe water treatment and disinfection.

ANTENNA ENERGY
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Antenna develops a powerful and affordable solar lighting kit for homes without electricity.

ANTENNA AGRICULTURE
Research for progress

Local production of biofertilisers and biopesticides help small-scale farmers and strengthen local food security.

ANTENNA MEDICINES
Research for progress

Two medical projects promote the use of traditional and natural methods.

ANTENNA MICROCREDIT
Research for progress

Microcredit helps to create income-generating activities and the acquisition of technologies in developing countries.

1. History of Antenna

- Antenna = network working around Antenna Foundation based in Geneva
- Antenna Geneva = created as NGO in 1989 --> Foundation since 2010
- Starting point : Denis Von Der Weid associated with high level scientists who put their knowledge at the service of development and humanitarian causes :
  - Scientific Research
  - Validation of the techniques
  - Diffusion of technology and development of economically viable and sustainable programs

1. Our vision

Our goals :

- To overcome difficulties in line with basic needs of deprived population
- To enable sustainable economic development with local resources
- To empower local communities helping them to overcome their difficulties by themselves



Our work :

- We enable and engage R&D on durable, low-cost and easy to use technologies
- We carry out dissemination of these technologies in developing countries together with local and international partners.



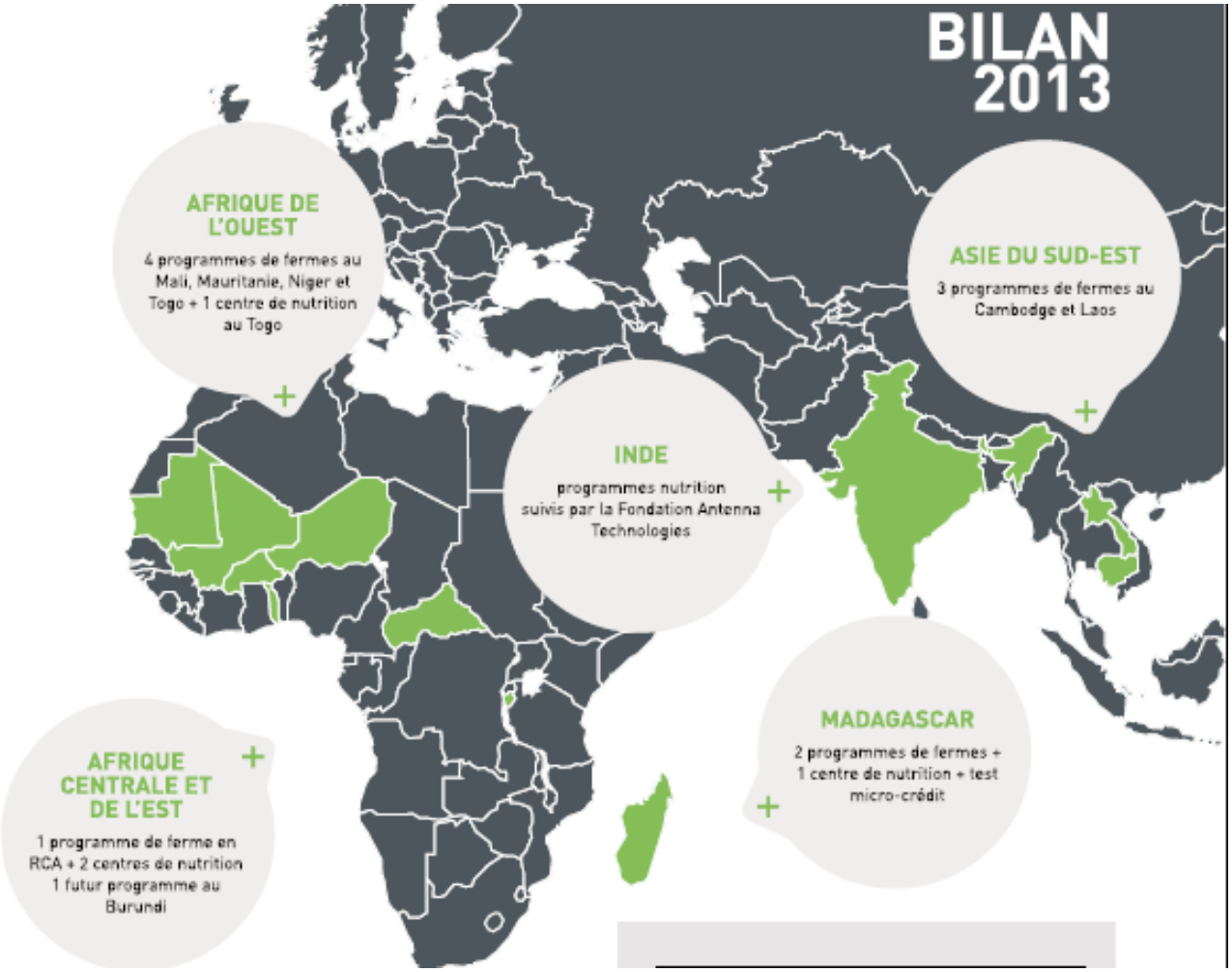
1. Antenna France

- Created in 2002
- Leader within Antenna in local production and distribution of Spirulina
- Other activities (in coordination with Antenna Foundation in Geneva) :
  - microcredit
  - safe water access

- President – Jean-Patrice POIRIER
- 30 members
- 10 active members
- 4 remunerated persons (2,5 full time equivalent)

- Annual budget : 250 000 to 300 000€

1. Antenna's spirulina programs



Mauritania, Mali, Burkina Faso, Niger, Togo, Central Africa, Laos and Cambodia

1. A few figures

- 12 production programs and distribution of Spirulina in 8 countries.
- 3 Nutrition Centers (Madagascar, Togo, RCA)
- 4 tons of dry Spirulina produced/year on 3,000 m² of ponds.
- 54 local jobs created since 2004.



30 to 40% of production distributed to 16 000 children each year

1. Success and failures

- Success :
  - 9 programs completely autonomous
  - 3 programs on the way to be autonomous
  - More than 50 full time jobs created (much more with partial time job in distribution)
  - Spirulina notoriety is growing regularly

- Failures:
  - 3 programs stopped
  - 1 program having difficulties to become autonomous
  - Notoriety growing too slow.

2. Spirulina presentation (*Arthrospira platensis*)



Microfilament of Spirulina under microscope

2. Spirulina presentation : history





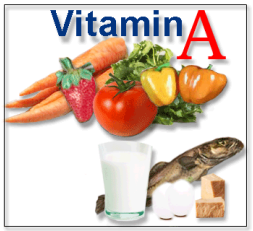


- Micro-organism (cyanobacteria)
- Naturally grows in lakes (Tchad, Mexico)
- Needs warm and alkaline water
- Green and spirally filament of 0.1 millimetres length
- Rediscovered in Lake Tchad in the 1950's

2. An exceptional composition

- **Proteins :** Between 50 and 60% of its dry weight almost twice of soya. All essential amino acids included

- **Phycocyanin :** 15% of the total weight of Spirulina
  - Stimulates immune system, plays a role in the production of red blood cells
  - Antioxidant effect



- **Vitamin A** (Beta-Caroten): Essential to eyesight, antioxidant, and is a usual deficiency of pregnant women possibly mortal

- **Vitamin B12 :** Best non-animal source of vitamin B12, fights pernicious anaemia, four times higher than raw liver



- **Vitamin K :** Increase calcium fixation, soften artery and increase blood coagulation



Vitamins A, B12 and K : 1g cover the daily needs of a child

2. An exceptionnal composition

- **Iron :** fights anaemia, much more digestible than all other vegetable sources of Iron

  1 or 2 g cover daily needs of a child

- **Gamma-linolenic acid (GLA) = Omega 6 :** precursor to anti-inflammatory and immune mediators, the second richest source of this nutrient after maternal milk

- **Sulphate polysaccharids :** strengthen immune system virus replication inhibitors and part of some cancers prevention.

Exceptional bio availability

2. How to use Spirulina ?





Savor spirulina plain, its sprinkles crack nicely in your mouth

CHILDREN = 1 spoonful (2-3gr) per day
course of 4 to 8 weeks

ADULTS = 2 spoonfuls (4-5gr) per day
course of 4 to 8 weeks

Highly recommended for pregnant & breastfeeding women

2. Scientific research

Examples of scientific results

- **Maduraï (India) ►**
  1 g of spirulina /day during 6 weeks allows complete recovery of malnourished children



Nutrition Journal — BioMed Central

This Provisional PDF corresponds to the article as it appeared upon acceptance. The fully-formatted PDF version will become available shortly after the date of publication, from the URL listed below.

Nutrition rehabilitation of undernourished children utilizing Spiruline and MISOLA

Nutrition Journal 2006, 5:3 doi:10.1186/1475-2891-5-3

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ISSN 1475-2891

Article type Research

Submission date 13 Oct 2005

Acceptance date 23 Jan 2006

Publication date 23 Jan 2006

Article URL http://www.nutritionj.com/content/5/1/3

This peer-reviewed article was published immediately upon acceptance. It can be downloaded, printed and distributed freely for any purposes (see copyright notice below).

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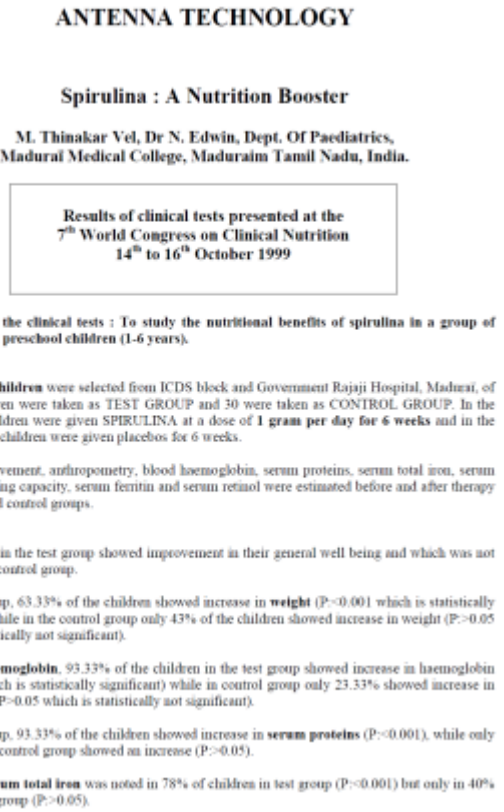


ANTENNA TECHNOLOGY

Spirulina : A Nutrition Booster

M. Thinakar Vel, Dr N. Edwin, Dept. Of Paediatrics, Madurai Medical College, Maduraim Tamil Nadu, India.

Results of clinical tests presented at the 7th World Congress on Clinical Nutrition 14th to 16th October 1999

Objectives of the clinical tests : To study the nutritional benefits of spirulina in a group of malnourished preschool children (1-6 years).

Methodology
A total of **60 children** were selected from ICDS block and Government Rajaji Hospital, Madurai, of wich 30 children were taken as TEST GROUP and 30 were taken as CONTROL GROUP. In the test group, children were given SPIRULINA at a dose of **1 gram per day for 6 weeks** and in the control group, children were given placebos for 6 weeks.

Clinical improvement, anthropometry, blood haemoglobin, serum proteins, serum total iron, serum total iron binding capacity, serum ferritin and serum retinol were estimated before and after therapy in both test and control groups.

Results
Most children in the test group showed improvement in their general well being and which was not noticed in the control group.

In the test group, 63.33% of the children showed increase in **weight** (P:<0.001 which is statistically significant), while in the control group only 43% of the children showed increase in weight (P:>0.05 which is statistically not significant).

Regarding **haemoglobin**, 93.33% of the children in the test group showed increase in haemoglobin (P:<0.001 which is statistically significant) while in control group only 23.33% showed increase in haemoglobin (P>0.05 which is statistically not significant).

In the test group, 93.33% of the children showed increase in **serum proteins** (P:<0.001), while only 16.66% in the control group showed an increase (P:>0.05).

Increase in **serum total iron** was noted in 78% of children in test group (P:<0.001) but only in 40% in the control group (P:>0.05).

- **Ouagadougou (Burkina Faso)**
  ◄ Spirulina + Misola during 8 weeks allows complete recovery of malnourished children

More details on these scientific studies available on website www.antenna.ch

2. Worldwide recognition of Spirulina

The Food and Drug Administration (FDA in USA) in its response letter GRAS (Generally Recognised as Safe) Notice Number GRN 000127, to Cyanotech Corporation, a firm that produces Spirulina in Hawaii (100 % Arthrospira platensis) the 6th of October 2003 proclaim

The subject of the notice is the dried biomass of *Arthrospira platensis* (spirulina).

The notifiers discuss published animal studies relevant to the safety of spirulina. These include oral feeding studies in rats, pigs, mice, and hamsters. The notifiers report that no adverse effects were observed in the studies. The notifiers also describe several published human studies evaluating the potential for beneficial effects of spirulina and report no adverse side effects.

Conclusions

Based on the information provided by Cyanotech Corporation and Earthrise Nutritionals, Inc., as well as other information available to FDA, the agency has no questions at this time regarding the notifiers' conclusion that spirulina is GRAS under the intended conditions of use. The agency has not, however, made its own determination regarding the GRAS status of the subject use of spirulina.

2. Worldwide recognition of Spirulina

The United Nations Food and Agriculture Organization (FAO)conclude in its 2008 report about Spirulina …/…

A review on culture, production and use of Spirulina food for humans and feeds for domestic animal and fish, FAO, Fisheries and Aquaculture circular No. 1034, Ahsan B.Habib, Mashuda Parvin,Tim C. Huntington, Mohammad R. Hassan, Rome, 2008.)

6.1 Conclusions

Spirulina appears to have considerable potential for development, especially as a small-scale crop for nutritional enhancement, livelihood development and environmental mitigation. In particular, the production and use of spirulina has the following advantages:

- it provides an easily digestible high (c. 60 percent) protein product with high levels of β-carotene, vitamin B_{12}, iron and trace minerals and the rare essential fatty acid γ-linolenic acid (GLA). In addition, it has no obvious negative cultural or religious issues associated with its consumption;
- its production occupies only a small environmental footprint, with considerable efficiencies in terms of water use, land occupation and energy consumption when compared to traditional terrestrial crops;
- its production is especially suitable to saline and alkaline conditions that are often unfavourable to traditional crops and are frequently occupied by disadvantaged people suffering from, or vulnerable to, natural disasters;
- its production can be conducted at a number of different scales, from household "pot culture" to intensive commercial development over large areas;
- it has the potential for integration with rural organic waste treatment processes to improve both environmental conditions and improve energy transfer efficiencies;

6.2 Recommendations

There is a role for both national governments – as well as inter-governmental organizations – to re-evaluate the potential of spirulina to fulfill both their own food security needs as well as a tool for their overseas development and emergency response efforts. Other international organizations that have developed both an interest and capacity for developing small-scale spirulina production would be key potential facilitators in demonstrating available technologies for local uptake. They could also develop improved technical and economic solutions to spirulina production in environmentally impoverished conditions, as well as prepare tested production packages for rapid deployment in emergency situations.

3. Spirulina growing process



3. Spirulina growing process

Growing in ponds



Harvesting = filtration





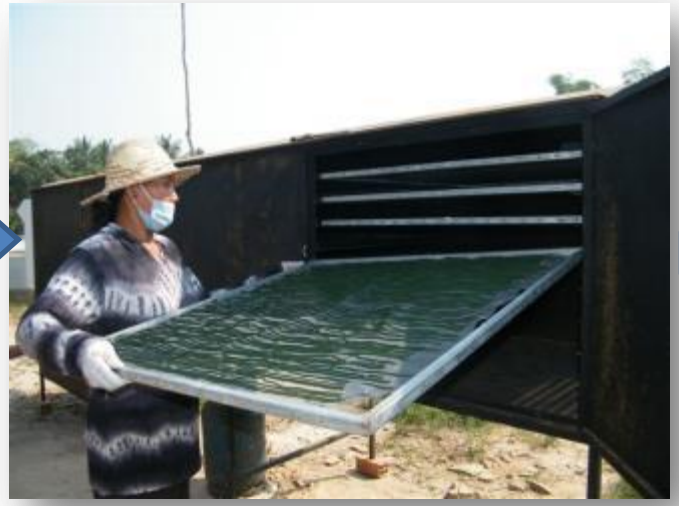
Pressing



3. Spirulina growing process



Extrusion



Drying



Storing



Packaging

Quality control





4. Spirulina against malnutrition



- Thanks to its exceptional composition and its excellent bio availability, spirulina is an attractive tool against malnutrition
- Produced locally and dispatched at very low price, spirulina is accessible for children and pregnant or breastfeeding women in difficult nutritional situation.
- Produced locally, spirulina allows nutritional autonomy of the countries where it is grown

4. Spirulina against malnutrition

Some major NGO dispatching already spirulina :

ChildFund India

World Vision

Red Cross



Pour un Sourire d'Enfant
Association loi 1901, reconnue de Bienfaisance
Lauréate du Prix des Droits de l'Homme

Plan

5. Spirulina, a development tool

- Thanks to its exceptional composition, spirulina is also attractive for well nourished people : fortifying, antioxidant, cosmetic, etc .....

  => Spirulina can be sold on a commercial market



- Antenna has developed the following business model :
  - Social distribution (see slides above) at very low price.
  - Commercial distribution with sufficient margin to compensate social distribution and cover production and distribution costs

- Most of time financial balance is reached with :
  - 30 to 40% of social distribution
  - 60 to 70% of commercial distribution



5. Spirulina, a development tool

- This business model allows
  - To meet the social target of the project (nutrition)
  - To guaranty continuation of the project allowing population to face their problems by themselves for a long time

- For this reason, spirulina is a development tool :
  - Durable economic activities.
  - Creation of long term employments

- Examples :
  - Madagascar : equilibrium reached with 20% social/80% commercial (social=free)
  - Togo : : equilibrium reached with 33% social / 67% commercial
  - Cambodia : : equilibrium reached with 50% social/50% commercial
  - Niger : : equilibrium reached with 34% social/ 66% commercial

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Thank You for your attention !





To know more : www.antenna-france.org