

# Lemna (Duckweed)



A Cheap Source of Protein and Ideal for Water Treatment

## Key Attributes:

- ✓ Cheapest source of protein (similar or lower than soybean)
- ✓ 42% crude protein in dry matter (highly digestible)
- ✓ Yield 25-35 tons dry matter/ha/year
- ✓ >10 times higher yield than soybean (lower footprint)
- ✓ Protein source independent from imports
- ✓ Does not require arable land
- ✓ Good source of protein, starch, antioxidants, minerals (Ca, Mg, Fe), chlorophyll
- ✓ Use for food, feed or organic fertiliser
- ✓ Easy to harvest by automation (floating on surface)
- ✓ Efficient nutrient removal from wastewater (piggery effluent or poultry)
- ✓ Clarification of wastewater
- ✓ Limits water evaporation



Schenk Lab

[WWW.SCHENKLAB.COM](http://WWW.SCHENKLAB.COM)  
[www.SustainableSolutionsHub.com](http://www.SustainableSolutionsHub.com)



Prof Peer Schenk

Email: [p.schenk@susolhub.com](mailto:p.schenk@susolhub.com)

## Lemna Nutrient Attributes

| Component              | % of Dry Matter |
|------------------------|-----------------|
| Crude Protein          | 41.7            |
| Acid detergent fibre   | 15.6            |
| Non-fibre carbohydrate | 17.6            |
| Crude Fat              | 4.4             |
| Ash                    | 16.2            |

## Costs and Requirements of Production

- \$400 - 700 per ton dry weight (unprocessed)
- Shallow ponds or raceways (liner or clay)
- Tolerates water with high turbidity, high nutrient loads and <5 ppt salinity
- Fertiliser or Poultry manure + minimal micronutrients

## Productivity

- 7-15 g dry weight per m<sup>2</sup> per day
- 25 - 35 t per hectare per year (equiv. 12 000 kg crude protein)

## Growth Requirements

- Neutral pH 7-8 is ideal (growth is impaired below 5.5 or above 10)
- NH<sub>4</sub><sup>+</sup> concentrations should be below 18 mg/L
- Ideal N:P ratio is 20:1
- >70% water surface coverage should be maintained (reduced evaporation and prevention of algae growth)

## Benefits of Nutrient Recycling

- ✓ Utilisation of high-nutrient wastewater (e.g. piggery effluent) to produce a valuable source of protein for feed or organic fertiliser/compost
- ✓ Nutrient recycling, particularly phosphorus reduces production costs



## Amino Acid Profile - *Lemna gibba*

| Amino Acid    | g/ 100 g | Amino Acid    | g/ 100 g |
|---------------|----------|---------------|----------|
| Taurine       | 0.03     | Methionine    | 0.64     |
| Aspartic Acid | 3.51     | Isoleucine    | 1.66     |
| Threonine     | 1.68     | Leucine       | 2.89     |
| Serine        | 1.39     | Tyrosine      | 1.27     |
| Glutamic Acid | 3.67     | Phenylalanine | 1.75     |
| Proline       | 1.42     | Histidine     | 0.73     |
| Glycine       | 1.93     | Ornithine     | 0.05     |
| Alanine       | 2.30     | Lysine        | 1.85     |
| Cysteine      | 0.44     | Arginine      | 2.14     |
| Valine        | 2.12     | Tryptophan    | 0.40     |

