

Lemna (Duckweed)



Ideal for Nutrient-Rich Wastewater Treatment and Cheap Protein or Fertiliser Production



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 animal feed or as organic fertiliser**
- ✓ Easy to harvest by automation (floating on surface)
- ✓ **Efficient nutrient removal from wastewater** (e.g. piggery effluent or poultry)
- ✓ Clarification of wastewater
- ✓ Limits water evaporation



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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 m² 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)
- NH₄⁺ 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

