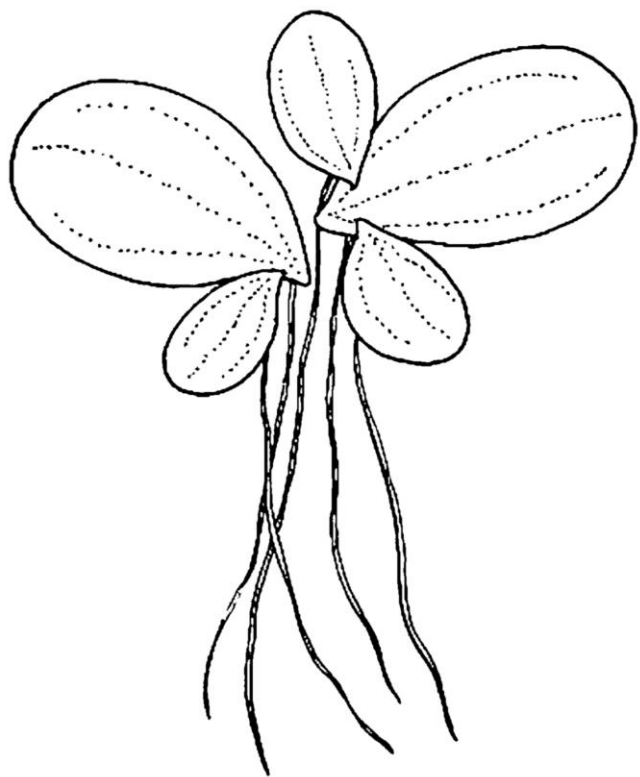


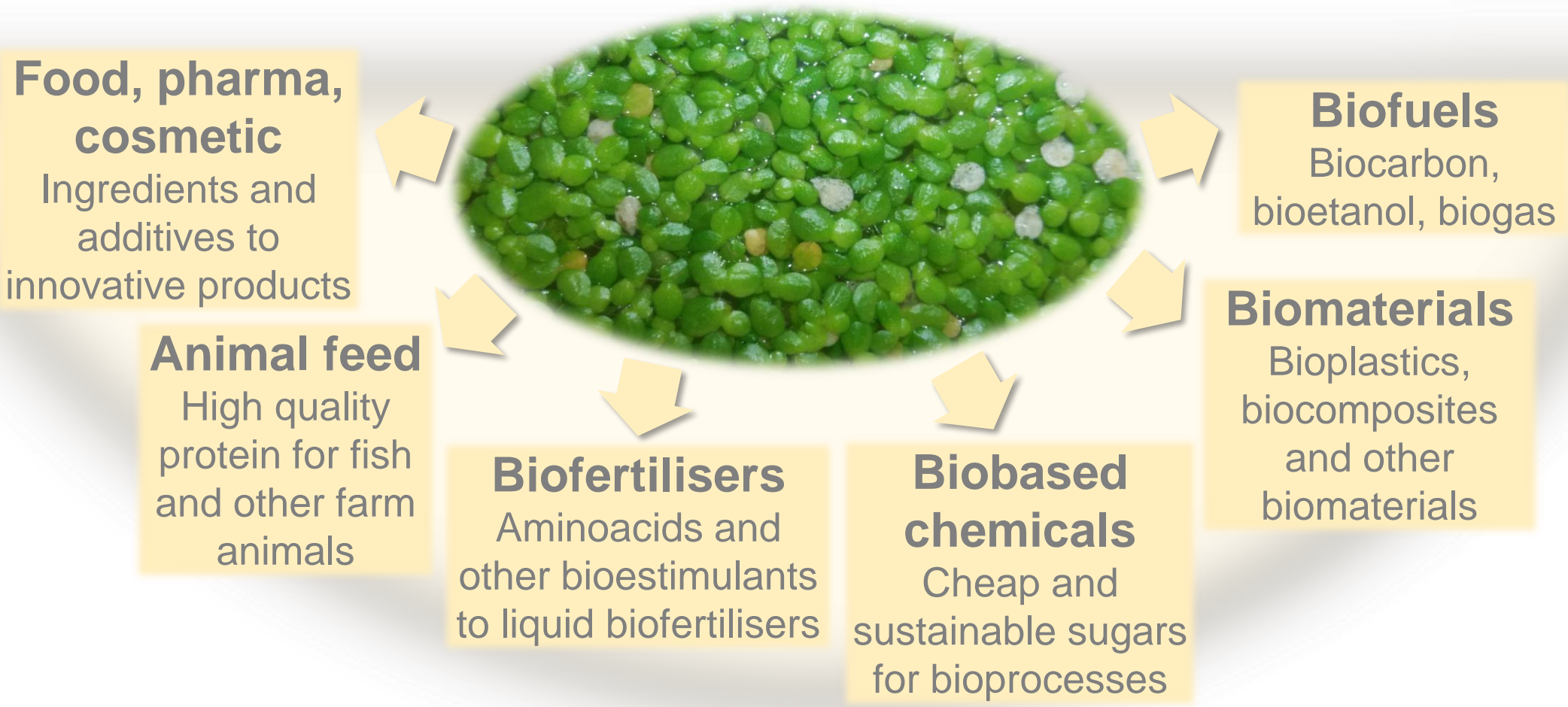
# Duckweed for nutrient recovery and/or biomass production

## About Lemna.

- Duckweed (*Lemnaceae*) is a small floating macrophyte
- 4 genus (*Lemna*, *Landoltia*, *Spirodela* and *Wolffia*) and 40 known species
- Duckweed naturally grows in river banks or lakes but it is also been used for wastewater phytoremediation through lagoons or raceway systems
- Capacity to duplicate weight in 16 h-2 days
- High productivity per surface (see table).
- High absorption capacity N and P: 2 and 0.5 ton·ha<sup>-1</sup>·year<sup>-1</sup>
- Biomass composition rich in proteins 22.5-29.3 %, carbohydrates 10-32.5 % and lipids 8.7-11.2 %. Suitable for many biobased products



## Potential applications of duckweed biomass



Species	Production MT DM/ha/year	Protein % DM	Protein yield MT/ha/year
Duckweed	12-16	16-45	1.9-7.2
Water hyacinth	24-32	12-35	2.9-8
Homwort	10	20	2
Cattail	32	10-14	3.2-4.5
Algae	8	50	4

Small Scale Biorefining, 2016. Wageningen University & Research

## ainia's technical resources and know-how

- Laboratory (1 L) and pilot scale duckweed (50-200L) cultivation systems
- Know-how on duckweed cultivation including initiation, cultivation and harvesting
- Process control by light, pH, COD, morphology and other parameters



Duckweed morphology study



Lab scale optimization cultivation



50 L outdoor cultivation



200 L raceway cultivation

## Experience



**Duckweed technology for improving nutrient management and resource efficiency in pig production systems**

### Objectives and scope:

**Life LEMNA aims to reduce manure nutrient pollution** of water bodies in farming areas, improve **resource efficiency** and **close the mineral cycle**. A **250 m2 duckweed-based cultivation system** will be designed and built to daily treat about 3.000L of digestate and produce >35 kg of duckweed biomass. A biogas plant located in a pig farm will be the project site for demo trials. The **duckweed biomass** will be used as a feedstock for producing a **biofertiliser** and **feed** which will be evaluated.

### Foreseen results

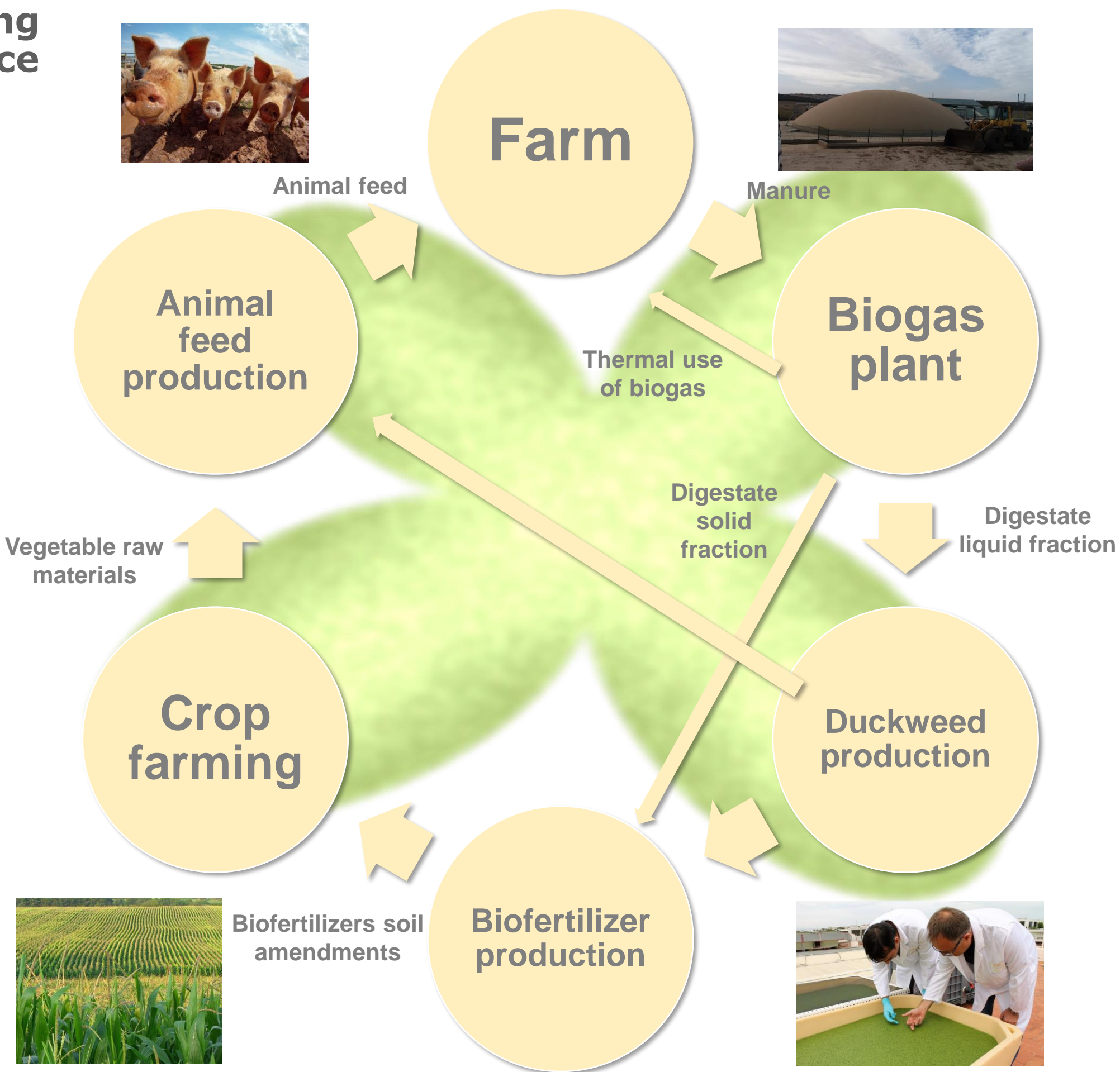
- ✗ **Pioneer prototype** in the EU for duckweed cultivation on digestate.
- ✗ A collection of **25 duckweed strains** will be developed.
- ✗ **95-100% nutrient (N and P) recovery efficiency rates** treating anaerobically digested pig manure
- ✗ Validation of **new duckweed biobased products**: feed /biofertiliser
- ✗ **Carbon footprint reduction** of animal production.
- ✗ **e-LEMNATOOL** for system replication in other EU farms.

### Beneficiaries

AINIA, CNB-CSIC, Ecobiogas

### Duration

3 years, 2016-2019



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