

Eco-systems of agricultural landscapes
and sustainable land use: Livestock systems

04 - Livestock Farming Systems - 4

Post-industrial organic livestock farming



Public concerns about industrial livestock production systems

Landscape destruction and environmental damage

GHG emissions and climate change

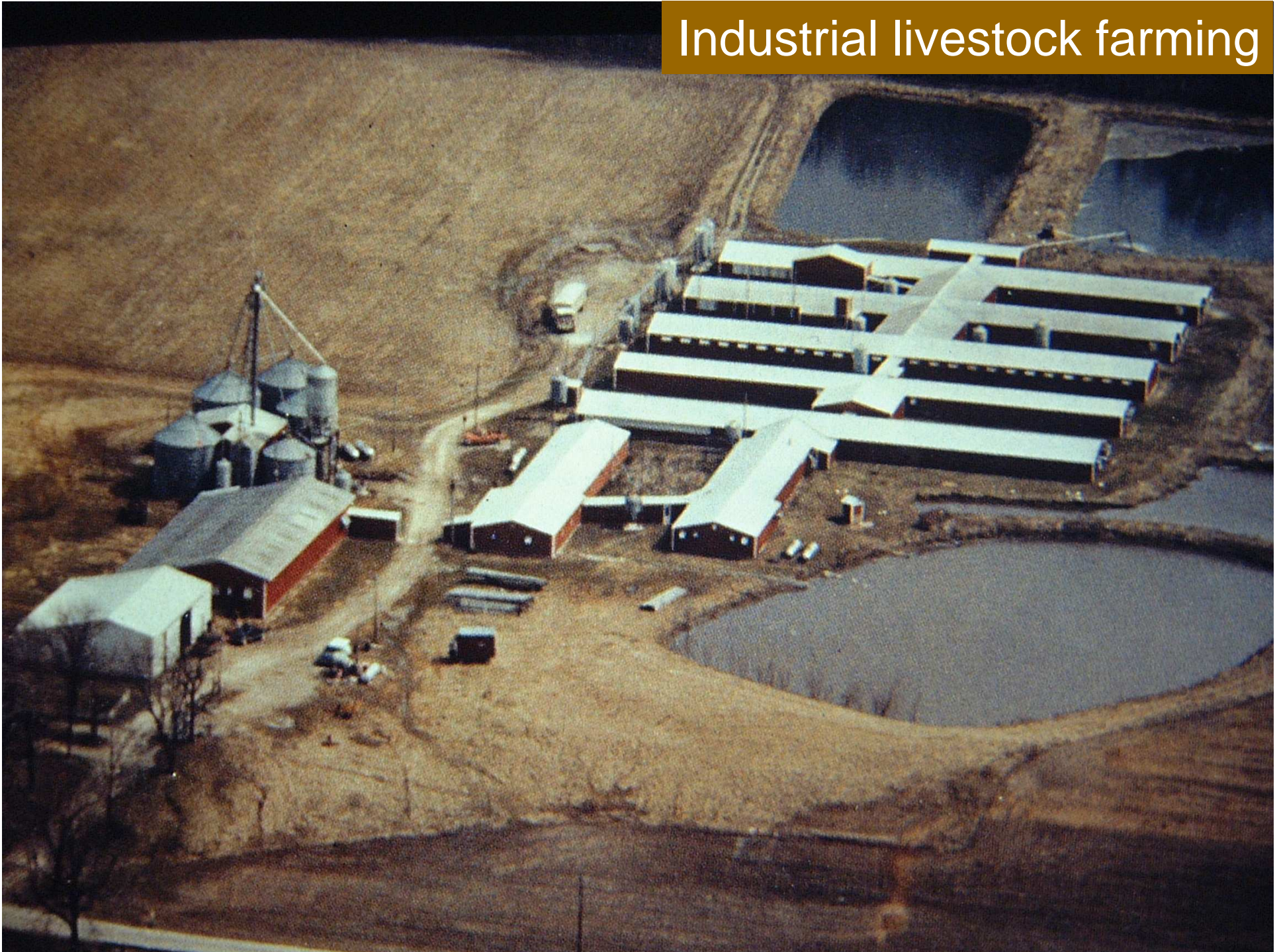
Animal health and welfare

Product quality and hygiene

Food, feed and fuel controversy



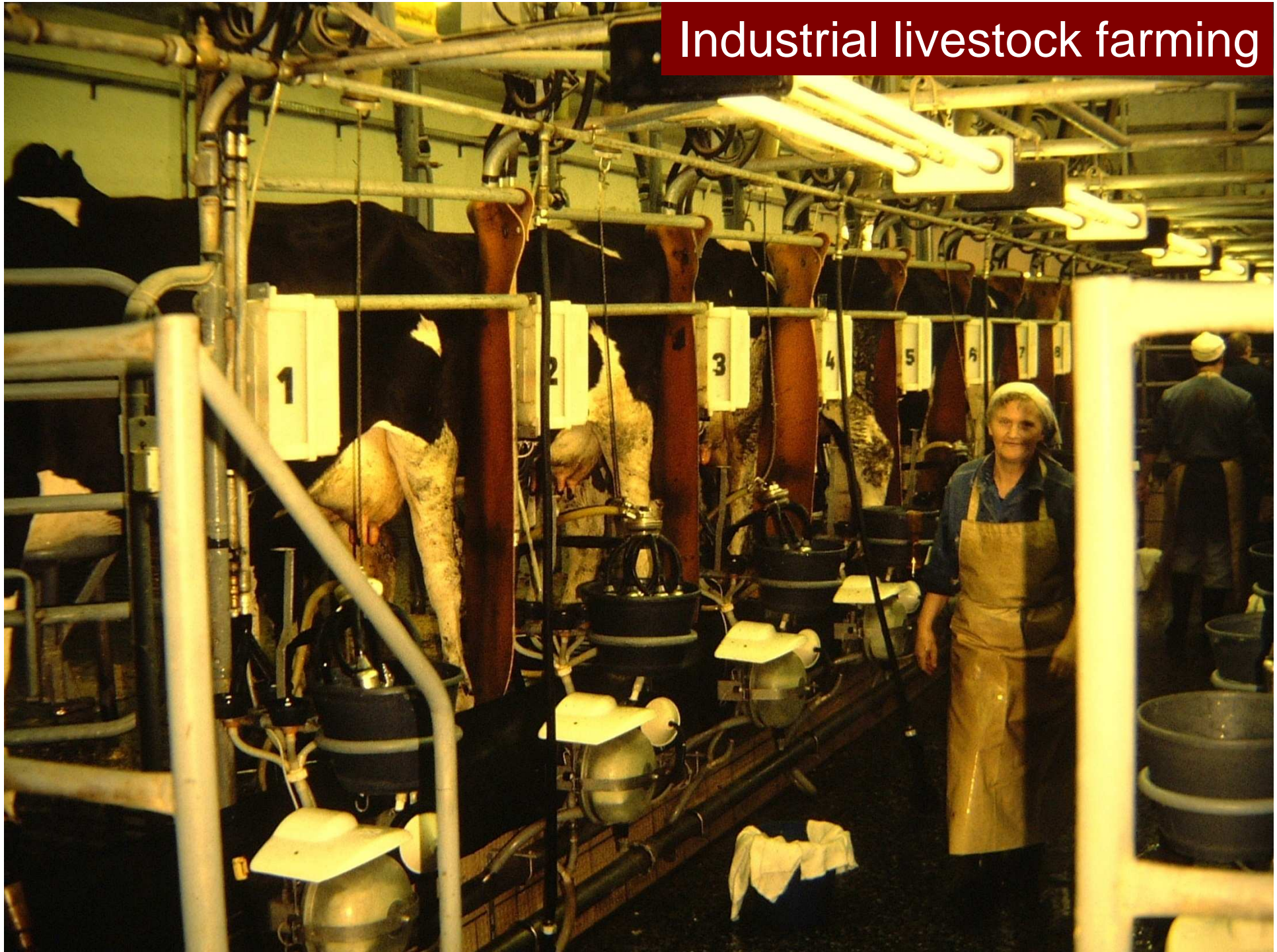
Industrial livestock farming



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Key elements of post-industrial organic (livestock) farming

Avoid use of pesticides, antibiotics and other drugs

Limit use of chemical fertilisers and pesticides in
feed production

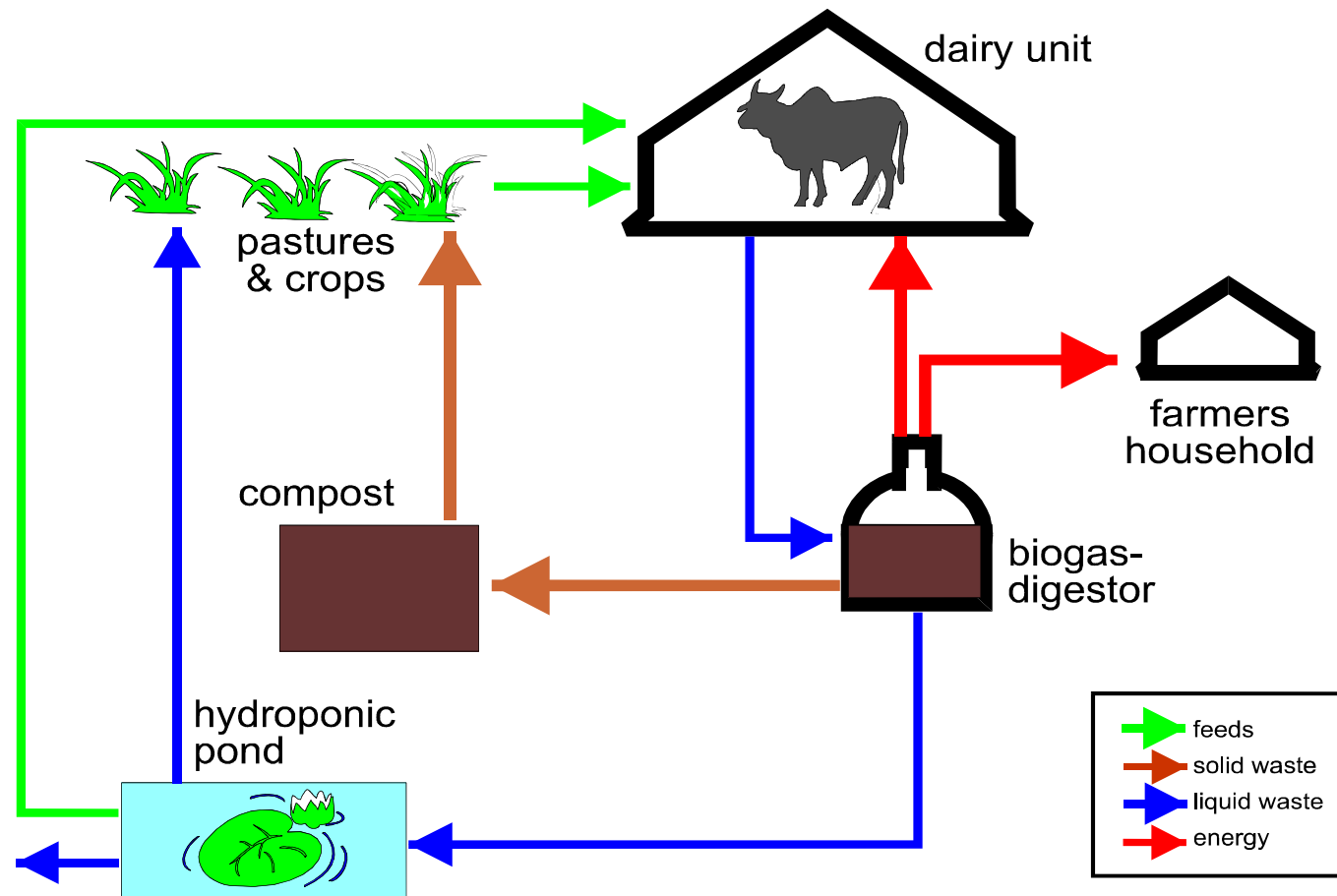
Limit use of concentrate feeds

Adhere to strict animal welfare standards

Purify or recycle all waste materials



Recycling of nutrients and energy



Liquid manure is collected in an intensive dairy unit and channelled into a biogas fermentation chamber





Above: Fixed dome biogas fermentation chamber under construction

Right: Overflow (front), gas collector and off-take pipe (centre), feeder funnel (back) of a biogas fermentation chamber



Biological purification of biogas fermenter effluent in hydroponic ponds through nutrient extraction by aquatic plants (left *Azolla* sp.; right *Lemna* sp.); protein rich plant biomass is used as cattle feed; pond effluent is used to fertilise a fish pond.



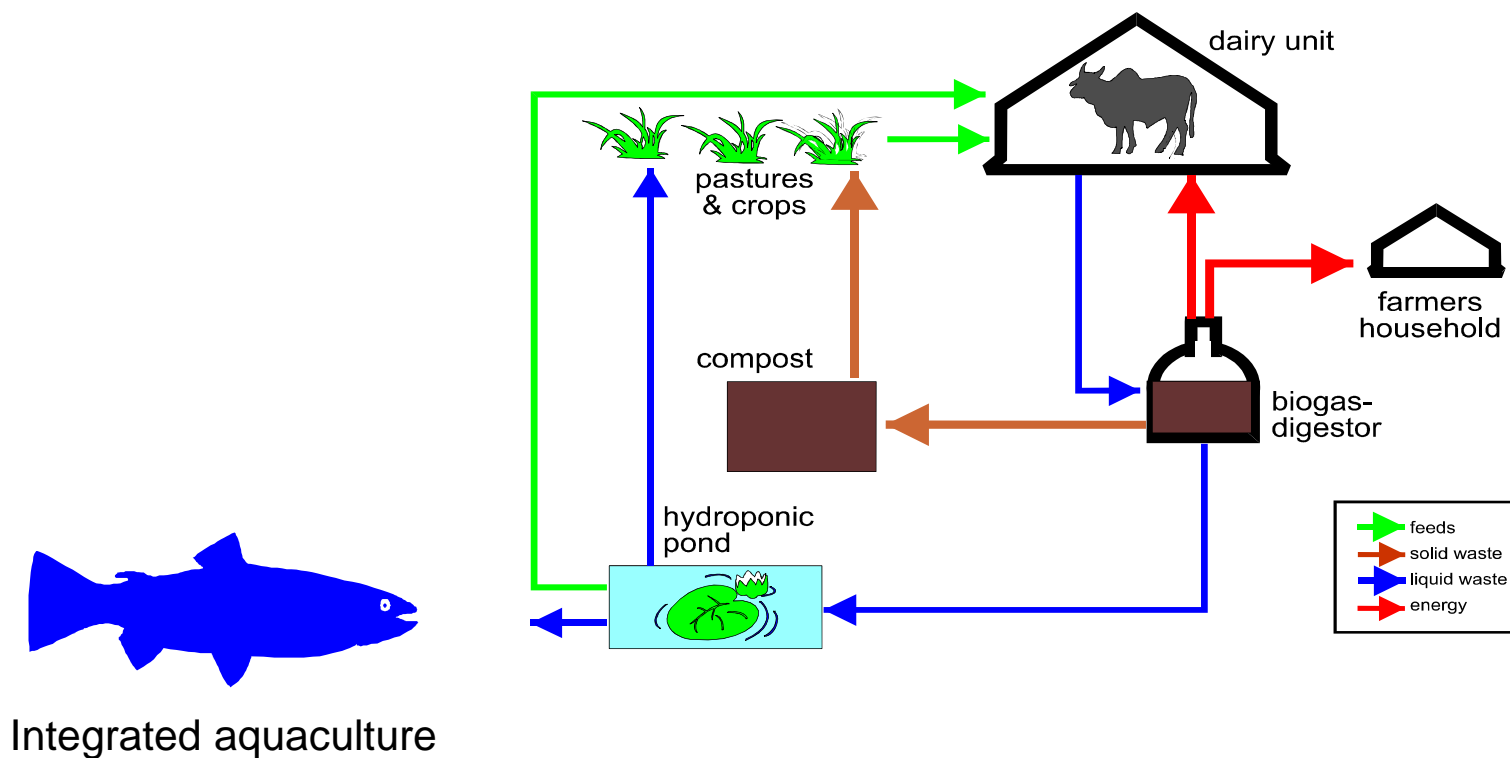
Freshly harvested *Azolla* plants are air dried and fed directly to the dairy cattle as protein supplement (35% CP) or ground and added to concentrate feed for chicken



The biogas fermenter sludge is composted and used for earth worm production. The material is placed into concrete troughs and inoculated with earth worms, which are sporadically harvested and used as chicken feed or used as inoculation material for other compost production.



Further option for integration



Integrated systems consist of sub-systems linked through mutual input-output exchanges. Integrated aqua-culture serves as a sink for by-products of other production systems and provides outputs which in turn are recycled back into the previous system or are sunk to another system level.

Aquaculture is the cultivation of plants and/or the systematic breeding of animals in water. This can be sweet water or sea water and can take place in natural water bodies or in man-made containers. Fishing or harvesting plants from wild populations is not considered aquaculture.

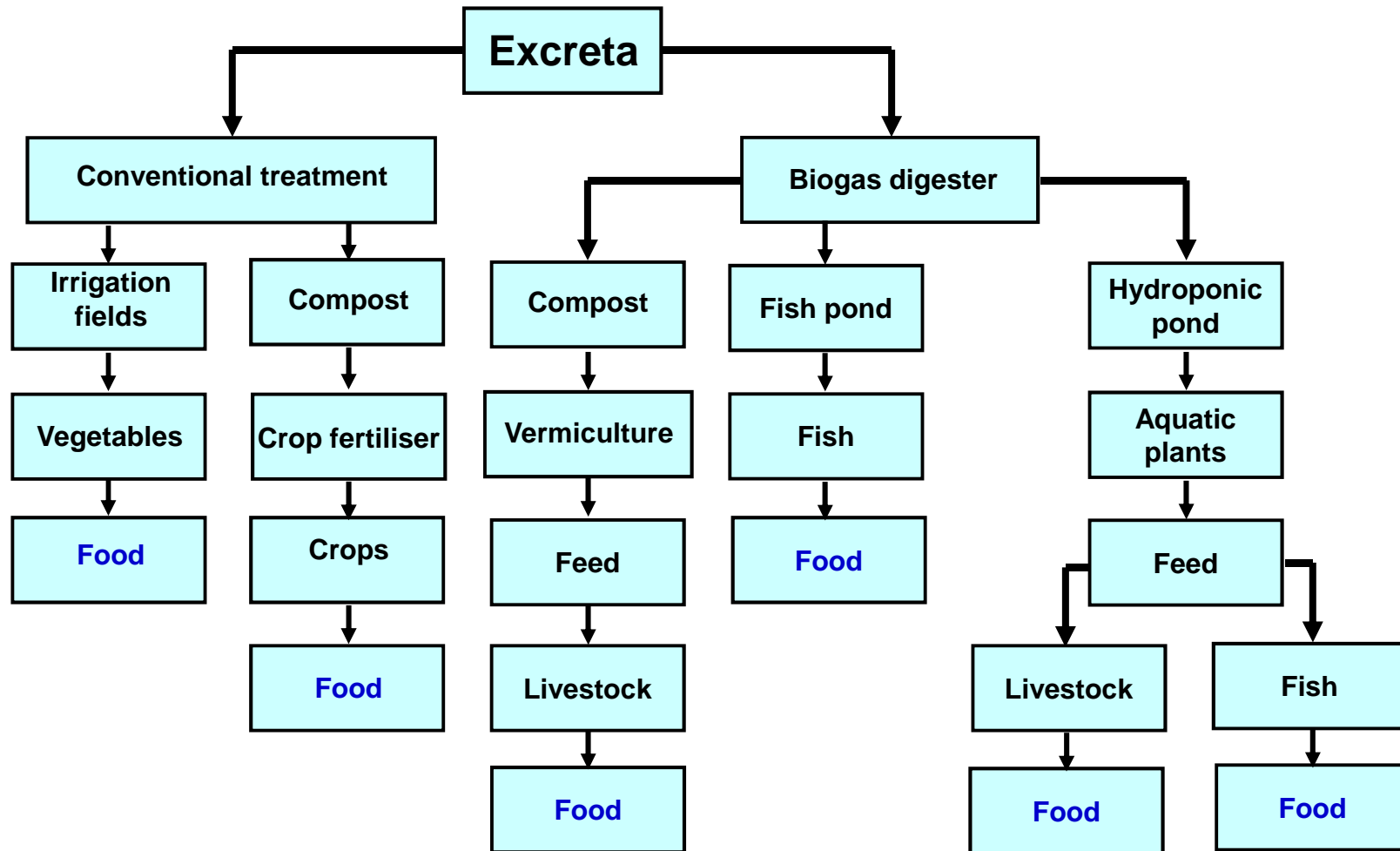


Potential roles of integrated aquaculture within a farming system

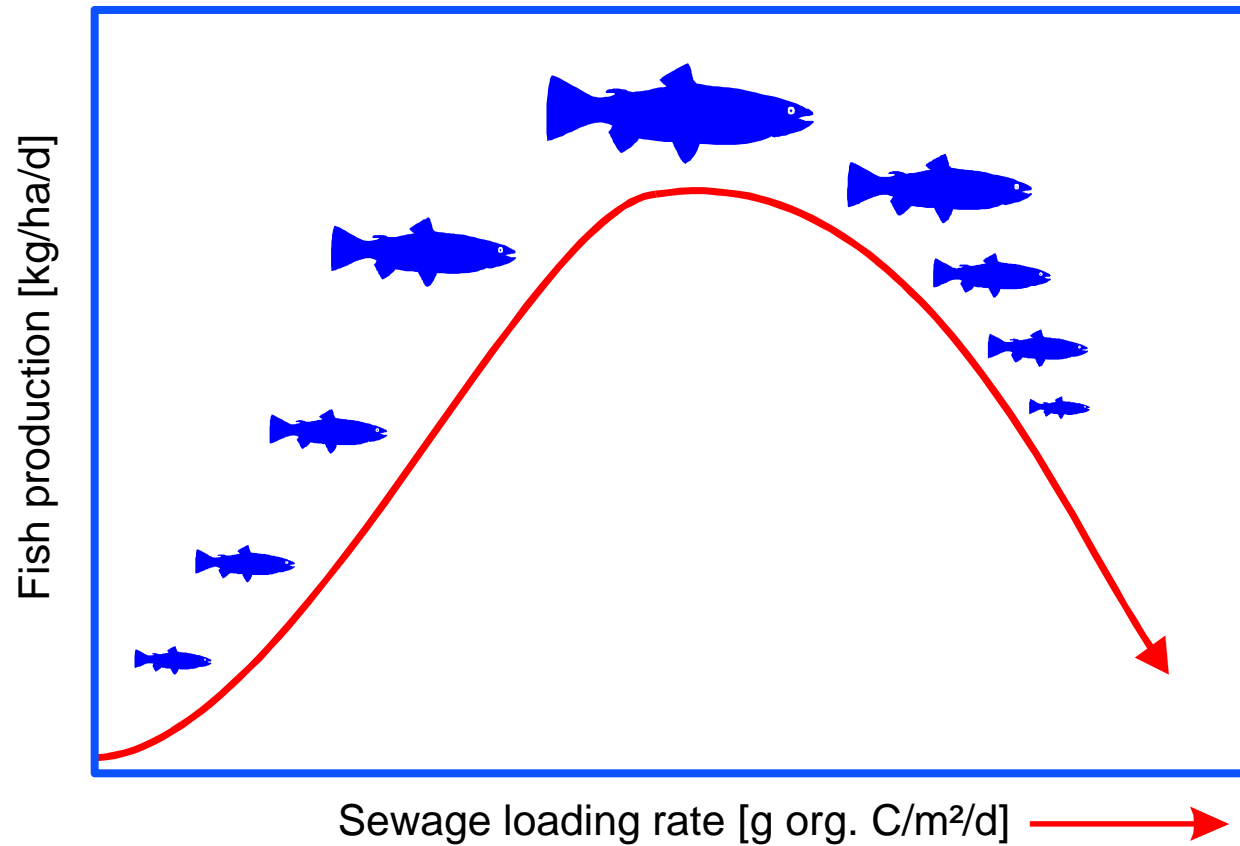
1. Waste water purification
2. Nutrient recycling
3. Energy recovery
4. Weed and pest control
5. Improving soil fertility
6. Intensification



Various pathways for recycling of human and animal excreta



General relation between sewage loading rate and fish production



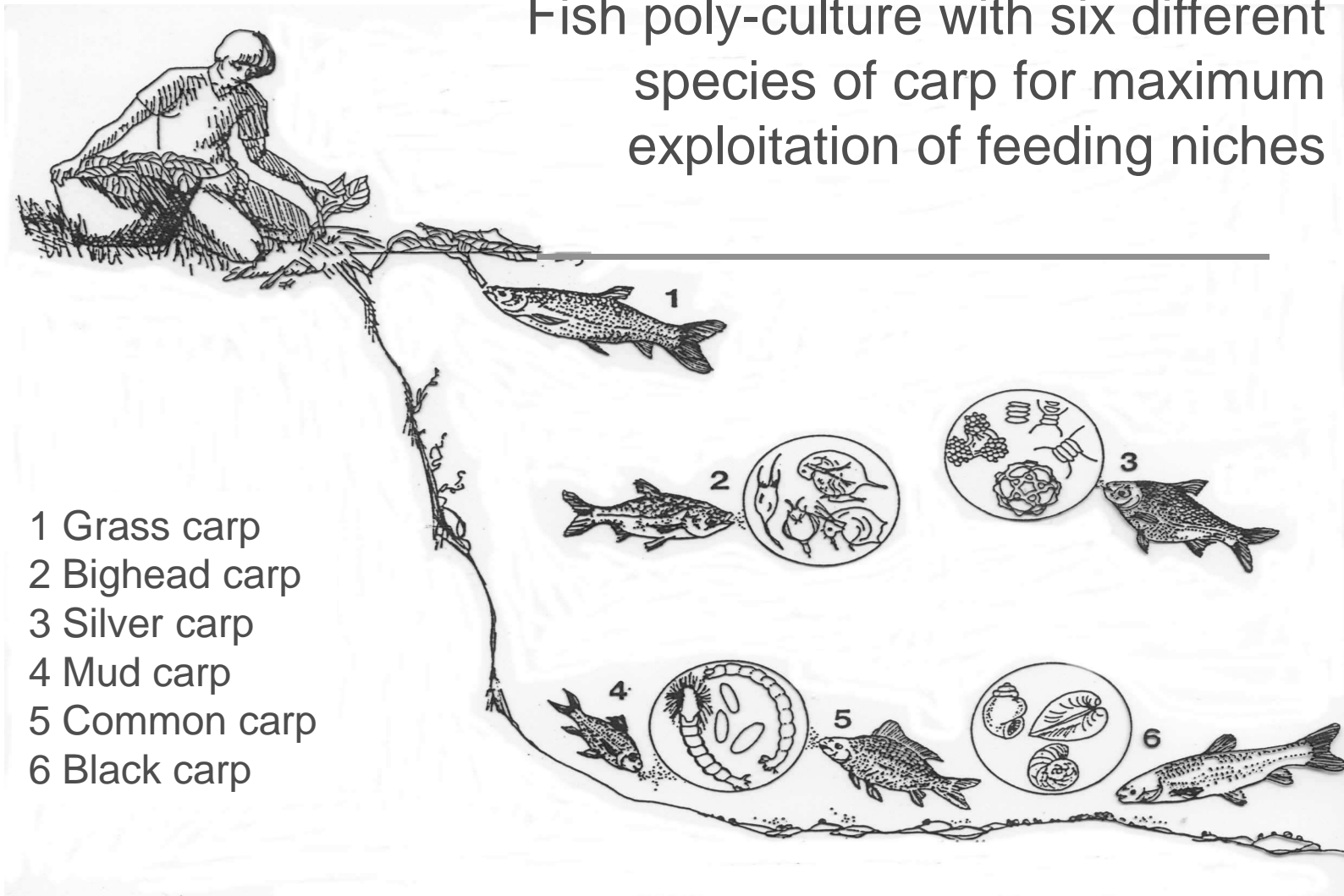
Nutrient recycling of poultry manure through fish poly-culture



Nutrient recycling of poultry manure through fish poly-culture



Fish poly-culture with six different species of carp for maximum exploitation of feeding niches



- 1 Grass carp
- 2 Bighead carp
- 3 Silver carp
- 4 Mud carp
- 5 Common carp
- 6 Black carp



Intensification and diversification of production in large scale farms in China



Intensification and diversification of production in large scale farms in China

