

Aquaponic Produce & Certified Naturally Grown

~A Backgrounder for Soil-Based Farmers serving as Inspectors~

The on-site inspection is a core part of CNG's certification process. It helps ensure that the standards are upheld, but also provides a chance for members to share and exchange knowledge that can be valuable for an operation's success. Below, we'll provide a general overview about aquaponics, and then introduce a few ways aquaponics is different from soil-based agriculture and what to look for during the inspection.

When in doubt, check out the Aquaponics Standards (www.cngfarming.org/aquaponics_standards) or get in touch with kat@naturallygrown.org

Aquaponics – basic definition

Aquaponics combines raising fish and plants together in a symbiotic, recirculating system. Fish turn food into flesh and waste products, namely ammonia, which is excreted into the water by the fish's gills. If left to build up it would become toxic and kill the fish. Biological filters house the nitrifying bacteria *Nitrosomas* and *Nitrobacter*, which convert toxic ammonia into nitrite and then into nitrate. Plant roots absorb the nitrate from the water before it flows back into the fish tank.

Different kinds of systems

There's a wide variety of system designs and set-ups. Here are a few of the most common ones:

- Deep Water Culture (also called raft system): Plants grow in small baskets embedded in a floating raft. The roots are immersed in the water below, so making sure the water is well oxygenated is important. This is the one of the most common commercial designs.
- Media filled beds: Here, the plants grow in beds filled with media such as expanded clay pellets. The system can be run with a continuous flow of water through the bed or by flooding and draining the bed.
- Nutrient Film Technique: Plants grow in troughs, and their roots dangle into a thin film of water flowing through the troughs. This is only suitable for certain crops with smaller root masses, such as leafy greens. There is a smaller volume of water and nutrients are more concentrated in NFT systems. This also means that there is a smaller margin for error when adjusting water quality factors.
- Wicking beds: Plants grow in a bed filled with media such as soil or compost, and get water from a reservoir along the bottom of the grow bed. In CNG standards, wicking beds are only allowed in a recirculating system when they are a dead end, meaning that the water that enters the wicking bed *does not* recirculate into the rest of the system.
- Vertical systems: Plants grow in synthetic media within vertical towers. Water is pumped to the top and trickles through. The media may or may not be approved for CNG – please contact us.
- Combination: In practice, many systems combine elements from the models discussed above.

Growing Media

There are many different kinds of growing media that are allowed by CNG standards and some that are not. Here are a few of the most common:

- Expanded clay – allowed.
- Rockwool – allowed.
- Coir – allowed.
- Grow plugs – usually made from compressed peat and a binding agent. These are allowed, unless they also contain synthetic fertilizers, which are prohibited
- Compost – allowed only in dead end wicking beds.

See https://certified.naturallygrown.org/documents/AP_Allowed_Prohibited.pdf for a full list!

Water Quality

Aquaponics producers must pay close attention to water quality indicators to keep the fish healthy, the nitrifying bacteria healthy, and the plants healthy. Producers must keep a log of the regular monitoring they do.

- Temperature: Especially important for the health of the fish. Each species of fish has a different ideal temperature range. Best if temperature is kept fairly stable. The standards require weekly monitoring, and recommend daily monitoring.
- pH: Water pH affects health of fish, plants, and nitrifying bacteria. The pH can be affected by the natural level of dissolved minerals in the source water, the nitrification process within the system, and any minerals leaching from growing media. There are several natural, and some synthetic materials allowed for use in adjusting pH. The standards require weekly monitoring, and recommend daily monitoring.
- Dissolved oxygen: Important for the fish and plant roots. Sufficient aeration can be achieved through physical system design, though usually air pumps are required. The standards require monthly monitoring, and recommend weekly monitoring.
- Ammonia, nitrites, nitrates: These are crucial to fish health and plant growth. Producers should keep a close eye on these to ensure that stocking densities are matched to the growing area, and the ability of the crops to take up the nutrients produced by the fish. The standards require monthly monitoring, and recommend weekly monitoring.

Water Testing

Water is the foundation of any aquaponic system, so it is essential for producers to ensure they have high water quality. Risk of contamination varies by water source and by region.

- Municipal water: Conduct an annual test at point of use, with particular attention to levels of chlorine, chloramine, and heavy metals. Alternatively, producers can obtain annual test report from municipality.
- Well water: Speak with local water quality experts to identify contaminants of concern. Conduct tests before first use (or before certification) and annually thereafter.
- Rainwater: Test for heavy metals and pesticide residues before first use.
- Surface water: Prohibited.

Nutrients

Fish waste supplies all but three of the 13 essential nutrients that plants need to grow. Calcium and potassium are typically supplied in sufficient quantities by the materials used to adjust pH, such as calcium carbonate or potassium carbonate. It's usually necessary to supplement aquaponics systems with iron, and CNG allows chelated iron products. OMRI-approved nutrient solutions are allowed, as long as they are suitable for aquaponics. Synthetic forms of nitrogen, magnesium, sulfur, boron, manganese, zinc, copper, molybdenum, and nickel are prohibited.

Pest and Disease Control

Producers must be extremely careful to protect fish health. The best pest and disease management practices are preventative. If necessary, producers should use cultural practices, physical barriers, and biological pest control. If these aren't sufficient to achieve appropriate control, natural and non-synthetic substances may be used with care. Synthetic pesticides, copper-based pesticides, petro-chemical based pesticides, and rotenone are never allowed.

Fish

CNG certifies aquaponic produce only, not the fish. (This is largely because at this point it is incredibly difficult to find fish feed that would meet CNG standards.) That said, the whole aquaponic system depends on the health of the fish, so CNG do standards require producers to take measures to protect fish health for the sake of animal welfare and the stability of the system. These include biosecurity practices, maintaining a stable and healthy environment for the fish, and providing appropriate medical treatment offline when necessary.