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Both pumps provide efficient water flow and the decision to use both Ã®mainly to the system owner. Submerged pumps are designed to be immersed in the fish tank and are often In the most small systems where experience is not necessary with the hydraulic system. To prolong the duration of the pump, buy and use a submarine pump classified for continuous use. An online pump is external to the tank and in a hydraulic line inside the system. It is slightly more demanding in a lead in an online pump; However, the in -line pumps are relatively efficient in the water in motion through the system. The in -line pumps are generally more powerful and are mainly used on larger systems in which the system hydraulic system is much more complicated. Figure 6. Various pumps are used in aquaponic systems. The pumps used include a small submerged water pump (left) and large (central) and a water pump (right). Image credit: Lance Beecher, Clemson University. Figure 7. Avice equipment used in an aquaponic system. Image credit: Lance Beecher, Clemson University. The ventilation in aquaponic systems is fundamental to provide adequate dissolved oxygen for the survival of fish, beneficial bacteria in the units of filter and adequate levels for the growth of plants. An air pump, which produces compressed air, tubes to transport the compressed air to the bottom of the tank and air stones for air bubbles in the system, constitutes the ventilation system (Figure 7). Comparable to the water flow, it is essential to accurately size the ventilation system to provide a sufficient level of oxygen dissolved throughout the aquaponic system. The ventilation also provides water movements in unit to help deliver solids suspended to the filtration system. Plant systems The part of an aquaponic unity which is the most productive is the vegetable system containing vegetables selected for the collection. 7 The germination of the seeds takes place in the rocky whore and the plants can establish a system of vital roots odnoforp odnoforp li odnoforp ozzop id ametsiS .atavitloc eneiv ehc atnaip alla attada is ehc enoizudorp id opit lad ednepid otanoizeles elategev ametsis lI .acinopauqca Ätinu'nu ni osseccus noc atitseg eresse ²Âup ilategev imetsis id Äteirav anU .elanif aticserc id ametsis ia itirefsart onognev etnaip eloccip idniuq ,enoizavitloc id Äteirav aloccip anu Or "the saddle system" Ã½ is probably the most popular¹ for fast-growing plants with a short life, collected as a whole plant (Figure 8). The construction Ã is simple and Ã is made up of a depression with water of about six to eight inches deep it is usually four to eight feet wide and may be up to one hundred feet long. The width often is no greater than eight feet¹ because plants should be inspected daily for pests and diseases. Nutrient-rich, well-oxygenated water is dispersed at one end of the system, moves through depression and exits to the extremity opposite. If the channel Ã ³ more¹ is twenty-five feet long, the water inputs can be spaced at specific intervals to ensure that the nutrient levels are sufficient throughout the bed. Additional aeration can also be applied to support adequate dissolved oxygen levels for a successful culture. Figure 8. Diagram of the system of Â¢ â ÂDeep Well âo Ã¢ â ÃFraft â-, allowing the roots of the plant to suspend freely in the water. Image credit: Lance Beecher, Clemson University. Flow and flow systems The ebb and flow or flood/drainage system are probably the most diverse plant system¹ practical for a unit aquaponic (Figure 9). For example, this system allows fast-growing lettuce to grow adjacent to long-growing tomatoes that carry fruit. The system of flood growth and cultivation is also widely accepted because plants are grown in a medium that mimics the soil, providing additional structural support. The medium usually consists of a substrate (e.g. clay) formed in a specific form or any porous inert material that drains easily. The system works by slowly allowing nutrient-rich water to enter the tray and fill to a particular level. A "Bell" siphon comes otseuq otseuq noc aznereffid anU .onroig la etlov id otilibatserp oremun nu eraizneuqes id otitnesnoc e otallortnoc eresse ²Âup oigganerd/enoivulla id ossecorp otseuQ .ovoun id eripmeir a aizini oiossav li e ossecorp li epmor aira'l ,enofis led odnof li egnuiggar auqca'l ehc atlov anU .otouv isauq ¨Ã onitsec li odnauq a onif ametsis lad auqca'l etnemacitamotua errarttos rep Ã ¨ sufficient dissolved oxygen levels in the incoming water are not so critical because the root zones of the plant are re-aerated when the tray drains. Figure 9. The ebb and flow plant growth system allows a variety of of plants to thrive in the system. Image credit: Lance Beecher, Clemson University. Nutrient Film Technology System Nutrient Film Technology (NFT) adapted to aquaponics offers versatility for plants with a fast and long growth cycle. The NFT system Ã is widely used in the hydroponics industry and Ã is highly productive. The traditional NFT system is adjusted to operate in the aquaponic. These adjustments include replacing smaller diameter¹ tubes with larger diameter¹ tube materials due to excessive bacterial growth clogging smaller diameter¹ tubes. In addition, a large diameter (4 and 6 inches) PVC tube could be used as a channel instead of expensive commercially available channel material for plant cultivation (Figure 10). Figure 10. The hybrid system Nutrient Film Technology can be integrated into an aquaponic system. Image credit: Lance Beecher, Clemson University. Bucket System The Dutch bucket system (figure 11) Ã is another hydroponic production system used to successfully grow vinification vegetables in aquaponica, although it can be used to grow any vegetables. Nutrient water can be² entering the bucket and dripping through a medium that includes the plant roots or by flooding from below. Plants absorb nutrients as water passes through the root structure. Water comes out of the bucket through a drain at the bottom of the bucket. Water does not accumulate and fills the bucket, so plant root systems remain aerated, even under continuous flow conditions. Figure 11. The bucket system is a system efficient for growing vines in the aquaponics system. Image credit: Lance Beecher, Clemson University. Abstract A vision and careful consideration are needed to build a functional and efficient aquaponics The information presented in this article allows owners to consider all options and adjust or modify their specific production requirements. Specific equipment is needed to ensure a healthy environment for both fish and plants. This publication describes what Ã² is needed and offers information to understand why it is essential to have these components for a productive aquaponic system. References Mentioned Rakocy JE, Masser MP, Losordo M. Recirculating aquaculture tank production systems: aquaponics Ã ÂÂ integrating fish and plant culture. Stoneville (MS): Southern Regional Aquaculture Center (SRAC); 2006. SRAC Publication No 454 Rakocy J. Ten guidelines for aquaponic systems. Aquaponics Journal. 2007;46:14ÂÂ17. Timmons MB, Ebeling JM, Wheaton FW, Summerfelt ST, Vinci BJ. Recirculation aquaculture systems. Ithaca (NY): Cayuga Aqua Ventures, LLC; 2002. Malone RF, Beecher LE. Use of pearl floating filters to clean up recirculating water in high density aquaculture production systems with hot water. Aquaculture engineering. 2000;22(1):57ÂÂ73. Kuhn DD, Drahos DD, Marsh L, Flick GL. 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