

Example JARPA Language: In-Substrate Culture for Manila Clams

Activity	Description
Timing	<p>In-substrate culture activities are generally tide-dependent but can occur year-round. During low tides, farm crews may be on the farm site for 3 to 6 hours before the tide re-floods an area. Activities may also occur at high tide when there is enough tidal inundation for a vessel to access farm sites. High-tide work typically occurs during the day.</p>
Access	<p>Access is either on foot or by vessel at high and low tides. Work vessels that are used to transport farm crews, materials, and equipment to the farm site for low tide work may either be anchored in a channel or in deep areas during low tide or be allowed to go aground. Once farm crews arrive at the farm site, culture beds within an intertidal farm site are typically accessed by foot.</p> <p>Maintenance and harvesting work may involve mechanized equipment such as tractors. Mechanized equipment is stored on a floating work platform on-site or transported to the farm by vessel. In limited areas, farm crews may access beds with an All-Terrain Vehicle (ATV). ATVs may be used to transport materials to and from the farm site from an upland location, as well as to conduct bed preparation and maintenance activities.</p>
Bed Preparation and Enhancement	<p>Bed preparation, if employed, is site-specific and may occur manually or mechanically. Manual activities entail farm crews accessing targeted areas by foot at low tide to reduce irregular surfaces with a hand tool such as a rake and may occur to a depth of 3 inches. Mechanical bed preparation activities varies by region due to bed conditions. In some instances, on-bottom beds are prepared for seeding using other mechanical farm implements. Other mechanical methods involve towing a farm implement, such as harrows, angle bars, or chains, behind a work vessel when the bed is submerged.</p> <p>Bed enhancement, if used, may involve the spraying of washed gravel or clean shell over the bed at a thickness of approximately 1 inch and may occur annually or after longer periods as needed. Bed enhancement activities are conducted by a work vessel when the bed is submerged, typically before the bed is seeded. A pump on the work vessel is used to withdraw water through a screened intake and to discharge seawater from the work area to wash the gravel or clean shell from the deck. .</p>
Predator and Invasive Species Control	<p>Predators may cause significant damage to in-substrate crops at various stages of their life cycles. Predator control techniques to protect crops include timing, siting, passive exclusion, relocation, and removal. Activities may be timed, and crops may be planted at specific tidal elevations, to avoid or minimize predation. Other control methods may be used to avoid or minimize predation such as the use of large seed that are less vulnerable to predation for planting.</p> <p>When predator exclusion nets are used, they are bundled together and loaded onto a vessel at high tide. At low tide, farm crews install area nets on the culture bed. Area nets are</p>

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	<p>secured to the substrate with rebar stakes up to 30 inches deep along the perimeter of the net. They may also be secured using rope anchors with an end piece affixing the net to the substrate installed up to 5 feet deep. Nets sit flush on top of the substrate, so disturbance is generally limited to the top 1 inch of substrate excluding rebar or rope anchors. In some instances, farm crews bury the bottom edge of their area nets. This activity may be done manually at low tide by making a narrow net perimeter up to six inches deep using a hand tool such as a shovel.</p> <p>Mechanical net installation involves using a farm implement on a tractor (in Samish Bay) to open two furrows in the ground 4 to 6 inches deep approximately 4 feet apart. The implement installs the net edge in the furrow and covers the net in the furrow with the substrate previously pulled out of the furrow. The depth of disturbance may be up to 6 inches.</p>
Seeding	<p>Culture beds may be seeded at both low tide and high tide. Farm crews may plant culture beds at low tide by manually scattering seed as they walk along the bed with 0 to 3 feet of water over the bed. They may also scatter clam seed from a vessel at high tide or natural set of shellfish that are incorporated into the culture beds.</p>
Maintenance	<p>In-substrate culture crops are accessed regularly at low tide to perform maintenance activities, including inspection and inventory. Nets are inspected regularly and replaced or repaired as needed. Material that washes onto the farm site such as coarse wood or unrooted algae may be relocated outside the farm site. Nets that become fouled with biota may be manually cleaned on- or off-site. In limited regional instances, nets are cleaned in-place at low tide mechanically using a brushing implement. Nets may become covered or buried in silt due to natural shifting of the substrate or after storm events. In those instances, farm crews may use buoys to float the middle of the net to gently lift the net out of the substrate and prevent it from becoming re-buried. Nets may also need to be manually removed by hand or using a hand tool such as a shovel or pulley.</p>
Harvest	<p>Manila clams may be harvested between 18 months and 5 years after planting. A bed may be harvested in sequential years if there is a new crop planted annually, or as needed by determining harvestable populations. Alternatively, all clams in a bed may be harvested after 3 to 5 years and then re-planted (i.e., a single age class of clams is present). Manila clams are harvested during a low tide when the culture bed is exposed. Clams may be harvested manually or mechanically; in either case, disturbance from harvest activities is limited to the top 6 inches of the substrate. Farm crews manually harvest clams using a hand tool such as a rake or mechanically using a harvester. Either technique removes the clams and then returns disturbed substrate back to its original location.</p>