Hanging floating bags on trestles

The hanging floating bag system has been developed independently by different operators, using different materials, and thus there are many variations. The versions described below were being used by operators to finish oysters. The anticipated benefits were reducing labour by utilising tide and wave movements to tumble oysters in the bag and produce a hardened, deep cupped oyster which could be finished to "speciale" standard.

Materials and structural specifications

Table 1: Materials required for (modified) 3m trestle and hanging bag systems:

Materials	**Cost €** **Guideline only**
Standard or modified trestle	
• 20mm rebar, 700mm high, 3m long trestle	60.00
• Addition of protective plastic sheath to trestle bar	0.50
Bag and accessories	
Costs per bag	
• 10mm Zip-lock oyster bag	4.78
• Stainless steel clips x 2	0.30
• 700mm x 16mm oval electrical conduit	0.35
• 600mm float	1.95
• 3 x 4.8mm cable ties	0.03
• 4 x 7.6mm cable ties	0.40
Cost per 1kg of 35g oysters stocked	**€4.19**

Floating bags can be hung from standard trestles using the stainless steel clips or a clip of choice. The long end of the hanging bag which is attached to the trestle must be re-enforced with 1m lengths of plastic piping or electrical conduit, secured internally with cable ties, to stop the clips tearing the mesh.

The bags may be hung on one side of the trestle with the top of the trestle utilised as normal (Figure 1) or on either side of the trestle (figure 2).

Some farmers have reported that the bag only worked on one side of the trestle. This is because the prevailing current lays the hanging bag on top of the trestle on the outgoing tide, restricting the rotation of the bag to 90^{o} and reducing the tumbling effect. This can be avoided by removing the middle bars from the trestles, as can be seen in Figures 3 and 4. The priority is to ensure that each bag continues to rotate freely, unobstructed by the bag beside it, in a 180^{0} arc on every tidal cycle.

Figure 1: Hanging bag added to the long side of trestle already stocked with bags in the traditional way

Figure 2: Hanging bags hung from both sides of an otherwise empty trestle

Figure 3: Modified trestles: 3m trestle divided into 3 sections by horizontal rebar to keep the bags separated

Figure 4: Modified trestle with short stainless steel bars welded horizontally to restrict the bag rotation to 180^0

Table 2: Materials for single bar trestle and hanging bag systems:

	Cost € **Guideline only**
Single bar trestle *20mm rebar, 6.4m long*	25.00
Bag and accessories (Cost per bag) • 10mm Zip-lock oyster bag • Stainless steel clips x 2 • 700mm x 16mm oval electrical conduit • 2 plastic coated hooks • 1 rubber band	 4.78 0.60 0.35 0.12 0.16
Cost per 1kg of 35g oysters stocked	**5.12**

Producers sometimes choose to use a single steel horizontal bar from which to hang the bags (Figure 5). These are made from 6.4m lengths of 20mm rebar bent in a series of 90° angles. 1.2m is driven into the ground on either side and the support bar from which the bags hang is 2.2m wide and 0.7m above the ground. There are 90° bends on each leg 0.2m above the ground which adds stability to the frame and should stop it from sinking too far. In Figure 6 below the bag is attached using 2 steel snap clips at each end and a rubber band around the trestle and hooked to one side of the bag to restrict the movement of the bag to 180°

Figure 5: Hanging bags from purpose built frame

Figure 6: Rubber band restricting range of movement of the bag

<u>Recommended method of deployment for modified trestles</u>

The long end of the bag should always be perpendicular to the prevailing wind or tide. This is crucial when an operator is deciding what trestle modification will allow them to maximise yield without changing their trestle configuration.

Trestles deployed perpendicular to the tide and prevailing wind should be modified to allow bags to be hung along their length, possibly on either side. (Figure 3). Trestles deployed in line with the tide and prevailing wind should be modified to allow bags to be hung across their width and far enough apart so as not to interfere with the swing of the bag (Figure 4)

There are numerous options for hanging the floating bag from the trestle. Stainless steel clips are the cheapest option and most widely used. However, they do cause wear on the trestle (Figure 7). Plastic clips originally designed for swinging basket systems are manufactured by SEAPA,Hexcyl, BST Oyster Supplies, Zapco Aquaculture and NodusFactory Aquaculture but are somewhat more costly.. Bungee cords are available from Atlantic Weave. Note the plastic piping around the trestle bar (Figures 8 and 9) to reduce the rate of corrosion. This will increase the longevity of the trestles life span but is not completely fail safe because sediment gets caught between the pipe and bar and also causes wear, albeit at a slower rate.

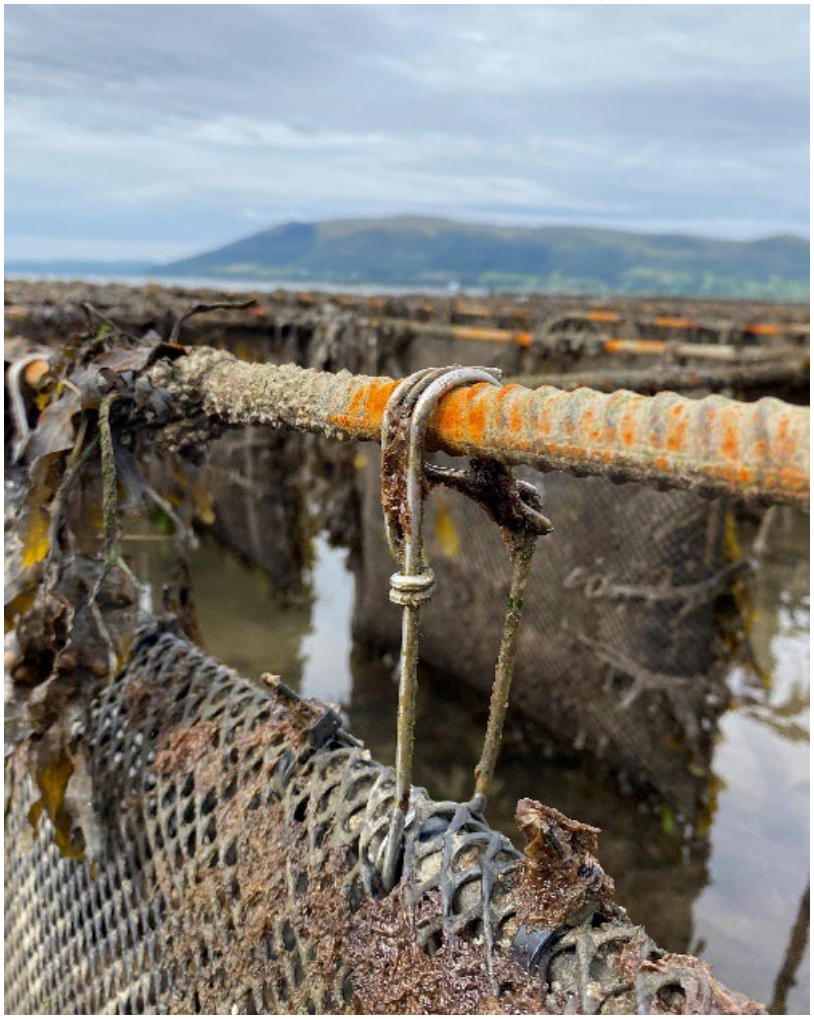

Figure 7: Stainless steel clip imported. Note the wear on the trestle

Figure 8: Clip sourced from Australia

Figure 9: Bungee cord sourced from Ireland and fitted with toggle

Recommended method of deployment for a single bar trestle

The frames are deployed perpendicular to the prevailing wind or tide, whichever is stronger. They are driven 1m into the seabed using a water pump to give them stability. A rubber band is wrapped around the horizontal bar and connected to the mid-point of the long end of the bag using 2 hooks. This is designed to take some of the load off the hooks and helps to restrict the motion of the bag. However, it is not recommended due to the risk of littering. The bags are otherwise hung in the same way as with the fixed longline described above.

Site Specifications

In the case of modified trestles, a reasonably sheltered site is recommended and the seabed needs to be firm so that trestles do not sink too quickly reducing the range of motion of the bags.

A sheltered site with a flat sandy seabed, suitable for driving bars into the ground is required for the single bar trestle system.

Reported Lifespan

There was no information available on the lifespan of floating flip bag systems in use on trestles. There were signs of wear on all modified trestles at the points around which the bags rotate (see Figure 10) so it is reasonable to assume the life expectancy of the trestle is reduced. The more exposed the site the less the life expectancy of the bag and the trestle.

Recommended Stocking Densities

Similar stocking densities to what are used for traditional bag and trestle systems are recommended:

- Seed at 1,000 to 2,000 per 2 - 4mm bag
- Half grown at 150 to 500 per 6 – 9mm bag
- Market size at 100 to 150 per 9 – 14mm bag

Some farmers reported having seed stocked at densities of 5,000-8,000 G6's per bag. They believe the higher stocking density reduces the amount of movement within the bag and therefore the stress on the oysters and still produces a "bullet" shaped oyster that begins its half-grown stage of life in an already ideal shape that is hard to deform from.

Potential yield per hectare

In the case of a typical inter-tidal 6 bag trestle farm, one hectare laid out in double rows with 5m tractor corridors between them will potentially return 28 tonnes of 50g oysters or 31 tonnes of 85g oysters.

Modified 6 bag trestle (see Figure 3)

A number of assumptions have been made in estimating the potential yield per hectare from swinging bags on modified trestles:

- The area is 100m x 100m
- Trestles are 3 m long and up to 1.3m wide laid out in single rows,
- 6 bags hang from each trestle
- The rows are 1-2m apart to allow all 6 bags to swing freely around the trestle at all stages of the tide
- There is a 5m tractor corridor every second row
- An acceptable mortality rate of 20% over one growing season may occur

Table 3: Potential return per hectare with modified 6 bag trestles (Figure 3)

Growth	# Bags/Ha	Stocking Density/bag	Normal mortality rate for one growing season	Potential Return after one season
35g up to 50g	2,376	150	20%	14 tonnes
50g up to 85g	2,376	100	20%	16 tonnes

Single bar trestles

The assumptions made when estimating the potential yield per hectare from swinging bags on single bar trestles are as follows:

- The area is 100m x 100m
- Trestles are laid out in double rows, each double row occupying 6m
- The rows are set 1.5m apart
- There is a 5m tractor corridor between each double row
- An acceptable mortality rate of 20% over one growing season may occur

Table 4: Potential return per hectare with single bar trestles

Growth	# Bags/Ha	Stocking Density/bag	Normal mortality rate for one growing season	Potential Return after one season
35g up to 50g	2,412	150	20%	14 tonnes
50g up to 85g	2,412	100	20%	16 tonnes

By comparison, in the case of a typical inter-tidal 6 bag trestle farm, one hectare laid out in double rows with 5m tractor corridors between them will potentially return 28 tonnes of 50g oysters or 31 tonnes of 85g oysters because of the lower stocking densities required.

Environmental considerations

Relying on single use plastic items such as rubber bands, plastic hooks or cable ties to take the load of a swinging floating bag in full or in part is not sustainable and will lead to littering on sites. This in turn may put an operators reputation and licence at risk. It is important to monitor the condition of the frames, bags and clips on every tide.

The bags will be visible for a slightly longer period on each tide but the overall height of the trestle and turner is no greater than that of systems already licensed around the country and the visual impact would not be considered significant in the majority of sites.

The greatly reduced labour requirements with this system means there will be less human activity on the shore and less risk of disturbance of fauna.

Finally, it is generally accepted that the replacement of physical shaking of bags to promote optimal shell shape and meat content with a gentler constant tumbling effect is less stressful on oysters and makes them more resilient against the *Vibrio* outbreaks linked with mortality events in Ireland.

STRENGTHS	WEAKNESSES
• Oysters are moved four times a day by the rise and fall of the tide which should improve shell shape and meat content • Reduced labour costs • Less human activity on the shore means less disturbance in the environment • A more robust oyster is produced because of the additional movement within the bags • Bags are adaptable from currently used bags which offers a saving on capital investment • Existing trestles can be modified to take floating bags, again offering a saving on capital investment • Most widely trialled modern method of growing	• Components have been known to work well in some bays and not in others. • Floats pose a potential marine litter risk • The movement of the clips around the trestle bar causes wear and tear and reduces the life expectancy of the trestle • Fewer bags can be transported or stored at the one time • System requires regular checks and maintenance to ensure that the risk losing bags, hooks, clips and rubber bands is reduced.
OPPORTUNITIES	THREATS
• Because the systems are easily adopted more Irish farmers have the opportunity to access the “speciale” market • Labour requirements are greatly reduced in the growing months allowing farmers to focus attention on summer sales or seed care etc. • The range of bags, floats and clips available is continuously evolving making this system adaptable to a greater variety of site conditions	• The system is visible until the floats are completely submerged which may need to be considered in sensitive areas