

FEATURE

FRESHWATER SPECIAL



Photos by Jeff Mah and John Nickum

High Plains Coho

The Miller Hutterite Colony is ramping up production of freshwater coho at a novel new recirc facility in high plains Montana

BY JOHN G. NICKUM

A coho salmon farm on the high plains of Montana, literally in the shadows of the Rocky Mountains, may seem like illusion, not a real farming operation. But, no, this is not an illusion. Those are real coho salmon swimming in the tanks, enclosed in a large metal building just a few miles from the Rockies... and the men operating the systems are real farmers, with many years of experience growing crops and raising domestic livestock. Remarkably, they have no previous experience raising fish, nor operating an aquaculture recirculation system. But, the system functions and the fish are growing. After seven months of operation, "Prairie Aquafarm Systems" is a "go."

Teton Fisheries, LLC, located near Choteau, Montana, is a creation of the Miller Hutterite Colony, but basically operates as a joint venture with SweetSpring Salmon. The land, buildings, and equipment are owned by the Colony. The Colony also provides the labor, water and utilities to operate the facility. The unique, fast-growing freshwater coho were developed by SweetSpring Salmon, an independent affiliate of AquaSeed Corporation in Washington state. The salmon are provided to Teton Fisheries as eyed eggs. The contractual agreements between SweetSpring Salmon and the Colony provide a legal basis for a system best described as a growout operation. A similar operation and agreement is in place with the East End Hutterite Colony near Havre, Montana.

THE GENESIS

So, how did this unlikely venture come to be? Not surprisingly, another party served as the catalyst, bringing these partners together. Jeff Mah, the Vice-President for Marketing and Business Development at Envirotech Ag Systems, Ltd, probably deserves the additional title of "matchmaker." Jeff has a long history of working with Hutterite colonies on livestock production systems. When the instability of hog markets caused the Hutterites to consider a new venture, Jeff recognized the potential for a freshwater coho venture based on the systems developed by SweetSpring Salmon. Many months of negotiations, including difficult permitting processes, and the cooperation of several additional support businesses, eventually led to a functioning fish farm.

LAND-BASED SALMON

Land-based, recirculation systems for rearing an anadromous fish a thousand miles from the ocean do not just happen. Jeff Mah had worked previously with Henning Gatz of Aquacare Environment, Inc and Per Heggelund of SweetSpring Salmon. The foundation was in place, but, many decisions remained to be made. Choosing a recirculation system was a critically important step. The one selected was the HTE Biofilter designed by Holder-Timmons, LLC, which is sold by Aquacare Environment, Inc.

A unique fish in a unique system requires a specially

designed feed. Bio-Oregon has developed a feed specifically formulated for use in recirculation systems. The feed includes modest amounts of fish meal and fish oils, is designed to produce fecal pellets compatible with a bio-filter, and still achieves efficient feed conversion and rapid fish growth.

ENVIRONMENTAL WATCHDOG

Perhaps one of the most unusual aspects of this venture is that Seafood Watch, the environmental "watchdog" of the Monterey Bay Aquarium, has given the freshwater coho produced by SweetSpring Salmon, its highest green, sustainable rating, "Best Choice," commonly called, "Super Green." Earning this classification opens additional markets with consumers focused on environmental issues, as well as, food quality. Even David Suzuki, the long-time foe of ocean salmon farming, has even given his approval to the SweetSprings freshwater coho production systems, as operated at the Rochester, Washington facility.

The Miller Colony's system is actually an improvement in terms of bio-safety over the SweetSprings operation in Rochester that was reviewed by Seafood Watch. There is virtually no effluent from the system. The small amount of fish effluent goes into a Harvestore "sewage" tank, is mixed with effluent from other livestock operations, and ultimately sprayed on flat farm fields from which there is no runoff. There is simply no opportunity for fish or disease agents to gain access to the waters of Montana. Montana Fish, Wildlife, and Parks insisted that there must be zero probability for such escapes before it was willing to grant permits to operate the facility. The conditions of the permits are so stringent that even professional visitors, including this writer, are not permitted access to the rearing units.

OPERATIONAL ASPECTS

A discussion of the operation and its progress to date will help readers understand the system, its unique features, and the potential for similar systems in other locations. Such a system that can be set up in nearly any location, has no connection to natural waters, and can be operated by inexperienced fish farmers has been the "Holy Grail" for entrepreneurs bent on becoming fish farmers for many years. Is this that system? Only time and experience will tell if this is *the* system.

There is an old adage that states "a fish farm is only as good as its water supply," or stated differently, "good, clean water... no problems; dirty water... nothing but problems." Water for the Choteau operation comes from a well that is only 45' (~14 meters) deep. So far, the maximum pumping rate has been 25 gpm (gallons per minute). Typically, even less water, ~5 gpm, is needed. Given the shallow depth of the well, its temperature varies somewhat, reaching a low of 4°C (39°F) in winter. Water temperature in coho growout units should be maintained around 15°C (59°F) to obtain maximum growth rates.

The well produces hard water, approximately 500 mg/l hardness, but chloride levels are low (~40mg/l), so, calcium



Juvenile coho salmon will be reared for entire lifecycle in freshwater recirc system.

Unique Features of SweetSpring-Domsea coho

- 20 generations of genetic selection for fast growth, full life in freshwater, and superior flesh quality.
- Rapid growth on feeds using relatively low content of fish meal and fish oil.
- Family group genetic selection model similar to that used in poultry industries.
- No genetic engineering.
- Adapted to the intensive conditions of a water reuse system.



A flat field (no runoff) where effluent from the farm is sprayed... with snow-capped Rocky Mountains in the background.



The "fish barn".

chloride is added to raise the level to optimal conditions for coho. Saturation levels for oxygen are maintained by an air blower system incorporated into the recirculation system, but treatment with ozone (and oxygen injection if needed) provides consistent levels of dissolved oxygen.

DISEASE - FREE SO FAR

The ozone injection also maintains an environment free of disease agents. In seven months of operation, the Colony has experienced no disease outbreaks. When eyed eggs are brought to the Choteau facility from the SweetSpring Salmon broodstock hatchery, they are free of known disease agents, but never-the-less, the eggs are given an iodophore dip as an additional precaution. Clean water, plus clean eggs, plus no interactions with outside sources of disease agents has resulted in no diseases.

Thus far, the HTE Biofilter systems at Teton Fisheries

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The rearing center for hatching and early life stage rearing.



The interior of the "fish barn" with a group of Hutterite men discussing the operation.

Features of water supply and conditioning system

- Low volume of water required – Shallow well with limited production (~25 gpm).
- Based on HTE Biofilter water recirculation system.
- Oxygen supplementation and ozone treatment capabilities are included.
- Minimal hydraulic head pressure in filters allows the use of economical high volume – low-head pumps, thus reducing production costs.
- Each biofilter unit provides carbon dioxide stripping, oxygen addition, nitrification, and fine solids capture in a single unit.



Left: Sidewall Drain and Mortality Box. Right: Pneumatic Mortality Drain.



Live Fish Pump.



Montana Hutterites.



Miller Colony Juvenile Section under construction.

have not experienced any "crashes," a problem that has plagued many recirculation systems. Skeptics may argue that "it's just a matter of time" and "what can happen, will happen." However, there may be some simple answers to the success story. A common problem with biofilters has been insufficient time to allow the beads to become fully charged with the bacteria that feed on the nitrogenous wastes. The filters at Teton Fisheries were given an initial charge of ammonium chloride and allowed 6-8 weeks to fully develop before any fish and feed were added to the system. The 1 mm Styrofoam beads seem to be a preferred substrate for a thriving bacterial colony. The system has never been overfed, a common temptation for even experienced fish farmers. – There is a direct relationship between the amount of feed placed in the system and the amount of nitrogenous waste, (ammonia) produced. More feed does not necessarily produce more rapid growth, but, too much feed is nearly a certain prescription for a system crash. – An inexperienced farmer probably is more willing to stick to the prescribed feeding schedule and, thus, not crash the system.

UNIQUE FISH

Unique fish stock is the final component of the "high plains coho" farm. The story behind SweetSpring-Domsea freshwater coho goes all the way back to Dr. Lauren Donaldson's pioneering work with steelhead trout and the family-based breeding program used to develop Domsea-Donaldson steelhead trout. This breeding program is similar to those used in poultry industries and has now been applied by AquaSeed to 20 generations of coho salmon. The result is a strain of coho that is adapted to freshwater, grows rapidly, maintains excellent feed conversion, and fish with preferred taste, texture, aroma and color.

The complete history of Domsea Farms, AquaSeed, and freshwater coho is too lengthy for this article; however, the basic story is that AquaSeed acquired the Domsea coho broodstock in 1991 from the Campbell Soup Company, which had bought Domsea Farms from Union Carbide, which had founded Domsea Farms in 1969. AquaSeed and its subsidiary, SweetSpring Salmon, continue the family-based genetic selection program to develop fish especially adapted to growers, such as, Teton Fisheries, and the sophisticated palates of today's consumers.

The eyed-eggs for the initial production at Teton

Fisheries arrived at the Colony in December, 2010. They were incubated in standard incubating trays, but at several different temperatures to establish different hatching times and, subsequently, different lots of market-size fish. The fry then move through a series of three tanks in the "fry room." These tanks are equipped with automatic feeders programmed to provide feed in amounts appropriate for the number and size of the young fish. At 10°C, it takes about 100 days for swim-up fry to attain a weight of 10 grams. Once fingerling size is attained, the fish are transferred to larger, growout tanks in the main room of the production building.

GROWOUT AND SALES

As the fish grow and tanks begin to become crowded, (~250 gms) the fish are pumped to additional growout tanks. The number of tanks in use is increased again and again as the fish grow, thus maintaining appropriate densities of fish while using no more tanks and water than is needed. Once harvest size (~2.5 -3 kg) is attained the fish are headed and gutted onsite at the Colony, placed on ice, and shipped by truck to the Sweet Spring Salmon distribution center in Seattle, Washington.

SweetSpring Salmon has contracted with the Overwaitea Food Group for the estimated production from the Choteau facility, and its sister facilities in Havre, Montana and Rochester, Washington. Production is staged so that market size fish are available throughout the year. Each lot of fish takes about one year to attain market size. The "out of the box" sustainable production system was designed to be market-driven. The benefits of a coordinated system brings owner/operators closer to the consumer, which results in a preferred product for the consumers and more profit per pound of fish for the producer.

It remains to be seen whether or not the unique collaboration that is the basis for operating Teton Fisheries is the future for freshwater production of salmon, and potentially other species. Traditionally, energy costs have been a problem for recirculation aquaculture system; however, HTE has a developed a prototype that is predicted to reduce energy costs by a factor of five. Land, facility development costs, and labor costs will vary from area to area. However, the ability to rear a desired species in any desired location with very low water and land requirements solves most of the constraints that have kept North American aquaculture from competing effectively with producers located in developing nations.



First eyed eggs being placed in Incubator.



Fish grading & counter system.