

## Proposition for a cooperative Eucheumatoid hatchery in SE Asia

### Problem

Currently, seaweed farmers in S.E. Asia are using the same fragments of plants over and over for 20+ years. This has resulted in a severe reduction in quality, as well as disease and stress tolerance. Patterns of seasonal die-off, prevalence of heat waves and extreme weather events (e.g. typhoons) mean that restarting after significant loss can be challenging for many farmers as there is no secure seedling supply. Finally, a poor understanding of the life-cycle of red seaweeds (farmers may be farming the haploid or diploid life phases) means that production may not be optimized, and may be more impacted by shifts in environmental conditions.

### Proposal

We are proposing the development of a cooperative R&D program and hatchery facility that could:

- Develop an R&D program to better understand the seasonality of *Kappaphycus* and how these patterns are linked to lifecycle changes.
- Focus hatchery research to 'close the life cycle' to produce new seedlings on demand for provision to farmers. This would help re-start in the event of die-off, but would also provide a continuous supply of seedlings for growers as needed
- Research and collection of more stress tolerant strains, as well as improving genetic diversity of farms to ensure a future for the industry and the production.
- Investigate improving growth rates and product quality in new strains from around the region
- Investigate how growing different life phases can influence growth rates, product quality and seasonal longevity. Both life phases of these species (haploid gametophyte, and diploid sporophyte) are identical. There is no way for farmers to know which they are growing, and both life phases will have very different environmental requirements and may be better suited to different locations and seasons. That is, growing the right phase at the right time of year could make significant differences to stress tolerance, survival and production
- Create a learning and training facility that can ultimately be led by locals for the supply of seedlings across the country

### Execution

Initially a small, centrally located hatchery could be established. This could be a warehouse or processing facility near the ocean, ideally with access to seawater, but not essential. The program would:

- Make collections of samples of seaweeds from all participating farms and conduct experiments to look at thermal tolerances and growth rates.
- Survey seasonal patterns at various farm locations to understand growth rates throughout the year, as well as patterns in reproduction with ocean temperature and natural conditions.

- Make collections of wild seaweeds to compare to existing seedstock to identify better performing strains, and see if this could improve tolerance of farmed seaweeds
- Undertake experiments that focus on inducing spore production in local specimens to determine which life phases are being cultivated on farms. The resultant seedlings will be cultured for out-planting on farms, to determine survivability throughout the year. Tissue culture practices would also be developed to create a faster output of seedlings
- Further experimentation to attempt to manipulate and improve thermal tolerances through generational breeding
- Maintain a store of seedlings and develop a rapid reestablishment protocol for affected farms
- Collaborate with researchers at universities to undertake further research, and implement findings from academic and government institutes into practical protocols for farmers
- Involve and train locals in processes so that successful techniques can be maintained and commercialized beyond the life of the project

## Extension

A hub-and-spoke model could be implemented to aid expansion of the program throughout S.E. Asia. A centralized mother facility would undertake the majority of the research, hold stocks of all strains, and be a training facility for all. However, smaller hubs in regional locations could be established where small groups provide seedlings to local farmers and act as secure repositories for seedlings.

This program may be solely implemented by a single organisation for production for their farmers, or if successful could be deployed in other regions and countries, or the IP licensed to other growers. Potentially the program could be established in collaboration with other researchers in other SE Asian Countries.

