GenoMar
SAFE SUSTAINABLE SEA HARVEST

Regional seminar on aquaculture
for
Embassies, Norad and fisheries advisers

17 January 2013

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CEO

GenoMar
SAFE SUSTAINABLE SEA HARVEST

Life Sciences Enterprice since 1996 with utilization of DNA technology into commercial breeeding program

Business areas:

1. Knowledge based – consultancy services and products:

   Breeding services - providing breeding services to public or private organizations wanting to develop genetic resources and to engage in long term programs for breeding and stock performance improvement.

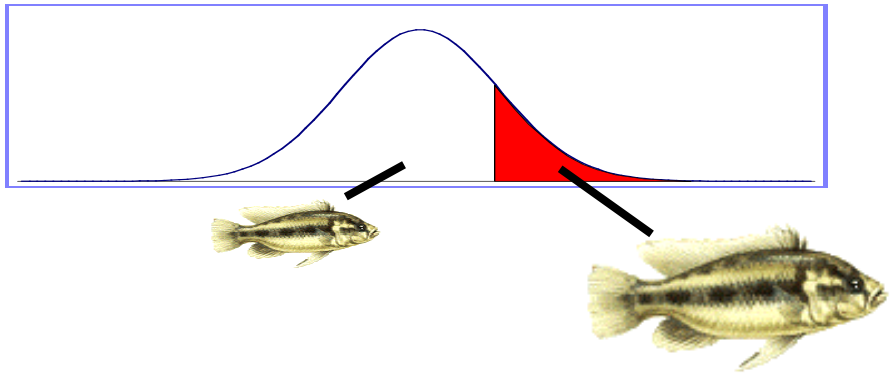
   DNA verifiable traceability

2. Tilapia Value chain:
   - Genomar Supreme Tilapia (GST) - commercialization of superior tilapia brood stock and fingerlings.
   - Integrator: Trapia – integrated value chain in tilapia

The majority shareholders : Fred Olsen & Co. and Glastad Invest - together 96%

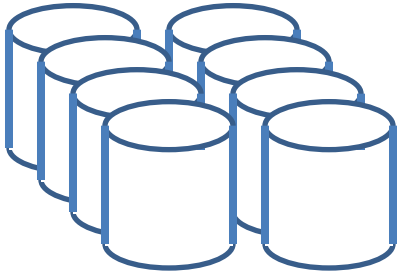
From life science to integrated aquaculture operation

Breeding services



Long term genetic gains

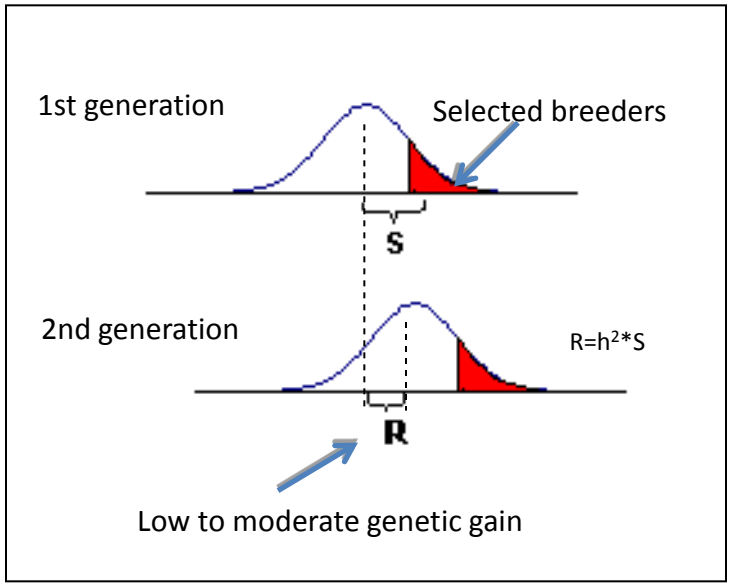
GenoMar's technology increases genetic gains



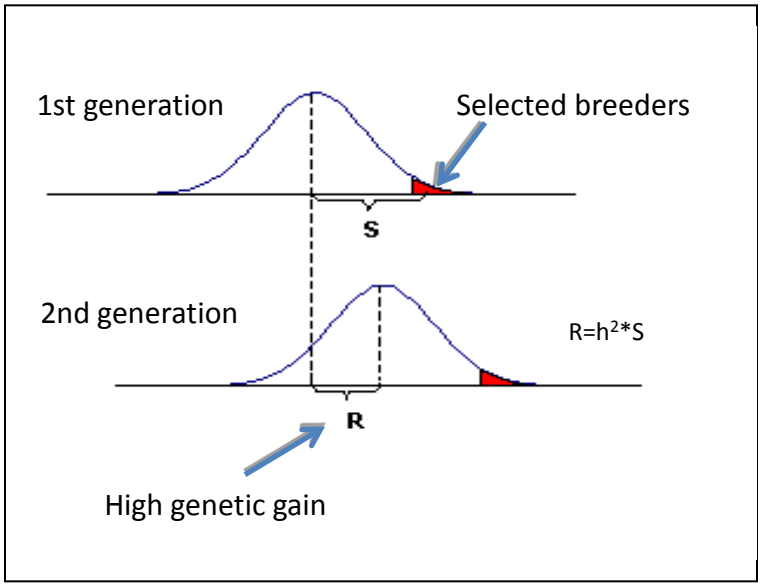
Separated rearing of families until physical tagging limits the population size.

GenoMars DNA markers allow communal rearing of families and greatly increased population size.

Traditional breeding program with a small population size and low selection pressure.



GenoMar breeding program with a big population size and high selection pressure.

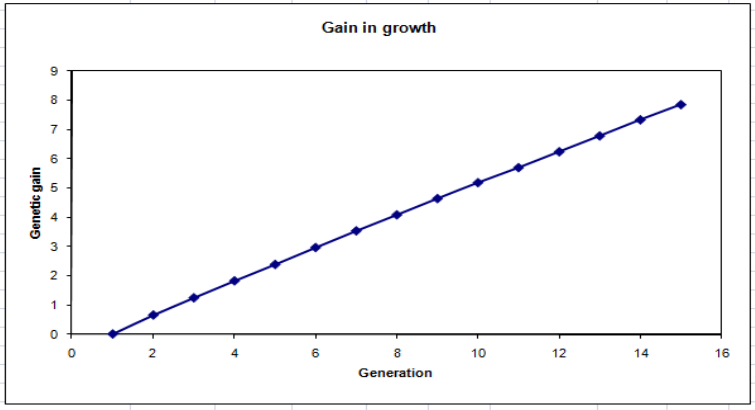


High genetic gain - save operational breeding costs

GenoMar Breeding Activities

- **Atlantic salmon**: over 4 generations of breeding services for various traits, Growth, fillet color, disease resistance, etc.

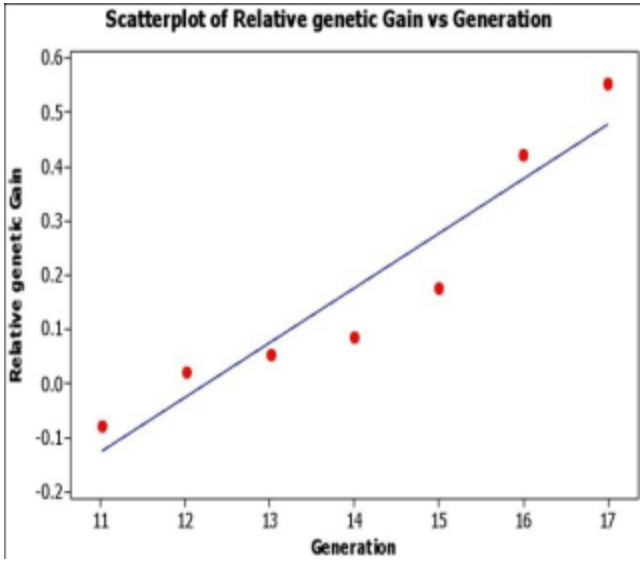
VarPsd2	VarG	VarG2	VarGsd	VarGsd2	h2	h22	h2_sd	h2_sd2	redh2	redh22	akkG	akkG2	akkGsd	akkGsd2	delG	delG2	delGsd	delGsd2	akkF	akkFsd	delF	delFsd
0,0148	0,2446	0,2522	0,0146	0,0147	0,246	0,251	0,011	0,011	0	0.0-0.006	0,002	0,0179	0,0317	0	0	0	0	0	0	0	0	
0,0126	0,2123	0,2402	0,0062	0,0123	0,221	0,242	0,005	0,009	10,3	3,5	0,652	0,129	0,0317	0,0372	0,658	0,1276	0,0329	0,0297	0,0027	0,0015	0,0027	0,00149
0,0101	0,2074	0,2327	0,0118	0,0098	0,216	0,237	0,01	0,008	12	5,8	1,242	0,226	0,0428	0,0538	0,5899	0,0969	0,0219	0,0641	0,0081	0,002	0,00536	0,00207
0,0087	0,2012	0,2277	0,0097	0,0086	0,211	0,233	0,008	0,007	14	7,3	1,823	0,316	0,0608	0,0647	0,5804	0,0903	0,027	0,021	0,0154	0,003	0,00745	0,00266
0,012	0,2062	0,2307	0,0134	0,0122	0,215	0,235	0,011	0,01	12,4	6,4	2,385	0,391	0,0757	0,0904	0,5621	0,0742	0,0431	0,0366	0,0226	0,0047	0,00724	0,00363
0,0063	0,2072	0,2278	0,0101	0,0067	0,216	0,233	0,008	0,005	12	7,4	2,965	0,461	0,1127	0,1036	0,5805	0,0701	0,0702	0,0515	0,031	0,0049	0,00866	0,00385
0,0099	0,2058	0,2325	0,0078	0,01	0,215	0,237	0,006	0,008	12,5	5,8	3,537	0,565	0,1086	0,0986	0,5721	0,1039	0,0421	0,039	0,0397	0,0075	0,00895	0,00641
0,0132	0,2	0,2235	0,0103	0,0139	0,211	0,229	0,009	0,011	14,4	8,7	4,086	0,649	0,1016	0,1263	0,5492	0,0847	0,0434	0,0495	0,0474	0,0092	0,00803	0,00542
0,0119	0,2006	0,2202	0,0131	0,012	0,211	0,227	0,011	0,01	14,2	9,8	4,644	0,719	0,1093	0,1549	0,5576	0,0697	0,0539	0,0433	0,0551	0,0119	0,00808	0,0042
0,0128	0,1987	0,2212	0,0134	0,0128	0,209	0,228	0,011	0,01	14,8	9,5	5,19	0,801	0,1151	0,1706	0,5457	0,0823	0,0448	0,027	0,0645	0,0109	0,00991	0,00307
0,016	0,202	0,2186	0,0141	0,0157	0,212	0,226	0,011	0,013	13,7	10,3	5,704	0,862	0,1062	0,1703	0,5146	0,0605	0,0507	0,0238	0,0704	0,0115	0,00634	0,00496
0,0159	0,1999	0,2245	0,0085	0,0158	0,21	0,23	0,007	0,013	14,4	8,4	6,25	0,912	0,1321	0,1739	0,546	0,05	0,0393	0,0461	0,0779	0,0106	0,00808	0,00494
0,0142	0,1943	0,218	0,007	0,0139	0,206	0,225	0,006	0,011	16,3	10,4	6,792	0,983	0,1327	0,1705	0,5412	0,0715	0,0544	0,0492	0,0848	0,011	0,00746	0,00377
0,014	0,1944	0,2165	0,0102	0,0142	0,206	0,224	0,008	0,011	16,2	11	7,344	1,046	0,1472	0,1624	0,5522	0,0624	0,0478	0,0331	0,0945	0,0135	0,01059	0,00605
0,0175	0,1899	0,2182	0,0068	0,0177	0,202	0,225	0,006	0,014	17,8	10,4	7,863	1,109	0,1729	0,16	0,5189	0,0627	0,0545	0,0459	0,1014	0,0149	0,00769	0,00618



New selection can be done every 3-4 year

GenoMar Breeding Activities

- **Tilapia: over 12 generations of selective breeding for growth, fillet yield and stress tolerance,**



Selection of a new generation every year !

Genopass™

- Ultimate tool to verify if a storyline (document based traceability) is true;
- DNA cannot be faked;
- Non-GMO technology;
- Total consumer confidence;
- Setting a new standard in food safety.

Verifiable 100% Traceability

GenoMar – Value Chain

Breeding Nucleus → Multipliers → Hatchery → Grow-out → Processing → Importing company → Retail → Consumer market

GenoMar Supreme Tilapia	Trapia branded value-added products

GENOPASS.COM ORIGIN VERIFIABLE

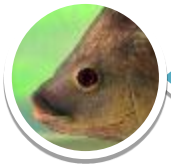
Genopass DNA-verified traceability

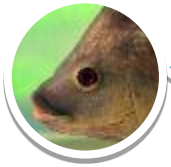
Safe , Sustainable, Traceable

GST - value chain

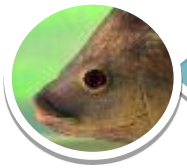
GenoMar Supreme Tilapia (GST)

- Partner in the GIFT project (Genetic Improvement of farmed Tilapia)
  -Continued with the GIFT broodstock from the G10
- Being based on **22** generations of state of the art selective breeding and an optimal founder population with very high genetic robustness;
- The GST represents most likely the internationally most genetically advanced tilapia broodstock.
- Create higher profit for our customers


22 generations of selection.


High genetic diversity.


Selection for fast growth, high fillet yield and stress tolerance


Full pedigree.


Low inbreeding, around 0.25% per generation.

Probably the best genetic tilapia O. niloticus broodstock in the world

Operations:

Norway:

- HQ - Oslo
- RD + Cooperation with life science Universities

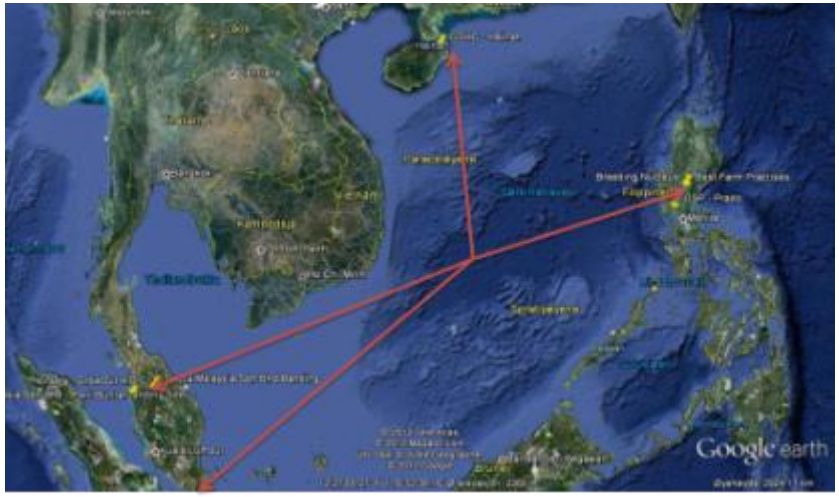
Asia:

Philippines:

China:

Malaysia:

Singapore:



GenoMar – Norwegian aquaculture supplier with longest local precense in Asia

Genomar Supreme Philippines

- Presence with own company since year 2000
- 4 locations: Breeding Nucleus, BN–Backup, Best Farming Practises, GSP-fry/fingerling
  - Downscaled from large fingerling production due to market conditions
  - Prepared for sustainable growth
- 22 employees

Philippines : GST breeding centre

Genomar Supreme HatcheryChina

- Started in China 2001 as J/V tilapia Hatchery - Hainan
- 100% owned company from 2005
- Major supplier of high quality tilapia fingerlings in China.
- Capacity > 300 mill fingerling
- 160 employees

GST -Highest recognised brand of Tilapia broodstock in China

Trapia Malaysia Sdn Bhd

- Long term commitment to produce an all natural, safe and healthy products with no compromise on environmental and social responsibility standards;
- Fully integrated breeders-egg-hatchery-nursery-grow-out – processing – sales /export
- Established as JV with local partner 2008 - today owned 85% by GenoMar
- 30 year license in Lake Temenggor, man-made lake in one of the oldest tropical rainforest, license cover 10 modules with a total capacity > 20.000 tons,
- Installed capacity end of 2013 – 5 modules > 10.000 tons
- Dedicated modules for Synergy Farming program for local people starting tilapia farming – in cooperation with MOA/DOF
- Established own processing with sales to overseas and local market
- Qualified as supplier to high end markets – holding major certifications as ;
  Global GAP, ASC, BRC, Halal ,,,,
- 220 employees

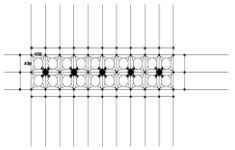


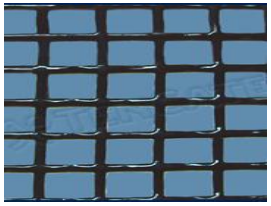


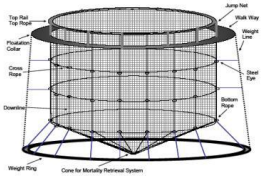
Fully transparent, traceable and verifiable products

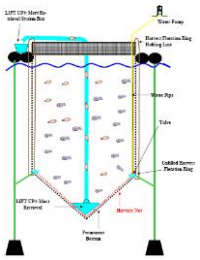
Implement farming technology

- Utilize and adapt <u>proven farming technology</u>
  - Location in defined Industrial Aquaculture Zone
  - Positioning, mooring and layout
  - Minimum distance beetween cages and sites
  - Standardize –
    - Use Aquagrid™ net system for low CO2 footprint and prevention of escapees;
    - Use of mortality and waste removal system to reduce environmental impact and improve fish growth and feed control;









Adapting innovations from other areas of aquaculture

Genomar South East Asia Ltd

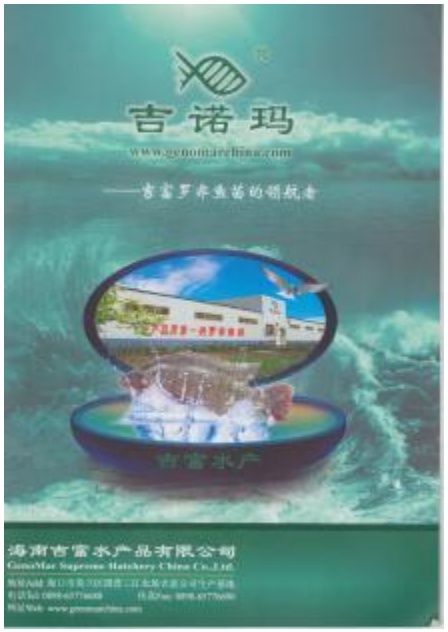
- Established 2004 in Singapore
- From 2004 regional support and R&D projects
- Development of GenoPass – DNA verifiable traceability system
- Activitiy reduced in 2010 – today 3 employees support + local market development for tilapia products

Market development in Singapore - support for operations

Knowledge development and transfer

- **China - GSHC**

- **Sharing best practices with farmers and distributors:**
  - **BFP - Manuals**
  - **Workshops**



Sharing best practices

Knowledge development and transfer

- **Philippines - BFP – Best Farming Practices**

- **Objective:**
  - To compare the performance of generations produced from the Genomar Breeding Nucleus.
  - To provide information for developing a best farming protocol for Genomar Supreme Tilapia (GST).

- **Training:**
  - Farmers
  - National and Local Government Units
  - Students (Foreign and Local)
  - Foreign Trainees

- **Cooperation Central Luzon State University**

Best Farming Practices for local conditions

Knowledge development and transfer

- Malaysia - Trapia

- **Synergy farming program:**
  - Development of local entrepreneurs into Trapia fish farming
  - 1st cycle as training program
  - Producing based on Trapia requirements and SOP's
  - Cooperation with MoA / DoF
- **Aquaculture regulatory framework**
  - Active in process to establish institutional collaboration program between Ministries of Fisheries in Norway and Malaysia
  - Project for assistance in Aquaculture regulatory framework for sustainable aquaculture development signed between governments of Malaysia and Norway end of August 2012 – for the period of 2012-2015

Regulatory framework essential for sustainable growth

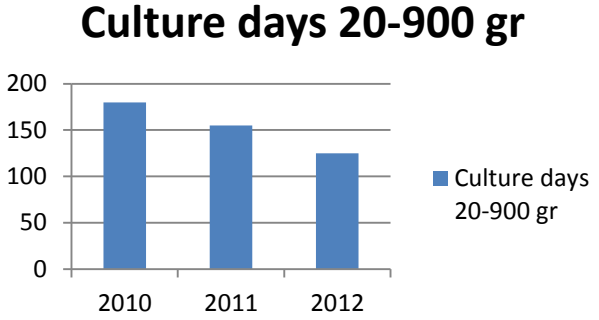
Certifications

- Liscense to «drive» – obtain access to markets
  - Key element in GenoMar strategy to demonstrate compliance and be beyond international and local sustainable aquaculture standards :
  - Trapia achievements:
    - GlobalGap – farm & processing;
    - EU farm export registration;
    - Halal certified for our farm and processing operation;
    - EMAS (Environmental Management Audit Scheme, ISO 14001);
    - SPALM, (Malaysian Aquaculture Farm Certification Scheme);
    - ASC – Tilapia by end of 2012 – 1st in Malaysia, 2nd in Asia
    - BRC - Grade A for processing plant

License to «drive» – a must for future aquaculture operations

GenoMar Achievements in Asia

- Development of GST – leading tilapia strain
  - 2010 - 180 culture days from 20 – 900 gr
  - 2011 - 155 culture days from 20 – 900 gr
  - 2012 - 125 culture days from 20 – 900 gr



Results from commercial cage farming harvesting 40 ton/cage

- Utilization of genetic gains
- Improvement in feeding management
- Fish health - improvement

The full genetic potential of the fish has not been exploited in commercial production since the tilapia industry is still in the early industrialization phase.

Parameters such as feed, water quality management and applied technology is not yet in place to take full advantage of the genetic material GenoMar can provide.

GST – fast growing

GenoMar Achievements in Asia

- Developed an Integrated Tilapia operation in Asia – in 4 years based on sustainable standards
  - Qualified for the high end market
  - Excellence in taste and texture
  - Fully traceable from breeding to customer (verifiable if needed)

GenoMar looks for:

- Market opportunities for our products/services
  - SME to large scale companies
    - Market for GST-fingerlings
    - Market for breeding services - species/volume/structure
- Market opportunities in local/global market for actual species
- Predictability
  - Regulatory framework
    - Licenses, bio-security, Fish health regulations
  - Risk management
- Business culture - Code of conducts - IPR
- Established clusters - Established support industry
- Access to motivated and skilled workers
- Close cooperation with other stakeholders

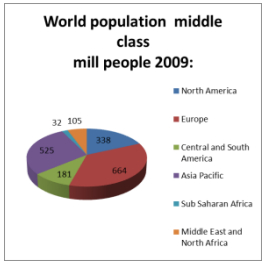
Market volume/structure - Predictability – Risk management

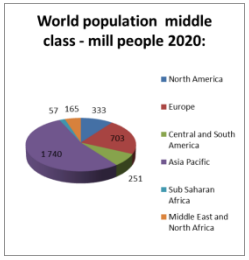
Asia – most important markets

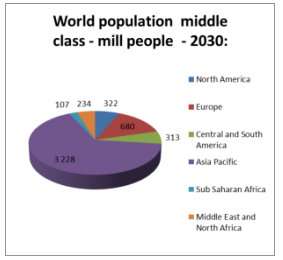
Population growth - Global middle class

Numbers (millions) and Share (percent) of the Global Middle Class

	2009		2020		2030	
North America	338	18%	333	10%	322	7%
Europe	664	36%	703	22%	680	14%
Central and South America	181	10%	251	8%	313	6%
Asia Pacific	525	28%	1740	54%	3228	66%
Sub-Saharan Africa	32	2%	57	2%	107	2%
Middle East and North Africa	105	6%	165	5%	234	5%
World	1.845	100%	3.249	100%	4.884	100%







Source: OECD

Asia - 54 % of middle class population in 2020

Norwegian contribution in Asia

- Identify sustainable species / farming environments with a potential commercial market
  - Define challenges to be solved
  - Find local entrepenurs with motivation and resources
- Establish projects together with committed industrial aquaculture support suppliers in areas where solutions exists
  - Genetics, feed, fish health, technology, logistics .....
- Establish projects using institutions to provide assistance to develope
  - Aquaculture regulatory framework
  - Training projects
  - Criteria for site locations
  - ----------

Utilize experience from large scale aquaculture and adapt to local conditions

GenoMar
SAFE SUSTAINABLE SEA HARVEST

Sustainable aquaculture in harmony with environment and local stakeholders

Thank You

Enjoy with good conscience