

ShARed Governance of Sustainable fisheries and aquaculture activities as leverage to protect marine resources in the Adriatic sea

WP3– Governance framework

D3.1.3 Application document as output from the assessments resulting from D3.2.2

Comprehensive study on the possibilities of Croatian aquaculture development and innovation of farming processes, biodiversity conservation due to setting of fish aggregating devices and necessary changes in spatial planning for fishery and aquaculture areas

Project acronym: ARGOS

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Priority Axis: Environment and cultural heritage

Specific Objective: 3.2 - Contribute to protect and restore biodiversity

Work Package: WP 3 - Governance framework

Activity: 3.2 - Maritime Spatial Planning assessment

Partner in charge: P6 Istria region, P7 County of Primorie and Gorski Kotar and P10 Public Institution RERA S.D. for Coordination and Development of Split Dalmazia County

Partner involved: all project partners

URL: <https://www.italy-croatia.eu/argos>





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Spatial planning-basis of fisheries development: Croatia-Main tips to consider-

- Fishing infrastructure
- Locations and cultivation capacities
- Risk management in production
- Production drawings
-  New technologies/new species
-  Cooperation with marketing
-  Importance and position of aquaculture.....
-  Biodiversity



Spatial planning-basis of fisheries development: Croatia-Main tips to consider-

<p>4. Plavnik (G. Krk)</p>				<ul style="list-style-type: none"> - lokacija nije predložena stručnom podlogom kao uzgajalište riba i/ili školjkaša - lokacija je integrirana u važeći PP PGŽ kao uzgajalište riba i školjkaša (max.pov: 60 ha; max.kapacitet: ribe - 970 t/god, školjkaši 50 t/god) - lokacija je ucrtana u PPUG Krka
<p>5. Stara Baška (O. Puntat)</p>				<ul style="list-style-type: none"> - lokacija je predložena stručnom podlogom kao uzgajalište riba i školjkaša (max.pov: 6 ha; max.kapacitet: ribe - 90 t/god, školjkaši 30 t/god) - lokacija je integrirana u važeći PP PGŽ kao uzgajalište riba i školjkaša (max.pov: 6 ha; max.kapacitet: ribe - 90 t/god, školjkaši 30 t/god) - lokacija je ucrtana u PPUO Puntat (ali bez definirane zone, već je označena samo simbolom)
<p>6. Uvala Zaplot-Veliki bok, otok Cres (O. Cres)</p>				<p><u>Postojeće uzgajalište za proizvodnju riba.</u></p> <ul style="list-style-type: none"> - lokacija je evidentirana stručnom podlogom kao postojeće uzgajalište riba (max.pov: 11 ha; max.kapacitet: ribe - 990 t/god) - lokacija je integrirana u važeći PP PGŽ kao uzgajalište riba (max.pov: 11 ha; max.kapacitet: ribe - 990 t/god) - lokacija je ucrtana u PPUG Krka (ali bez definirane zone, već je označena samo simbolom)

FISHERY INFRASTRUCTURE/ FISHING - AQUACULTURE - PROCESSING - SALES - SERVICE – LOGISTICS- FOCUS TO DEVELOP PARALEL WITH FARMING

- The categories of infrastructure in the economic categories of fishing and aquaculture are similar
Fishing and aquaculture share a number of common operations
- Basic requirements Fishing/aquaculture ports and/or landing places - specially designated places related to physical separation and non-obstructing the boarding and disembarking of fishing /farming boats and small boats - calculation of the coastal area - obligation to disembark
- Permanent moorings or moorings of fishing boats and small boats
- Manipulative parts of the shore for manipulation with nets and inspection and storage of tools , fish feed etc.



Service parts of the coast for equipment and repair of boats
Storage infrastructure - on land for receiving fish and other marine organisms
Pump stations - Fuel
Disposal of waste from fishing boats
Market infrastructurecoming after....



NECESSARY LOGISTICS INFRASTRUCTURE AND SUPRASTRUCTURE CONTENTS FOR MARICULTURE DEVELOPMENT CAPACITIES

- Mariculture and its development mainly includes the cultivation of organisms in the marine part of the maritime domain.
- Traditional cage fish farming and traditional shellfish farming can be broadly divided into sea and land.
- The sea part consists of installed anchoring and breeding installations and the harbor basin used by the associated vessels. The land part of the farm is the land part of the port (dock-disembarkation place) with an adequate coastal area for all logistic.
- RAS systems and open land based farms needs especially for Trout/Salmon



NECESSARY LOGISTICS INFRASTRUCTURE AND SUPRASTRUCTURE CONTENTS FOR MARICULTURE DEVELOPMENT CAPACITIES

- Coastal infrastructure is often the weakest logistical link in the development of aquaculture in a certain area.
- The beginning of the development of aquaculture usually relies on the existing port capacities and already then induces competition on the coast. The growth of production is proportionally followed by the number and/or size of vessels, which depends on the cultivation technology applied.
- Smaller farms are usually set up in locations protected from large waves, while large farms are usually set up in more exposed locations.
- The exposure of the locations, the size of the breeding facilities, the cultivated species and the distance of the breeding grounds from the coastal infrastructure determine the size of the vessels in aquaculture, and the number of breeding units determines the number of vessels

Table 14 Criteria for the placement/location of operational coastal infrastructure for mariculture

Farm size	> 700 tons	100-700 tons	< 100 tons
Good distance from the farm	< 10 Nm	< 2 Nm	< 1 Nm
Medium distance from the farm	< 15 Nm	< 5 Nm	< 2 Nm
Connection with transport infrastructure	mandatory	mandatory	Mandatory
Availability (minimum limiting factor: unloading/young)	Access to trucks required	Access to trucks required	Access to trucks required



NECESSARY LOGISTICS INFRASTRUCTURE AND SUPRASTRUCTURE CONTENTS FOR MARICULTURE DEVELOPMENT CAPACITIES





Table 15 Criteria for positioning of auxiliary coastal infrastructure, mooring

Farm size	> 700 tons	100-700 tons	< 100 tons
Position within the location	recommended – not necessary	required	required
Mooring safety	High	high	high
Connection with transport infrastructure	Not necessary	recommended	recommended

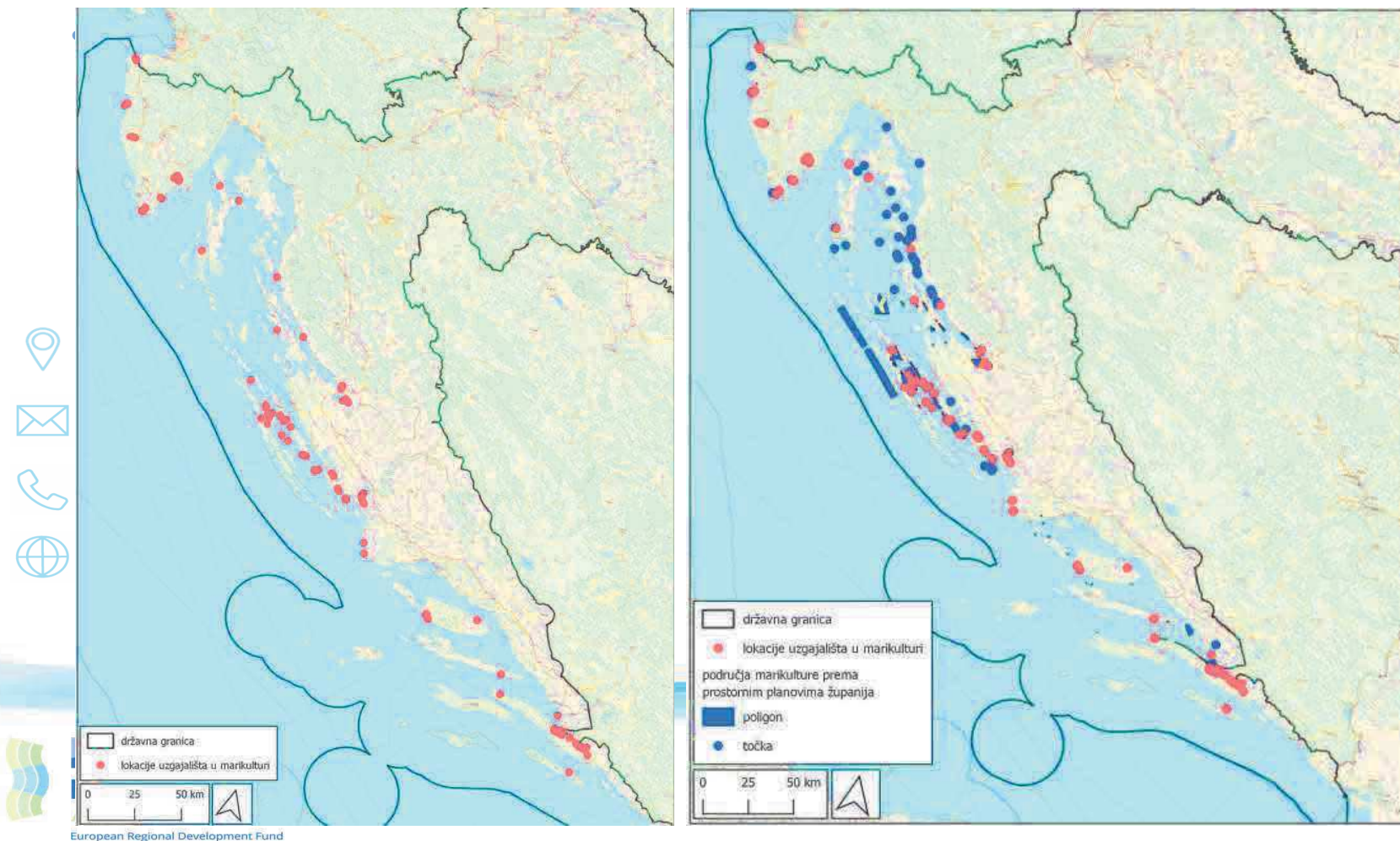
Table 16 Criteria for the dimensions of operational coastal infrastructure

Farm size	> 700 tons	100-700 tons	< 100 tons
Length of operational shore	Min. 20 m – plus 15 m on each 1000 t	15 – 25 m	Min. 10 m
Operating shore width (concrete, asphalt)	Min 10 m	Min 10 m	Min 10 m
Sea depth	Min 4 m	Min. 3 m	Min 2 m
Mooring length at the breeding site	Min 15 m	Min 10 m	Min 10 m

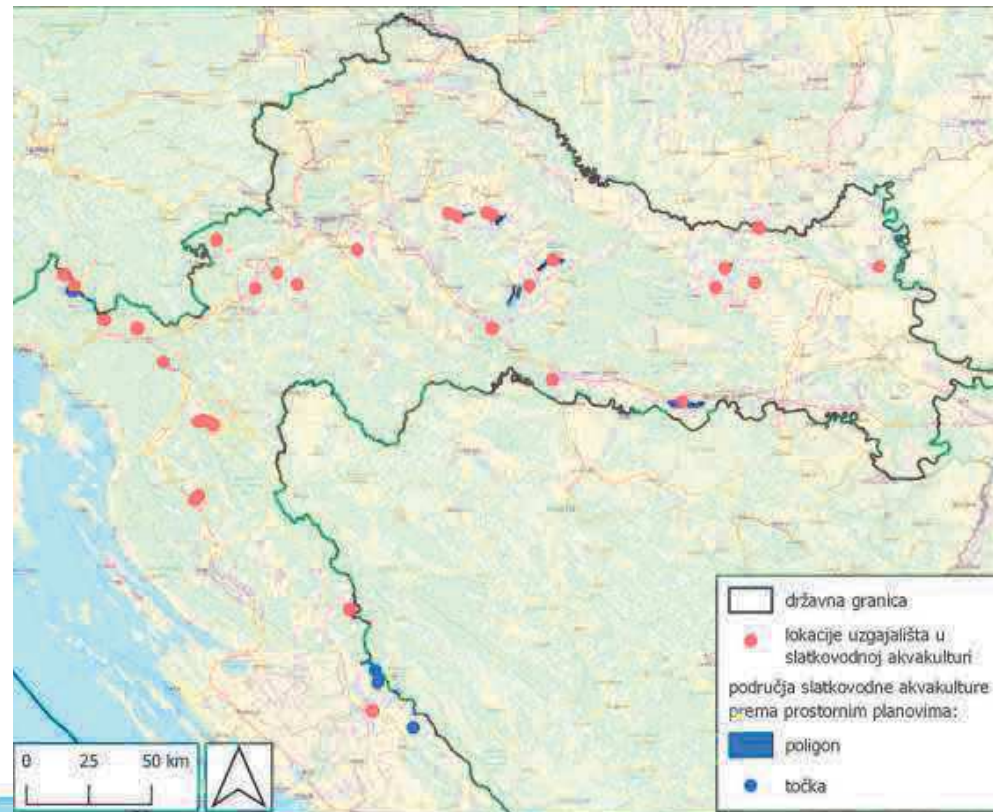
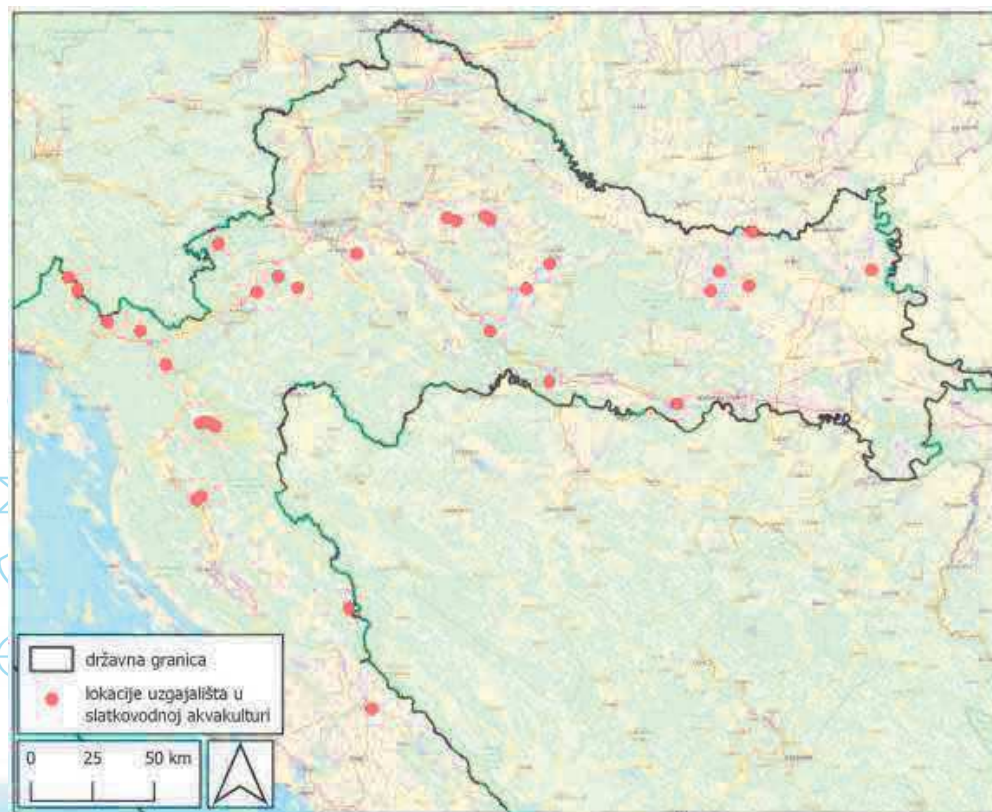
FURTHER DEVELOPMENT - FOCUSING

- The most acceptable is the establishment of zones - the establishment of larger zones in order to increase competitiveness and economies of scale
- Support for smaller farms - flexibility of supply
- Focus on breeding species
- Introduction of shellfish farming in polyculture - expansion of the zone
-  • Independent and unique management of production units - dedication to the farm
-  • Strategic capacity filling
-  • Focus on categories of fish by farms (juveniles/adult/land structure in case of
-  salmonids)

MARICULTURE PRESENT POSITION (RED) AND POTENTIAL (BLUE) IN SPACIAL PLANING



FRESHWATER PRESENT POSITION (RED) AND POTENTIAL (BLUE) IN SPACIAL PLANING



SPECIES CULTURED IN CROATIA (SEABASS, SEABREAM, TUNA AS A DOMINANT SPECIES)

vrsta	2015.	2016.	2017.	2018.	2019.	2020.*
lubin	4.488.388	5.310.025	5.615.808	6.220.125	6.089.084	6.754.049
komarča	4.074.788	4.100.956	4.829.601	5.590.969	6.774.425	7.779.888
hama	66.664	125.276	253.338	807.787	724.733	618.140
zubatac	4.135	1.106	0	0	0	0
romb	7.133	552	0	0	0	0
gof	0	0	0	0	0	34
tuna	2.603.361	2.934.276	2.161.608	3.227.135	2.746.739	3.321.557
degnja	746.382	698.700	919.763	881.627	946.674	496.812
kamenica	52.079	63.879	62.047	53.756	60.791	14.367
j. kapica	16	66	44	59	16	93
ukupno	12.042.946	13.234.836	13.842.209	16.781.457	17.342.485	18.984.943
* preliminarni podaci						

EXAMPLE OF BIG(CCA 3 000 T) AND MEDIUM (1 000 T) MARINE FARMS IN CROATIA



DEVELOPMENT POTENTIAL-MEDIUM TO HIGH

- Within the framework of the existing realized investments as well as the development plan, it is necessary to set the determinants of growth and development of production by segments as well as by locations with possible impact studies as part of the preparation of the national development plan and operational programs Financial support is linked to this, and it determines the success of the investment and the further direction of the investment Based on each production, as well as the availability of new locations, potential investors need to realistically look at the possibility of growth

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Uzgoj bijele ribe u kg po županijama ref 2019

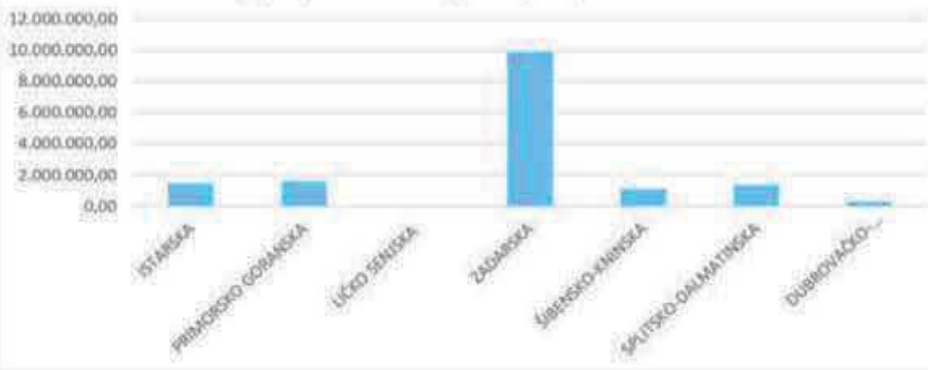


Table 1-2. Overview of concessioned areas for shellfish farming (m²) in Croatia, (2019)



PACKAGING DISTRIBUTION CENTER - PROCESSING SORTING

It is necessary to define the land capacities in the zones - Closely related to farm production and placement

Requirements of both fishing and aquaculture

Location of capacity along the coast or access to the unloading of refrigerated trucks and transport to the economic zone –

EXAMPLE-Utilization for processing - optimal whole -Used every square meter within the existing framework - polyvalent approach - Ideal position - direct delivery of fish from the farm and removal - highway, port - In the immediate vicinity of the fishing port - the possibility of marketing wild fish –



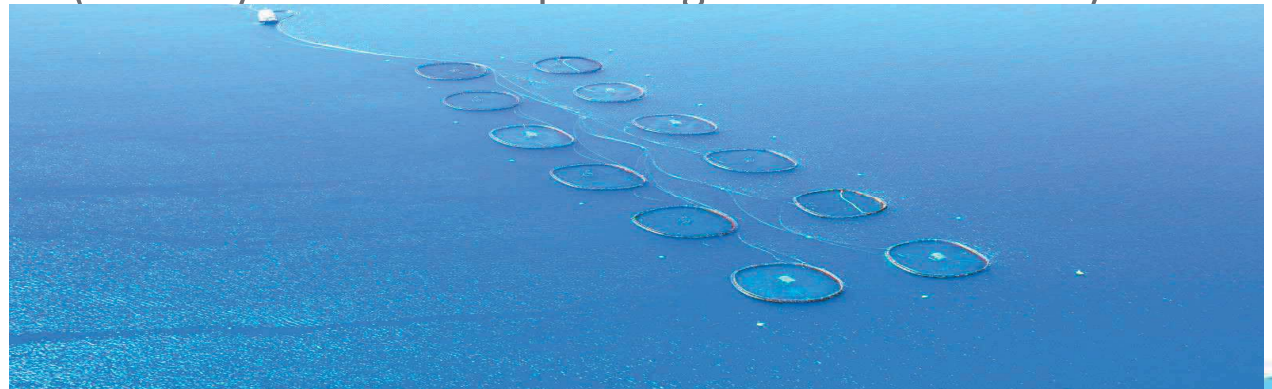
Surrounding areas with the basis of closing the necessary land infrastructure in the capacity of storing food, nets, other raw materials and in the case of building new farms - a special review and the preparation of foundations for the related land infrastructure is required

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OFFSHORE CAGES

- Preparation of projects in all touch points is extremely important for the success of cultivation and the avoidance of accidents Anchoring and installation projects
Monitoring rapid growth with part of the set technical and technological frameworks that have not been defined Selection of sizes and shapes of cages and other installations - related to marketing and capacities The possibility of substituting part of the cage - possible into cages for breeding new species - a species that has market potential (salmon/sea trout...depending of cost evaluation)







MANAGEMENT OF RISKS IN PRODUCTION

- Basic risks related to –

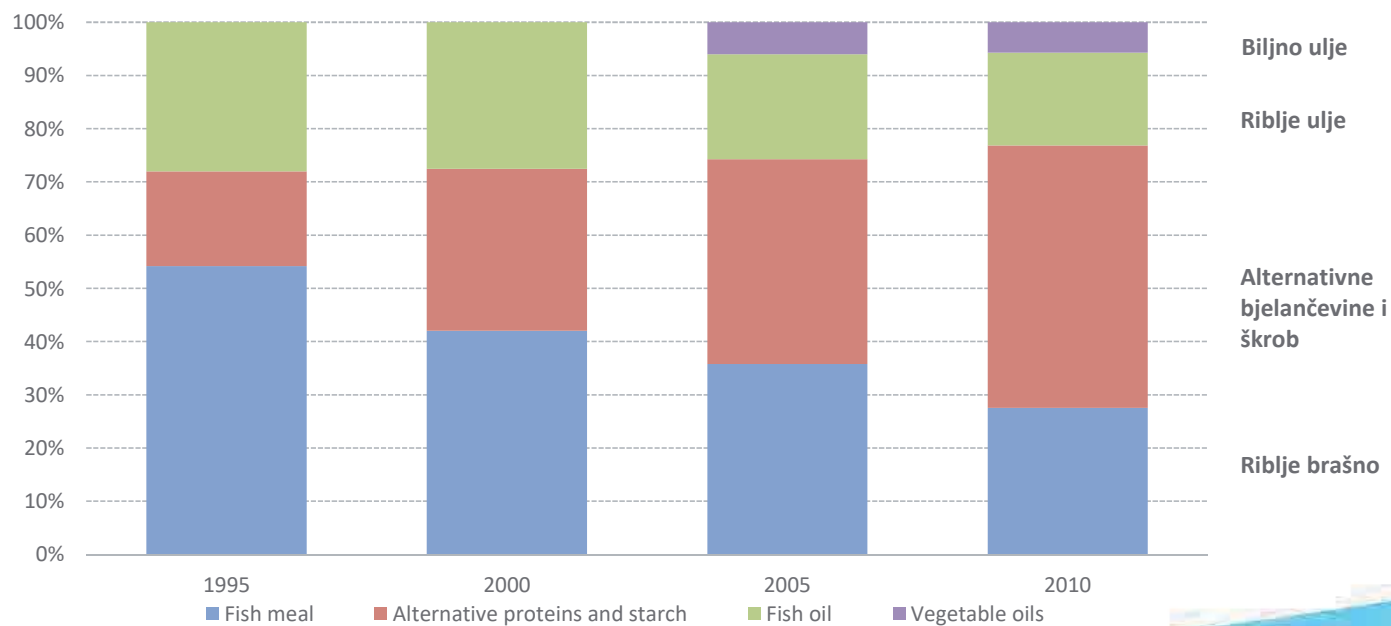
Environmental risks - natural disasters, pollution, inadequate location selection, temperature fluctuations, extreme temperatures –

Biological risks - diseases in cultivation - pathogens, predators, phytoplankton blooms –



-  Operational risks - poor planning, weak and fragile system design, injuries at work -
-  Financial risks - market changes, inadequate financing, influence of competition -
-  Social risks - negative perception, newspapers, thefts, vandalism, lack of experienced workforce, competition for quality workforce
- 



THE BIGGEST RISK FOR FARMING PERFORMANCE – DECREASING PROPORTIONS OF FISH MEAL AND OIL IN FOOD WITHOUT QUALITY SUBSTITUTES



FOCUS ON FURTHER DEVELOPMENT AND EXPANSION

- Industry does not have the strength for independent investments - high need for working capital and financing of current production
- All investments in new capacities should be viewed separately In future investments, emphasis should be placed on diversification as well as technical and technological systems that allow a quick change of direction and cultivation of new species
- - RAS - cultivation on land or next to land in closed systems. The economy of volume in production ends at the optimal cost price and is defined by the category of the maximum law above which the system breaks down, because each new farm has its own limits and restrictions
- Achieving the optimal cost price depends on the years of work on biological performance and the optimal technology and capacity of each farm.
-  The height also depends on the size and structure of the fish - bigger fish costs more It is not possible to have all farms at the same cost price
-  The construction of the hatchery (or strict defined chaneels for joungers) as well as the construction of the pre-growth area closes the most important cycle of this industry – especialy for salmonids



ESTABLISHMENT OF OPTIMAL BUT LARGER PRODUCTION UNITS

- Expansion in zones - strengthening competitiveness and economies of scale
- The segment of capacity expansion and capture in the zones has been launched and is close to realization - do not overdo it - monitor the biological capacity
- Avoid spreading "at all costs" - growth can vary depending on biological factors Avoid farms that are too small - unless they are for the purpose of breeding separate new species of higher value Avoid breeding grounds in unfavorable surroundings of any risks Enable the reduction of plantations in certain years - rest of the location - reduction of pathogenic flora



- Separate a smaller production farm into the category of a scientific research unit for the cultivation of new species as well as technological knowledge - the cost of dividing it among all capacities A separate development and research segment



NEW TECHNOLOGY

Related to monitoring trends in production -The strong influence of environmental lobbies as well as the competition for space reduces the possibility of breeding in cages and calls for new solutions -RAS- Cultivation in closed recirculation systems - on land or cultivation in closed basins emphasizes ecologically acceptable production - possible cultivation of algae and other types of organisms -When this emphasis is connected with the cultivation of possible organisms on fish waste in certain species, a double benefit is obtained in combinations of cultivation - The same thing needs to be done in cage farming - Polyculture and Integrated trophic levels of cultivation



LAND CULTURE

Focus on creative technologies - hatcheries - pre-growth, cultivation of new species
- Coexistence with the environment Polyvalent cultivations RAS-farming or open circuit on land- systems in which it is possible to grow more species- quick change of species in case of market risks Simple and cheap construction systems Risk reduction Control of breeding parameters Cultivation of organisms at trophic levels Waste management Constant analysis of the competition



IMTA

It means the cultivation of a large number of different species in the same location, in such a way that they form a closed trophic chain or network to the greatest extent possible - we have partly moved in this direction with bivalves - it gives a trait of responsible behavior expanding the classic model of fish and shellfish farming possible combinations: fish - filter feeders (shellfish) - autotrophs (algae) - benthic phytophages (urchins) or detritivores - and marine polychaetes - (ringworms) in cultivation on land - The so-called breeding on waste products of fish farming - it is also possible to grow crabs on processing waste - Aquaponics





NEW SPECIES –CULTURE DETERMINANTS

Selection of species for cultivation

Biological principles-production characteristics

Market acceptability Economic profitability

Development of R&D infrastructure Development and adaptation of production techniques
Development and adaptation of technologies Development of environmentally acceptable technologies
Selection of species for cultivation

-  WHICH SPECIES TO TARGET- In terms of price and costs, can we sustain only on sea bass and work on mass production in the Mediterranean - determine the limit of production of these species and awareness of the sure profit of the target market that recognizes quality -
-  Where is the limit? Certainly, aquaculture is growing, but some species are looking for
-  locations that are not available and development is limited
- 



„OLD SPECIES –DRASTIC PRICE DROP DOWN”-HISTORY LEVEL

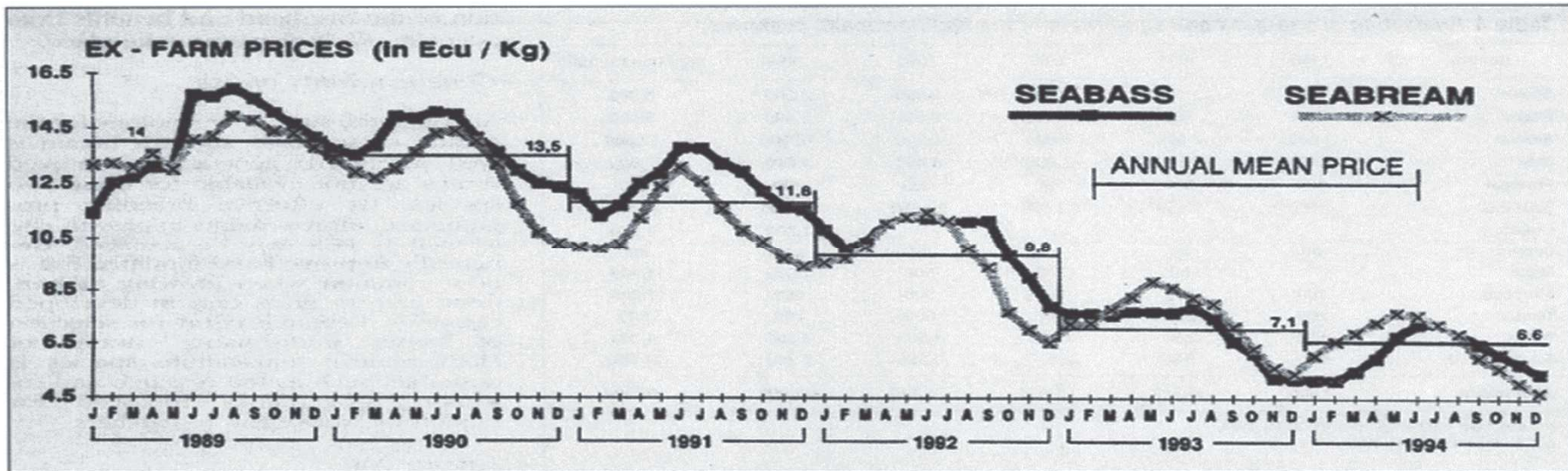
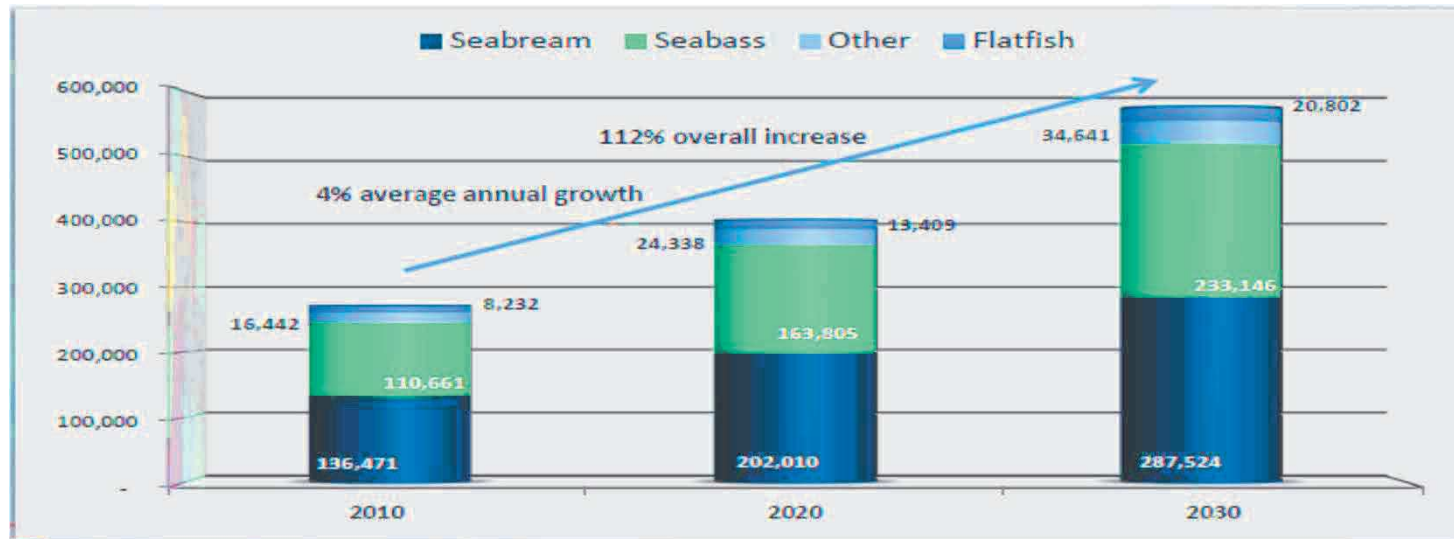


Figure 1 - Sea bass and sea-bream ex-farm price evolution in Greece (Source: SELONDA).




COOPERATION WITH MARKETING

Build the image of the product according to what is recognized and in demand - grasp what the consumer wants to hear and see and thus create the product Do you emphasize GMO free, without PAP? It is necessary to market the mentioned species and their potential Production must, if it wants to have development programs, have production sites that are specially managed and separated from larger productions, and at a very low level introduce experimental new species until the complete cycle is mastered



FURTHER DEVELOPMENT

There is room for growth in the spatial framework - in several different fields - several different types - it is necessary to see what the potential of the basic types are in the upcoming market competition and what price targets we can expect at the level of the target markets By expanding the existing farms into production zones, the production targeted a lower cost price in volume because there is no biological comparative advantage in the growth itself due to the deficiency of the temperature profile

 Comparatively, production at existing locations must currently strive for stabilization and establishment of normal cycles that can keep production cost stable. In order to start the breeding of new species, it is necessary to evaluate the market of all the listed species



FURTHER DEVELOPMENT

Possible new activities in currently unpromising zones (innovative mariculture and possible related development activities)

- Aquaculture / mariculture - initial production - micro and macro algae / aquatic and marine plants (greenhouses), ponds and bio reactors

Land-based farming systems for the production of fish and other marine and freshwater organisms in RAS plants - initial hatcheries and overgrowth - especially for salmonids)

- Mini wind farms / solar panels / water tanks in cultivation combinations/offshore technology

- Integrated Hydro & Aquaponic plants for plant production-vegetables-supply



- Desalination plant
- Algal salt production plant
- Fish processing plants
- Bio waste processing plants, low trophic aquaculture
- Technology park for research and demonstrations
- Educational and faculty campus for marine technologies
- Production of equipment - logistics center for the spread of new technologies and equipment



AQUACULTURE IS THE FUTURE OF THE EUROPEAN UNION AND THE FOOD CHAIN

The strategic guidelines of the EU show this very clearly: Call for simplification of administrative procedures and shortening of the licensing procedure for aquaculture farms, coordinating spatial planning in order to mitigate the negative effects of space shortage, strengthening the competitiveness of EU aquaculture, promoting a level playing field on the market

Development of mariculture/aquaculture is Croatian national program



Biodiversity conservation due to setting of fish aggregating devices

Regarding the preservation of biodiversity, according to the interpretation of the title, we can refer to the categories of devices that form the basis for the aggregation and protection of fish.

According to this principle, we can mention the most important

- Artificial reefs-
- Marine farms
- Other marine structures



Biodiversity conservation due to setting of fish aggregating devices



Thanks



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