AQUACULTURE I

6. WEEK

CHARACTERISTICS OF AQUACULTURE

WEEKLY TOPICS

WEEK	TOPICS
1. WEEK	WHAT IS AQUACULTURE?
2. WEEK	IMPORTANCE OF AQUACULTURE
3. WEEK	AQUACULTURE: ANIMAL PROTEIN
4. WEEK	HISTORY OF AQUACULTURE
5. WEEK	ORGANISATION OF AQUACULTURE
6. WEEK	CHARACTERISTICS OF AQUACULTURE
7. WEEK	POND CULTURE
8. WEEK	IN STATIC FRESHWATER PONDS
9. WEEK	IN BRACKISH-WATER PONDS
10. WEEK	RUNNING WATER CULTURE
11. WEEK	CULTURE IN RE-CIRCULATORY SYSTEMS (RAS)
12. WEEK	AQUACULTURE IN RACEWAYS, CAGES, AND ENCLOSURES
13. WEEK	MONOCULTURE AND POLYCULTURE
14. WEEK	RECENT ADVANCES IN AQUACULTURE

- 1.1 Overall situation
  1.2 Lakes, rivers and reservoirs (extensive aquaculture)
  1.3 Intensive and semi-intensive inland aquaculture (including integrated aquaculture)
  1.4 Aquaculture inside coastal lagoons[3]
  1.5 Land-based coastal aquaculture
  1.6 In-shore aquaculture
  1.7 Off-shore aquaculture

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- **Overall situation**
- Commercial freshwater aquaculture in the Mediterranean countries started at the end of the last century. **Cold water salmonids**, principally *Oncorhynchus mykiss* and *Salmo trutta*, **are the most important group amongst the aquaculture production of France, Italy, Spain and Turkey.** Salmonids are still considered a middle–high value product, commercialised, fresh or processed, destined **for their domestic markets, but also exported.** The high volume of this production is also its major constraint because of the progressive saturation of the demand. **A slow increase in production is**, nevertheless, still **foreseen.**

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- Warmwater freshwater species (originally based on common carp, to which introduced Chinese carps and tilapia were later added) represent the major aquaculture production in Croatia, Bulgaria, Romania, Israel and Egypt and are almost totally consumed domestically. In the three European countries of this group the production declined sharply due to the political transition period, and only recently showed a positive trend again (high potential was indicated for this type of aquaculture was reported in these three countries). On the contrary, in Israel and Egypt production has steadily increased and today contributes significantly to national food security and limits the import of fish. In these two countries the main constraint is the limited availability of freshwater (conflicts with agriculture and requirements for domestic water consumption) so both are trying to increase the stocking density in this form offish rearing.

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- **Marine aquaculture began more recently,** during the 1960s, **and has shown rapid growth.** The high product value of the species reared (with the exception of mussels) directs this product towards export markets but, at the same time, marine aquaculture is also seen by many countries as a means to limit fish imports. **The sector has been for a long time dominated by two species, sea bass** (*Dicentrarchus labrax*) **and sea bream** (*Sparus aurata*) but, during recent years other Sparids (*Diplodus sargus; Puntazzo puntazzo*) and, more recently still, the imported *Sciaenops ocellatus* (Israel) are contributing to the diversification of production. **Mollusc culture is more commonly a corporate activity,** bringing direct positive social benefits, while fish culture is mostly dominated by private enterprises. **Shrimp culture is still a minor sector** and algae/macrophyte cultivation is practically absent in the region. Marine aquaculture is facing **common problems in all the countries,** such as a progressive **saturation of available** sites (both for extensive and intensive aquaculture), **high competition in coastal areas** use (especially with tourism development), **and market restrictions** (particularly due to the recent EU import regulations). A rather slow but continuous expansion of me aquaculture sector is generally anticipated, while **off-shore fish culture is the activity which is actually attracting potential investors.**

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- **Lakes, rivers and reservoirs (extensive aquaculture)**
- There are **two major activities** in this sector: i) **re-stocking for commercial fisheries** and ii) **seeding for sport fisheries**. Both activities are normally supported by public authorities dealing with fisheries and aquaculture, with forestry, or with agriculture (irrigation). The sector is **only relevant in a few countries** (Bulgaria, Egypt, Romania, Tunisia; several thousands of tons per year), and activities take place in a wide range of water bodies, which differ in size and use (mostly reservoirs used for electricity production or for irrigation), which support a huge number fishermen either belonging to cooperatives or working individually. Users frequently have exclusive fishery rights and only in a few cases do they have to pay for the resource use (by leasing the water surface or paying for the fingerlings introduced). Fishing communities are sometimes directly involved in fingerling production and/or management (Egypt, Morocco, Romania).

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- The most common species stocked are rainbow trout (*Oncorhynchus mykiss*), common carp (*Cyprinus carpio*) and the introduced Chinese carps (*Ctenopharyngodon idella, Aristichthys nobilis, Hyphophtalmichthys molitrix*). Various species of Tilapia, pike (*Esox lucius*) and perch-pike (*Stizostedion lucioperca*) are also frequently used. Egypt is a special case in that it successfully practises culture-based fisheries in an inland saltwater lake (Lake Quaroun) by using marine fish and shrimp species. Wild-caught fingerlings of grey mullets (*Mugil cephalus* and *Liza ramada*) are used to restock reservoirs in Tunisia, which has contributed to an increase in freshwater fish production from 700 t in 1996 to 1,010 t in 1997. However, production is highly dependent on yearly fluctuations in the supply of wild-caught fingerlings. Re-stocking lakes and rivers' in support of angling is commonly done in most Mediterranean countries. Anglers pay for fishing licences.

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- **Intensive and semi-intensive inland aquaculture (including integrated aquaculture)**
- This sub-sector is mainly **dominated by trout, carp and tilapia** farming.
- **Aquaculture inside coastal lagoons***
- *Most authors correctly assumed that the term "aquaculture inside coastal lagoons" strictly referred to the well-known "vallicoltura" practised in Italy, which involves the control of the hydraulic circulation and water renewal in lagoons as well as selective fish "seeding". For this reason mollusc farming or the cage culture of fish, which is practised in several countries inside coastal lagoons, were reported under "in-shore aquaculture" and are synthesised in section 1.6.

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- **Land-based coastal aquaculture**
- **The farming of marine species** developed during the 1970s and 1980s in land-based facilities essentially because there were no acceptable alternatives. This activity **is currently more and more constrained** in most Mediterranean countries, **because of high land costs and severe competition with other users** of the coastal area (tourism, urban development, environment protection, harbours).
- **In-shore aquaculture**
- This sub-sector still **represents the bulk of coastal aquaculture production**, having been developed in protected areas such as bays, gulfs, canals and coastal lagoons (see note in section 1.4), mostly based on mollusc farming and finfish cage culture. **Despite** the fact feat it is subject to the same **numerous constraints** to on-land aquaculture (conflicts wife other users, deterioration in coastal water quality), which limit the availability of adequate sites, **a few countries still plan a significant expansion of in-shore aquaculture**, as well as its gradual transfer into open waters (see section 1.7).
- **Off-shore aquaculture**
- **This form of aquaculture has the potential to solve most of the hindrances which hamper the expansion of coastal aquaculture, and therefore attracts great interest in most of the Mediterranean countries.** It is already well developed in Cyprus (840 t/yr; 87% of the total national aquaculture production) and Malta (about 2,000 t/yr; which is almost the total aquaculture production of the country), where no sheltered areas exist. It is also well developed in other countries, such as Italy and Spain, where conflicts with the tourism industry or scarcity of appropriate sites are already forcing the producers to move far from the coast. In addition, the Black Sea countries reported interest in developing off-shore aquaculture, and some activities are already carried out by Turkey involving the farming of salmon and large-size trout.

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