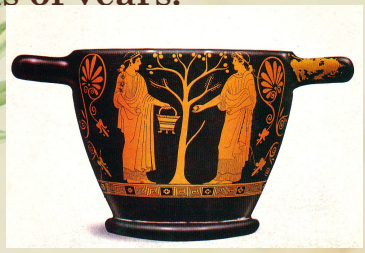
Constraints and strengths of North African countries for a productive and sustainable olive cultivation

Dr Costas Gregoriou
Managing Director
Agro Forum LTD
Nicosia
Cyprus

- The olive tree is a major agricultural crop in North African countries and its economic importance in this region is well recognized.
- Olive oil has historically been associated with sustaining human life in many parts of the Mediterranean Basin included North African countries and it has provided mankind with essential nutrients for thousands of years.



- **Olives and olive oil are a particularly favorite food for the Mediterranean people and have been a basic staple food in their diet. Olives and olive oil are appreciated for their nutritional value, delicate flavor and quality.**
- **A characteristic is that the table olive consumption in North African countries is relatively high compared with olive oil consumption.**

- **In North African countries olive cultivation is a crop capable of establishing a sustainable system in subsistence agricultural areas. It thus plays an important social role in reinforcing the subsistence-base of a large population group by encouraging settlement in rural areas versus migration to urban centers.**

- Thousands of families depend on the crop for the bulk of their income, as a large number of olive groves in several countries in this region belong to small and medium size holders. It also provides seasonal employment for many farmers, especially women.
- In many cases the traditional cultivation method still exists in olive industry in North African countries, in spite of the emergence of the intensive and irrigated modern olive growing methods. Generally, traditional olive growing is localized in the arid and semi-arid regions and the mountainous zones.

- In these regions/zones, olive tree production presents the only possible livelihood and culture. The olive tree has low productivity in those regions, but it provides a model of sustainable use of natural resources, while limiting desertification and strengthening water and soil conservation.
- In North African countries the olive tree is generally cultivated in compact plantations and is sometimes mixed with other fruit trees.

- Plantation density varies appreciably according to the availability of water. Orchard density also varies according to soil and climate conditions and variety.
- Modern young olive groves are developed in plains with higher densities. The majority of olives in North African countries are used for olive oil production.

Main constraints and future vision

Agricultural Knowledge for Science and Technology

Agricultural Knowledge for Science and Technology

- The number of scientists and the research and development (R&D) effort going into agriculture are still insufficient.
- Although research institutions exist in North African countries, there is a shortage of innovative and modern technology, as well as inadequate laboratories and equipment for research studies.
- Most of the research institutions are fragmented and lack adequate financial support and technical facilities.

Agricultural Knowledge for Science and Technology

- **Therefore, R&D should be strengthened and better coordination needs be established to strengthen the collaboration between these institutions, the farmers and the private industry.**
- **In order to improve the coordination of the research and to strengthen the collaboration between the institutions in the region the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA) has established in 2004 a Regional Olive Network the AARINENA Olive Network.**

Agricultural Knowledge for Science and Technology

The AARINENA Olive Network is constituted from three working research groups

- **Olive Production and Protection Group;**
- **Post-harvest, Processing and Technology Group; and**
- **Socio-economic and Commercialization Group.**

The participating countries are:

Morocco,
Tunisia,
Algeria,
Libya, Egypt,
Turkey,
Cyprus,
Saudi Arabia,
Syria,
Iran,
Yemen,
Jordan and
Palestine

The objectives of AARINENA Olive Network are:

- **The reinforcement of cooperation between the European System of Cooperative Research Networks in Agriculture (ESCORENA) and the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA).**
- **The reinforcement of cooperation between these two networks and the International Olive Oil Council (OOC), the European Union, the International Center for Advanced Mediterranean Agronomic Studies (CIHEAM) and the Food and Agriculture Organization of the United Nations (FAO);**

The objectives of AARINENA Olive Network are:

- **To implement a coordination system in order to avoid a possible overlap between their activities and permitting also to rationalize their contributions concerning research and valorisation of research findings;**
- **Encourage and facilitate the mobility of researchers between the different Mediterranean countries;**
- **The reinforcement of technology transfer; and**

The objectives of AARINENA Olive Network are:

- **Make known and valorise research findings thanks to implementation of an efficient information system (database made up of programmes and results of research, and mechanisms of information exchange).**

Natural Resources

- The Natural resources in connection with sustainability in agriculture has received much attention in the last decade.
- The production system plays a vital role in the sustainable use of natural resources and influence phenomena such as e.g. soil erosion, flooding, fire hazards etc
- Managing the natural resources required for olive and olive oil production is one of the key factors.

Natural Resources

- Farmers should know of the need to balance short-run profit from maximizing production at the cost of longer-terms sustainability.
- All of us we understand the need to ensure these resources that are there for future generations to enjoy and utilize.
- Specific approaches should be developed to balance production and environmental outcomes, including water management, scarcity and quality, and improving water-use efficiency.

Natural Resources

- Similarly, management of soil, erosion and on-going fertility should be taken into serious consideration.
- ‘ Olive’ and ‘Erosion’. The importance of olive tree in the control of erosion is well known.
- Managing and sustaining native biodiversity and its essential support of ecosystem function needs to be better understood in order for the olive and olive oil sectors to survive and flourish in this region.

Planting materials

The use of healthy planting materials and the selection of the cultivar is of paramount importance in the establishment of olive orchards in order to have high yield and good quality fruits

Planting materials

- Many olive cultivars have been developed over the centuries, which differ in various ways, including the size, color of the fruit and the oil content.
- This wide range of olive biodiversity was brought about by centuries of interaction between growers and the natural environment.
- Each North African country has its own unique cultivars, and in many cases many seedling trees are also cultivated.

Planting materials

- In addition, there is considerable confusion around cultivars throughout the region, where the same name may be given to similar cultivars and different names may be used for identical cultivars.
- Some cultivars are found only locally where as others are spread in several countries. The presence of so many varieties, many of which are little different, can lead to incorrect identification.

Planting materials

- Varietal surveys have been undertaken in almost all countries included the North African countries.
- These are undertaken to determine and describe cultivated olive varieties and thus obtain information which can be used for varietal improvement for modern olive growing as well as for distinctive characterization of varieties specific to different olive growing regions

Planting materials

The main objectives of these varietal surveys are:

- a) The olive biodiversity brought about by centuries of interaction between growers and nature be documented, published and made available via the Internet;
- b) The genetic variability not yet lost will be saved for future generations thus stopping genetic erosion, which is a high risk everywhere in the Mediterranean Basin;
- c) The selected varieties will further enhance the cultivation of olives as a sustainable crop in the current growing areas.

Planting materials

Some years ago a success attempt has been undertaken in order to determine and describe cultivated olive varieties in the region through a project entitled:

Conservation, characterization, collection and utilization of the genetic resources in olive (CFC/ IOOC/03)

Planting materials

- The participating countries in the project were Morocco, Tunisia, Algeria, Syria and Egypt. The estimated total cost of the project was1, 150,181.00 USD and its duration was five years.
- The funding agents were the Common Fund of Commodities (CFC), the International Olive Oil Council (IOOC) and the European Union.

Planting materials

The Project Executing Agency was the Istituto per la Valorizzazione del Legno e delle Specie Arboree (IVALSA), Italy, formerly Istituto sulla Propagazione delle Specie Legnose (IPSL), Consiglio Nazionale delle Ricerche (CNDR) and the Project Co-ordinator was Dr. Antonio Cimato, who was assisted by Dr.ssa Cristina Attilio.

I was the independent evaluator for the final project evaluation at the end of 2007

Planting materials

The main task of the project was to address the crucial issue of low olive productivity in the above five Mediterranean countries, where the olive constitutes a basic commodity.

The phenomenon of low olive tree productivity is mainly due the fact that farmers are using unsuitable cultivars resulting in a decreased farmer's income and in urbanization.

- Therefore, the project goals were timely and well justified since plant genetic resources are essential for the increase of productivity and the improvement of olive sector.

Planting materials

- **The scientific project objectives were the collection, identification, evaluation and utilization of the genetic resources in the participating countries.**

BECAUSE

- **Those genetic resources are well adapted to local climatic conditions, are resistant to biotic and abiotic factors and are the suitable cultivars to increase productivity, to contribute to farmer's income, and to make the olive a sustainable and competitive crop.**

Planting materials

The main findings were the following:

- **A total number of 310 accessions have been recorded, compared with 186 accessions at the beginning of the project.**
- **As a result, a total of 124 accessions have been recovered and studied through out the project implementation.**
- **The following is the contribution from each country:**
- **71 accessions in Algeria,**
- **19 in Egypt,**
- **64 in Morocco,**
- **75 in Syria and**
- **81 in Tunisia.**

Planting materials

Multiplication of the autochthonous olive accessions has been undertaken by the centres in order to complete the National collection fields of the five participating countries based at:

Sidi Aich (Algeria),
Giza (Egypt),
Idleb (Syria),
Marrakech (Morocco) and
Sfax (Tunisia).

Planting materials

Multiplication of the autochthonous olive accessions has been also undertaken by the centres in order to be transferred and planted into the two international collections:

- **International Collection, Tassaout, Marrakech, Morocco**
- **International Collection, Cordoba, Spain.**

Planting materials

- A bimolecular methodology for olive DNA fingerprinting has been set up by the Project Executing Agency and provided to all centers and to IOOC and CFC for consideration.
- The main purpose of this activity was to provide a reliable method for the genetic identification of olive accessions that differ very little, as for clones belonging to the same cultivars.

Planting materials

- Another very important component of managing planting materials is multiplication and certification.
- Modern propagation techniques, good nursery facilities as well as appropriate certification schemes should be established for the production of high quality, healthy and true-to-type planting materials.
- Another lecture on the propagation will be delivered later on to-day

Soil

- Erosion
- Selection criteria for soil cultivation systems.
- Avoid soil degradation
- Avoid soil erosion

Soil

- Avoid soil compaction
- Water retention / infiltration / evaporation
- Conserving the chemical and biological properties of the soil

Water

- The water scarcity in the region is a crucial issue.
- Olive cultivation is a necessity under the existing water situation in the region
- Water conservation is also a necessity under the existing water situation in the region.

Water

Therefore consideration should be given on:

- Irrigation methods - frequencies - rational irrigation.
- Defining water requirements of newly cultivated olive trees from planting to first commercial bearing age, specifically the role of rational irrigation in minimizing this period.

Water

- Techniques aiming at reducing water input requirements in the processing of table olive and olive oil included vegetation water .
- Methods for recycling and reuse, in olive grove irrigation, of water effluent from olive processing plants.

Water

- Use of treated sewage water for irrigating olive oil varieties and not table olive varieties.
- Safe applications that will affect neither the environment nor humans when using treated sewage water

Water

Any other practical solutions and techniques which can be implemented by olive growers to minimize water losses, to improve water-use efficiency and commercial effectiveness of water in olive irrigation which should maintain sustainable levels of yield and quality

Horticultural and Cultural Practices

- **Horticultural practices have a direct effect on fruit yield and quality. In many of the olive producing countries in the region, several problems exist that affect both the yield and quality of the fruit produced.**
- **In North African countries, the main topics and cultural practices which will be taken into consideration in order to increase productivity are:**

Horticultural and Cultural Practices

Design of new groves, selection of variety and planting distances

The main factors to be taken into consideration in designing and establishing anew olive orchard are:

- **Site selection**
- **Choice of cultivar (s)**
- **Use of pollinators**
- **Planting distance, plant density and orchard layout**

Horticultural and Cultural Practices

Low yield problems may arise in orchards with cultivars that are not totally self-compatible or are not compatible if there are no pollinators.

Also, in years when pollination takes place at high temperatures, a high rate of sterility can be observed in single-variety orchards; this can be corrected using effective pollinators.

Horticultural and Cultural Practices

Therefore:

- **Cross-pollination is essential in varieties with anomalies in their reproductive organs and it can help to reduce the percentage of the parthenocarpic fruits.**
- **When designing an orchard, it is often wise to combine two or three infertile varieties with similar flowering periods, to ensure there are pollinators available.**

Horticultural and Cultural Practices

Planting density varies widely with soil, rainfall, variety and cultural practices, ranging from:

17 trees/ha (Sfax area, Tunisia)
To
500 trees/ha (in highly intensive irrigated groves).

Horticultural and Cultural Practices

Proposed Planting density

Water resources	Plant Density (trees/ha)
Rain fed 200-300mm	Below100
Rain fed 300-400 mm	100
Rain fed 400-500 mm	200
Rain fed 500-600 mm	250
Rain fed 600-700 mm	300
Irrigated	600 or more

Horticultural and Cultural Practices

Pruning operations throughout the olive tree's life span are necessary and should:

- Balance growth and fruiting;
- Not devitalize or prematurely age the tree;
- Be economic; and
- Bear in mind that the main constraint on productivity is water.

Horticultural and Cultural Practices

Pruning of olive tree is a vital cultural practice as it:

- **Secures regular fruiting and long life of the olive tree;**
- **Adapts the olive tree to local conditions (temperature, humidity, sunlight, soil);**
- **Ensures a better balance between vegetative growth and flowering, besides which it regulates the alternate bearing of the trees;**
- **Prevents and secures easier control of pests and diseases;**

Horticultural and Cultural Practices

Pruning of olive tree is a vital cultural practice as it:

- **Saves water and humidity (as it reduces transpiration), which is essential because of the semi-arid conditions of the area and the long dry summer;**
- **Regenerates the branches;**
- **Regulates the nutrient distribution of the trees; and**
- **Makes for easier harvesting.**

Horticultural and Cultural Practices

Pruning types

- Training pruning
- Pruning to promote fruit production
- Rejuvenation and regeneration pruning
- Mechanical pruning

Horticultural and Cultural Practices

- Efficient Management of Irrigation Water
- Water availability and cultivation systems.
- Choosing the appropriate irrigation method

Horticultural and Cultural Practices

Selection and installation of modern irrigation systems and water-use efficiency.

Criteria for selecting and installing modern irrigation systems

Advantages of modern irrigation methods

Problems or drawbacks of modern irrigation systems

Horticultural and Cultural Practices

Advantages of modern irrigation methods

- Significant water saving
- Increased yields.
- Utilization of steeper slopes
- Poor quality saline water can be used with the drip and minisprinkler.
- They require limited labour.
- They can be automated by using automatic metering valves, electronic tensiometers, time switches, computers, etc.

Horticultural and Cultural Practices

Problems or drawbacks of modern irrigation systems

- Cost
- Emitter clogging

Horticultural and Cultural Practices

Correct fertilization should cover the needs of the crop and provide the quantities of nutrients which cannot be extracted from the soil.

Special consideration should be given for the management of organic fertilizers.

Horticultural and Cultural Practices

Element	Deficient	Sufficient	Toxic
Nitrogen(%)	1,40	1.50-2.0	
Phosphorus (%)	0,05	0.10-0.30	
Potassium (%)	0,40	over 0.80	
Calcium (%)	0,30	over 1.0	
Magnesium (%)	0,08	over 0.10	
Manganese ppm	0,08	over 20	
Zinc ppm		over 10	
Copper ppm		over 4	
Boron ppm	14	19-150	185
Sodium ppm			over 0.20
Chlorine ppm			over 0.50

(Critical levels of essential nutrients in olive leavesas proposed by Freeman et al. (1994))

Horticultural and Cultural Practices

- Fertigation/Fertirrigation.

It is a technique that you can apply the fertilizers through the irrigation system using various types of injectors.

Horticultural and Cultural Practices

Control of alternate bearing.

- In olive cultivation alternate bearing is one of the most serious phenomena that affect olive grower profitability, especially in the table olive industry.
- The olive tree has a very marked alternate or biennial bearing pattern.
- Heavy crops are invariably followed by lighter ones.

Horticultural and Cultural Practices

Factors affecting alternate bearing of olive trees

Although, biennial bearing is genetically determined, the degree to which it occurs is greatly affected by cropping level, environmental conditions (especially the weather), and by cultivation practices such as irrigation, fertilization, pruning, harvesting, plant protection etc.

Therefore the degree of alternation depends on the interaction between a large number of external and endogenous factors, the most important of which are:

Horticultural and Cultural Practices

Factors affecting alternate bearing of olive trees

- Age of trees
- Maturity- harvesting
- Chilling requirements
- Weather – Disease
- Pruning
- Irrigation
- Fertilization
- Cropping level - shoot length - fruiting ability

Horticultural and Cultural Practices

- Guidelines on soil cultivation systems, erosion, and organic matter;

Horticultural and Cultural Practices

Weed management.

Weeds are commonly controlled either mechanically (mowed or tilled) or chemically treated with herbicides.

Alternatively, mulches, cover crops and flamers can be used.

Often several weed management techniques are combined.

Also weed management it can be done before planting

and/or

after planting

Horticultural and Cultural Practices

Weed management usingHerbicides

- In order to control weeds with herbicides after trees are planted and before bearing, it is recommended to apply a pre-emergent herbicide to either a square or circle around each tree (at least 1.5m-2m across) or as a band down the tree row. Young trees need to be protected from contact by some post-emergent sprays.

Horticultural and Cultural Practices

Mechanical control of weeds must be done repeatedly when weeds are at a young stage.

Cultivating established perennials in an irrigated orchard often increases the weed problem.

Cultivation also cuts and damages the roots of trees, reducing the ability of the tree to take up nutrients and allowing soil pathogens access to the tree.

Horticultural and Cultural Practices

Pest and disease control

- **Of all agricultural practices, it is perhaps pest control that has the greatest impact on public opinion. Most Quality Assurance schemes tailored to market and consumer demands require foods to be clear of chemical residues and the population is increasingly aware of and concerned about chemical impacts not only on the human body but also on the environment**

Horticultural and Cultural Practices

Pest and disease control

Maintenance of crop health is essential for successful farming for both yield and quality of produce as well as for safety and environmental protection. This requires long-term strategies and application of good agricultural practice. The GAP approach should be based on the following:

Horticultural and Cultural Practices

Pest and disease control and key elements of integrated pest management (IPM) in order to improve fruit and oil quality and avoid residues. IPM should be based on:

- **Use of certified high quality, healthy nursery plants;**
- **Use resistant cultivars and varieties;**
- **Apply proper cultural practices that maximize biological prevention of pests and diseases (soil management, pruning, fertilization, irrigation, weed control, harvesting etc);**

Horticultural and Cultural Practices

IPM should be based on the:

- Maintain regular and quantitative assessment of the balance status between pests and diseases and beneficial organisms of all crops;
- Adopt organic control practices where and when applicable;
- Apply pest and disease forecasting techniques where available;

Horticultural and Cultural Practices

IPM should be based on the:

- Decide on interventions following consideration of all possible methods and their short and long-term effects on farm productivity and environmental implications in order to minimize the use of agrochemicals, in particular to promote integrated pest management (IPM).

Horticultural and Cultural Practices

Pesticide Management

use,
misuse and
precautions

Horticultural and Cultural Practices

Guidelines for control of the main pests and diseases;

and

Guidelines Farmers' health and safety.

Horticultural and Cultural Practices

Harvesting

- **Harvesting Time**
- **Harvesting Methods**
- **Hand Harvesting (Picking)**
- **Mechanical Harvesting**
- **Transporting and Storing the Olives Prior to Processing**

- **Apart of the low productivity due to the various factors which have been already discussed some other negative factors are:**
- **The increasing production costs,**
- **The strong influence of the climate,**
- **The lack of effective farmer's associations.**
- **Olive farmers have experienced diminishing returns because of the decrease of property size (through inheritance),**

- Post-harvest handling and storage
- Issues to be considered are the improvement of oil extraction plants, storage and packing facilities, processing and preservation units for table olives as well as the introduction of modern technology.
- Other matters to be considered are the by-products of oil processing and valorisation and environmental issues.

Marketing

Marketing is relatively weak due to the:

1. lack of product classification,
2. lack of marketing skills,
3. inadequate packaging and
4. low consumption due the lack of awareness of the contribution of olive oil to human health.

Marketing

- Consumers need to know that their demands for 'clean green' produce have been heard and responded to.
- Wholesalers need to know they can continuously source and show they are able to provide such products to consumers.
- And regulators need to be comforted that industry is self-regulating in the correct way for the benefit of the olive growers and consumers.

Marketing

Products with the
Protected Designation of Origin (PDO)

and Products with the
Protected Geographical Indication (PGI)

Olive Manual on Good Agricultural Practices (GAP)

- The AARINENA Olive Network and the Food and Agriculture Organization, Regional Office for Near East
- in order to contribute to the increase of productivity and the to the improvement of the olive sector in the region
- prepared an Olive Manual on Good Agricultural Practices (GAP) Guidelines for the WANA (AARINENA) countries.

Olive Manual on Good Agricultural Practices (GAP)

The reference of the manual is:

- "OLIVE GAP MANUAL ON GOOD AGRICULTURAL PRACTICES FOR THE NEAR EAST AND NORTH AFRICA COUNTRIES". FAO Publication (ISBN 978- 92 - 5- 106348- 4 , © FAO 2009).
- The manual can be download as PDF file from the web site of FAO Regional office for the Near East - Cairo Production and Protection Publications

Olive Manual on Good Agricultural Practices (GAP)

The web site of FAO Regional office is:

http://www.fao.org/world/Regional/RNE/Inform/FAOAND/PlantP_en.htm

Olive Manual on Good Agricultural Practices (GAP)

The manual is in English has more than 250 pages with photos and it is a valuable guide for the extension horticulturists, students of agriculture and farmers of the Near East and North Africa countries. The content of the book is in accordance to environmental management systems (EMS

Olive Manual on Good Agricultural Practices (GAP)

The objective with the GAP Guidelines is to elaborate on the internal factors related to the production systems in order to improve the productivity and the quality of olive oil and olive production in an economically viable, environmentally sustainable and socially acceptable way.

Olive Manual on Good Agricultural Practices (GAP)

The aim of the manual is to give to agriculturists, students and farmers the necessary guidelines on improvements and new techniques to the existing olive farming systems in order to increase productivity in an environmentally and socially sustainable manner and to make the olive a sustainable and competitive crop and contribute to the income of olive farmers and avoid urbanization in the countries of Near East and North Africa.

Olive Manual on Good Agricultural Practices (GAP)

The manual includes 12 Chapters and the titles and author/s of each one is as follows:

- **Introduction (Author: Costas Gregoriou, Cyprus).**
- **Olive sector in AARINENA countries constraints & strengths (Author: Costas Gregoriou, Cyprus).**
- **Soil (Authors: Mohamed El-Kholy, Egypt).**
- **Water (Author: Mohamed El-Kholy, Egypt).**

Olive Manual on Good Agricultural Practices (GAP)

- **Design of New Grove, Germplasm (varieties) and Propagation- Nursery (Authors: Belkassem Boulouha, Morocco and Costas Gregoriou).**
- **Tree training and Pruning Methods (Author: Costas Gregoriou, Cyprus).**
- **Irrigation (Authors: Mohamed El-Kholy, Egypt).**
- **Fertilization (Authors: Costas Gregoriou, Cyprus and Mohamed El-Kholy, Egypt).**

Olive Manual on Good Agricultural Practices (GAP)

- Alternate Bearing in Olive Trees (Authors: Costas Gregoriou, Cyprus and Belkassem Boulouha, Morocco).
- Weed management (Authors: Costas Gregoriou and Nicos Serafides, Cyprus).
- Pest and disease management (Authors: Costas Gregoriou, Cyprus Mohieddine Ksantini, Tunisia and Nicos Serafides, Cyprus).
- Harvesting, Post-Harvest, Processing and Olive By-Products (Authors: Anwar Ibrahiem, Syria and Saleh Shdiefat, Jordan).

Organic cultivation

- It is an alternative olive cultivation system for both table olives and olive oil production.
- Especially for the areas where olives are not cultivated in intensive systems (orchards).
- More easy to apply organic cultivation systems for olive production.
- More easy to apply organic cultivation in orchards with low inputs

Quality Products

Food system is experiencing a change in the relationship with the consumer and with the distribution.

The customers are increasingly demanding, and are attracted, by products that have high quality content and a strong link with the territory.

Quality Products

The brands with the price are the two factors affecting the strategic policies of the food producer firms. At the same time, the retail system has proven to be very sensitive to consumer demands by providing quality products at competitive prices and using their brand as an element of loyalty.

Quality Products

Therefore special consideration should be given for:

Products with the Protected Designation of Origin (PDO)

and

Protected Geographical Indication (PGI) recognition

In conclusion for the improvement of the olive sector in the North African countries the following actions should be considered:

- 1. Strengthen research and development efforts and establish a comprehensive and robust scientific database of cultivars;
- 2. Increase olive productivity through increased uptake of good agricultural practices
- 3. Improve the quality of olives and olive oil to meet market demand;

- 4. Reduce production costs where possible through more exact application of inputs (such as fertilizer, labour etc);
- 5. Increase olive oil competitiveness in the world market;
- 6. Demonstrate the olive industry's environmental credentials and responsiveness to consumer preferences;
- 7. Increase local consumption through awareness programmes; and
- 8. Improve post-harvest handling, processing and storage.

Thanks

I would like to express my sincere thanks to:

- Organizers.

and

- IOOC

For funding my participation to deliver this presentation

Thank also all of you for attending the seminar

Some photos from Cyprus where according to mythology Aphrodite was born from sea waves