10
Water sustainability of agribusiness activities in the **Mediterranean Basin** Italy, Greece and Morocco

10.1 Introduction

The European Environment Agency (EEA) contends that water use in agriculture is unsustainable in many parts of southern Europe. A contributing factor is that current regulatory and pricing mechanisms 'have failed to manage [and reduce] demand'.[92] In a recent report, the EEA highlights appropriate water pricing as 'the core mechanism' for making agricultural water use more efficient. Farmers have been shown to reduce water consumption and adopt water efficient practices when illegal extraction is effectively policed and water paid for by volume. It should be noted, however, that contradictory findings have been reported in other studies.[93]

Several global studies have concluded that the Mediterranean will be significantly affected by climate change through decreases in precipitation and increases in temperature. These factors lead to confident projections that the area will suffer from increasing water shortages in the future.[94]

10.2 Local water challenges in Greece

10.2.1 Water availability

Water availability in Greece is limited due to its Mediterranean climate. Precipitation is spatially skewed with 1500 mm/year in the west to less than 400 mm/year in the East. Water shortages are common, particularly in south-eastern areas where water use is highest while precipitation lowest.

Few rivers exist in peninsular Greece all of which are small, and many dry up during the summer. By contrast, rivers in the Balkan Peninsula, which flow through northern Greece – e.g., the Vardar and Struma – have significant summer discharge.[95] The relatively small and seasonal nature of many rivers leads to limited capacity for irrigation. Agriculture at present uses 84% of available resources while domestic supply and industry account for 13% and 1.7% respectively.

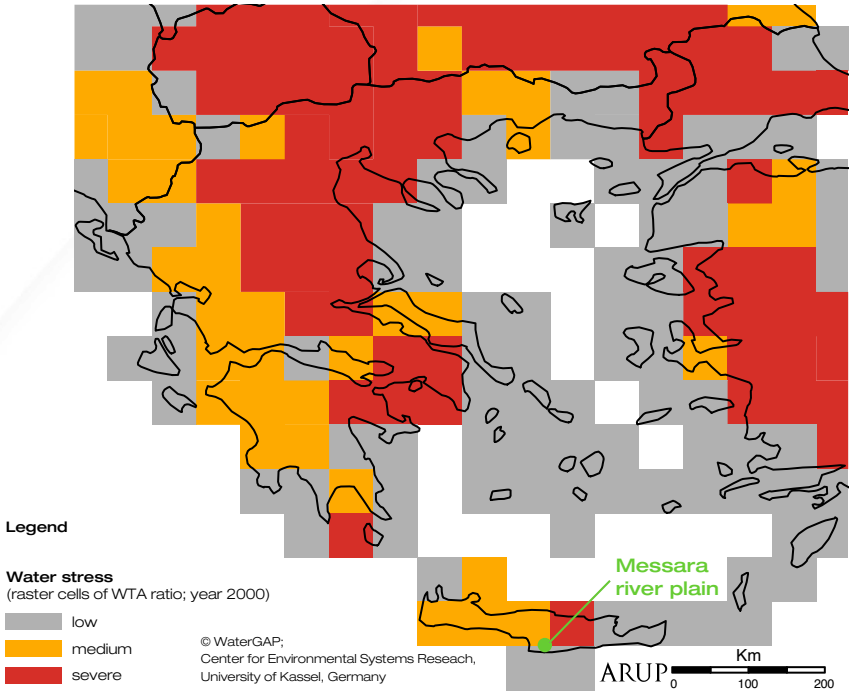
Over-exploitation of groundwater resources has resulted in low groundwater tables and there is limited effective control on the amount of water extracted.[96] **In Greece as in most Mediterranean Basin countries, financial institutions should pay close attention to the sustainability of water availability and water use, with a special focus on the sustainability of groundwater exploitation by clients and other users in the vicinity of clients.**

See PI 2

In the addition to agricultural activities, the large Greek tourism industry also continues to have significant impacts on water availability. The high tourist season takes place in the period May to September when water availability is at a minimum and water stress peaks. Levels of water stress in river basins across Greece are presented in Figure 11.

Figure 11

Overview of the water withdrawal-to-availability ratio calculated by WaterGAP that indicates low, medium and severe water stress in river basins in Greece.



10.2.2 Water quality

Groundwater salinity is a growing problem which is caused by both seawater intrusion into aquifers and 'returns' from irrigation water. Seawater intrusion is exacerbated by the long coastline of Greece, the karstic characteristics of the aquifer systems and the potential for sea-level rises in the future. Critical areas of aquifer salinisation are shown in Figure 12. Deteriorating water quality directly depletes overall resource availability as irrigation water with a high level of salt content can damage crops.

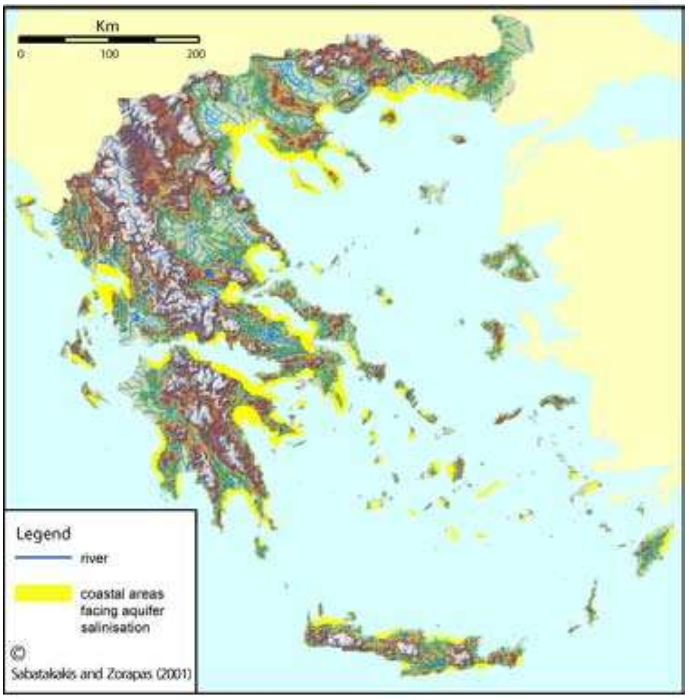
Arsenic contamination in groundwater in the north of the country (Thessaloniki, Chalkidiki prefecture and others[97]) is found in some agricultural 'hotspots' where groundwater is used for irrigation. Risks to food safety and yield are likely to increase with the build-up of arsenic in the soil.[98] The pollution of surface and groundwater from excessive use of agrochemicals further challenges farmers in Kopaida and Arta, Argolida.[99]

See PIs 3 & 7

In addition to the over-exploitation of surface and groundwater resources in terms of volume, the exposure of borrower clients as well as their direct contribution to water pollution should be carefully assessed by financial backers.

Figure 12

Areas facing problems of aquifer salinisation across Greece.



10.2.3 Institutional context

The transposition of the European Water Framework Directive (WFD) into Greek legislation has resulted in a new institutional arrangement.[101] The protection and management of river basins and the implementation of the WFD are the responsibility of the 13 Regional Water Directorates. In the case of shared river basins, the National Water Committee determines which regional authority is responsible.[102] To comply with the WFD, increasing attention has been given to minimum ecological flows, which is the component of river flow necessary to maintain ecosystems. **Financial institutions will have an increasing interest in ensuring the compliance of borrower clients with existing and/or emerging environmental regulation such as the European Water Framework Directive.**

See PIs 1 & 7

10.2.4 Agricultural activity and water use

Water for agricultural use has become a controversial issue in recent years. For instance, the cultivation of water intensive crops in arid areas such as Thessaly is a source of concern where inefficient irrigation scheduling, illegal wells and low irrigation efficiency have depleted water availability.[103] Lake Karla, a lake within the plain of Thessaly, has been drained and the government is proposing to recharge it with water from a nearby reservoir. **Such adverse developments can, in principle, be avoided through a number of measures including: the early assessment of the appropriateness of crops in light of local hydrological conditions as well as the introduction of water-efficient irrigation technology.**

See PI 4

Until 2005, irrigators connected to public networks still paid according to the irrigated area rather than the quantities of water used. After the implementation of the WFD, agricultural water users will have to start paying for water at levels that reflect the real costs of its supply. **Financial institutions should therefore start assessing the viability of clients' operations on the basis of higher overall costs.**

See PI 5

10.2.5 Transboundary water management

Approximately 25% of the available water from rivers comes from trans-boundary rivers, with Greece situated at the downstream end.[104] Increases in water use in upstream countries and subsequent reductions in river flow will further reduce the water availability for agriculture.

10.3 Local water challenges in Italy

10.3.1 Water availability

Water availability in Italy varies substantially across the country. Parts of southern Italy, with its extremely uneven rainfall pattern, are considered semi-arid and water here is a limiting factor. Severe droughts have occurred in the past, for example during the period 1988–90.[105]

The common practice of withdrawing groundwater (principally for irrigated agriculture) throughout Italy, and particularly in the south, has led to the overexploitation of potentially renewable resources. This has put serious pressure on many of the underground water systems.[106] As a result, public water supply increasingly relies on desalinated water as an additional resource. **In Italy as in most Mediterranean Basin countries, financial institutions should pay close attention to the sustainability of water availability and water use, with a special focus on the sustainability of groundwater exploitation by clients and other users in the vicinity of clients.**

See PI 2

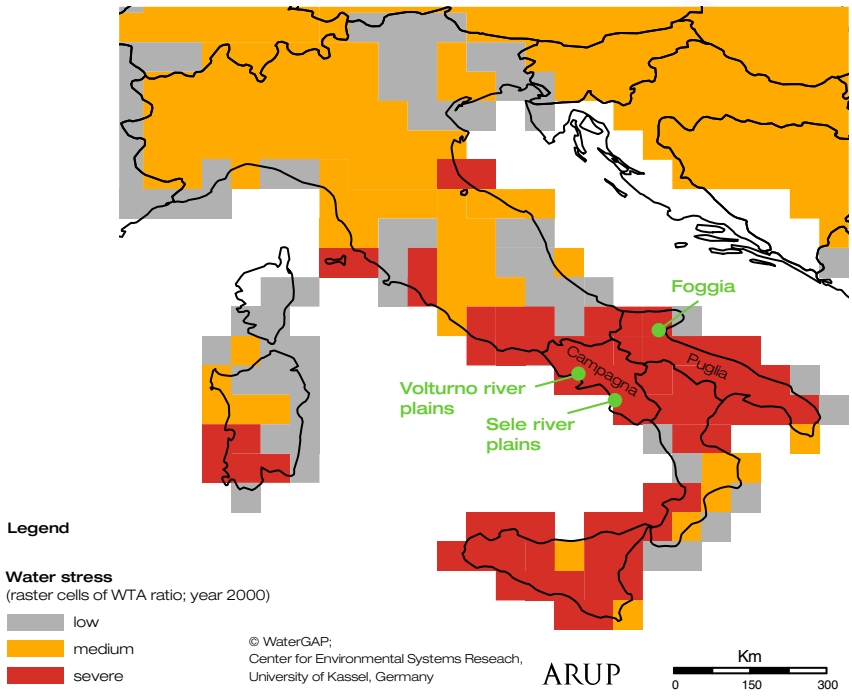
Increasing standards of living and a growing tourism sector have placed additional pressures on water availability. The tourism industry in particular exacerbates water supply problems as the high season, which takes place from May to September, coincides with peak water stress. Consequently, water resource conflicts between different users (tourism, industry and agriculture) are becoming increasingly likely. An overview of the water stress in river basins across Italy is shown in Figure 12.

Treated urban wastewater provides a reliable source of water supply relatively unaffected by periods of drought or low rainfall. In Italy this water source is used primarily in agriculture. However, use in golf courses, municipal land and, increasingly, industry has been observed.[107] **Given the sustainability as well as the risk and cost benefits linked to the concept of water re-use, financial institutions should promote such approaches to their borrowers as well as local authorities.**

See PI 6

Figure 13

Overview of the water withdrawal-to-availability ratio calculated by WaterGAP that indicates low, medium andsevere water stress in river basins across Italy.



10.3.2 Water quality

See PIs 2 & 3

In some coastal plains, groundwater abstraction results in saltwater intrusion and a deterioration in groundwater quality. The Volturno and Sele Plains in southern Italy are areas where this problem has been observed.

See PIs 3 & 7

Where there are high levels of agricultural activity, for example in the Po River Basin, groundwater resources often contain high concentrations of nitrates due to fertiliser use. The waste produced by agricultural and animal production and the high level of regional development has negatively impacted water resources and led to additional degradation of surface and groundwater quality. **In addition to the over-exploitation of surface and groundwater resources in terms of volume, the exposure of borrower clients as well as their direct contribution to water pollution should be carefully assessed by financial backers.**

10.3.3 Institutional context

Italy has a long history of water legislation with core principles mentioned in the Consolidated Law of 1933, Law 319 of 1976, regarding water quality and water use and followed by Law 183/89, which takes the catchment basin as the principal focus for water use and conservation measures.[108] The European Union Water Framework Directive commits Italy to achieve a sufficiently good state of all water bodies by 2015 both in quantitative as well as in qualitative terms. On a regional level, the established District Basin Authorities are responsible for water resource management and allocation to different uses.[109]

In many parts of the country irrigation water withdrawn from surface water bodies continues to be paid for on the basis of the area irrigated. The transposition of the European Water Framework Directive (WFD) into Italian legislation has led to a new water fee system that aims to charge on a volumetric basis. While this transformation has not yet been adopted in every part of the country, it is fully implemented, for instance, in the Foggia province. Currently, the water fee is of approximately Euro 0.12 per m^3 of surface water withdrawn. It should be noted that groundwater, which is used intensively in the Foggia province, is not as of yet subject to the water fee.

See PI 5

After the full implementation of the European WFD, agricultural water users will be required to pay for water in a way that more accurately reflects the real costs of water supply. Financial institutions should start assessing the viability of clients' operations on the basis of higher water costs.

10.3.4 Agricultural activity and water use

Italy has the greatest absolute area equipped for irrigation within the southern member states of the European Union (3.97 million ha). Agriculture accounts for approximately 50% of Italy´s total water use.[110]

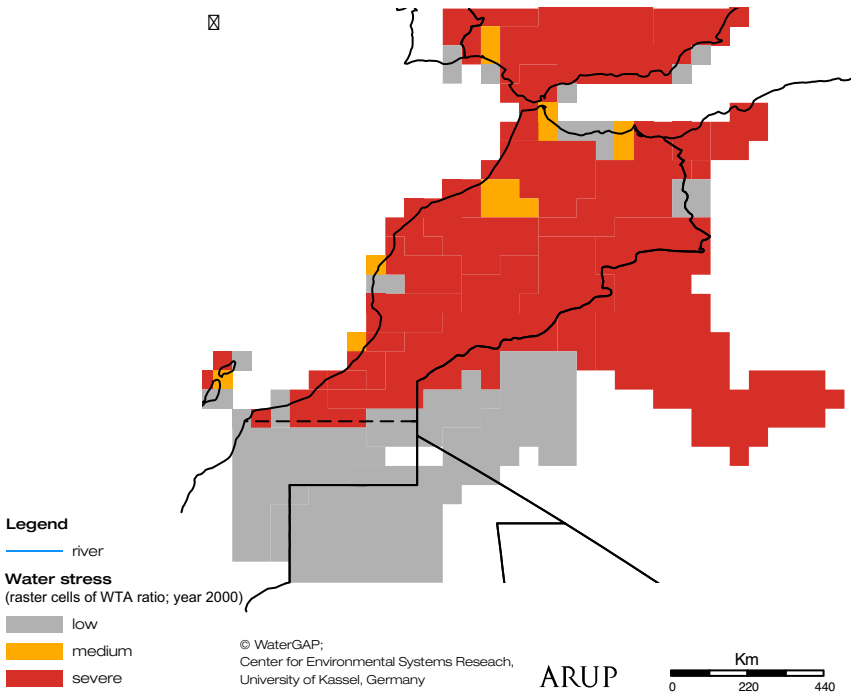
10.4 Local water challenges in Morocco

10.4.1 Water availability

Three river basins (Loukkos, Sebou and the Umm Ribia) provide over 70% of Morocco´s water resources. Until 2000, only 3 of the 8 major river basins in Morocco were considered to be water stressed. Since then, a growing population, increased urbanisation, extended irrigated agriculture, the production of water-intensive crops and the growth of the industrial and tourism sectors, have placed additional pressures on water resources. Today's water stressed basins include the Souss Massa, Bou Regreg, Tensift, Loukkos of Sebou and Umm Ribia (see Figure 14). It is predicted that the Moulouya river basin will be added to the list in the near future.[111]

Figure 14

Overview of the water withdrawal-to-availability ratio calculated by WaterGAP that indicates severe water stress in river basins across Morocco.



10.4.2 Climate change impacts

Likely climate change prospects were briefly outlined in the introduction. In addition, a preliminary trend analysis of available rainfall data suggests that climate change will decrease precipitation in parts of the Atlas Mountains, which is the main source of water supply in western Morocco.[112] Notwithstanding the effects of climate change, Morocco's water deficit is exacerbated by variable and irregular climatic conditions, which include cycles of repeated drought. In the past, drought cycles have roughly spanned over 4 years.

10.4.3 Water quality

Water quality problems in Morocco have been reduced by the improvement of the sanitary conditions of urban areas through the collection, treatment and reuse of wastewater.

10.4.4 Institutional context

Morocco has made considerable progress in the management of irrigation systems by passing management responsibility to groups of users known as Water User Associations (WUA).[113] In 1984, an irrigation water pricing review introduced the current formula-based tariff system, whereby volumetric tariffs are directly linked to the real costs of water supply. Today, irrigation charges are moving towards complete cost recovery for operations and maintenance.[114] Authorities have, furthermore, partially revoked earlier plans to expand irrigated schemes, have introduced water-quotas and scheduled the building of additional dams.[115] However, the work of the WUAs is reported to be very inefficient in some regions. This is due to poorly qualified farmers and the often old irrigation infrastructure.

The Government of Morocco has recently introduced Le Plan Maroc Vert which aims to develop a modern, high-performance and internationally competitive agricultural sector within the period 2009-2013. Among other objectives, the plan aims to support small farms in rural areas to achieve better productivity through the cultivation of cereals that are more drought resistant. **This signals the importance that should be given to the appropriateness of crops with regards to local water conditions.**

See PI 4

Public-private-partnerships in irrigation management have been implemented in Morocco. These are the El Guerdane project and the ORMVA reform project. Small-scale farmers' inability to progress towards higher-value-added agriculture and adjust to potentially higher water prices may, however, pose risks to these partnerships.[116,117]

See PI 5

10.4.5 Agricultural activity and water use

Water challenges in Morocco are interlinked with the economy's dependence on agricultural exports. Morocco uses 80-90% of its freshwater resources for irrigated agriculture.

Of the total agricultural area equipped with irrigation systems, approximately 30% is irrigated from groundwater, often unsustainably. For example, in the Souss region in southern Morocco the main aquifer is largely depleted and water is being withdrawn at 179% of the renewable resource.[118] Since 1969, the water table has decreased at an average of 1.5 m per year. Some private tube wells now pump water from depths of over 200 m. Despite this, the Souss valley produces 60% of the country's citrus fruits, contributing to half of Morocco's exports of these products. **In Morocco as in most countries in the Mediterranean Basin, financial institutions should pay close attention to the sustainability of water availability and water use, with a special focus on the sustainability of groundwater exploitation by clients and other users in the vicinity of clients.**

See PI 2

Experiences in managing large-scale irrigation systems in Morocco such as the Bitit Irrigation System, have shown that:[119]

- Clear water allocation rules are the basis for good water management practice. Transparency in assigning water rights to farmers appears is key to reducing water conflicts.
- Increasing water productivity is a key component in the development of sustainable irrigation systems. **Financial institutions can play a role in increasing water productivity.**
- Conflicts between agricultural, domestic, industrial and tourism users, will become more frequent, as will conflicts between small-scale and large-scale farms.

See PI 9

10.5 Water sustainability in irrigated agriculture: citrus fruit, tomatoes and olives

10.5.1 Situation in Greece

Greece has the highest population dependent on agriculture in Europe. Between 33-40% of total agricultural area is under irrigation, mostly for crops (approximately 70%), vines (4%) and trees (25%).[120] Water is often supplied through public networks. Within these networks, efficient irrigation technologies have not been widely adopted. While surface water irrigation accounts for 35-40% and irrigation with sprinklers amounts to 50-55%, drip irrigation remains at 10% only. There is significant scope, therefore, to improve water productivity at the farm level by switching to more water efficient techniques or by improving current systems. **Financial institutions can play a role in equipping the agribusiness sector with more water efficient irrigation systems; in most Mediterranean countries corresponding government subsidies are in place.**

See PI 8

Data suggests that water recycling and reuse is limited in Greece.[121] The use of treated effluent to irrigate crops is limited as there is still low public confidence in this concept. **It should, however, be in the highest interest of financial institutions and their agricultural clients to further explore such opportunities.**

See PI 6

Citrus fruits in Greece

Citrus fruits are grown predominantly in the Northeast Peloponnese, Crete, Thesprotia and Arta. These areas are predominantly classified as water stressed regions in Figure 11. The water requirements of citrus fruits vary between 900-1200 mm/yr. Yields of these citrus crops are considered good if they fall between the ranges of: orange 25-40 t/ha/yr; grapefruit 40-60 t/ha/yr; lemons 30-45 t/ha/yr and mandarin 20-30 t/ha/yr.[122] Water productivity for various citrus is between 500 – 600 m^3/t yield suggesting marginal opportunities for further improvement.[123] **Financial institutions can play a role in increasing water productivity.**

See PI 9

Olives in Greece

Olives are remarkably tolerant to water stress. Three different types of olive orchards can be found: non-irrigated, low-output orchards often on marginal soils; intermediate orchards; and high-intensity, high-output orchards.[124] While, in overall terms, only a few olive orchards are irrigated, efficient water irrigation systems such as drip and scheduled irrigation are typical features of high input systems.

In many cases, the rise of productivity in olive groves has been achieved at the expense of dramatic reductions in groundwater levels. In parts of the Messara plain, a 20 m drop in the groundwater level has been recorded since 1985.[125,126]

Water productivity data is limited, but research suggests it to be in the order of 450 – 1100 m^3/tonne yield for Spain.[127] It appears that the best water productivity values can normally be obtained in high yielding and intensively managed orchards. **Financial institutions can**

See PIs 2 & 9

play a role in increasing water productivity and the sustainability of groundwater exploitation.

10.5.2 Situation in Italy (the Foggia Province and Campania Region)

Tomatoes in Italy

Tomatoes in southern Italy are cultivated mainly in the alluvial plains of the Campania Region (8,000 ha) and in the Foggia Province (27,000 ha; largest concentration of tomato production in Southern Italy). The average production is 60 t/ha. Tomatoes are produced for industry (e.g. canned peeled tomatoes) and for direct consumption (e.g. salad tomatoes).

Industry-tomato is traditionally grown in the Campania region (the so-called 'red gold' area) where most of the processing plants are based. Increasing demand for canned tomatoes during the 1980's has furthermore increased production levels in the province of Foggia. Industry-tomato is predominantly grown in open fields. Water resources are derived mainly from the rivers in the region. In the Foggia province, the entire irrigation system is dependent on large artificial reservoirs; in Campania, small diversion dams are used. Irrigation is managed by *Irrigation and Land Reclamation Consortia*, which are responsible for collection, adduction and distribution of water.

Fresh-produce tomatoes for direct consumption are grown in greenhouses, which are concentrated in the Sele plain (province of Salerno, Figure 13). Producers have widely installed groundwater wells to assure year-round availability of water for their production. The withdrawal of water from these coastal aquifers has been pushed to the edge of sustainability and saline intrusion in the coastal plains is a problem. Problems may, therefore, arise in the future if the over-exploitation of water resources, and the increasing salinity levels that accompany over-exploitation, continue.

See PIs 2, 3 & 7

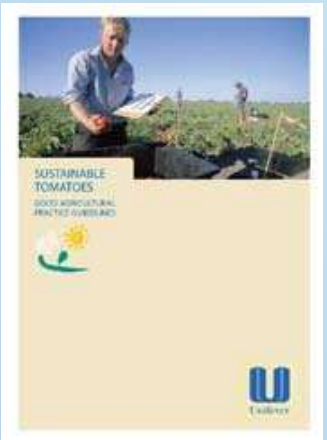
Through asking the right questions, financial institutions can play a role in making sure that groundwater resources are neither over-exploited nor polluted.

See PI 8

Water productivity may be improved by soil moisture monitoring, optimised irrigation as well as root drying and regulated deficit irrigation management.[128, 129] Guidelines on sustainable tomato production are available (see case study below).

Case study 5

Sustainable tomatoes and the Good Agricultural Practice Guidelines by Unilever[130]



Unilever provides good agricultural practice guidelines which address sustainability of tomato production under the focus of soil health, soil loss, nutrients, pest management, biodiversity, product value, energy, social and human capital, and water.

To further increase water productivity the potential areas for improvements are outlined as follows:

- Promote wider use of irrigation scheduling techniques
- Support enhanced water management systems based on drip irrigation
- Evaluate drip irrigation distribution uniformities

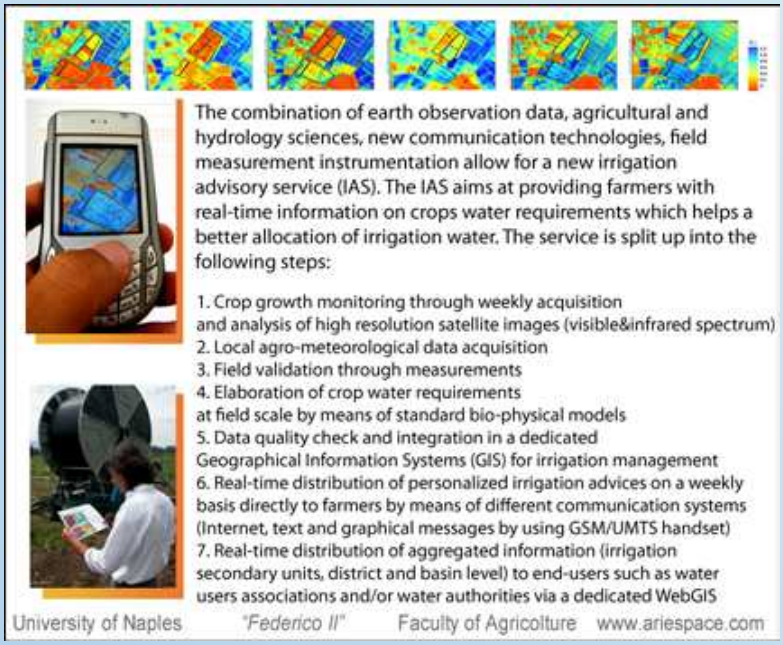
Case study 6

Re-use of water in the Belice Basin, Western Sicily, Italy

Within the Garcia-Arancio districts a number of projects have been undertaken aimed at using the effluent of treatment plants to supply irrigation water. Secondary treatment plants of the municipalities of Castelvetrano, Menfi and Sambuca di Sicilia, were connected to the internal irrigation networks of the respective agricultural districts in order to directly supply water during the summer, when high peaks of water demand arise.[131]

Case study 7

The "Piano Regionale di Consulenza all'Irrigazione" in Campania



See PI 6

Given the sustainability as well as the risk and cost benefits linked to the concept of water re-use, financial institutions should promote such approaches to their borrowers as well as local authorities.

10.5.3 Situation in Morocco

Morocco is a key producer of citrus fruits with exports to EU, Russia, US and Canada. Approximately 90% of water in Morocco is used for agriculture. More than 30% of the citrus orchard area is under drip irrigation, with the remainder being irrigated by furrow systems.

Cost recovery of irrigation water is achieved in large irrigation schemes managed by the regional agricultural development agencies, on the basis of a system of pricing principles outlined in the Agricultural Investment Code, enacted in 1969. National policies have recently led to the introduction of incentives to install advanced technology drip irrigation in all new and/or replanted orchards. All farmers eligible for a credit can receive subsidies of 60% when installing drip irrigation, provided they have legal titles for their land. **Financial institutions can play a role in equipping the agribusiness sector with more water efficient irrigation systems (and subsequent training); in most Mediterranean countries, corresponding government subsidies are in place.**

See PI 8

Case study 8

Water resources sustainability and reuse of water in agriculture

In the rapidly expanding town of Drarga (6000 inhabitants), near Agadir in southern Morocco, a new wastewater treatment and reuse plant sells treated wastewater to farmers for irrigation. The Municipality collects sewage fees to recover all of the operation and maintenance costs and some of the plant's capital costs. Further cost recovery elements include the sales of reclaimed water to farmers, reeds harvested from the polishing ponds, and sludge and methane gas from the anaerobic basins to, respectively, produce compost and drive pumps at the plant. Since October 2000, the treated wastewater has met WHO guidelines for reuse in agriculture without restriction. The project, furthermore, includes the introduction of drip irrigation demonstration plots.

Source:[132,133]

See PI 6

Given the sustainability as well as the risk and cost benefits linked to the concept of water re-use, financial institutions should promote such approaches to their borrowers as well as local authorities.

Citrus fruits in Morocco

Citrus fruit is produced by both large-scale orchards (mainly for export) and small scale traditional enterprises (primarily for domestic markets). Average annual yields for the year 2004 are estimated at 15-18 t/ha, which is lower than other large Mediterranean producers such as Italy, Greece, Spain, Turkey and Egypt. Yields levels are expected to increase to 24 t/ha in 2010. Water productivity of citrus fruit production is in the broad range of 500 – 1000 m^3/t yield indicating that there is potential to further improve water productivity per hectare through improved irrigation practice (such as better timed irrigation; improved pest and disease management which would further improve water productivity as yield losses would be reduced).**Financial institutions can play a role in increasing the water productivity of agribusiness clients.**

See PI 9

Citrus production is affected by water stress and sub-optimal yields are commonplace:

See PI 9

- The largest production area, the arid Souss valley, is often subject to inadequate supplies of water. This affects overall yields and the quality of yields.

See PI 2

- The water table in many parts of Morocco is below 150 m. Pumping from this depth adds significant costs for producers.
- Quality of water is important: high salt content seriously affects both the quality and quantity of citrus yields. Additional irrigation may also be needed to dilute and move salts into deeper soil.

Case study 9

Drip irrigation and small-scale farmers in the Tadla irrigation scheme in Morocco

To relieve water scarcity, public authorities in Morocco have set-up various subsidy programs giving farmers access to efficient irrigation technologies, such as drip irrigation. 42'000 ha have been equipped with drip irrigation technology so far, and the Ministry of Agriculture aims to equip another 550'000 ha by 2020.[134] The importance of training offerings to farmers alongside equipment subsidies has been one of the key lessons learnt.

10.6 Performance indicators

Based on the current context of water challenges and agribusiness operations in the Mediterranean Basin, 9 tailored PIs are presented. These aim to support financial institutions in starting to assess the water-performance of farms and agribusiness operations in the region.

	Description	Rationale and materiality
PI 1 **Does the client comply with existing environmental standards and/or is the client in a position to comply with regulation likely to emerge in the future?**	Environmental standards relevant to water sustainability are related to the pollution of water courses and the over-exploitation of water resources. Under the EU Water Framework Directive, member states should aim to achieve good status of all bodies of surface water and groundwater by 2015. This is supported by the Directive on Plant Protection Products (i.e. pesticides and control of pollution), a directive that regulates pest-control and a directive that limits nitrogen pollution from fertilisers and manure.	Breaching environmental standards and subsequent prosecution can result in financial costs and cause reputational damage and losses from litigation, both for the farm as well as the lender. In contrast, agribusiness operations that already comply with environmental regulation likely to emerge in the future will be at a clear advantage relative to unprepared peers.
PI 2 **Has the client conducted an assessment of the security of sustainable water availability in terms of quality (including the sustainability of relevant groundwater resources)?**	An indication of water-stress levels in river basins is shown in Figures 11, 13 and 14. ***General*** • Current and future availability of water within the river basin • Levels of accessible storage capacity and load such as dams and tanks • Climate change impacts ***Surface water*** Reliability of surface water availability, e.g. the incidence of unforeseen canal closures; load and capacity levels of reservoirs, etc. ***Groundwater*** Levels of ground water use as a percentage of annual recharge; observed trends and forecasts regarding groundwater levels (water table developments), groundwater exploitation and groundwater recharge. Many agricultural regions in the Mediterranean Basin rely heavily on groundwater abstractions leading to the unsustainable over-exploitation of such resources and their potential failure in the near future. ***Water demand factors*** • Levels of unallocated water within the catchment • Socio-economic factors such as the number and nature of competing users and corresponding demand forecasts	A better understanding of the availability and constraints of sustainable water supply is key for business success. Together with a basin-wide assessment, a local assessment at the farm level will provide the foundation to identify bottlenecks, adverse developments as well as possible measures and promising solutions.
PI 3 **Has the client conducted an assessment of the security of sustainable water availability in qualitative terms?**	An assessment of water quality should include an assessment of salinity. Maps of salt affected soils are available for Italy and Greece. [135] Groundwater salinity from arsenic contamination (Thessaloniki area) are visble in Google Earth Pro.[136] The assessment should further include: • aquifer salinisation (e.g. Figure 12 and local maps of Morocco and Italy), • micro-pollutants, • eutrophication (e.g. River Po in Italy), and • industry discharge. Under the EU Water Framework Directive the quality of water is likely to improve in future years.	High levels of salinity or pollutants in irrigation water can significantly reduce crop yields. Lemons and oranges in particular have very low tolerance levels. Attention should also be given to how the activities of the client may exacerbate existing water quality issues. This includes, for example, saline returns from irrigation and the non-appropriate use of agrochemicals.

PI 4 **Does the client use best available water-efficient irrigation systems/ technologies?**	In South Africa, irrigation consists of 33% surface water systems, 55% sprinkler and 12% Micro-Drip Irrigation.[87] In light of sharpening water pressures, farmers should strive to adopt the most water efficient system available for their irrigation requirements. This is in line with recommendations in the Water for Development and Growth Framework (2009) – Promoting Water Conservation and Water Demand Management. [88] These recommendations should be taken seriously as they are likely to be picked up in future regulation requiring farmers to do so.	The use of innovative irrigation systems such as drip irrigation or well managed centre or linear pivot sprinkler systems[89] enhances irrigation efficiency relative to conventional techniques. It reduces exposure to water risks and input costs making an agribusiness operation more resilient, profitable and solvent.
PI 5 **Will the client´s operations still be commercially viable once meaningful and volume-based tariffs have been introduced?**	Both under the European Water Directive as well as in Morocco, new water tariff structures are being established based on water volumes consumed rather than the area irrigated. Tariffs are likely to increase in order to more fully reflect the true costs for water provision and provide strong incentives for water efficiency.	Meaningful and volume-based water tariffs are strong incentives for water efficiency improvements. However, they put increased cost pressure on agricultural activities potentially making previously bankable operations unprofitable.
PI 6 **Does the client access innovative sources of water supply: re-use of water and/or rainwater harvesting?**	The water situation of much of the Mediterranean Basin is and will increasingly be characterized by (1) climate change induced reductions in precipitations and surface water availability; (2) overexploitation of groundwater resources and declining water tables. In addition to water productivity improvements, more sustainable water sources must be explored and exploited. Many pilot projects in different countries have already successfully implemented water re-use concepts in agricultural activities.	Farms and agribusiness operations reliant on conventional/unsustainable water resources will be at a competitive disadvantage relative to those that manage to diversify water sources to more sustainable alternatives. Increasing levels of water re-use and potentially rainwater-harvesting appear to be promising ways forward.
PI 7 **(a) Have steps been taken to mitigate impacts on ecosystems and the environment?** **(b) Are processes in place to monitor the impact of the facility on the water environment over time and to review and implement strategy on the basis of the monitoring data?**	(a) Steps may include natural pest management, low water fertilisers and addressing the question of whether the production area is located in or near a site of ecological importance. (b) Environmental monitoring is necessary to asses the impacts of farms on the environment and allows to identify actions to be undertaken in order to prevent damage to aquatic ecosystems, surrounding vegetation and public health. (c) In countries of the European Union these aspects have become material to the private sector in general since the inception of the Environmental Liability Directive, which makes businesses liable for any environmental damage they cause.	Good environmental practice may have positive impacts on financial performance in light of tightening environmental regulation. Agribusiness operations that already today comply with emerging environmental regulation (under the European Water Directive as well as the Environmental Liability Directive) will be at a clear advantage relative to peers. The implementation of such considerations may also have reputation benefits for financial institutions in light of consumer preference increasingly shifting towards 'more sustainability'.
PI 8 **Does the client use best available water-efficient irrigation systems/ technologies?** **Have government subsidies been secured for the installation of such systems?**	Commonly, drip and micro-sprinkler/under canopy systems are both economically practicable and highly water efficient. In many European countries and beyond, special Government programs and subsidies are in place to support farmers purchase and install new and water-efficient systems.	The use of drip and micro-sprinkler/under canopy systems enhances irrigation efficiency relative to other conventional techniques. It reduces exposure to water risks and input costs making an agribusiness operation more resilient, profitable and solvent.

PI 9 **What is the client's crop-specific water productivity performance?**	High levels of water productivity/efficiency may not be a sufficient condition for sustainable water management, but a necessary one. Water productivity is usually measured as m^3 per ton of harvest or unit of turn-over. The level of water efficiency of a given operation will depend on a wide set of local parameters. National or regional averages can, therefore, only serve as rough proxies. **Reference values** Benchmark values of water productivity in the Mediterranean Basin are: **Tomatoes** 125 m^3/ton, however, large differences exist subject to growing conditions and varieties.	In addition to environmental benefits, high levels of water productivity/efficiency have positive impacts on the cost-structure and drought-resilience of agricultural activities