AGRICULTURE, POLICY AND ENVIRONMENTAL DEGRADATION: THE CASE OF THE ARGOLID VALLEY

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Abstract

Farming across much of the Southern Mediterranean has evolved in response to the uncertainty of its natural and climatic conditions with small units, part-time farmers and diverse cropping. It is argued in this article that much of European agricultural policy has been based upon criteria of efficiency which have resulted in standardisation and higher unit production. Using the Argolid Valley in Greece as an example it will be seen that the adoption of policies directed at the farmer, the crop and water resources can encourage, and entrench, intensive monocropping practices while exerting considerable strain upon the natural resources of the area. It is maintained that the degradation of natural resources, and the decreased potential for income generation resulting from this, have resulted in a reduced set of options for farmers and the inequitable distribution of those options among them.

Résumé

Dans les pays sud-méditerranéens, l'agriculture a evolué face aux aléas de ses conditions climatiques et naturelles en donnant lieu à de petites exploitations, des agriculteurs à temps partiel et à des systèmes de culture diversifiés. Dans cet article on soutient qu'une grande partie de la politique agricole européenne s'est basée sur les critères d'efficience qui ont abouti à la standardisation et à une production unitaire plus élevée. Prenant la Vallée d'Argolide comme exemple, on constatera que l'adoption de politiques orientées aux agriculteurs, aux ressources en eau et aux cultures, peuvent encourager et consolider les pratiques de la monoculture intensive tout en exerçant une pression énorme sur les ressources naturelles de la région. On soutient que la dégradation des ressources naturelles et la moindre potentialité pour la création de revenu qui en résulte, ont réduit le nombre d'options disponibles pour les agriculteurs et donné lieu à une répartition inéquitable des ces options.

Agricultural policy has been increasingly directed towards the improved efficiency of farming activities(1). The effect of this in some areas has been to encourage a move towards increased production and standardisation with insufficient consideration of the impact upon the physical environment (Clunies-Ross and Hildyard, 1992; Manitea-Tsapatsaris, 1986). This has had disastrous effects in areas of the southern Mediterranean where, over time, farming structures have previously emerged in response to local physical conditions.

Paradoxically the failure of some parts of the region to adopt «more efficient» agricultural production systems has been attributed to the continuation of the very characteristics that have historically enabled it to survive without threatening local natural systems. The nature of this change has not just highlighted a perceived «backwardness» in the southern Mediterranean, it has also led in certain instances to an inequitable distribution of the costs and benefits within its regions, particularly in terms of the ability to respond to declining natural resources.

The physical environment of the Mediterranean is inherently more vulnerable than that of the more temperate regions of Northern Europe. There is considerable variation in the temperature and precipitation levels from year to year and more importantly a disjuncture between the two. This, alongside the geomorphologic and geological variation of the region, has created an environment that will support a wide range of vegetation. However, with the exception of indigenous crops such as olives this is not matched by an ability to produce yields at the levels achieved in Northern Europe (Ruiz, 1988).

Agriculture in the region has, therefore, been determined by the physical and social landscape in which it operates. Traditionally this has involved high levels of direct consumption and diversity in the crops grown. Agricultural holdings are generally small and divided into a number of parcels(2) with a high percentage of the local work force actively employed in farming, often in a part-time capacity(3). These characteristics (i.e. multiple job holding, small farms, local markets and diverse low input cropping) have supported an adaptive agriculture capable of responding to the uncertainties of the physical and climatic environment. They are, however, invariably less efficient in terms of the economic criteria that have been central to recent agricultural policy. Indeed where some of these «structural deficiencies» have been overcome (i.e. through the establishment of co-operative organisations) the resulting loss of crop diversity has often been accompanied by the degradation of natural resources.

In Greece the failure to meet criteria of economic efficiency has frequently been accredited to the «structural weaknesses» of Greek agriculture(4) rather than the relevance and suitability of the policies introduced for different localities (Green and Lemon, 1995). The failure of policy to account for physical and social difference can force the farming community into a treadmill of intensive practice that ultimately jeopardises the natural resource upon which it depends, and the social context in which it operates.

This paper will draw upon research carried out in the Argolid Valley in the Peloponnese of Southern Greece. It will provide one example of an agricultural system that has developed along an unsustainable path. This has coincided with the distribution of environmental costs among the farming community being perceived as inequitable by many within that community. The field work for the study was carried out in two phases. Firstly a series of thirty extended semi-structured interviews were undertaken with farmers, agronomists, hydrologists and other key actors in the area. These were intended to establish the range of agricultural agendas (Lemon and Park, 1993) that required further investigation and formed the basis for the second part of the study. This phase elicited more detailed information about farming activity and water use and consisted of two hundred structured interviews (Lemon, Seaton and Park, 1994).

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(1) For example see Council Regulations (EEC) Nos. 797/85 and 2328/91 «*On improving the efficiency of agricultural structures*».
(2) In the Argolid study the average farm size was five hectares divided into five parcels of land
(3) Percentage of population employed in agriculture: Greece 24.5%, Portugal 17.8% compared with UK. 2.1%, Netherlands 4.6%.
(4) i.e. Small fragmented land holdings, inefficient marketing organisations and insufficient rural infrastructure (Spanopoulu, 1990; Polopolus, 1989; Demoussis and Sarris, 1988)

Both sets of interviews were undertaken by local agronomists who were accepted by the farming community.
The area has considerable variation both in its» natural features (soil, hydrology, topography etc.) and in the type of farmers working the land (full/part time, mixed farming/monocropping etc.). In order to represent this variation considerable time was spent attempting to define a useful zoned structure. The need to adopt contiguous zones for modelling purposes (Allen et al., 1994), and the different spatial structure of the various attributes (i.e. topography, water, soil, crop, frost), made it particularly difficult to identify zones which represented combinations of those attributes while retaining their individual integrity. The provisional zones, represented in Figure 1, were established through a series of extended discussions with local agronomists(5). Subsequent analysis of cropping and water use data broadly supported this structure.
The paper will be divided into three parts. The first section will describe the changes in agricultural production for the Argolid Valley, the technology employed to support it and the qualitative and quantitative condition of the natural resources. The changes will then be related to a range of policy instruments that have been introduced by different levels of government (local, national, European) and have focused upon the farmer, the crops and the water supply. The final part of the paper will suggest a number of more sustainable policy scenarios for the Argolid.

Table 1 ***Change in main crops (hectares).***

	Arable		Trees		
	Cereal	Vegetable	Citrus	Orange	Olive*
1960	18933	5809	6862	5041	1783
1964	16464	5002	8119	6487	2449
1972	10961	3846	10452	8356	2600
1980	9469	3173	9482	7469	2885
1986	7174	2887	10784	8733	2852

Source: Greek Service of Agriculture.

* per 1,000 trees.

Background to agricultural change in the Argolid

The Argolid Valley is situated in the Argolis region of the North-eastern Peloponnese in Southern Greece (**figure 1**). The total catchment (approx. 1100sq. km.) is divided into 38,600 ha. mountains, 26,500 ha. hills and 42,000 ha. valley. The valley itself is divided into 29,500 ha. cultivated land, 7,800 ha. pasture, 3,000 ha. urban surface and 1,750 uncultivated land. The soils of the valley are deep (silt, loam and clay) and fertile whereas those of the hillside are stony and of poor irrigability.
The area is dominated by agriculture with fifty percent of the working population involved in farm work of some form although many of these have other sources of income(6). Agriculture is also the main consumer of water in the area using approximately 140 million cubic metres of water (89% of the total) compared with ten million m^3 for potable water and less still for other industrial uses (Argolid Association of Agronomists, 1992).
The climate is predominantly Mediterranean with temperatures ranging from the extremes of minus five centigrade in January to plus forty in the summer months. The temperature away from the sea is approximately two degrees lower. Mean rainfall for the area is over 500 mm and is usually recorded within ninety days (throughout the year). These factors lead to a high relative humidity in the winter (when there is most precipitation) with the result that frost poses a major threat to crops. This is most evident in the central areas where there is the greatest proportion of irrigated agriculture, in particular citrus crops(7).

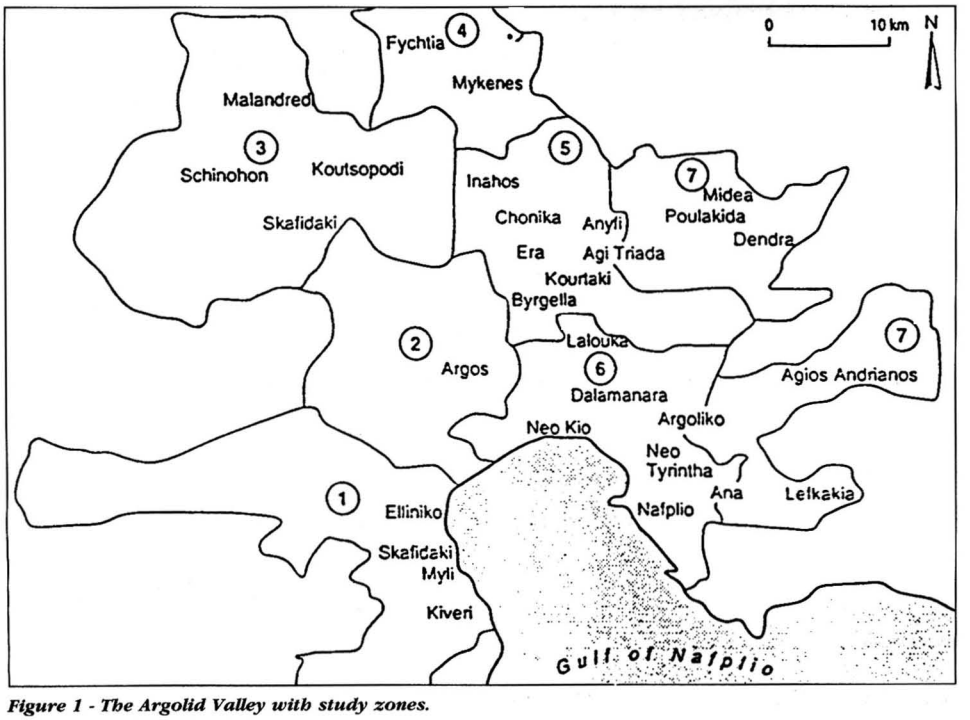

Figure 1 - The Argolid Valley with study zones.

Production, technology and degradation

The use of irrigation water has increased markedly over the last fifty years. Before 1940 there were 4,000 hectares of irrigated land compared with over 20,000 hectares today. The majority of irrigation water is obtained from ground water through wells and bore holes (95-125,000 million cubic metres per annum, dependent upon precipitation levels). An additional twenty five million cubic metres is acquired from springs via specially constructed pumping plants and distributed through the plain by aqueducts.
Table 1 shows the general movement away from subsistance, and predomi-

(5) The interviews lasted approximately eight hours.
(6) Part time farmers in the central zones are often professional people who commit less time to working the land and consider farming to be their second occupation. By comparison those who farm part-time in the peripheral zones often do so because they cannot earn a sufficient income from poorer quality land.
(7) The problem of frost is perceived by many local farmers to have become far worse with the increase in irrigated trees.

nantly rain fed, crops (cereals, vines, olives and grazing), with a limited amount of irrigated production (vegetables), towards a more intensive and less diverse agriculture based upon fruit production.

This transformation towards irrigated monocropping is most pronounced in the central and coastal areas, a more diverse production system is apparent as one moves towards the outer zones (**figure 2**).

Table 2 shows the distribution of irrigated land throughout the study area. It is noticeable that the percentage declines away from the central plain towards the foothills in zones three, four and seven. The introduction of orange trees provides a temporal indicator of the movement of irrigated agriculture from the centre outwards.

It can be seen that the size of farms also increases away from the centre alongside a decrease in the productivity (for oranges) per hectare. Poorer soils, slope, water depletion etc. have all restricted the productive capacity in zones three, four and seven-as has the limited access to alternative water sources. Farm size is not therefore an appropriate indicator of potential income generation. Paradoxically the mean price per kilo of oranges is noticeably lower for zones five and six which are the main citrus producers and the least diverse farmers. To understand this it is necessary to consider the relationship between crop and market characteristics and the farming structures in place to produce and sell.

With the exception of the picking period([8]), oranges are not labour intensive to produce([9]). This has meant that the monocropping of citrus has emerged alongside a pluriactive farming community (Arkleton Trust, 1988). In the central areas this form of farming often provides a supplementary income to other occupations whereas in the periphery multiple job holding has often been forced upon farmers because of difficulties in generating sufficient income from the land (Damianos et al., 1991). Two important points arise out of this which help to explain the price differential mentioned above.

- The dependence upon citrus production in the central plain is reinforced by the high proportion of part-time farmers who are unable to farm in a manner which is more time consuming than that required for the production of citrus fruits([10]).
- They are less likely to have the time, or the inclination, to sell their produce at local markets, albeit it for higher prices than can be achieved through the co-operatives and the supported price system. The adoption of local markets for citrus, in conjunction with other crops, is more often preferred by farmers from the peripheral zones.

The higher production per unit and the cushion provided by other incomes have therefore combined to reinforce the monocropping of citrus crops in the central zones. Any movement away from water intensive crops in that locality is made still less likely by the relatively low cost of the resource to farmers. **Table 3** is an estimate of the cost of water by zone as a percentage of agricultural income. This is based upon the total income (current price for main crops by production level), and the water cost

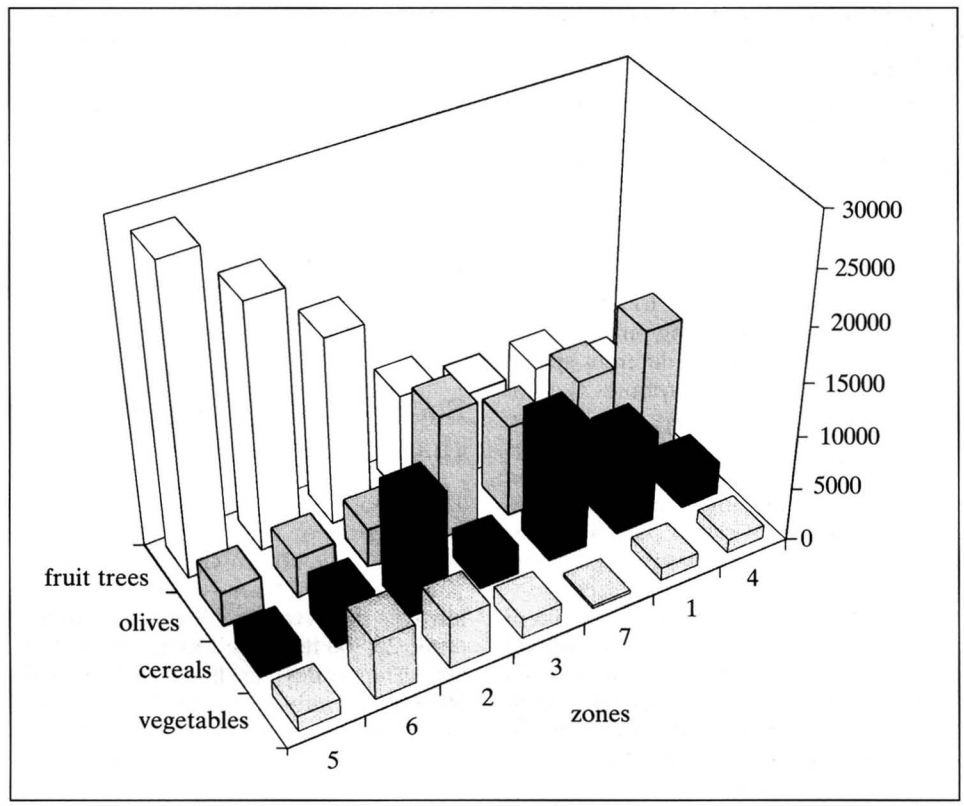

Figure 2 - Distribution of main crops by zone.

Table 2 ***Variation by study zones.***

Zone	1	2	3	4	5	6	7
% Irrigated land	70	79	58	59	84	92	46
Oranges introduced	1969	1961	1965	1973	1952	1958	1969
Mean farm size (ha.)	5.7	4.7	8.9	6.5	4.5	3.5	7.2
Oranges/hectare (tonnes)	27	35	25	18	37	34	18
Mean price (kg) oranges	47	45	37	33	29	28	34

Source: Archaeomedes survey.

Table 3 ***Variation in water cost: income between study zones.***

Zone	Income/str	Cost/str	% I/C
One	66613	6777	10
Two	86266	5112	6
Three	43231	10244	24
Four	38709	17589	45
Five	66515	5716	8
Six	77398	4664	6
Seven	35706	9890	27

([8]) Most of the citrus picking is undertaken by seasonal, migrant labour from Eastern Europe, although there has been an influx of Albanian workers in the 1990's. The local Gypsy population and mountain villagers have also traditionally supplied seasonal labour.

([9]) The farmers irrigate 4-5 times in a growing season. Pruning, pesticide and fertilizer application are not heavy labour commitments.

([10]) This inflexibility is reinforced by the unwillingness of farm children to enter farming and thereby provide the additional labour required for the production of more labour intensive crops. This is not the case in some of the peripheral zones where the children tend to enter farming directly from secondary school.

(bought water and bore hole costs - electricity and drilling), per stremma([11]). It clearly shows the differential cost of irrigated farming throughout the area with zones three four and seven having a far higher water cost to income ratio than the central zones.

Qualitative and quantitative degradation

A dramatic transformation has occurred in the visual landscape as a result of these crop changes, both in terms of the crops themselves (i.e. a blanket of fruit trees), and the visibility of the technologies in place to support their production([12]). The rapid expansion of sprinkler systems, in contrast to free flow irrigation, can be interpreted as a more «economic» approach to water use. In certain areas of the valley this reduction has been more than offset by the excessive use of sprinklers at night to protect against frost, an activity about which there is very little existing data([13]). Alongside this visual transformation has occurred a qualitative and quantitative deterioration of the water system. This has manifest itself in a number of ways:
In the peripheral zones (three, four and seven)

- The depth at which water is obtained has reached 400 metres plus in some areas.
- There has been an increase in the number of bore holes going dry.
- It has become more difficult to access water and the number of wells that are dry upon drilling has increased.

In the central zones (two, five and six)

- The quality of ground water has declined markedly with increased salination

The agricultural system has therefore entered a technological spiral, firstly for accessing water and extending the irrigated area and secondly for easing the impact of the resulting degradation. The most intensive and least diverse production has occurred in the central areas which also have access to the «Anavalos» canal infrastructure. This is not available to most of the peripheral area and as such covers that area which is suffering from salination rather than depletion.
The central zones also suffer from more acute problems of frost. This is countered in two ways, firstly through the use of sprinkler systems which draw upon ground water and raise the air temperature around the trees and secondly through the introduction of air mixers which disturb the air and prevent ice forming. The second part of the paper will now seek to explain some of these changes through the range of policy instruments that have impacted upon agriculture in the Argolid Valley.

Policy background

The field work undertaken in the Argolid identified three broad types of policy instrument that have influenced the emergence of agriculture in the area. These are inevitably linked, but essentially they relate to the farmer, to the crop and to the water system. The instruments originate from different levels in the policy hierarchy i.e. local regulations about the drilling of bore holes, national support for large scale infrastructure (the Anavalos canal system) and reduced agricultural electricity prices and European Union price support and subsidies for agricultural production.

Instruments focused on the farmer: management support

There are two forms of policy instrument which focus directly upon the farmer, the first provides management support and the second improved access to production technologies. Both have played a central role in the way that agriculture has developed in the Argolid. By management support is meant the provision of information, education and training and marketing. This will not be discussed at length here although two points can be made. Firstly the level of «on farm» support, or extension service, provided by the Service of Agriculture is perceived to have become infrequent and ineffectual.
«Nobody came from the Service of Agriculture to tell us about the programmes and what we need to do (to qualify). At the time subsidies existed but the agronomists were employed «policing» the dumping of oranges» (Secretary of agricultural Co-operative).
A number of explanations can be provided for this. The two that are most prevalent refer to the increased administrative demands upon agronomists which have «tied» them to the desk and, less charitably, to the emergence of highly educated agronomists who do not wish to make contact with farmers outside of the office([14]). This has resulted in a situation whereby many farmers go to private agronomists for advice and has coincided with recent changes that have made the sale of pesticides the responsibility of licensed agronomists([15]). Inevitably this raises the possibility of a conflict of interests, which alongside the sale of fertilizers, could have negative effects upon the natural environment([16]). Both of the above points are encapsulated in the following statement by a farmer from the village of Pyrgella
«They (agronomists from the Service of Agriculture) offer no advice about the cultivations and we only use them to sign certificates. The dealers of pesticides do show an interest because they want to sell».

Marketing support

Although certain crops tend to be sold through particular markets (i.e. Oranges through co-operatives, olives through dealers, vegetables through local markets and vines for home consumption) these are not exclusive and where choice is exercised by farmers it is often determined by two central factors.

- The social formation of the farm household and the capacity to spend more time selling the crop at a higher price, this generally refers to the local markets (Athens, Argos etc.)([17]).
- The propensity of farmers to deal with risk and the willingness to forsake a lower guaranteed price for crops with price support in favour of the possibility of a higher price on the open market. The rejection of the former option also leaves the farmer exposed to crop loss through climatic uncertainty (frost) or virus and disease.

The key agencies in marketing support have been the co-operatives. These have

([11]) One stremma is approximately 1/10th hectare.
([12]) Bore holes, sprinkler systems and canal infrastructure for the distribution of spring water. Also the air mixers that are used in some areas to protect crops against frost are a distinctive feature of the landscape.
([13]) It is estimated that 10% of agricultural water is for frost protection (Allen et al., 1994).
([14]) Farm work, or work on the land, is often perceived to be of a low status. Equally office based work has a high status attached to it (De Waal, C., 1991), the combination of these factors may help to explain the perceived role played by public service agronomists.
([15]) Pesticides were previously distributed through the Agricultural Bank of Greece.
([16]) The excessive use of fertilizer has led to a concentration of nitrates in the ground water. This situation was exacerbated by the payment of a state premium to the fertiliser manufacturers. The level for this was determined by the amount of fertiliser produced however it was reduced in 1980 and removed in 1992.
([17]) There is a clear distinction between households that utilise the extended family to support farming activity and those who are reliant upon outside labour and therefore have less flexible marketing options. This also applies to the type of farming undertaken in that it often coincides with more diverse cropping.

evolved into their present form alongside the increased production of citrus fruits over the past thirty years. The original co-operatives were formed in the late 1940's to provide production and financial support to farmers. This role has been largely superseded by the marketing function undertaken today, particularly in response to the requirements of EU policy([18]).

The number of members, and production levels, required to qualify for subsidy varies between Prefectures, i.e. The Argolid requires 100 members and 5,000 tonnes whereas Corinth only requires fifty members and a total production of 1,500 tonnes per co-operative. The scheme provides five year support for «start up costs» for groups of farmers producing fruit and vegetables. Legally formed groups of farmers are helped with the costs of management and administration, insurance, transportation of personnel and rent of buildings. The production related policy instruments to which the co-operatives respond are discussed below under crop support.

Technological support

Technological support refers to the improvement of access to relevant production technologies. A number of such policy instruments have helped to shape the agricultural system in the Argolid over the past thirty years. Between 1960 and 1980 the Greek Government provided subsidies of 20% for the installation of sprinkler systems and bore holes and for the purchase of farm machinery. These were subsequently taken over by the European Community([19]).

Financial support has also been provided for the establishment of air mixers for the protection of crops, and trees, against frost. The first experimental mixers were installed in 1967 however the state supplied greater numbers in the mid 1970's, the mid 1980's and again in 1992. For the earlier mixers no contribution was required from the farmer and the operating costs were met by the Organisation of Farm Insurance (OGA). This has since been terminated and 25% of the total cost is expected to be met by the farmer([20]). A 20% EC purchase grant is also available for those farmers, or more particularly, groups of farmers who require mixers but have not been in receipt of those distributed by the state. The nature of this distribution is inevitably contentious and is perceived as one example of inequity in local farming([21]). More particularly the early distribution of subsidised mixers was seen to relate more to political allegiance than need and as such the requirement for a co-ordinated pattern of mixers to protect against frost was not achieved.

Two other significant sources of technological support can be identified over the past thirty years, the public electricity company (DEH) and the Agricultural Bank of Greece. The former have implemented a programme for farm electrification which provides advice about electrical installations (i.e. the size of bore hole pumps) and offers reduced electricity costs for on farm machinery and non-dwelling farm buildings([22]).

In the period between the 1960's and early 1980's the Agricultural Bank of Greece was the main source of low interest capital loans to farmers. This supported much of the capital investment which underpinned the expansion of irrigated agriculture during this period. Loans have become much more difficult to obtain in the 1990's with farmers struggling to borrow money for the purchase of agricultural technologies which are becoming more expensive, both in unit cost, and in terms of meeting the demands made upon them as degradation becomes more extensive (i.e. the need for deeper drilling)([23]).

The final form of technological support has been through the establishment of a canal infrastructure for transporting water from freshwater springs (Anavalos), which emerge into the sea in the south west of the area, to the central part of the valley. This infrastructure has been under development since the early 1960's and is perceived locally as something of a political football which has changed pace and course according to the priorities of the prevailing power base.

«We have been told that Anavalos will come to our village since 1981 but nothing has happened. Even if we want to bring it here ourselves they (the government) will not let us. It is used politically by PASOK and ND([24]), everybody tells us that they will bring water». (Interview with village field guard)

Where farmers have good quality bore holes and Anavalos they tend to opt for the former as the source of their irrigation water([25]). However when this choice does not exist (i.e. where the ground water is heavily salinated) then Anavalos will be used if it is available. This raises a number of issues. Firstly the option is not open to those around the periphery of the region who have suffered severe ground water depletion. Secondly, as degradation has increased local attention has focused more upon the need to expand the infrastructure than to encourage changes in agricultural practice likely to reduce water consumption. Thirdly the water from Anavalos has variable salt content which will exacerbate the problems of salination and require additional technological intervention in the form of acquifer recharge and the enforced leaching of salts from the soil.

Instruments focused on the crop

The main reasons cited by farmers for the emergence of less varied agriculture, although not necessarily for the expansion of irrigated land, are the internal support for production prior to the 1980's and, alongside the saturation of the internal market, the arrival of EEC price support and subsidies after accession in 1981. There are two forms of crop related policy instruments to take into account. The first is concerned with the level of price support made available for specific crops (i.e. oranges). The second is based upon subsidies that are paid to encourage changes in the existing crop balance. This is either in response to a diminishing market for a crop or alternatively to the presence of a disease or virus to which that crop is vulnerable.

Price support

Price support has been introduced since accession to the EC in 1981 and is a mechanism by which guaranteed prices are offered for specific crops. It is also perceived to be the source of greatest uncertainty for the majority of the farm-

([18]) Regulation 1035/72 of the European Community provides the basic legal structure for most of the co-operatives in the Argolid.

([19]) Subsidy for machinery under twenty million drachmas was paid under reg. 797/85 (superseded by 2328/91) and for projects above this figure reg. 1262. The larger subsidies were mainly for livestock units, fish farms and large greenhouses. Only the latter of these was taken up in the Argolid, and then infrequently.

([20]) Air mixers cost approximately £20,000 to purchase with an additional £500-600 per year operating costs.

([21]) It is possible for farmers with air mixers to extend the growing season and thereby to sell their produce after the peak picking season when prices are generally higher.

([22]) The supported rate is approximately ten drachmas per kilowatt lower than the standard rate (of around twenty five drachmas) although this varies with the amount used.

([23]) For example, the approximate cost of a new 200 metre bore hole is 6,000,000 drachmas or £18,000.

([24]) The dominant political parties (Socialist and New Democracy)..

([25]).Anavalos has a variable salt content, is rationed and paid for by units of time.

ing population. Support that is relevant to the Argolid mainly relates to citrus crops([26]), although there is a complicated guaranteed pricing procedure for olive oil([27]). Unlike the majority of subsidies, which apply to individual farmers, this support is generally only provided when certain production criteria are met and representation is made through co-operative marketing structures. The negotiations regarding the full price for produce take place between the co-operatives and dealers who receive the subsidy from the EU([28]). An increasing number of co-operatives are now also operating as dealers.

The EU guaranteed price is central to farmers» decision making because it provides the benchmark by which they can estimate their income for the following year from citrus fruit. The price support paid for oranges extends to the dumping of excess fruit([29]), to its use in fruit processing, particularly for juice([30]), and to its distribution for welfare purposes (i.e. to schools in areas of special need).

Subsidy

Whereas price support is in effect a market guarantee, subsidies are a way of restructuring agricultural land use in response to concern about the market potential of a crop or its vulnerability to disease or a virus. Before accession to the EEC the Greek government subsidised the planting of new crops, mainly Merlin oranges, but also grapefruit, clementine and satsumas. Since 1981 a number of restructuring measures have been introduced. Some of these were designed to extend agricultural production through the year (i.e. the replacement of Merlin oranges with other citrus crops particularly Clementines). Other programmes were intended to uproot and replace existing crops:

- for which there was a reduced or inadequate market (i.e. the uprooting of vines and common mandarins)([31]);
- that were vulnerable to disease or virus (i.e. the uprooting of the profitable apricot crop in response to the Sharka virus)([32]).

The take up of subsidies for uprooting have generally been high([33]), however, the second phase of these programmes which provide support for planting suggested replacement crops have often been less successful. A number of reasons have been cited in explanation of this.

- The crops may have been untried in the area and farmers are not prepared to «risk» their introduction. They have no «champions» (i.e. pistachio nuts were recommended as a response to the removal of apricot trees and had an extremely low take up)([34]).
- The promoted crops may be perceived as more difficult to cultivate (i.e. early peaches and nectarines which do not keep and require immediate sale) and more labour intensive than existing crops such as oranges.
- There was a perceived discrepancy between the time scales for subsidising new crops and the length of time for them to reach maturity and a stable production. This was compounded by the inability to anticipate markets at the time the tree reached maturity and the subsidy terminated.
- Some promoted crops were felt to be inappropriate to the physical locality (i.e. the climate was perceived to be too dry for Kiwi fruits).

When the take up of suggested crops has been more successful it has tended to be with citrus crops (i.e. the replacement of Merlin oranges and common mandarins with other mandarin varieties such as clementines). This has had two significant and related effects. Firstly there has often been a weak correlation between replacement crops and the existence of a «real», as opposed to an artificial or guaranteed, market. Secondly, and of particular relevance to the Argolid, has been the fact that the adopted crops have tended to be heavily water dependent and as such have exacerbated the degradation of that resource in the area.

Instruments focused on water

Until the early 1960's the aquifers which supply the bore holes of the area were adequately recharged by run-off from the perimeter hills and foothills. Demand for irrigation water was matched by this natural recharge. In consequence farmers have tended to regard land-tenure as conferring rights to this «renewable» beneath their land. The absence of any mechanism by which individual farmers could be made to take into account the effects of their decisions on the availability and quality of water in the future has been one of the principle factors underlying what are potentially very serious ecological and welfare problems.

Two types of policy instrument have influenced water use, the first is indirect and has determined the price of water by influencing the cost of access. The second has focused upon the control or rationing of water to which that farmer has access.

Water pricing

At present the pricing of irrigation water is primarily through the costs attached to accessing water of variable depth, flow and quality. As has already been seen the costs of access to water are influenced by various forms of technological support. However there is no pricing mechanism which can relate to the farmers impact on the water resources. Similarly because it is a collective resource there is little incentive for farmers to reduce water consumption unilaterally.

Where a fixed price is attached to water it is invariably tied to restricted access through the canal system. Farmers, therefore, pay for a certain number of hours at a fixed rate and in some instances they can extend this period at a higher unit price([35]). Water pricing is also operated by arrangement between those farmers who have excess supplies and those who do not. The use of this water is often at night when the owner does not require it and payment may be in the form of cash or produce.

Water control and rationing

There are two main ways of controlling access to water, by regulating the amount of water that a farmer can draw, and/or restricting physical access to ground water. The former predominates in the highly salinated areas of the central plain where more water is obtained through the canal system. The latter form

([26]) In 1992/93 oranges that were sold within the European community received 11 dr/kg support and those sold to «third» countries received 32 dr/kg.

([27]) The price guarantee for olive oil in 1992 was approximately 120 dr/kg.

([28]) One of the main concerns about the price support system was the uncertainty caused by the delays in payment from dealers to the co-operatives. The main market for oranges from the Argolid is Eastern Europe.

([29]) If 30% of a co-operatives produce is exported then it is entitled to bury excess production. The standard price support is available and a two drachmas charge is levied at the havuza or dump.

([30]) An EU premium of 28 drachmas per kilo is paid for juicing oranges. The factories purchase the fruit at 32 drachmas per kilo from the co-operatives (the standard rate of price support). 60-70% of building and capital costs are also available for the development or expansion of fruit processing factories.

([31]) reg. 1196/3029 (1990) for uprooting common mandarins and reg. 1442 for the abandonment of vines.

([32]) reg. 89/949 for uprooting the Tyranthas and Bebekou apricot plants. The EEC met 70% of the 640 ECU/stremma and the Greek government paid the remaining 30%.

([33]) One of the main problems cited by farmers was the difficulty in obtaining information about the programmes.

([34]) 150 ECU/stremma was provided to plant suggested crops in this scheme with a further 510 ECU per year for five years.

([35]) i.e. Oranges may cost 3,000 drachmas per stremma for eight irrigations whereas vegetables will cost 3,750 for the same number. This is because the total number per annum for vegetables will exceed the threshold of twenty five irrigations.

of control is more in evidence in the peripheral villages where ground water depletion is the main concern and where there is no access to the Anavalos canals.
The physical access to ground water is controlled by the need to obtain licences for drilling or deepening bore holes. This is reinforced by the refusal of the electricity company to make the necessary electrical connection for bore hole pumps without the provision of a valid licence. No licence will be given for the drilling of a bore hole if it is within fifty metres of another. The effect of this has been to encourage the drilling of excessive numbers of bore holes as a precaution against the future loss of flow, or the salination, of those already operating. This restriction also fails to take into account the horizontal movement of the water under the surface and when excessive drilling does occur can result in the communication of salt between bore holes([36]). The small size of individual parcels of land in conjunction with this fifty metre restriction has meant that the most significant impact may well be in the ability of farmers to manipulate land values by drilling bore holes close to the perimeter of their land. Direct access to ground water can more than double the value of a parcel of land.
Recent changes in agricultural production across the Argolid valley as a whole have, therefore been inseparable from the irrigation technologies that have initially supported the expansion of irrigated agriculture and subsequently been used to counter the effects of a progressively deteriorating water source. This process has been underpinned by policy instruments that have

- provided a guaranteed income from water dependant crops,
- supported the organisational and capital requirements for the marketing and processing of those crops, and
- subsidised the technologies that are central to their production.

Of equal importance has been the way in which the costs and benefits of this process have been distributed within the area.

Conclusions and discussion

This paper has argued that agriculture in the Argolid valley has been shaped by policies that have contributed to a reduction in crop diversity and increased water dependency. These policies have taken the form of price guarantees for citrus crops that are heavy water users, technical support for accessing water and for remedial action in response to water degradation, and management support for the establishment of co-operative organisations that have focused upon the marketing of citrus.
Considerable qualitative and quantitative ground water degradation has been seen to result from these changes and it has been argued that the costs and benefits arising out of them have not been evenly distributed among the farming population. These factors have supported the emergence of a two tier farming system with the existence of a high proportion of part time citrus farmers in the valley. Farming is often a secondary occupation for this group and while they can adapt to reduced prices they are less able, or willing, to change the crops that they grow([37]). Elsewhere, full time farmers, or those for whom farming is the primary source of income but who have to supplement it with other work, have continued to grow more diverse crops with greater labour requirements([38]).

Water reduction, equity and the introduction of policy

It has been argued that farm related policy for the Argolid must encourage the reduction of water use and a more equitable distribution of the costs and benefits among the farming population. Any intervention must account for the spatial context in which production occurs i.e. the complete uprooting of orange trees would not account for the fact that a certain number can be efficiently grown in combination with other crops. It is essential, therefore, to identify those areas that are most conducive to a particular crop and to acquire a better understanding of the social context under which change would be adopted i.e. what information and support is required by farmers? (Lemon and Park, 1993). Similarly, policies must address the process by which they are implemented as well as their overall objective. Therefore, support must be available for both the substantive costs of transition and the administration of the process. For example, the difficulty of obtaining information from the public administration has been seen as a significant constraint by many farmers.

Uprooting orange trees: a policy option for agriculture in the Argolid Valley?

Because of the variation in social, economic and natural conditions within the area a package of policy instruments would need to be considered to reduce water use while supporting equitable production options. The uprooting of a proportion of the orange crop is the most obvious way to reduce levels of irrigated agriculture and thereby slow down soil and aquifer degradation. Questions then arise about what land should be taken out of orange production and what should be done with this land?
The payment of an additional premium for «set aside» (Potter and Gasson, 1988) would reduce water consumption. However, if this was lower than the potential for generating income from more sustainable cropping practices (i.e. cereals([39]), olives([40]), then uprooting payments would encourage «authentic» farmers to adapt and continue farming while supporting the removal of those who are less flexible, farm as a secondary occupation, and tend to mono-crop citrus fruits. In addition those farmers who continue to grow citrus crops would have access to a wider market, particularly in the local free market. This would reduce the dependency upon price support which could be lowered incrementally and subsequently removed.
A number of other conditions could be incorporated into this package.

- Uprooting should be by the tree - approximately forty five per stremma and at least four years old - and not by area. This would discourage new planting and in conjunction with reduced price support would provide some backing for those who planted prior to the introduction of the restructuring policy.
- The level of subsidy for uprooting

([36]) Isolation techniques are used to prevent this transfer, however, if one bore hole is not isolated or is inefficiently isolated then the surrounding holes are vulnerable to salt intrusion.
([37]) Many of these farmers have business interests outside of agriculture (i.e. property development) or professional occupations (teachers, lawyers etc.)
([38]) This group are perceived locally as «authentic» farmers.
([39]) Hard wheat forms the base for local bread. It is, however, only occasionally grown and usually on poor quality soil producing 150 kilos/stremma. With improved soil conditions, through regeneration and expansion to better soils currently used for citrus production, this could rise to 500 kilos. With improved marketing and local economies of scale (co-operatives) the additional production could be sold to local bakeries.
([40]) The production of olives requires very little water and far less fertilizer and pesticides than citrus trees. However, the market for olive oil is limited in Northern Europe and that which does exist is dominated by Italian produce. Retail prices are also very high. It would therefore be necessary for temporary crop support to be introduced alongside marketing initiatives (i.e. related to issues of health) to underpin production while the market is expanded.

could be adjusted according to the dependence upon ground water sources of irrigation. Lower payments could, therefore, be made in those areas that have access to other irrigation sources.

These criteria would reduce the dependence upon artificial markets for water dependent crops, would encourage the use of non-ground water irrigation sources where they are available and the adoption of crops with lower water demands where they are not. Incorporated within this policy package would be marketing and organisational support for farmers and subsidy for irrigation technologies which are less heavy water users (i.e. drip irrigation). This would be based upon an improved understanding of the farming agenda and the conditions that need to be in place to encourage agriculture that is less water dependent.

Therefore in conclusion, the socio-economic and natural characteristics of the Southern Mediterranean have historically generated an agricultural system which produces a wide variety of crops at yields considerably below those of Northern Europe. Attempts to restructure agricultural production according to criteria of technological and economic efficiency without paying sufficient attention to social and ecological factors has resulted in the removal of options from many farmers. This has manifest itself in several ways; through the loss of agricultural diversity, the increased degradation of natural resources and the inequitable distribution of costs and benefits among the farming population. ●

References

Allen, P. Black, I. Lemon, M. and Seaton, R., 1994, «*Agricultural production and water quality in the Argolid Valley, Greece: A policy relevant study in integrated method*», Final report for Archaeomedes Project (EV5V-0021).

Argolid Association of Agronomists, 1992, «*The water problem of the Argolid*», Seminar proceedings, (in Greek).

Arkleton Trust, 1988, «*Rural change in Europe: Research programme on farming structures and pluriactivity*», Proceedings of the Montpellier Colloquium.

Clunies-Ross, T and Hildyard, N., 1992, «The politics of industrial agriculture», *The Ecologist*, Vol. 22, pp 65-71; Manitea-Tsapatsaris, V, (1986) «Crisis in Greek agriculture: diagnosis and an alternative strategy», *Capital and Class*, Vol. 27, pp 107-130.

Damianos, D. Damoussis, M. and Kasmis, C., 1991, «The empirical dimension of multiple job holding agriculture in Greece», *Sociologica Ruralis*, Vol. 13 (1), pp 37-47

De Waal, C., 1991, «*Urban aspirations and rural development in southern Greece*», PhD. thesis, Cambridge University)

Demoussis, M. and Sarris, A., 1988, «Greek experience under the CAP: Lessons and outlook», *European Review of Agricultural Economics*, Vol. 15, pp 89-107.

Green, S. and Lemon, M., 1995, «Perceptual landscapes in agrarian systems: Degradation processes in northwestern Epirus and the Argolid Valley, Greece», *Ecumene* (forthcoming).

Lemon, M. and Park, J., 1993, «Elicitation of farming agendas in a complex environment», *Journal of Rural Studies*, Vol. 9 (4), pp 405-410.

Lemon, M. Seaton, R. and Park, J., 1994, «Social enquiry and the measurement of natural phenomena: the degradation of irrigation water in the Argolid Plain, Greece», *International Journal of Sustainable Development and World Ecology*, Vol. 2 (3) pp 206-220

Polopolus, L., 1989, «Greek agriculture in a period of adjustment», *Agriculture and Human Values*, Winter-Spring, pp 82-90

Potter, C. and Gasson, R, 1988, «Farmer participation in voluntary land diversion schemes: Some predictions from a survey» *Journal of Rural Studies*, Vol. 4 (4), pp 365-375

Ruiz, M., 1988, «Development of Mediterranean agriculture: An ecological approach», paper presented to «*Changing agriculture, changing landscape*», International Conference on the Future of the European Landscape, Rotterdam, 9-11 May.

Spanopoulu, K., 1990, «Structural weaknesses of Greek agriculture in the period 1950-1987», *Journal of Regional Policy*, Vol. 10, pp 519-554

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