Malta

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MALTA

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Information on physical and climatic factors

Topography. The Maltese Islands lie in the central Mediterranean region 96 km due south of Sicily, 352 km due north of Tripoli and about 288 km east of Tunis. The archipelago runs north-west to south-east and is 45 km in length.

The Maltese Islands consist of three main inhabited islands namely Malta the largest and most southerly of the islands with an area of 250 sq. km, Gozo which is 67 sq. km and lies the most northerly and the small island of Comino whose area amounts to only 3 sq. km and lies in between Malta and Gozo. The islands are composed mainly of limestone of O-ligo-Miocene age. There are no mountains, streams or lakes, but only minor springs. Natural water re-sources depend on percolating rainwater which col-lects in limestone aquifers. The flora is rich with about 2,000 species of plants many of which are en-demic.

Erosion of the different rock types gives a charac-teristic topography. The highest ground in Malta is the stretch of double-tiered sea-cliffs in the south-west, rising to 251 metres. The bottom tier of Lower Coralline Limestone rises sheer out of the sea up to 120 metres, above which is the yellow Globigerina limestone which forms most of the lower lying areas in Malta. This is overlaid by the Blue Clay and capped by Upper Coralline. From these pre-cipitous cliffs that form the south-west coast, the ground falls gradually away to the agricultural and urban areas of the Globigerina basin, ending on the low, rocky and deeply indented coastline on the north-eastern side. The north-western part of the

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island consists mainly of steep, barren hill-ridges of Upper Coralline running approximately north-east and south-west. In the valleys between ridges the Upper Coralline is down-thrown to form rich, terraced areas of cultivation where intricate systems of irrigation from wells and wind-pumps enabled the growers in the past to produce as many as three crops annually. These traditional systems have now all been changed with the introduction of drip irrigation. Some of Malta's rare sandy beaches occur on the coastal margin of these down-thrown areas, and the low-lying area at Ghadira has allowed the formation of a sand dune system and a small salt-marsh.

Gozo is a greener and more agricultural island than Malta, the plateau of Upper Coralline being occupied by the towns and villages which are surrounded by the terraced fields of Blue Clay on the slopes. Gozo's coastline on the whole is more precipitous than that of Malta, rising sheer from the sea to 135 metres at Ta' Cenc, where major faults expose the barren Lower Coralline in the surrounding area. The inland valleys tend to be shallow, and agriculture is as in Malta in the Globigerina areas.

The highlands in the north-west of Malta, and to a lesser extent in the coastal regions of Gozo are scored by a number of deep precipitous water courses, dry except after very heavy rains and mostly overgrown with vegetation.

In Comino, the Coralline limestone rises from the sea to 75 metres on the south-west side, from where it slopes towards the Gozo channel. It is an exposed and barren island where fresh water is scarce. Little cultivation occurs by the handful of local residents. Several rocky islets occur in the Maltese Archipelago, the most important being Cominotto adjacent to Comino, and Filfla, 5 km south-west of Malta, which has been converted into a bird sanctuary.

A submarine ridge, averaging 50 fathoms in depth, extends southwards from the Ragusa peninsula of Sicily towards the islands, and it continues on as a broader and deeper shelf to the African coasts of

Tunisia and Tripolitania. This submarine ridge, which separates the Mediterranean into two main hydrographic basins, represents a sunken land bridge which connected Africa and Europe during parts of the Pleistocene and later Tertiary. The retreat of the ice after the last glaciation caused the level of the Mediterranean Sea to rise and isolate Malta from N. Africa and Sicily.

Climate.

The Maltese Islands have a Mediterranean climate, with hot dry summers and cool wet winters.

Rainfall is usually negligible between May and August (and, in some years, September), and as the temperature averages 26.5 deg. C. between June and September, the summer is unfavourable for plant growth. In autumn rain typically falls in heavy but short storms, October being the month with the highest average fall. In winter and spring it is usually less heavy, March mostly being the last month with sufficient rain for a good growth of vegetation in shallow soils.

The annual rainfall averages about 500 mm., but is very variable. In some years it can be below 50% of the average while in some other years it can be above 150 % of the average. Rainfall is often variable within the Islands. While the monthly rainfall usually decreases between October and March, the number of days on which rain falls each month remains more stable. The amount of rain falling per day is highest in autumn. Hail is precipitated during some storms. About twice each winter there is a shower of soft white hailstones which resemble snow and sometimes remain on the ground for a few hours.

Dew is often heavy, particularly between April and September, when the rainfall is slight. Dew can also be heavy in other dry periods e.g. November, February and March.

Sunshine hours average about 12 per day in mid-summer, day-length being around 14 hours. Even in mid-winter the average sunshine is over 5 hours, the amount of cloud being low.

Relative humidity is high, usually 65-80 %, with little seasonal variation, and rarely falling below 40 %. This is higher than that in coastal regions of neighbouring Mediterranean countries.

Temperature in striking contrast to the rainfall, is remarkably stable from year to year. Hence the very marked annual differences in vegetation are due more to variations in rainfall than to those in temperature. The difference between day and night temperatures is slight.

January, February and March are, on average, the coldest months with dry temperatures averaging hardly above 15 deg. C. and night ones, hardly above 10 deg. C. Light frosts occur. Grass minimum temperatures below 0 deg. C. occur on a few days in a year and last a very short time.

July and August are normally the hottest months, and the maximum temperature in some years can reach up to 43 deg. C. Grass level and soil surface temperatures go higher and can reach a temperature of 49 deg. C.

Wind is a characteristic of the Maltese climate. Only 10 % of days are calm, with summer and autumn being less windy than spring and winter. The cool north-westerly Majjistral blows, on average, on 29% of days in the year, the dry north-easterly Grigal on 15%, and the hot humid Xlokk (Sirocco) on 13%. The northerly Tramuntana brings the coldest weather, and the southerly Nofsinhar the hottest.

Soils

In Malta are highly calcareous (with a pH normally over 8.0), all being derived from calcareous rock. Soils are young and very similar to the parent rocks. There are three main types:

The carbonate raw soils are of relatively recent origin. Their organic content is very low, usually 1-1.5%, and consists of raw humus and undecomposed plant remains. The surface layer is usually brownish. The calcium carbonate content is 80-90 % in soils derived from soft limestone, and 50-60% in soils derived from the Blue Clay.

Xerorendzina soils are rather more mature, with less unweathered rock waste and slightly more humus. The organic content is usually 2-3%, but may be up to 6% in uncultivated soils. The surface layer is usually pale brown. The calcium carbonate content is usually 55-80%, which is less than that of carbonate raw soils derived from limestone.

The terra (terra fusca, terra rossa and intermediates) soils are the oldest, and were formed under a different, and probably wetter climate than that of the present time. They are relic soils of ancient origin that have changed little in recent times. The organic matter content is comparatively high, about 4.5%. The soils are usually reddish. They occur mainly on the Upper and Lower Coralline limestones.

Soils which are too disturbed and altered to fall into these categories occur locally throughout the Islands, on any rock type.

The soil depth usually has more effect on the vegetation than the soil type. Depth, in a warm climate, has a controlling effect on moisture. Soil depth varies from pockets a few centimetres thick to areas over half a metre deep in the flat alluvial valleys. In spring it is noticeable that the vegetation of the shallow soils dries and dies before that of deeper soils alongside. Roots of some herbs as well as of trees can grow deep into cracks in the rock below, thereby reaching a less ephemeral supply of water.

Soil erosion takes place constantly and this is facilitated by shortfalls in arable land management. Farmers do not always plough their fields according to the contours of the land, rubble walls are not maintained and the use of natural windbreaks is scarce. Strong winds and heavy downpours of rain contribute to soil erosion.

Geology

The geology of the country affects the distribution of plant communities. The geological structure of the Maltese Islands is markedly uniform, consisting of Tertiary calcareous sedimentary rocks, clays and

maris, differing mainly in their appearance and consistency. The Upper and Lower Coralline Limestones are both hard, often densely crystalline rocks, forming the two tiers of vertical cliffs on the south-west coast of Malta. The Lower Coralline is the oldest rock in the Maltese Islands. The soft yellow Globigerina limestone lies above the Lower Coralline. Readily eroded, this fine-grained, even textured rock has been quarried and used as a building stone since prehistoric times. The inland areas are usually intensively agricultural or urban, except for a few watercourses which are left more or less undisturbed.

The Blue Clay forms the spring line for the upper water table. At the base of the Upper Coralline cliffs there is frequently a layer of coarse orange-brown greensand. Its plant community does not appear to differ from that of the coralline cliffs above.

The Upper Coralline plateaux occupy most of the northern half of Malta, they are mostly exposed arid areas.

Ecology

The ecology of the Maltese Islands is very much affected by the proximity of any area to the sea. In fact, the furthermost point in Malta away from the sea is only 6.5 km. According to weather conditions salt spray may be blown on to any vegetation on the island. Thus all species of plants growing on the island must be more or less salt-tolerant. Coastal areas receive regular inundation of salt water or spray during the winter and spring months.

Agricultural population

Malta, which lies 93 kms south of Sicily and 288 kms north of Tunisia, has a current population of 379,000 with an annual growth rate of 1%. This represents a population density of over 1,200 people per km^2. The farming community is divided into the full-time farmers and the part-time farmers. The number of full-time farmers which at present is 1,470 is slowly decreasing while the number of

part-time farmers which at present is 13,800 is gradually increasing. This increase in the number of part-time farmers is mainly due to land fragmentation. The current rural exodus will result in a further environmental degradation. The average area per farmer now is about 0.78 ha. The GDP per capita is Euro 8,900 with the agricultural sector contributing 2.8 % of GDP and directly engaging 2.3% of the total gainfully occupied population. It is calculated that about five times this figure of the population depends on agriculture for their livelihood.

Patterns of agriculture

Agriculture in the Maltese Economy

The significant economic and social changes which are taking place in Malta are strongly influencing the evolutionary process of the agriculture sector. Though the economy of the Maltese Islands can by no means be described as agricultural, agriculture has played a significant role in economic development. About 38% of the area of the Maltese Islands is still arable Of these 12,000 ha., only 6% is irrigated or semi-irrigated. The economy of Malta has grown much beyond its natural resources on account of its strategic importance and the development of the tourist sector. The unemployed in Malta amount to only 4% at present, but wages are relatively low in comparison to those of other western European countries. Malta's GDP per-capita in Purchasing Power Parities (PPPs), that is, taking account of differences in price levels, is 8,100 Euros.

The production of fruit forms an important part of the total agricultural output but Malta is only self-sufficient in fruit for the summer period except for tropical fruit which is imported in small quantities mainly for the tourist sector. The expansion in stone fruit production has been going on over the last three decades. This was mainly done at the expense of citrus growing mainly due to the constraints of water and wind damage. During 1990, Agricultural imports amounted to 64.8 m. Malta Liri while exports of agricultural goods amounted to 6.3

m. Malta Liri (just 2.3% of total Maltese domestic exports).

Land Ownership

Two factors hampering the development of agricultural and specifically horticultural output are water shortage and land fragmentation. Water supply for irrigation purposes is particularly limited in view of the needs of the dense population. This has lately been alleviated with the introduction of drip irrigation technology and the building of a large sewage purification plant in the south-east of Malta, having a capacity of 12,000 cubic metres per day with 90% of the water produced going for agricultural purposes. About 450 growers benefit from the operation of this recycling project. Land fragmentation is caused mainly by the laws of inheritance under which the land is constantly subdivided until it is no longer feasible to work profitably.

There are at present some 13,000 holdings with about 70% of the farmers operating holdings under 2 hectares. For the most part the fields are composed of terraces. The shape and size of the individual plots often make cultivation difficult and the use of heavier agricultural machinery more complicated. Only about 7 % of the nursery area is fully controlled by owner-occupiers. Land in Malta is owned 2/3 by the state and 1/3 by the private sector. Growers are thus reluctant to make long-term investments due to the risk of not continuing to hold tenure on their land.

Because of its dense population and limited land and water resources Malta still remains a net importing country for agricultural products. However, efforts have recently been made to raise horticultural output through improved methods of cultivation in particular by the use of certified plants and drip irrigation. These efforts have led to an increase in production in spite of the fact that the number of full-time growers has dropped and the agricultural area is constantly loosing the battle against urbanisation. This increase has led to a limited reduction of imports.

While the Agricultural Leases (relating) Act of 1967 regulates land tenure in Malta with the objec-

tive of protecting growers from eviction, this is still possible where:

a) there is disagreement on the increase of rent payable to the landlord;

b) the landlord requests that he or a member of his family will cultivate the land;

c) the land is covered by a building permit (unless it is irrigated);

d) the land has been left idle for more than twelve consecutive months.

Agricultural Policy

There are general constraints of land availability, water resources and the lack of agricultural investment (only 2% of total Gross Fixed Capital Formation is channelled in agriculture). The largely poor state of Maltese agriculture is the legacy of a long period during which there was no coherent policy for agricultural development. Only recently have experts from FAO been brought over to make an evaluation of the situation.

There is no state regulation of prices for fresh fruit and prices are solely determined by market forces.

Sales of agricultural food items are exempted from Value Added Tax (VAT) while no form of export subsidies or intervention exists. The European Union (EU) remains the main supplier of Maltese agricultural imports

Maltese agriculture is characterised by features which although prevailing in other Mediterranean countries are quite typical to island states - limited agricultural land, water constraints, intensive production methods and hence pressures on ecosystems.

Co-operatives

The Constitution of Malta lays down, in its Declaration of Principles (Section 20), that "the State recognises the social functions of co-operatives and shall encourage their development". The number of co-operatives operating in Malta has reached 26, but is expected to continue rising when a government suggestion for the formation of co-operatives by civil servants is implemented. The memberships of co-operatives at present stands at just over 4,500. Malta's first set of rules governing co-operatives were established in 1946. It was called the Ordinance for Co-operative Societies, which was aimed at bringing the agricultural sector on sound economic ground. Agricultural co-operatives were first set up in Malta in 1947. The Co-operative Societies Act of 1978 was formulated mainly with the agricultural sector in mind. Each co-operative must have at least seven members to register. Registration is with the Ministry of Education and Human Resources.

Each member of a co-operative is a partner and has one vote, independently of the money invested. Co-operatives do not pay any tax on income which is re-invested in the co-operative, but have to deposit five per cent of their annual income in a Central Fund for Co-operatives. This money is used for the development of co-operatives and is run by a committee which, in its majority, is made up of representatives of co-operatives.

The Board of Co-operatives has the strict monitoring of the co-operatives' administration as one of its functions. This is to avoid the possible of the formation of cartels and monopolies.

Current development plans and projects

Between 1959 and 1987 there were six Development Plans for the Maltese Islands. The agricultural sector featured partially well in some while other Plans had no influence on this sector. While it is physically impossible as well as economically unsound to attempt to produce locally all Malta's food requirements, the Development Plans aimed to

increase production by intensifying agricultural husbandry methods so as to increase the rate of import cover.

As the Maltese Government is striving for full membership of EU, it has embarked on efforts to align its agricultural policy with that of the Common Agricultural Policy (CAP) and the agro-environmental measures. It is feared that the Maltese agricultural producers will, in general, be adversely affected following accession to the EU. The balance of agricultural trade is expected to continue worsening with the gradual application of Community threshold and reference prices. Maltese agricultural producers risk to bear the brunt of mounting competition from their Mediterranean counterparts. To counteract the impact of accession on Maltese agriculture the government has requested FAO aid in drawing up a strategic plan of action.

Major fruit crops and important pests

Fruits in order of quantitative importance and their respective pests

Peaches:	*Pseudomonas* spp. *Agrobacterium tumefaciens, Taphrina deformans.*
Grapes:	*Plasmopara viticola, Uncinula necator, Grapevine fanleaf virus*
Plums:	*Pseudomonas* spp., *Sphaerotheca pannosa, Stigmina carpophila.*
Figs:	*Tetranychus urticae, Parthenolecanium corni, Phomopsis* spp.
Lemons:	Scale insects, *Aleurothrixus floccosus, Pyllocnistis citrella, C. capitata.*
Apples:	Long-horned beetle, *Psylla mali, Monilinia* spp., *Aphis pomi.*
Strawberries:	*Tetranychus urticae, Botrytis cinerea, Sphaerotheca humuli.*
Small Pear:	*Venturia inequalis, Psylla pyri, Pseudomonas syringae.*
Oranges:	Scale insects, *Aleurothrixus floccosus, Ceratitis capitata, P. citrella.*
Pomegranate:	*Aphid* spp.

Pests of general importance

Poor soils and water resources of limited quantity and quality have been major constraints to production. A further adverse factor is the losses caused by weeds, pests and diseases. These harmful organisms occur wherever crops are grown and Malta is no exception.

Some serious quarantine pests, which attack fruit trees, but have never been encountered in Malta include the San Jose' scale (*Quadraspidiotus perniciosus*), the citrus stubborn phytoplasma disease (*Spiroplasma citri*), Citrus scab (*Elsinoe* spp.), Pierce's disease, Phylloxera, Grapevine flavescence dorée, Plum Pox Virus and the Citrus Tristeza Virus.

The major weeds in Malta include the following:

English name	Latin name
Cape Sorrel	*Oxalis pes-caprae*
Amaranth	*Amaranthus* spp.
Wild oats	*Avena fatua*
Corn-flag	*Gladiolus italicus*
Bindweed	*Convolvulus arvensis*
Antholyza	*Chaemanthe aethiopica*
Poppy	*Papaver* spp.
Bargemans cabbage	*Brassica rapa*
Bermuda grass	*Cynodon dactylon*

The pests of major importance are, however, the insect pests. This is especially the case for at least nine months of the year. This fact can be gauged by the predominant use of insecticides vis-à-vis other pesticides. The various types of aphids are the most damaging of the lot, not only for the direct negative impact, but also especially for the different viruses that they vector. The main aphids present are cotton and melon aphid (*Aphis gossypii*), the black citrus aphid (*Toxoptera aurantii*) and the Peach aphid (*Myzus persicae*).

Immediately following the aphids come the whiteflies with the sweet potato whitefly (*Bemisia tabaci*) being the most prevalent and the cause of major economic losses due to the transmission of the Tomato Yellow Leaf Curl Virus. The woolly whitefly (*Aleurothrixus floccosus*) can do serious damage to crops if uncontrolled and growers are committed to a spray programme. Damage is reduced to some extent by a parasite of the whitefly, *Cales noaki* that was introduced to Malta in 1985/86.

The Mediterranean fruit fly (*Ceratitis capitata*) has been a problem ever since citrus was established as a crop in Malta. It is also a pest of significance on fig and stone fruits. The larvae while feeding, tunnel into the fruit and secondary rots set in resulting in a product which is completely unsaleable. Of particular importance to Citrus is also the *Phyllocnistis citrella* (citrus leafminer). The Olive fruit fly (*Dacus oleae*), is a pest on olives, however, olive trees are only of minor importance in Malta.

A very large number of scales attack fruit trees such as black scale of olives (*Saissettia oleae*) and pink / white scale of figs (*Ceroplastes rusci*). Citrus mealy bug (*Planococcus citri*) is known to cause economic damage if not controlled. Wood boring beetles (*Cerambix* spp and *Capnodis tenebrionis*) can kill apple and pear trees and must be controlled by basal stem sprays.

Following the insect pests come the fungal diseases. In the dry summer Peach Leaf Curl (*Taphrina deformans*) can cause serious damage on peaches and nectarines, while the obligate parasites powdery mildew (*Uncinula necator*) and downy mildew (*Plasmopara viticola*) are common on grapes. The other major fungal disease encountered in vineyards is Botrytis bunch rot (*Botrytis cinerea*).

The longidorus dagger nematode (*Xiphenima index*) a member of the nepovirus group, which vectors grapevine fanleaf virus (GFLV), the root-knot nematode (*Meloidogyne*) and the stem & bulb nematode (*Ditylenchus*) are the main nematodes of importance in

Malta. The main bacterial disease of importance-*Pseudomonas syringae*-is soil borne.

As yet only a few viruses of fruit trees have been identified in Malta but it is suspected that many more are present. However, a recent survey carried out has revealed the absence of Plum Pox Virus (Sharka) on stone fruit trees. It is likely that grapes and other fruit trees such as citrus are also carrying viruses and viroids which are common in Italy, from where nearly all our fruit trees originate.

Post-harvest pest problems

As most fruits and vegetables are sold and consumed over a short period of time, there are no major post-harvesting pest problems. The storage of potatoes if not done properly is usually associated with *phytophthora infestans* (late blight) in the humid cold days of winter and with the *Phthorimaea operculella* (tuber moth) in the warm days of summer.

Organisational responsibilities in crop production

Ministry for Agriculture and Fisheries. It is based in the capital Valletta is headed by the Hon. Minister Mr. Ninu Zammit. Under this Ministry fall the various Departments such as that of the Veterinary Services, the Fisheries and the Agriculture. The Department of Agriculture is in turn divided into the various Divisions such as Animal Husbandry, Crop Husbandry, Landscaping and Plant Health. The Plant Health Division is responsible for the Diagnosis laboratories, the Plant Biotechnology Centre, Plant Quarantine and Certification Schemes.

Private Commercial Organisations. At present there are no commercial enterprises or organisations in Malta dealing in the production of certified plant material. However, there are importers that import such certified material. Some plant material that is imported is virus-free while other plant material is only virus-tested. There still exists con-

fusion among buyers concerning the difference between the two.

Farming Community. Some private growers buy certified rootstocks from the Department of Agriculture. They are grafted with stone fruit tree scions which were obtained either from their own stock or from a trusted source. However, these scions are not tested beforehand as a routine measure. The Plant Health Division has embarked on a monitoring programme to identify virus problems existing in the various orchards. While these surveys have revealed that there is no Plum Pox virus infection on the Island it has highlighted the fact that most of the trees in the different orchards are infected with one or more viruses which not only reduce the production quantities but also the quality.

Functions of various units involved in certification

In Vitro laboratory. The main function of the *in vitro* laboratory (that is located in Lija) as regards the Certification Scheme of Stone Fruit Trees (Fig. 1) is to produce virus-free rootstock from basic material obtained from the "Centro di Ricerca e Sperimentazione in Agricoltura" in Locorotondo, Italy. It is ensured that no more than 12 subcultures are made from each lot. The two rootstocks that are presently being propagated in this way are the GF 677 and the Myrobolan. The plants micropropagated in the lab are later on acclimatised in a computerised, air-conditioned acclimatisation glasshouse that is also found on the same premises. During the period of growth the plants are continually monitored to control that they meet the required specifications. The plants are finally certified before leaving the acclimatisation glasshouse according to established norms of general appearance size (length and thickness) and plant health status. Plants are grouped in trays of 60 (60 cm x 30 cm) and must be of a height of not less than 15 cm.

Fruit Nursery. The main stone fruit tree nursery belonging to the Department of Agriculture is the

St. Vincent Nursery that is located in Luqa. In this nursery the certified rootstock, coming from the *in vitro* lab after having been transferred to compost and acclimatised, is grafted with certified plant varieties. Initially, the certified scions were also obtained from Italy, but now a new Mother Block has been established to supply the desired varieties of nectarines, peaches, plums and apricots. The trees in the Mother Block are also regularly checked for the eventual supply of budwood. A yearly serological testing of fruit trees for plum pox virus is carried out in May.

Varieties in established Mother Block are:

Peaches and Nectarines Plot 29		
Cornet	Maycrest	Suncrest
Fayette	O'henry	Fortiner
Fay Elberta	Springcrest	
Sun Gold	Springtime	
Plums Plot 30		
Angeleno	Fortune	Ozark Premier
Black Amber	Friar	Santa Rosa
Black Beauty	Goccia d'Oro	Sungold
Black Star	Obylnaya	
Apricots Plot 30		
Baracca	Cibo del Paradiso	Pellecchia
Boccuccia Liscia	Fracasso	San Castrese
Boccuccia Spinosa	Monaco Bello	Tirynthos
Canino Tardivo	Peles Di Giovaniello	

During the last season (1999) which was the first season for the production of certified local production of stone fruit trees, 3,000 virus-free trees were produced while 1,400 others that did not make the grade were sold as standards.

A certification scheme for olives is soon to be started and presently olive seeds are being sown as a rootstock for grafting the desired varieties. The

sowing, growth and grafting of olives is being monitored.

Biological Indexing. 11 kg of Nemaguard seeds (@ 350 seeds per kg) were sown together with 15kg of Missour (@ 280 seeds per kg). The seedlings of such seeds were later on grafted on to GF 677 for seed production. Moreover, 12 indicator plants of each of GF 305 and Elberta were planted for seed production for eventual use for biological indexing. Herbaceous indicator plants such as *Chenopodium quinoa* and *Nicotiana tabacum* were also grown for seed production.

Diagnostic laboratory. The diagnostic lab caters for the control of pests and diseases (except for viruses) in the fruit nursery. Before any plantation is started the soil is tested for soil borne organisms and especially for nematodes which vector viruses. Monitoring for the presence of nematodes goes on throughout the growing of trees in the nursery. Undoubtedly the most common vectors of viruses are the insect pests amongst which stand out the aphids. These are controlled mainly by the use of insecticides.

Virology laboratory. The new virology lab is still not completed and presently the Tissue Culture lab is being used as well for the serological testing of plants for viruses. Biological testing of plants is carried out in the glasshouse where indicator plants are grown. The new virology lab will use molecular biology techniques for the better diagnosis of plant viruses and virus-like diseases. Such techniques as Polymerase Chain Reaction and Electrophoresis would be used not only to confirm serological tests for viruses but also for the detection of viroids.

Research in plant protection

Department of Agriculture. The main research on the Island in Plant Protection is carried out by the Department of Agriculture within the Ministry for Agriculture and Fisheries. Various disciplines such as bacteriology, nematology, mycology etc. have been researched in the past albeit in fits and

starts rather in a systematic way. The main limitation being the lack of qualified personnel. With the accession into the European Union proving to be a good incentive a greater effort is being made not only to upgrade the facilities of the laboratories but also to recruit new qualified staff and retrain existing staff. As organic farming has been ruled as not being feasible for Malta, all efforts are being directed at an Integrated Pest Management approach. The first priority is, however, to establish a pest map for the Maltese islands. This is imperative if Malta is to declare itself as a pest free area for particular pests and establish itself as a Protected Zone within the European Community.

Other Organisations. The organisations involved in agriculture are the co-operatives as producers' organisations have yet to be set up. These are involved indirectly in fostering the concept of certification schemes as they are importers of certified trees for sale to their members. These organisations conduct little research but sometimes they carry out useful surveys in plant protection. They also import various pesticides for sale to the growers. They have a good network with the growers and are usually the first to detect the presence of a new pest or the build up of resistance to pesticides. Unfortunately, the educational level of growers is low and most of them can only speak the local language. Imparting new knowledge is an arduous task and introducing new techniques is even harder.

Professional Societies. There are no professional societies that are involved in agriculture. The only professional body which contributes perhaps more indirectly than directly is the University of Malta. As yet there is no faculty of Agriculture though an Institute for Agriculture was established just a decade ago. Graduates from the faculty of Biology are presently becoming the new intakes in Agriculture. These, however, need training in agronomic studies and especially in specialised areas.

Libraries and Information Services. Although there are various good libraries on the Island these are very limited in the agrarian field. This has proven

to be a drawback to persons taking up agricultural studies. Both books and technical journals are lacking or outdated. It is true that the Internet is easily accessible to all and this has proved a source of knowledge. Also, easy contact with counterparts in other countries is now made even easier by e-mail. Papers from various journals can be easily obtained through the University library but the problem remains in being aware of the publication of particular papers.

Figure 1. Plant health division certification scheme in Malta