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Agriculture in the Maltese Islands

Josianne Vassallo, International Environment Institute, Foundation for International Studies, Malta

Human activities have shaped the Maltese landscape since early settlers colonized these islands and subsequently cleared the natural vegetation for agriculture (Blouet, 1992). The Middle Ages were characterised by invasions and corsair attacks that depopulated the islands. Eventually, depopulation led to the abandonment of cultivated land that resulted in soil erosion. The Knights of St. John tried to rehabilitate the abandoned agricultural areas. This was crucial since by the sixteenth century, sufficient food was required for the expanding local population. The Order established land-leasing schemes for farmers in order to increase the number of cultivated fields. Further fields were created through terracing. Agriculture during the British period was still one of the most important pillars of the Maltese economy. After the end of the Napoleonic Wars (post 1815), agriculture fell in a depressed state and began to revive after the Crimean War during the second half of the nineteenth century (Clare, 1988).

Malta's economic development was boosted after Independence, when the tourist industry started to flourish. The expansion of this sector brought about rapid tourism related development. Population growth and a better standard of living were also a major driving force behind development in the Maltese Islands. Government housing schemes encouraging couples to build their own house, contributed to a more rapid and steady urbanisation (With a total are of about 316 km2, the population of the Maltese Islands was 376,335 in 1995. The population density during the same year was 1,194 persons per km2 (Central Office of Statistics, 1996)). The built-up area increased from 5 per cent in 1957 to 16 per cent in 1983. This resulted in an increasing quarrying activity, in order to supply the growing demand for building material. Consequently, registered agricultural land has decreased from 50 per cent in 1957 to 38 per cent in 1983 (Government of Malta, Technical Report 5.4, 1991). This decrease has steadily continued up to 1991 (Table 1.1).

Table 1.1 Agricultural land in hectares (1956-1991).

YEAR	DRY	IRRIGATED	WASTE	TOTAL
1956	17,068	816	2,550	20,433
1966	13,752	693	2,028	16,476
1976	12,167	691	1,860	14,718
1986	9,878	664	1,444	11,986
1991	9,998	723	1,181	11,902

Source: Meli (1993), p. 74.

According to Meli (1993), the 42 per cent decline in agricultural land area is mainly due to:
• the fragmentation of land from inheritance laws;
• the lack of a freshwater water supply;
• the sloping land;
• the increasing pressures on the limited land resource available; and
• the increasing number of part-time farmers (Table 1.2) (With only 10 per cent of the farming population working full-time, the FAO classified local farming as a part-time business (FAO, 1992))

Table 1.2 Number of Maltese farmers (1961-1991).

Year	Full-time	Part-time	All farmers
1961	7,330	8,815	16,145
1971	5,636	8,324	13,960
1981	4,352	10,923	15,275
1991	1,473	13,807	15,280

Source: Meli (1993), p. 74.

Agriculture in Malta is limited by its small sized holdings, shallow soils and environmental constraints. Most of the present day agricultural land is found on terraced sloping land, where limestone rubble walls retain soil from being washed away, while allowing water to percolate. An unreliable wet season and a limited groundwater supply are the reasons behind the small percentage (5 per cent) of the total cultivated land that is irrigated (Charlton and Beeley, 1993). When the soil is left bare of vegetation during the dry season, the onset of heavy rainstorms during autumn, accelerate soil erosion and runoff. To prevent soil erosion, agricultural land is confined to the limited low-lying land available. This type of topography is found on the flat floor of valleys, subsidence structures and rehabilitated disused quarries.

In the past, there were attempts to reclaim karstland into rich agricultural land. Small pockets of decalcified soil accumulate in cracks and depressions (Young, 1964) and form 'oases' on karstland for agriculture (Bowen Jones et al., 1961). Areas reclaimed for agriculture in karstland extend to natural terrains such as valleys, subsidence structures (dolines) and to man-made landforms such as reclaimed disused quarries. Agriculture in these areas is aided by the limestone itself, which when weathered produces high quality agricultural soils (Gagen and Gunn, 1988).

Agriculture in valleys, subsidence structures and disused quarries is mostly restricted to their flat bottom. The sloping sides of a valley and a doline can also be terraced for agriculture. The major advantage which these landforms have over other agricultural areas, is that their structure provides shelter and protects the crops from wind action. Groundwater, in the case of valleys and dolines is stored in the joints, faults and bedding planes (Hardwick and Gunn, 1995). A major disadvantage in the practice of agriculture in valleys, dolines and disused quarries, is that such low-lying areas can be liable to flooding during heavy rainfall.

The lack of space for the further expansion and development of agricultural land is a problem that the island of Malta in particular, is facing. Therefore solutions regarding spatial problems must include careful pre-planning and management.

References

Blouet, B. (1992) The story of Malta. Malta: Progress Press.

Bowen Jones, H., Dewdney, J.C., and Fisher, W.B. [eds.] (1961) Malta: background for development. Durham: Department of Geography, University of Durham.

Charlton, W.A., and Beeley, B.W. (1993) Agriculture, Land Use and Resource Transformation in Malta. Tijdschrift voor Econ. en Soc. Geografie, 84 (5), 325-331.

Clare, A.G. (1988) Features of an island economy. In Mallia Milanes, V. [ed.], The British Colonial Experience 1800- 1964. Malta: Mireva Publications.

Food and Agriculture Organisation of the United Nations. (1992) Malta agricultural policy and the EC membership: challenges and opportunities. Rome: Food and Agriculture Organisation.

Gagen, P., and Gunn, J. (1988) A geomorphological approach to limestone quarry restoration. In Hooke, J.M. [ed.], Geomorphology in Environmental Planning. Chichester: John Wiley and Sons Ltd.

Government of Malta. (1991) Report of Survey. Natural resources. Technical Report No. 5.4. Malta Structure Plan. Malta.

Hardwick, P., and Gunn, J. (1995) Landform-groundwater interactions in the Gwenlais karst, South Wales. In Brown, A.G. [ed.], Geomorphology and Groundwater. Chichester: John Wiley and Sons Ltd.

Meli, A. (1993) Overview of agricultural land use in Malta. In Busuttil, S., Lerin, F., Mizzi, L. [eds.], Malta: Food, Agriculture, Fisheries and the Environment. Options Méditerranéennes. Séries B: Études et Recherches 7, 71- 74.

Young, B.S. (1964) Agricultural landscapes of the Maltese Islands. Journal of Geography, 63, 23-32.

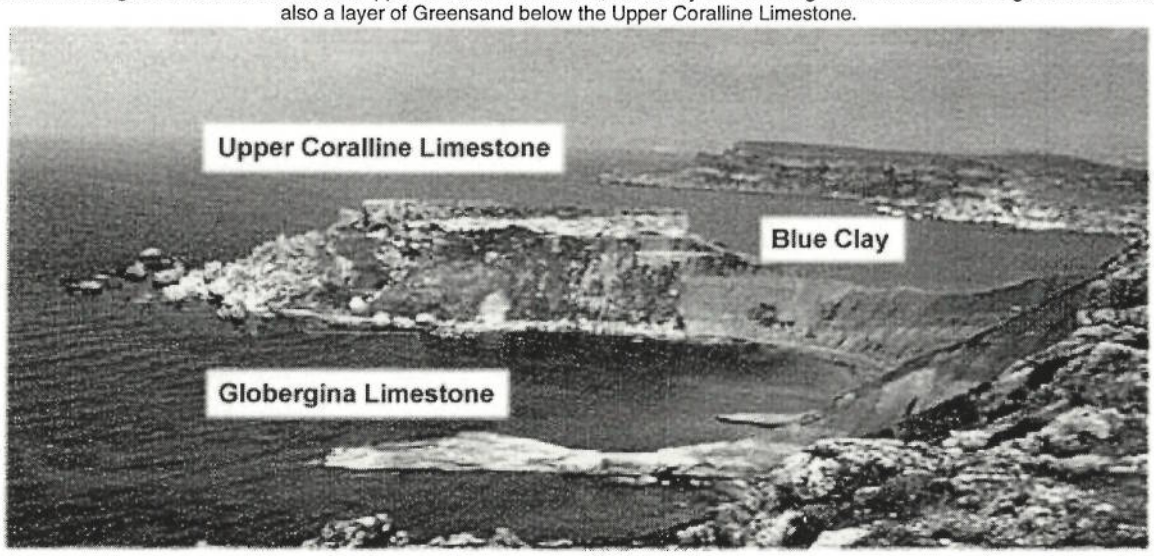
Geology and Geomorphology of the Maltese Islands.

Sandro Lanfranco, Department of Environmental Science, GF Abela Junior College, University of Malta, Msida

Overview

The Maltese Archipelago consists of a group of small, low-lying islands located in the central Mediterranean, approximately 96 km South of Sicily and 320 km north of North Africa. The archipelago extends for 45 km in a NW-SE direction and covers a total land area of 315.6 km^2. The largest islands are Malta (length 27 km; area 245.7 km^2) and Gozo (14.5 km; 67.1 km^2). The other islands of the archipelago are much smaller and comprise Comino (area 2.8 km^2), St Paul's Islands (10.1 ha.), Cominotto (9.9 ha.), Filfla (2.0 ha.) and General's Rock (0.7 ha.).

Il Karraba This image of Il Karraba shows the Upper Coralline Limestone, Blue Clay and Globergina Limestone. Although not visible there is also a layer of Greensand below the Upper Coralline Limestone.



Origin of the Maltese Islands

The rocks of the Maltese Islands are all sedimentary and result from the accumulation of carbonate sediments in a relatively shallow marine environment. Various types of rocks correspond to different paleoenvironments of deposition. A second class of rocks, quaternary deposits, represent sediments that were deposited in a terrestrial environment following the emergence of the Maltese Islands above sea level. The origin of the Maltese Islands is related to the formation of the Mediterranean basin and may be traced to the Triassic era of geological time, approximately 200Ma (million years ago). At this time the continents were not in their present positions and were aggregated into a large supercontinent now called Pangaea. During the Triassic era, rifting in Pangaea in an east-west direction produced a transverse ocean called the Tethys sea. River sediments and reef deposits laid down on this early ocean bed were to become the precursors of the rocks that comprise the Maltese Islands. Further rifting in Pangaea resulted in the northward movement of what is now the African continent, with the consequent destruction of most of Tethys. This rotational movement is ongoing and has formed a zone of collision between Eurasia and Africa. The effects of this collision on the geology and geomorphology of the Maltese Islands are evident as faulting, uparching and subsidence of the sediments deposited in the proto-Mediterranean.

General Structural Geology

Rifting in the vicinity of the Maltese Islands has resulted in alternate uplifting of various regions of the Maltese Islands. The most recent such episode has given the archipelago a tilt towards the north-east. The western regions of the islands are uplifted to form high cliffs while the eastern coastlines are drowned. The highest point on the archipelago is 253m above mean sea level and is situated at Dingli Cliffs on the south-western coast. The tilt of the archipelago is responsible for the predominant north-eastern trend of drainage channels on Malta.

Malta is crossed by two main fault systems representing the effects of two separate rifting episodes in the vicinity of the archipelago. The older of the two, the Great Fault, trends SW to NE, while the Maghlaq Fault system trends approximately NW to SE along the southern coast of the island and has been responsible for the downthrow of Filfla to sea level. A system of horst and graben structures of East-Northeast trend characterises Malta north of the Great Fault. These structures are indicated by prominent ridges and valleys. No well-defined horst and graben systems occur south of the Great fault.

Several circular subsidence structures are distributed throughout the islands. The origins of these structures are various, but are mainly associated with solution of limestone by percolating acidified groundwater leading to roof collapse of subterranean or submarine caverns.

Stratigraphy
Although the sedimentary platform on which the Maltese Islands are situated was formed during the Triassic, there are no surface outcrops of this age. All exposed rocks were deposited during the Oligocene and Miocene periods of geological time. No rocks of Pliocene age have been conclusively identified, indicating that definitive emergence of the archipelago above sea level probably occurred at this time. The rocks of the Maltese Islands are arranged in a simple layer-cake succession as follows:

Formation	Approximate Age	Maximum Thickness (m)
Upper Coralline Limestone	12 - 7.5 Ma	104 - 175
Greensand	12 - 7.5 Ma	0- 16
Blue Clay	13 - 12 Ma	0- 75
Upper Globigerina Limestone	15 - 13 Ma	5 - 20
Middle Globigerina Limestone	20 - 15 Ma	0 - 110
Lower Globigerina Limestone	20 - 15 Ma	5 - 110
Lower Coralline Limestone		140 (visible) 236 (borehole)
Clays and dolomitised limestone		+ 3000 (borehole)

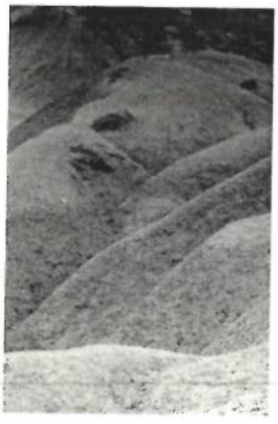
(modified from Alexander, 1988. A review of the physical geography of Malta and its significance for tectonic geomorphology. Quaternary Science Review, 7, pp. 41-53)

These rocks are sporadically overlain by terrestrial, aeolian and alluvial deposits laid down following the emergence of the Maltese Islands above sea level. Much of the central and south-eastern portion of the Maltese comprises outcrops of Globigerina Limestone while the northern and north-western regions are characterised by highlands on which upper coralline limestone is the dominant outcrop. The geology of Gozo is more varied than that of Malta, with more frequent outcrops of Blue Clay being a characteristic feature.

Lower Coralline Limestone is the oldest exposed rock in the Maltese Islands, outcropping to a height of 140m in the vertical cliffs near Xlendi, Gozo. It is mainly composed of the tests of coralline algae indicating deposition in a shallow gulf environment. Younger beds show evidence of deposition in more open marine conditions.

Globigerina Limestone is the second oldest rock and outcrops over approximately 70% of the area of the islands, eroding to give a broad, gently rolling land-scape. Variations in the thickness of this formation are considerable, ranging from 23m near Fort Chambray, Gozo to 207m around Marsaxlokk, Malta. This rock consists of yellow to pale-grey limestones comprising tests of planktonic globigerinid foraminifera. The formation is divided into Lower, Middle and Upper Globigerina Limestone by two beds of phosphorite pebbles.

Blue Clay overlies the Globigerina Limestone formation. It erodes easily when wet and forms taluses which flow out over the underlying rock. Variations in thickness are considerable ranging from 75m at Xaghra, Gozo to nil in eastern Malta, where Upper Coralline Limestone rests directly on Globigerina Limestone.
Deposition of the Blue Clay may have occurred in an open muddy water environment with water depths up to 150m for the lower part of the formation.



Greensand consists of bioclastic limestones rich in glauconite deposited in a warm sea. Unweathered sections are green but are oxidised to an orange colour when exposed. The deposit attains a maximum thickness of 11m in localised depressions at Il-Gelmus in Gozo, but elsewhere is less than 1m thick.

Upper Coralline Limestone is the youngest Tertiary formation in the islands reaching a thickness of approximately 160m in the Bingemma area, Malta. Several significant depositional breaks occur towards the top of this formation indicating emergence on at least two occasions and in general the top of the formation is dominated by facies which imply deposition in vary shallow water ranging from shallow subtidal to possible intertidal and supratidal environments.