Our Ancestral Country Allies:
The Rubble Walls

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"rubble walls (are hereby declared) as protected, in view of their historical and architectural importance, their exceptional beauty, their affording a habitat for flora and fauna, and their vital importance in the conservation of the soil and of water"

The Rubble Walls and Rural Structures (Conservation and Maintenance) Regulations
Legal Notice 160 of 1997, Malta

The Story of the Maltese Rubble Walls

Rubble Walls, locally known as '*Ħitan tas-Sejjieħ*', are a predominant and integral feature of the Maltese rural landscape. These traditional agricultural structures reflect the history, knowledge, and skill of our ancestral agrarian societies. For ages, Maltese farmers have realized the important role that these walls play in the preservation and sustainability of the local agricultural economy.

Fig.1: *Terraced fields with rubble walls – the Maltese rural landscape (Wied Għemieri, Malta).*

Lack of good quality soil or water can make agriculture a hard and unprofitable business. The limited surface area, the hilly topography, the water scarcity and the meagre soils of these islands have always been a challenge for the local agricultural sector. In an effort to exploit the limited resources available, farmers have literally re-sculptured the land surface by cutting terraces across the hilly landscape. The use of terraced fields allows for sloping areas to be cultivated and is also designed as a means to slow surface runoff and prevent the soil from being washed away. In Malta and Gozo, terracing supported by rubble walls has been used by the local farmers for many centuries.

Rubble walls are 'dry' stone walls, that is, walls entirely built without the use of cement or mortar. Their stability comes from the skilful placing and fitting together of the stones. The use of basic 'dry' stone building can be traced back to prehistoric times and examples of 'dry' stonewalls and buildings can be found all over the world throughout history. In the Maltese Islands, early examples of 'dry' stonewalls can be seen around the entrances of the Megalithic Temples, dating back as far as 5000 BC, and also at the Bronze Age village of Borg in-Nadur.

Fig.2: *Rubble walls are 'dry' stone walls (Wied Qirda, Malta).*

It was however, during the Arab occupation (870 -1127 A.D.) that the construction of rubble walls became a widespread agricultural practice. The Arabs established important agricultural practices and introduced new irrigation techniques and also new crops. Rubble walls were used not only to delineate the boundaries and ownership of agricultural land, but also as a measure against soil erosion in terraced fields. Ever since, this network of rubble walls surrounding agricultural fields has dominated the Maltese rural landscape.

Transforming the natural landscape can have severe consequences. In fact, throughout history, human intervention has continuously changed and manipulated the environment in favour of new developments that have often been detrimental. Rubble walls however offer a sustainable land use practice that supports agricultural activity in an environmentally unobtrusive way. The practice and use of terracing and rubble walls represents an approach to landscape transformation that is based on a long-earned understanding of the

Fig.3: *Rubble walls as* ***silent warriors*** *(Wied Qirda, Malta).*

interrelationship between land resources and human activity. Land transformation for agriculture is usually necessary and indeed, at times vital for the survival and sustenance of communities and the population at large. Land transformation practices which respect and sustain the natural environment on which agriculture depends should be well preserved and appreciated.

In this respect, the knowledge contained within the traditional practice of rubble walls is a real gift. When thinking about the future, we must not disregard or forget traditional practices. Most people accept these rubble walls as integral elements of our local rural character, however, few realise their extreme importance. Rubble walls are like ***silent warriors*** who protect our livelihood and our quality of life in the tranquil setting of the Maltese countryside.

A Maltese Building Technique

The use of dry stone walls as field enclosures, has been practiced in many countries throughout the centuries, but the type, and method of construction of these walls varies according to the region. In general, the type of wall built depends on the topography and natural resources available in the surrounding area. As has been the case in many ancient cultures around the world, the old agrarian communities in Malta developed their local terracing and wall building techniques using locally available materials. Consequently, the local rubble wall, '*Ħajt tas-Sejjieħ'*, is a unique feature of our rural landscape, part of our heritage and an important element of our identity.

Maltese rubble walls make use of natural, unhewn stones of different sizes, which are found in the countryside, hence the term 'rubble'. These stones are called '*ġebel tax-xagħri*' and are usually made of the hard-wearing upper coralline limestone.

In her book, '*Ħitan ta-Sejjieħ'*, architect Elizabeth Ellul (2005) provides a detailed study of the construction methods, the tools employed and the different types of rubble walls found on the islands. She identified three basic rules in the building of these walls:

1. the largest stones are placed at the base of the wall, except those used as tie-stones
2. there should be an infill in between the two outer walls
3. the wall has to incline slightly inwards as it goes higher

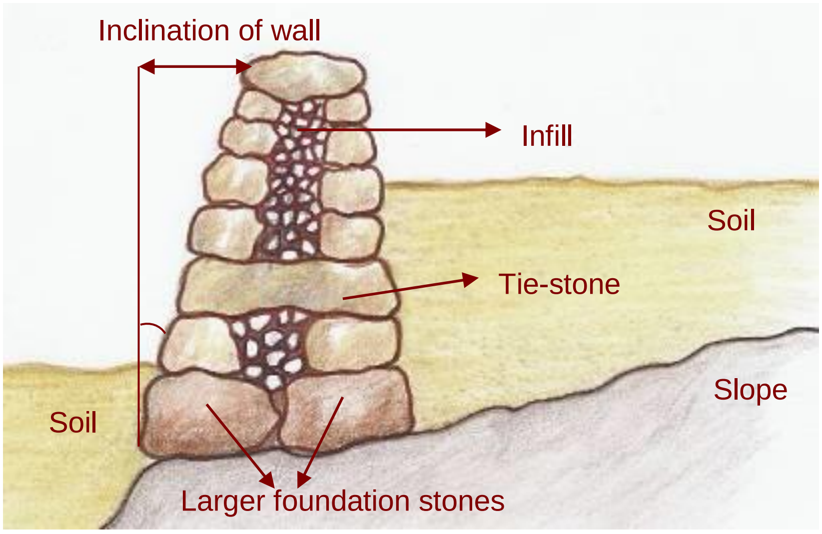


Fig.4: *Schematic diagram of rubble wall construction to obtain terracing.*

Fig.5: *Rubble wall infill, 'mazkan' (Wied Għomor, Malta).*

A rubble wall is constructed as a double wall with an infill of tightly packed smaller stones, called '*mazkan*', in the centre. This gives strength to the wall, preventing it from collapsing inwards. The strength and stability of the wall also depends on proper foundations which, ideally, are laid directly on bedrock. The walls are built up to the desired height layer by layer, and at intervals, large tie-stones are placed which span both faces of the wall.

The building technique is mostly focused on protecting the wall from giving in under the pressure of surface runoff during rainfall events. Apart from strengthening the wall, the central infill is also extremely important in regulating the drainage of rainwater around and inside these walls. According to Ellul (2005), the stones used for the infill must be graded and layed down systematically with the larger stones placed at the base.

Additionally, flow holes can often be seen at the base of these rubble walls. Primarily these flow holes prevent the collapse of the walls by relieving the pressure of heavy storm water. They are mostly used in walls retaining clayey soils, since these soils tend to hold more water and expand, thus increasing the pressure on the surrounding walls.

Fig.6: *Flow holes in a rubble wall (Wied Qirda, Malta).*

Fig.7: *Detail of flow hole (Wied Qirda, Malta).*

The building of longer walls, or those retaining terraces, requires more skill. Ellul (2005) notes that longer walls are usually constructed of independent "V" sections locally known as '*posta*' and '*ġwienaħ*'. Therefore if a '*posta*' collapses the adjacent section will not because it is not directly connected to it. Similarly, for walls retaining terraces, special considerations need to be taken with respect to the foundations, the infill and the inclination of the wall.

Fig.8: *Rubble walls made up of 'Posta' and 'Ġwienaħ' (Wied il-Kbir, Malta).*

It can be noted that the building of these rubble walls requires expertise and skill, especially in the construction of walls retaining terraces. This traditional skill, which has been passed on over generations is unfortunately slowly dying out. Acknowledging this, in 2004, local government together with the Building Industry Consultative Council (BICC) launched a specialised training course in rubble wall building. Presently, these classes are being offered by the Malta Employment and Training Corporation (ETC).

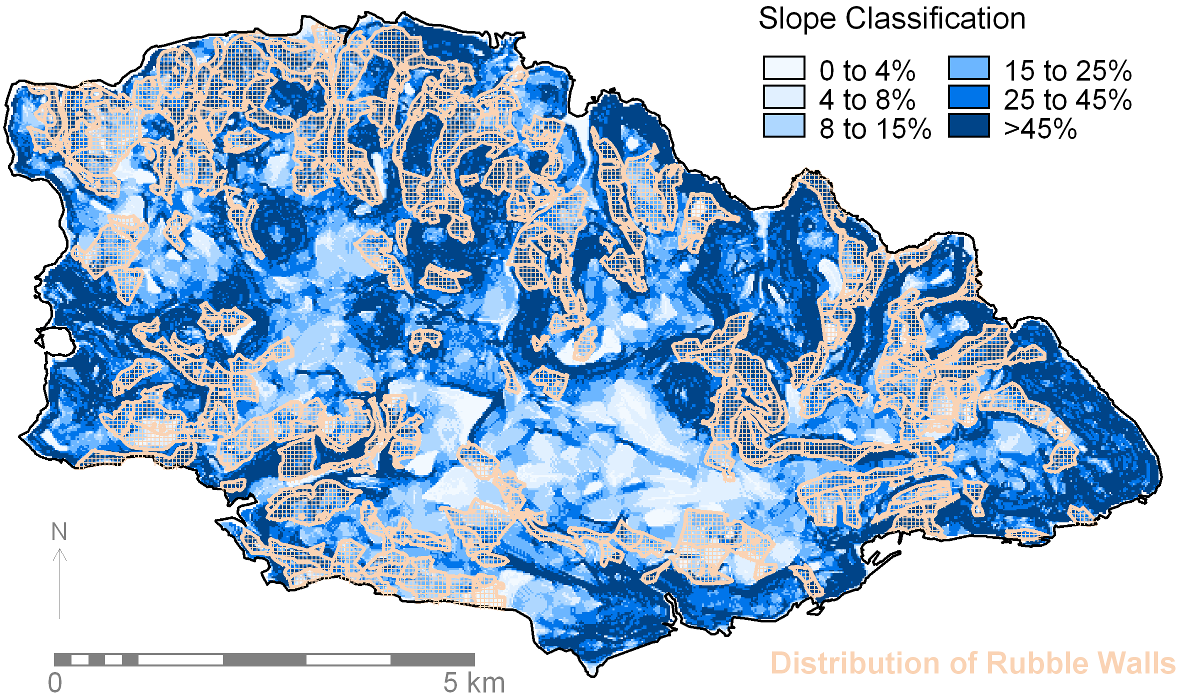
The many faces of rubble walls

The specific characteristics of the traditional rubble walls are such that they not only support the agriculture for which they are built, but in doing so they are also minimising human impact and in many aspects helping to improve the local natural resources. The different beneficial aspects of rubble walls can be appreciated through the many 'faces' they adopt as land developers, soil formation supporters, water collectors and walls of life.

Land Developers. The northern part of Malta and Gozo has a hilly topography. This makes agriculture hard since slopes increase water run-off and soil erosion, leaving the land depleted of its natural resources and difficult to manage. Slopes with an inclination higher than 15% are considered to be agriculturally challenging. Figures obtained from a slope map of Gozo show that 58% of the island has a slope of 15% or higher. Without the use of rubble walls and terracing this terrain would be considered as too demanding and tough to cultivate!

Slope Range Categories (%)	0-4	4-8	8-15	15-25	25-45	>45
Agricultural fields with rubble walls (km2)	0.40	0.80	2.20	3.50	5.20	7.90

Table 1: *Surface area of agricultural fields in Gozo in relation to slope categories.*



Map 1: *Distribution of rubble walls in Gozo in relation to slope categories.*

Agriculture is important for the economy of Gozo. In fact, 48.4 km^2 is arable land, which represents 72% of the island. Nearly half of this arable land, 20 km^2, is taken up by terraced fields supported by rubble walls. Figure 9 shows that the majority of these rubble walls are found along the steepest slopes on the island. This highlights the importance of rubble walls in **maximising the surface area available for agriculture** in hilly areas.

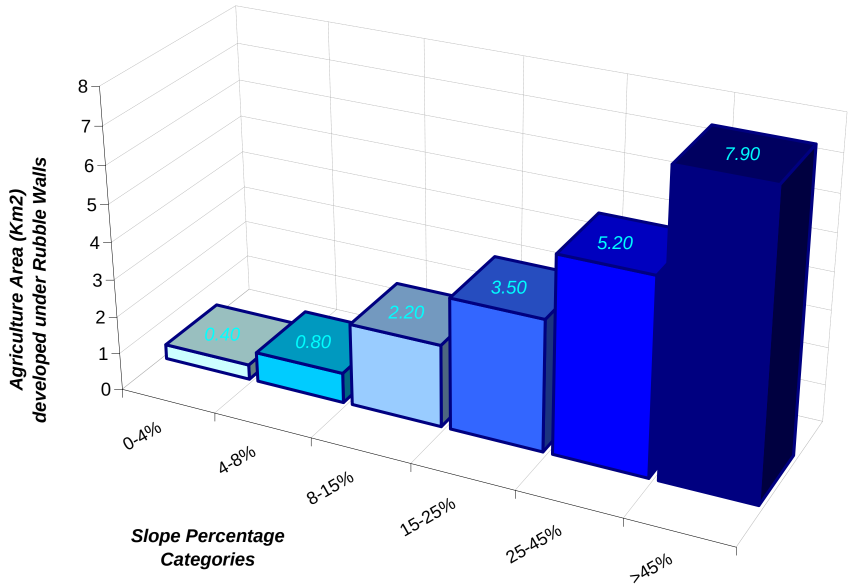


Fig.9: *Graphical representation of figures presented in Table 1.*

Soil Formation Supporters. A longer-term function of rubble walls is to assist in the process of soil formation which in turn increases the local agricultural productivity. Soil productivity depends on specific soil characteristics such as texture, organic matter content, conductivity, pH level and soil moisture. When productivity is related to agricultural production, these are referred to as the edaphological properties of the soil.

After a rubble wall is built, the space created between the wall and the slope is refilled with the soil previously removed. Initially, the edaphological characteristics of this newly displaced soil are not yet well developed. The process of soil formation requires time for the soil horizons to reach the best edaphological characteristics. Rubble walls support the conditions required for soil formation in that they allow for crops to be cultivated and help in retaining soil moisture. In the long-term, the inputs of crop residues (roots, stubble etc.) and natural fertilizers build up the characteristics of the soil, consequently increasing its productivity. Therefore, if the field created behind the rubble wall is well managed, the edaphological characteristics and the agricultural productivity of the soil can be greatly improved over the years.

Fig.10: *Stubble, an important agricultural input for soil formation (Wied Għomor, Malta).*

Water Collectors. The role of rubble walls in relation to the hydrological cycle is also worth considering. As mentioned earlier, most of the rubble walls are found on slopes greater than 15%. In areas with steep slopes, rainwater runs quickly down the slopes allowing little time for the runoff water to infiltrate. When terracing is used, previously sloping areas are transformed into a number of horizontal areas delineated by rubble walls. Both the terracing and the rubble walls themselves slow down the surface runoff allowing the water to infiltrate into the soil. Consequently, the soil is kept humid for a longer period of time.

It follows from the above that rubble walls may also be helping in the recharge of groundwater aquifers. The only geological formation that can be considered impermeable is the Blue Clay. Thus, in terraced fields found on the Blue Clay formation, water infiltration practically stops at soil level where the water is retained in the soil as discussed above. However, when these fields are found on the highly permeable Upper Coralline, water is allowed to infiltrate deeper to recharge the underlying aquifer. In both scenarios, rubble walls are retarding the flow of surface water runoff, which would otherwise be lost into the sea. Thus by **increasing the infiltration capacity** of the terraced areas, Rubble walls are also increasing the natural renewable water resources of the area.

Walls of Life. Rubble Walls built using traditional methods and materials provide an important habitat for a variety of local flora and fauna. In rainy winters rubble walls are wet to the core. During drier periods, the infill, '*mazkan'*, is able to retain moisture for a long period of time, providing a varied environment with different gradients of humidity, ranging from very damp at the bottom of the wall to very dry at the top (Ellul, 2005). This allows for different species of flora to grow and establish their roots alongside and within the cavities of the rubble walls.

The plants growing on or beside rubble walls are mostly the more widespread species of herbs, shrubs and trees of the Mediterranean region. To mention a few; plant species include the Maidenhair Fern, 'Tursin il-bir', (*Adiantum capillus-veneris*), the Sweet Alison, 'Buttuniera' (*Lobularia maritime*), Spiny Asparagus, 'Spraġ Xewwieki', (*Asparagus aphyllus*), and the Caper, 'Kappara', (*Capparis orientalis*), whilst the Fig Tree, 'Sigra tat-tin', (*Ficus carica*), and the Prickly Pear, 'Bajtar tax-Xewk', (*Opuntia ficus-indica*) are often seen growing close to these walls.

Fig.11: *Caper, 'Kappara'.*

Fig.12: *Spiny asparagus, 'Sprag Xewwieki'.*

The natural fissures and cavities found in between the rough stones used to build these walls also provide shelter for many small animals. Ellul (2005) provides an interesting list of fauna that inhabit or make use of these rubble walls for various reasons. Among others, the list includes the Maltese Wall Lizard that lives in these walls, the Gecko which uses the wall to live and to build its nest, the Edible Snail which is attracted to the cool dampness of the wall in summer, the Spider which looks for food in this wall and the Weasel which nests in these walls.

Fig.13: *Moorish Gecko , 'Wiżgħa tal-kampanja'.*

Fig.14: *Edible Snail, 'Għakrux raġel'.*

Furthermore, as the Rural Strategy Topic Paper (2003) points out, rubble walls surrounding fields provide a connection between distinct natural habitats. This means that rubble walls act as passageways for small animals allowing them to travel safely between the different habitats, away from the dangers of roads, hunters and predators. According to the Rural Strategy Topic Paper (2003) "Only few distinct areas characterised by natural habitats are connected with each other: this hinders enhancement and natural regeneration of natural habitats". Hence, rubble walls are supporting and preserving the local fauna and flora.

Silent Fighters against Soil Erosion

The most important role of rubble walls is undoubtedly to prevent soil erosion. Soil erosion has always been a major concern and a threat to the sustainability of the local agricultural sector. In the Maltese Islands soil is a limited resource, and except for the fertile agricultural land found in valleys, soils are usually very shallow ranging in depths from 20 to about 60 cm. Additionally, a recent increase in urban development, especially on the mainland, has led to the loss of important natural and agricultural land, with the consequent loss of valuable natural habitats and precious soils.

The soil erosion process is related to soil fertility loss and vegetation cover reduction, both of which play a central part in the larger framework of the process of desertification, which in turn leads to a devastating consequence: irreversible resource loss. Futhermore, given that the Maltese Islands have a typical Mediterranean karst setting characterized by young and shallow soils, it is important to point out that soil erosion usually results in more dramatic impacts in karst environments.
Soil conservation practices such as the use of rubble walls can be employed effectively to combat the processes leading to soil erosion, and eventually desertification.

To appreciate how rubble walls combat soil erosion we look at the parameters that are involved in this process. The Universal Soil Loss Equation (Wischmeier, 1978), is the most comprehensive technique available to estimate cropland erosion at the field level. The soil erosion rate (A) is calculated using six major factors, namely rainfall erosiveness (R), soil erodibility (K), slope steepness (S), slope length (L), cropping management techniques (C) and supporting conservation practices (P): $A = R \times K \times S \times L \times C \times P$.

Fig.15: *Terraced fields cutting through a steep slope (Xlendi Valley, Gozo).*

One of the principal factors affecting soil erosion is rainfall (R), even more so if we consider the Mediterranean climate which usually brings sudden and heavy showers in autumn when vegetation cover is scarce. When rainfall reaches the ground, raindrops hit the soil surface producing minuscule cracks, the magnitude of which depends on the soil erodibility (K). The broken soil particles are now more prone to be carried away by the surface runoff produced during rain storms. The amount of soil carried away in such conditions is also affected by the slope factor (S) and the distance covered down the slope (L). The USLE equation implies that the higher the value of any of the factors, the higher the soil erosion rate. Conversely, the reduction of the value of any of the factors through cropping management techniques (C) and conservation practices (P) will result in a decrease in the rate of soil erosion. Conservation practices, such as terracing and rubble walls, do not only affect the P values in the equation, but are also decreasing the topographical factors of slope gradient and length, two very important parameters for the calculation of the soil erosion rate at the field level!

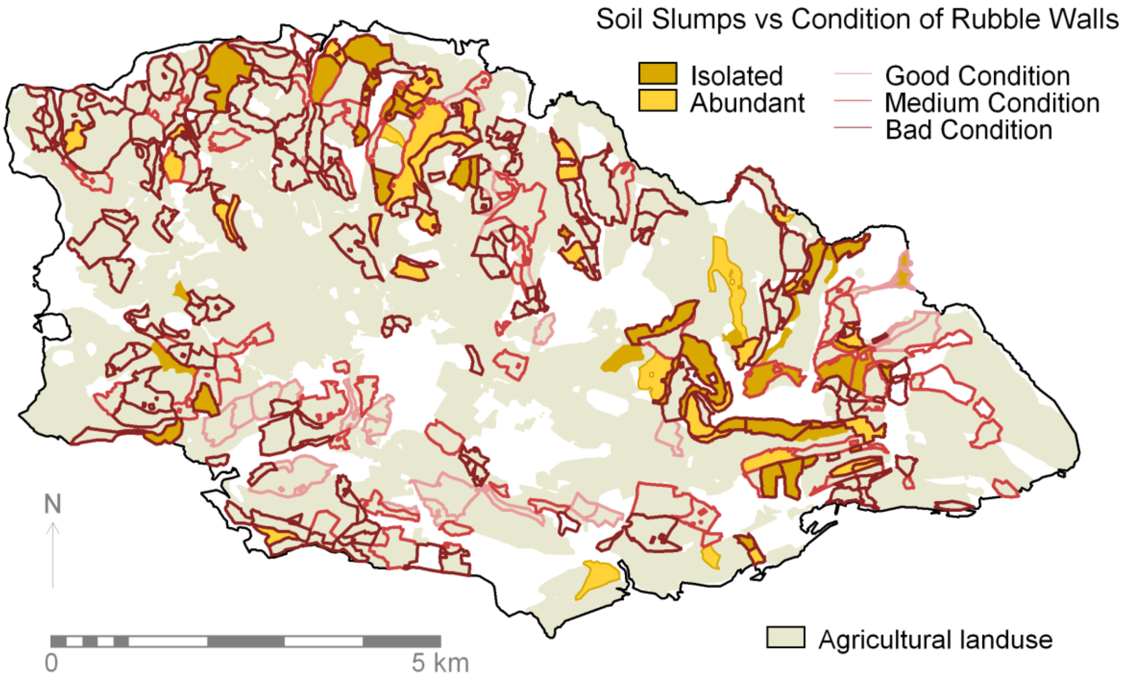
The USLE estimate is intended to highlight the importance of soil conservation practices and to enable "farmers and conservation advisers to select combinations of land use, cropping practices, and soil conservation practices, which will keep the soil loss down to an acceptable level - in today's terms it would be said to ensure that the farming system is sustainable" (Hudson, 1993). The first local farmers who built and maintained terraces and rubble walls clearly used their knowledge of the land to tackle the soil erosion problem in a very effective manner. Sadly, today, very few people recognize the importance of these conservation practices, and most of the terraced fields and rubble walls are not adequately maintained at the risk of losing a precious resource which has been painstakingly protected for several hundreds of years.

Fig.16: *Soil slumps are observed in the upper terrace. Lower terraces show better maintained rubble walls (Wied Għemieri, Malta).*

A field survey of rubble walls in Gozo carried out by IRMCo in 1999 in the context of the EU-sponsored International Cooperation (INCO) Project entitled *ResManMed:* Resource Management in Karstic Areas of the Coastal Regions of the Mediterranean, proved very enlightening in assessing the relationship between the condition of the rubble walls and the areas affected by soil erosion. The rubble walls were classified according to their condition, i.e. good, medium or bad. In parallel to this, the occurrence of soil slumps at the field level was recorded according to the following categories: isolated or abundant.

As shown in Map 2, the occurrence of soil slumps correlates extremely well with the condition of the rubble walls on the island. The map clearly reveals that rubble walls in poor condition were found predominantly in areas where a high incidence of soil slumps had been recorded. Figure 17 confirms that walls in good condition presented practically no soil slump occurrence. Both illustrations highlight the significance of well-maintained rubble walls as a conservation practice to combat soil movement and soil loss.

Map 2: *Occurrence of soil slumps in relation to the condition of rubble walls in Gozo.*



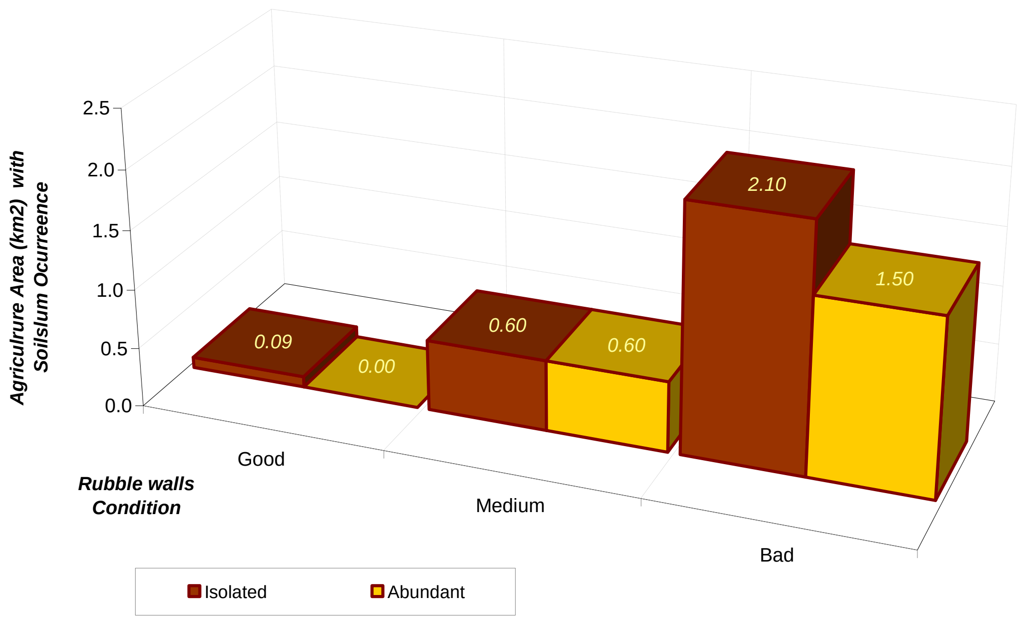


Fig.17: *Graphical representation of the information presented in Map 2.*

In recent decades, there has been a steady loss of rubble walls, mostly because of the loss of land due to development (buildings, roads, quarries etc.). At the same time, the traditional knowledge is being lost with the decline in the local farming community. While legislation does require that these walls are adequately maintained, it is unfortunate that a poor condition of these walls can be witnessed in many areas in Malta and Gozo. The Rural Strategy Topic Paper (MEPA, 2003) acknowledges that bad practices in wall maintenance have resulted in the loss or damage to the traditional rubble walls. These bad practices refer to the addition of new materials or new building methods without the proper consideration or understanding of the important functions of the rubble walls. The document insists on the importance of providing further control and guidance with respect to the maintenance, rebuilding and construction of traditional rubble walls.

The rubble walls have been providing us with huge benefits throughout the centuries.

*Let's take good care of **our ancestral country allies!***

References

Borg, J.J. et al. 2007. 'Nature in Gozo'. Birdlife, Malta.

Ellul, E. 2005. Il-Ħitan tas-Sejjieħ. Klabb Kotba Maltin, Malta.

Government of Malta 1973. Fertile Soil (Preservation) Act (1973) Chapter 236 found at http://docs.justice.gov.mt/lom/legislation/english/leg/vol_5/chapt236.pdf accessed 1/8/2008.

Government of Malta 1997. Rubble Walls and Rural Structures (Conservation and Maintenance) Regulations – LN 160, 1997, (amended LN 169, 2004). Malta.

Haslam, S. M. & Borg, J. 2002. Let's Go and Look After Our Nature, Our Heritage!. Ministry of Agriculture & Fisheries – Socjeta Agraria, Malta.

Hudson, N. W. 1993. Field Measurement of Soil Erosion and Runoff. Silsoe Associates, UK. FAO, Rome found at www.fao.org/docrep/t0848e/t0848e-12.htm#TopOfPage accessed on 6/8/2008.

MEPA 2002. National report on the implementation of the United Nations Convention to combat desertification. MEPA, Malta.

MEPA 2003. Rural Strategy Topic Paper – Volume 1, Final Draft found at http://www.mepa.org.mt/planning/factbk/SubStudies/RuralTP/Rural_TP.pdf accessed on 1/8/2008

MEPA 2006. State of the Environment Report for Malta – Sub Report 4: Land'. MEPA, Malta.

Ministry for the Development of Infrastructure, Planning Division, 1990. Structure Plan for the Maltese Islands. Malta.

ResManMed, unpubl. Interim and Final Reports on the INCO-DC project ERBIC18CT970151, Resource Management in Karstic Areas of Coastal Regions of the Mediterranean, 1997-2000.

Sammut, S. 2005. State of the Environment Report for Malta – Background Report on Soil. MEPA, Malta.

Wischmeier, W. H. & Smith, D. D. 1978. Predicting Rainfall Erosion Losses – a guide to conservation planning. U. Department of Agriculture, Agriculture Handbook No. 537, U.S.