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Soil Conservation from Scientific and Islamic Perspectives

Pemuliharaan Tanah dari Perspektif Saintifik dan Islam

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ABSTRACT

The problem of soil erosion and degradation has become a serious global issue that can threaten the environment, economic, and humans, signaling that soil conservation is a need. In this study, the approaches for soil conservation are examined from both an Islamic and a scientific angle. It looks at Islamic fiqh's guiding principles and teachings that place an emphasis on sustainable practises and good stewardship of soil resources. To find evidence-based strategies that support Islamic principles, scientific knowledge, and expertise in soil science and land management are also reviewed. In order to improve soil health and fertility, the study emphasises the significance of combining stewardship, over exploitation, and environmental harm avoidance into land management and agricultural practises. Combining Islamic and scientific viewpoints offers a comprehensive strategy for soil preservation that takes into account both ethical and ecological issues. Hence, this study is conducted by qualitative literature review methods in collecting data and information, while data analysis methods used are qualitative content analysis and comparative analysis method.

Keywords: Soil conservation; Islamic perspective; Scientific perspective; soil erosion; degradation

INTRODUCTION

Soil and water resources are always being relied upon by other organisms and human civilizations. The historical records have proven this when most of the early human civilizations were located in the location that were rich in soil (Plaster, 2009). History had also shown that mismanagement of soil resources can bring negative effects not only towards environment, but also human may be affected by malnutrition, poverty, and economic problems (Bezdicek, 1996).

Soils are one of the most vital non-renewable resources as it provides various ecosystem services where it functions as habitat for organisms, essential in nutrient cycling, and medium for plant growth. Biodiversity also may be affected if the soil quality is degraded and not conserved. So, soil can be said as the basic of all resources, however it is finite. Therefore, the conservation of soil is important as it can serve as an aspect of sustainable development in protecting human health, agricultural activity, and environmental quality.

United Nations Environment Programme reported that by 2014, about 23% of usable land on earth was degraded. The degradation is due to anthropogenic activities that introduce various pollutants such as minerals, metals, nutrients, pesticides, and pathogens that are suspended in the soil. This will then lead to water and air pollution by the water runoff and soil particles blown away by the winds (Diem, 2023). Soil erosion and degradation also cause food security issues where the agricultural crops and

harvest decrease over the time. The effects of this issue might not be experienced by us today, but the future will be badly affected as the world population will be doubled every 40 years, yet the percentage of usable land for agriculture is only about 7%, including those that had been lost to urbanization and degradation (Plaster, 2009).

In recent years, the interest about soil conservation has grown from both scientific and religious perspectives. The objective is the same which is to preserve and conserve natural resources. This is because there is a need to tackle the issue of soil conservation from both perspectives.

From an Islamic perspective, the concept of environmental protection and sustainable development are in line with Islamic teachings. Humans are related to soil and clay as it is stated in the verses of al-Quran that humans are created from those components. In Islam, humans are the servants of Allah SWT and Allah SWT has bestowed upon humans the responsibility as a steward for the Earth and its resources. There are many Quranic verses and Hadith that mention about the conservation as a whole and related to soil conservation. This can be said as the principles that Allah SWT decided upon humans in conserving the resources. Some practices from Islamic history have also proven that Islam has always concern about soil conservation.No section of methodology, or a paragrapgh explaninig the method of data collection and data analysis, please include method in the article

LITERATURE REVIEW

Soil conservation is a serious global issue that needs to be tended as an emergency, as the soil degradation has affected 33% of the earth's land globally (Lal, 2015). Ignorance about this issue can lead to other problems that may threaten not only the environment and economy, but humans will also be affected.

Therefore, this research will review some books and articles that are related to soil conservation and management from throughout the years and from the Islamic history and teachings that are beneficial in conserving and sustaining the soil.

Definitions

The soil definitions can vary from different perspectives. Some people define it based on their understanding and the usage of the soil to them. Farmers define soil and land as the same thing, which is a medium for plant growth because that is the function of soil to them. Even professionals are different in defining soils based on their subjects. Definitions by geologists can vary from the definitions by engineers. The words that indicate soils and land can also be seen in the Quran in some verses and also in Hadith, which also brings some definition of the soil itself. Those definitions show the diversities in understanding the soil, but they only cover some small parts of the soils itself based on their perspective. Thus, there is a need to understand the soils before going into the conservation.

Scientific Definition of Soil

Different science fields define soils differently. In soil science studies, soil is defined to be a 3-dimensional component. Their definition of soil is it is an unconsolidated substance found on the surface of the earth that has developed through intricate pedogenic processes through organic and mineral amalgamation. It has acquired different morphological, physical, chemical, and biological characteristics, and it has developed the ability to support vegetation and other life forms. It is both an ecosystem itself and a component of larger terrestrial ecosystems (Khan, 2013).

According to Hartemink (2016), soils are a 4-dimensional system that connects to the atmosphere, lithosphere, hydrosphere, and biosphere. Soil is defined as a living entity that consists of solids, water, and air. Most of it are present in the open systems and outside, and some in the shallow lakes and pavement. The soils are made mostly of a mixture of sand, clay, and silt as inorganic components, rocks, and organic materials that are dead or alive. Soils are systematically distributed across the earth, making every horizon has different type of soils component and it change over time. Soils can function

to store and transform energy and matter, it can support vegetation, habitat for terrestrial lives and help in producing our food. It can be said to be an integral part of the natural world and can affect the climate, litosphere and hydrosphere ecosystems.

Hartemink (2016) also defines the soil for the layperson as the complex mixtures of minerals and biological components that made up the thin layer that covers the earth and it has countless varieties and kinds. It is a vital natural resource and a very important component of the earth system.

Van (2017) defined soil as the layer that consists mostly of loose minerals and organic materials that can be affected by physical, chemical, and biological processes at the planetary surface and it has the ability to hold liquids, gases, biota, and support plants.

However, the definition of soil needs to conclude the economic values as it will be beneficial towards the objective of effective soil governance to promote conservation. The definition that fits the criteria is soil is an economic resource that deeply influences the social and political systems (Dazzi & Papa, 2022).

Based on the definitions above, soils can be concluded as a type of substances that exist on earth's surface or is made on the top surface of the earth, that consists of organic materials and minerals, has many characteristics that vary and it is an important and a vital resource.

Islamic Definitions of Soil

In Islam, Arabic language is very important as the guidance bestowed upon us is in Arabic language in the form of the Quran and Hadith (Mohammad Zaki, 2021). Thus it is appropriate to explore the meaning of soil from the Arabic language. In Arabic, there are many words that can be interpreted as soil, and some of the words are intertwined with land and earth in some contexts (Mikdar Rusdi, 2010). The terms that are used are as stated in Table 1, but the terms that generally refer to soil in Arabic are *al-Turab* "التراب" or *al-Thin* "الطين" (Muhammad Mushfique, 2017). Turab can be defined as soft soil on the surface of the earth or dust and some define it as dust while *al-Thin* is defined as mud or clay.

Table 1: The Terms Related to Soil in Arabic and Its Meaning

The words	transliteration	Meanings
التراب	*Al-Turab*	Soft soil on earth surface, the earth surface, dust
الطين	*Al-Tin*	Mud or clay
الارض	*Al-Ard*	The earth
الصلصل	*Al-Shalshaal*	Clay
الصعيد	*Al-Sha'id*	Highland, plateu
الثرى	*Al-Thara*	Surface of earth

It is important to know the Arabic terms that are used for soil to explore the Quranic and Hadith which mentions about soil despite some of the mentions need further interpretation by scholars.

Definition of Conservation

Conservation can be broadly defined as actions that are intended to establish, improve, or maintain good relations with nature which indicates that the actions are active and able to create new and better relationships with nature (Sandbrook, 2015).

The act of conservation is to use the natural resources and the environment wisely. It includes to focus on the sustainability of the resources by maximizing their usage and benefits without compromising the future of those resources. In other words, it is the act to ensure that the resources can benefit humans for as long as possible (Harris & Rolf, 2023).

Another perspective on the word conservation is to make something remain in its original state, unchanged, and protected from annihilation. This comes from the word sustainability and relates to human's effort to defend and protect the nature (Riatno, 2017).

Soil Conservation

Soil conservation can be defined as the practice of utilizing the soil for agricultural and cultivation methods that focus on preserving soil quality and minimizing the erosion that is caused by the practices (Diem, 2023). Traditionally, soil conservation is being discussed for protecting the soil for crop production. However, nowadays the scope is getting bigger, which includes the benefits to increase crop yields, reducing pollution, and mitigation greenhouse gas concentration in the atmosphere (Blanco and Lal, 2008).

Soil conservation is more focusing on earth's land uses for agricultural purposes. For a long time, traditional methods for agriculture have been practiced. The practices of ploughing and tilling have been shown to cause the soil to be degraded and about 24% of agricultural land is degraded globally. As technology and knowledge advance, these traditional practices are being replaced slowly by methods that focus more on improving and conserving the soil quality whilst improving productivity, profits, and benefits (Dumanski & Peiretti ,2013).

Importance of soil

Soil is a very important component of our world. It can be said as the most basic and fundamental resources of earth. It serves the world in many ways. First is as the ecological support for life on earth as it can support plant growth (Plaster, 2009). Soil also functions as recycling and detoxification media for organic matter (Bezdiek et al, 1996). Soil can also act as the storage for gases especially carbon, and soils are the second largest carbon sink and it sequester 80% of the global terrestrial carbon underground and contribute to nutrient cycling. Soils are also important as a supplier for water, nutrient and anchorage especially for plant growth. For humans, the functions of soil are not only for agriculture use, but non-agriculture sector also benefitted from the soil such as construction sector where it serves as building materials and for recreation purpose (Plaster, 2009). Therefore, the good practices and governance of soil usage are important as mismanagement of soil can cause various negative effects towards environmental and human.

Human and Soil from Islamic perspective

Importance of Soil from Islamic views

The relationship of humans and soils cannot be fathom. Even nowadays, soil that are sometimes called as dirt are essential in humans' life. Allah SWT stated in the al-Quran about the importance of soil towards human in many verses. One of them are as a place to reside as stated in Surah al-Mursalat, verse 25-26,

"Have We not made the earth a lodging, for the living and the dead" (77: 25-26)

Then, in *Surah al-A'raf,* verse 58, Allah SAW emphasize the importance of protecting land and soil as the source for food,

> *"The fertile land produces abundantly by the Will of its Lord, whereas the infertile land hardly produces anything. This is how We vary ˹Our˺ lessons to those who are thankful." (7:58)*

And there are many other verses about the use of land and soil (Hazura and Sharifah, 2007).

The importance of soil in Islam is not only for their usage in our daily life, but in terms of *Fiqh*, soil is important for cleanliness or purification, or also called as *taharah*. One of them is the use of soil for cleaning *najis mughallazhah,* where soil solution is included as one of seven times of washing for the parts that are affected by the *najis* or excrement of pig and dog. The soil properties made it as an important medium that are able to eliminate and clean the bacteria found in those excrement (Ashab & Erni, 2021).

The other used of soil in *fiqh taharah* is soil dust usage as a medium for tayammum. Tayammum is an essential knowledge for Muslims as tayammum affects our prayers, for it is a substitute for ablution. This is based on a verse in Surah al-Maidah, verse 6:

> *"...And if you are in a state of ˹full˺ impurity,[1] then take a full bath. But if you are ill, on a journey, or have relieved yourselves, or have been intimate with your wives and cannot find water, then purify yourselves with clean earth by wiping your faces and hands..."*

Here we can see that the dust and soil that are used for purification and tayammum must be the clean one. The function of soil as purifier are also mentioned in some hadith, one of them is from Hudzaifah al-Yaman RA, he said that Rasulullah SAW said:

> *"We have been made to excel (other) people in three (things): Our rows have been made like the rows of the angels and the whole earth has been made a mosque for us, and its dust has been made a purifier for us in case water is not available. And he mentioned another characteristic too"*
>
> (Sahih Muslim, no. 522)

From these evidences, we can see that the importance of soil is wide and include various aspects, whether in aspects of life or connection of human and Allah SWT.

Soil and Humans' Origin

In Islam, the relationship is more important. Allah SWT has stated in the al-Quran that humans are created from the soil and clay. The understanding of the human creation by the soil is very important as it will bring us awareness on the importance of soil. In the al-Quran, there are 18 verses that are related to the origin of humans from the soil. From those verses, five words are used that are related to the soil, each with a different meaning. The first word is *al-Ard,* that are mentioned in surah al-Najm, verse 32. Islamic scholars defined the words as the whole earth, that includes the surface and the below. Some scholars define it more specifically with the meaning of the soil on earth surface, as it is the widest area that covers the earth. Scholars relates the word *Ard* , as earth and the relation with human is that human comes from earth and will be back to earth when we died. Second word is *al-Turab* or *Turab,* that are mentioned in 5 verses. Scholars defined the words with the meaning of soil as general, without considering the types and size of the soil. Some scholars describe the verses with this word as the creation of Prophet Adam AS while some other describe it as the origin of human that relates to the formation of sperm. Thus, it can be said that it bears the meaning of human origin from the soil generally. Third is *al-Hama',* that are mentioned in a verse. The word can be defined as mud from the definition given by previous scholars. Next is *Salsal,* which are mentioned in 2 verses in the al-Quran. The word is defined as the type of soil like dried mud or clay. *Hama'* and *Salsal,* is

described as the stage of human formation after the stage of *Tin.* The last word is *al-Tin*, that are being mentioned 7 times in the Al-Quran. *Tin* can bring some definitions, which are as a stage and types of soil in the creation of Prophet Adam AS, the characteristics of clay that becomes the test of faith, and as a element that are essential in revitalizing plants. From these verses and words, Allah SWT has used the words related to soil and earth and relates it to the origin of human, and each words have different meaning that can be interpreted in many ways (Nurul Husna Abdullah, & Mohd Sukki Othman, 2017).

From this perspective, soil can be said as a fundamental aspect of human existences and serve as a reminder towards our humble origins.

Principles for Soil Conservation

The main objective of soil conservation is to reduce soil erosion and its effects. The aim is to maximize agricultural production and its sustainability, grazing activities and recreational activities can be done in an area without any or reduced disturbance to the environment. Despite soil erosion being a natural process, anthropogenic activities can bring impact, whether to slow it down or increase the rate of erosion. So, it is our responsibility to design and strategize towards the objective.

Morgan (2005) emphasizes that the principles of soil conservation must cover a few components, which are soil cover from raindrop impacts, infiltration capacity of soil to reduce surface runoff, aggregate stability of the soil and surface roughness that aim to reduce runoff and wind velocity. Agronomic and mechanical measures have to be taken into account to cover most of the components above.

According to Braimoh and Vilek (2008), soil conservation can be divided into three stages based on the degradation that the soil experience. First is prevention that are applied to the land that still maintain its environmental and productive function and it still not exposed to degradation despite the land being prone to degradation. Second is mitigation, where it is applied to the land that has already experience degradation and the soil quality had reduced. Thus, intervention is needed. In this stage, the aims are to stop further degradation from happening and to improve the build-up of the resources and the functions. Lastly, rehabilitation is a stage where the land no longer possible to be used and being productive anymore due to being heavily degraded. In those stages, agronomic, vegetative, structural and management measure may be used for conservation practices.

Thus, it can be said that the principles of soil conservation from a scientific perspective have to include the aspect of reducing soil erosion, soil organic matter management to ensure soil nutrient and use are sustainable, agricultural practices, vegetation cover, and soil management.

In Islam, the principles of soil conservation are not stated clearly, but based on the principles of environment conservation, some principles for soil conservation can be concluded. The traditions and teachings of our Prophet SAW focused on various environmental aspects. Examples are preservation of natural resources, reclamation of land and to maintain environmental cleanliness (Bsoul et al, 2022). The first principle of conservation in Islamic teachings is the concept of guardianship or stewardship as Allah SWT mentioned in the Holy Quran that humans are referred to as *khalifah fil ard.* It means we must be the one to lead and save the nature from destruction and harm (Riatno, 2017). The second principle is exercising moderation or in this context, moderation in using and utilizing the soil resources. This is in line with the goals of sustainability (Bsoul et al, 2022). Concept of justice between creatures can also be included as a principle as Allah mentions in the Quran that all creations are praising Him and all of us must respect each other (Hazura & Sharifah, 2007). The last principle is to refrain from being extravagant and excessive in everything (Bsoul et al, 2022).

Practice concept for soil conservation

The advancements in knowledge and technology have allow a few concepts and methods to be developed and practiced for soil conservation. The approaches towards soil conservation can be divided into two, for the cultivated lands and non-cultivated lands (Morgan, 2005) as shown in figure 1 and figure 2.

Figure 1: Soil Conservation Strategies for Cultivated Lands (Morgan, 2005).

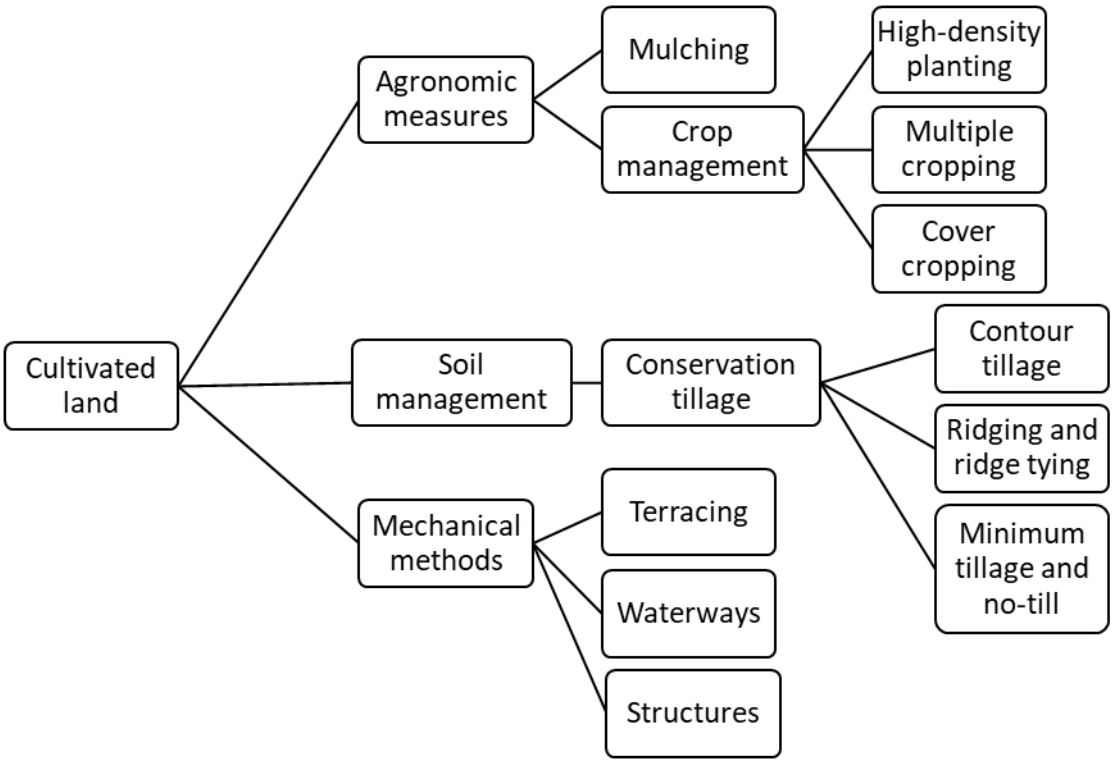
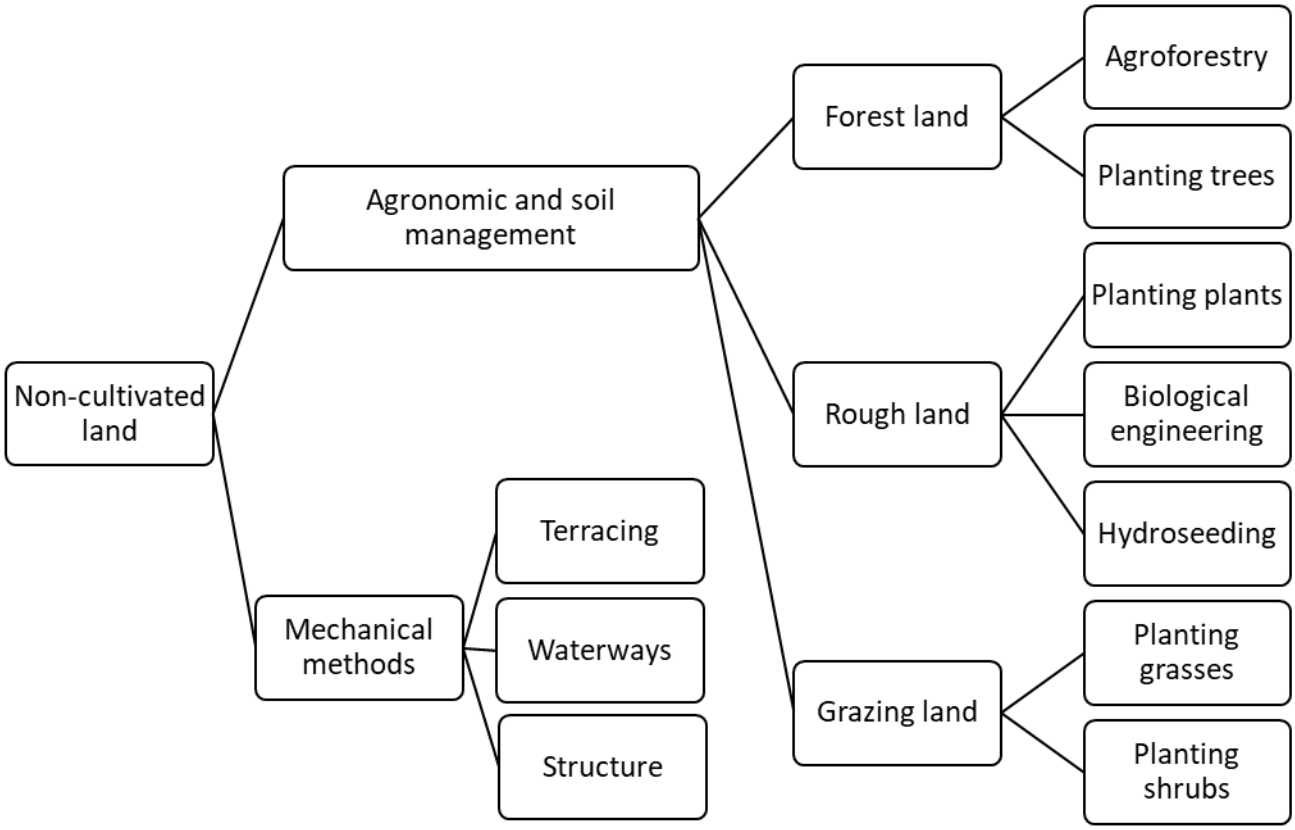


Figure 2: Soil Conservation Strategies for Non-Cultivated Lands (Morgan, 2005).



Some of the practices that are focusing more on agricultural sectors are no tillage, conservation agriculture and sustainable land management (Dumanski & Peiretti ,2013).

These modern concepts are focusing on agricultural practices as it is among the highest contributors towards soil degradation. Some of the practices are no tillage, conservation agriculture and sustainable land management (Dumanski & Peiretti ,2013).

a. No tillage: a practice of agriculture that minimize the disturbance for the soil in seeding and harvesting. For seed planting, only a small hole or a tiny slot are created on the soil for the seed planting. In harvesting, only the products which are fruits and grains are harvested, and the rest of the plant are kept on the soil surface. This way, the organic matter will accumulate for the soil and increase the soil health while reduce the cost for soil ploughing and harvesting and increase the crops yields.
b. Conservation agriculture: a series of principles that are created with the objective of conserving the soil. The four basic principles are the retention of crop residue as mulch, incorporation of cover crop in rotation cycle, use of integrated nutrient management that involves chemical and biological fertilizers, and eliminate the soil mechanical disturbances (Lal, 2015).
c. Sustainable land management: principles that are expanded from Conservation agriculture that includes the aspects of economics, markets, profits, and sustainability. This will promote a better management on soil usage and conservation. It can be defined as combination of technologies, policies and activities that integrates environmental awareness and socioeconomics.

These are the few concepts that are being applied and practiced in agricultural practices and the concepts are related to each other. However, the adoption of the principles is still being slowly adapted by the agriculture sectors as it requires knowledge and new technology in its adoption. Therefore, various agreements are being related to those principles such as United Nations Framework

Convention on Climate Change, the International Convention on Biodiversity, the International Convention to Control Desertification, and the various agreements on international waters as to promotes the principles in the agriculture sectors (Dumanski & Peiretti, 2013).

Roles of humans' stewardship in soil conservation

In soil conservation, Islamic teachings emphasizes the importance of protecting the environment and preserving natural resources for the future generations. Allah SWT has bestowed upon humans the responsibilities to be stewards on earth. This can be seen in the al-Quran, in Surah al-Baqarah, verse 30 where Allah referred to human as the caliph in earth.

> *"Remember when your Lord said to the angels, "I am going to place a successive ˹caliph˺ authority on earth." They asked ˹Allah˺, "Will You place in it someone who will spread corruption there and shed blood while we glorify Your praises and proclaim Your holiness?" Allah responded, "I know what you do not know." (2:30)*

From the verse, it is stated that the meaning of caliphate contains 4 elements, which are the man, the universe, the relationship between the two and responsibility from Allah SWT. The continuous relationship between humans and environment will deepen love towards each other as it will bring consciousness on the concept of equality of creatures. Thus, humans as the most dominant creature on earth and the one with the gift of *Aql* and knowledge, are required to be the leader in establishing the principles that can bring prosperity and peace to the nature (Riatno, 2017).

Soil practices in Islamic civilisation

During the pinnacle of Islamic civilization in Middle Ages, the knowledge of science, mathematics and technology are dominated by the Muslims. The advancement in agricultural science and soil science are developed from the previous civilizations' knowledge and records. There are many agricultural practices that are performed in the age to maximise the crop yields. Some of the practices are even harming the soil itself while others are more beneficial. Based on the records, *Ibn Wahshiya* said that the earth or soil will not always be the same as it changes over time and the changes are affected by its cultivators. They also identify each type of soil and the suitable plants for each of them based on records on *Ibn Bassal's* text. This has allowed them to maximise the usage of soil for the agricultural purposes (Zaimeche, 2001).

Other practice is the usage of agricultural calendar in 10th century, where there are tasks distributed monthly with the objective to prepare the soil for agricultural use. The calendar was developed in Cordoba; thus, its name is the Calendar of Cordoba that aids the agriculture sector.

The practice of "*"hima"*" has also being practiced by the Islamic community, even from the age of Rasulullah SAW and his companions. This practice has dated back to from the comings of Islam in the Arab Peninsular. *"hima"* is define literally as a prohibited or protected areas. It is a system where an area of land which are prosperous in plants and grass, are prohibited by the rulers of the area or the owner of the land prohibited any activities that are related to agriculture and grazing to protect the fertility and for regrowth purpose. Some findings stated that the harvest of the grasses and plant are allowed after a certain period, and the harvested crops are then feed for the animal farm but the act of direct grazing from the area of *"hima"* is prohibited. While other findings stated that grazing activities are allowed for a certain animals based on the numbers and types. In modern understandings, *"hima"* can be define as a reserve area, where an area is protected by laws which prohibited from being used for commercial production. In Malaysia, there are many reserves area that are being benefited by the communities from recreation and tourism activities, such as Pahang National Park and Royal Belum Forest Reserve. These areas are protected by various laws to protect its resources and biodiversity. In short, the practice of reserving areas is beneficial not only from reserving resources for futures but also to protect the biodiversity and promote sustainability (Mohd Takiyuddin, et. al., 2023).

The practice of *waqf* can also be implemented towards soil conservation. Waqf can be defined as a perpetual or temporary holding of an asset that are able to produces repeated services, products, or revenues or an objective of general or private righteousness (Khalifah Ali and Salina Kassim, 2020). Waqf assets are recognized to be perpetual and irrevocable, as it is now not belongs to the *waqif* but Allah SWT. In terms of soil conservation, concept of waqf can be applied in the form of land trust, where it is dedicated for charitable purpose such as research facilities and agricultural land (Mochammad Arif Budiman, 2011). It may also take form as funds for soil conservation programme. In managing the *waqf* properties, responsible bodies must be formed to assure the assets are used for environmental protection as its priority (Mochammad Arif Budiman, 2011).

Application of Fiqh in Soil Conservation

Natural conservation which includes soil conservation is an issue that are closely related to Islam. This is because environmental degradation can be considered as denying Allah's order to be just and compassion and one of the Islamic values. Environmental degradation also broke the human's role as stewards of the earth. Yusuf al-Qardawi stated that maintaining sutainability of life is the same as protecting 5 aspect of maqasid shari'a, which are protection of religion, life, mind, descendants and properties (Fakhri Sungit et al, 2021).

According to Imran Hayat et al (2023), Islamic environmental ethics are based from three fiqh-based ethical precept which are *maslahah mursalah* (public interest), *mizan* (balance) and *amanah* (trustworthiness). Maslahah mursalah lets the scholars to still abide with the Islamic teachings from al-Quran and Hadith while adapting the Islamic environmental ethics in this changing era. It is a concept where the goods of the community are taken into account in finding solutions, but the decision have to remain tied to the Islamic sources of al-Quran and hadith. Allah SWT concerns for the wellbeing of His creations, therefore we believe that there are guidance from Him (Jenkins, 2005). And it is our responsibilities in finding the guidance by using the Aql and ability to resonings that he bestowed upon us.

The other fiqh method is istihsan, which means to find the best arrangements in solving natural issues, including soil conservation. Istihsan open the opportunities for the Islamic scholars to apply logics and their own judgement to find the best solution for the environmental issues (Imran Hayat et al ,2023).

Based on the literature review that had been done, there are lacks of integration between Islamic studies and scientific knowledge in finding solutions towards the issue of soil conservation. The sources only look the issue from one perspective. Furthermore, many sources that focusing on Islamic perspectives are emphasizing the concept of environmental protection as a whole with less focus are given to the soil conservation and protection. Hence, the purpose of this research is to fill the gap in the previous research by focusing more on the soil aspect from Islamic perspective and integrate it with the scientific knowledge in forming a better view on soil conservations.

Therefore, integration of the previous knowledge and data from both Islamic and scientific perspective to identify the possible solutions that can be applied to tackle the issue from both perspectives. As not only the practices are important in conserving the soils, but the awareness towards human about the importance of the soil and its relation towards their faith are equally important in developing ecological ethics and awareness in their own self towards this issue.

FINDINGS AND DISCUSSIONS

Comparative Analysis

Similarities in Principles and Practices

Islamic teachings are based on the Quran and Hadith of the Prophet PBUH. The teachings have provided the followers with various guidance and instructions on interaction and relationship between humans and environment, where the aspects of soil conservation are also being discussed. Islamic

teachings are more focusing towards the ethics and human's behaviour itself in the objective of protecting and conserving the soils (Ali Mohamed Al-Damkhi, 2008). Those principles towards soil conservation are derived based on the Quran and Hadith and the opinion of the Islamic scholars.

As for scientific research and perspective, these are more dependent on factual and evident based information and opinion in soil conservation. Based on scientific research and evidence, the importance to conserve the soil are realized in 1935, when the soils are officially recognized as a limited resource (Montanarella, 2015) whereas Islamic teachings has already emphasized the issue 1400 years ago.

Both Islamic and scientific perspective might differ in the understanding and method of soil conservation, but there are some similarities in the basic principles that led to some similarities in the practices of soil conservation. These similarities can offer a thorough understanding towards a better and comprehensive strategies that integrate the two perspectives.

The first similarities between both Islamic and scientific understanding in soil conservation is the concept of stewardship of the earth (Chapin III et al, 2011, Riatno, 2017) . Both Islamic and scientific highlight this concept and believe it is humans' responsibilities to care and protect earth resources including soil resources to ensure the sustainability and the wellbeing of the future generation . This has made both Islamic teachings and scientific knowledge to search for solution and take actions towards sustainable soil practices.

Second is the significance of natural resources preservation. Even though Islamic teachings and scientific knowledge recognize different usage and importance of the soil from their perspective, both understandings realize the importance of preserving the soils. In scientific knowledge, the importance of the soils are based on the physical and chemical usage of the soil for vegetation and crops, as a carbon sink and as building materials. As for Islamic teachings, the importance of soils are not only for its physical properties and use, but also spiritually important as it is important in connecting a human with Allah due to soil and dust are used for taharah and medium that enables human to properly pray to Allah by the tayammum. Soil also serves as a reminder towards our humble origins as stated in Quran that humans are made up from clay and soil (Nurul Husna Abdullah & Mohd Sukki Othman, 2017).

Both Islamic and scientific understandings also agree on the aspect of ecological interconnections between all elements in the environment. Both believes that neglection of soil conservation issue will cause harm onto different aspects of the environment, and then to the human itself. Islamic teaching emphasizes that everything that Allah and His prophets had guide us will always bring benefits to the human and protect us from harm. In this matter, there are many Quranic verses and Hadith text that highlight the importance of natural conservation and moderation in utilizing resources. This is proven by scientific research that extensive usage of soil had caused the soil to experience degradation and erosion, then lead to other issues such as pollution and crop yield decreases.

Differences in Philosophical Foundations and Perspectives

Despite the similarities in basic principle of soil conservation for Islamic teachings and scientific knowledge, there are some differences can be pointed from their foundations and perspectives.

In Islamic teachings, the approaches for soil conservations are derived from divine revelation that are sourced from Quran and Hadith as the primary sources. This is in line with a part of environmental ethics, the divine command theory, where the commands for soil conservation are from Allah SWT and it is humans' responsibilities to follow the practices of His messengers as a guidance towards conservation practices. In contrast, scientific knowledges are derived from observation, experimentation and empirical method as sources of knowledge. It can also be said that scientific knowledges are proof-based and needs for reasonings and proof.

Islam also emphasize the importance of ethical and spiritual aspect in finding solution towards this issue as it highlights the concept of human stewardship and it is a moral duty for human to protect and care for the earth. Islamic ethics in conservation are closely related with the concept of tauhid, khalifah

and ibadah (Mohd Nor Mamat, 2002). For scientific knowledge, the ethical parts are also being discussed, but there are too many concept and ethical theories being debated and to be considered as it did not have any clear guidance and all of them are created from logical thinking such as utilitarianisms, right theories and social Darwinisms. While the ethical aspects are always being discussed, the focus are given more on the physical, chemical and biological aspects of the soil to control and mitigate the currents problems related to soil.

Islamic solutions towards soil conservation are always focusing on the human itself, as humans are the only variables that can cause changes in the environment, whether it is good or bad. Thus, the solutions take longer time to instil the sense of responsibilities in the form of Amanah to promote sustainable and longer effects of conservation. The difference that it had with scientific approach is scientific approach always focus on the problem and the solution to the problem. Zaini Ujang (1998) stated that scientific approach towards ecological issues tend to be temporary and only focusing on the current problems.

Integration of Islamic Teachings and Scientific Approach Towards Soil Conservation

Soil Conservation Practices

There are many practices of soil conservation that had been recognized by years of scientific research and observation, that varies based on the location, the type of soil and the degree of degradation that the soil had experienced. According to the concept of *maslahah mursalah* or public interest, all the practices towards soil conservations are good as it will only bring benefits to the human as well as protecting and reducing the impact of soil erosion and degradation for the sustainable use of land and soil. There are a few practices that can be closely related to the Islamic teachings.

The practice of preserving areas or forest reserve is one of the practices that are can be carried out which integrates both Islamic teachings and scientific knowledge. In Islam, the practice of reserving an area of land is called *Hima*. It is a public reserve land that had been existed in Islamic Land Law (Abdul Basir Mohamad, 2018). In the practice, the owner of the land or the government and ruler have the power to gazette an area of land for the benefits of the public as a whole. Any activity that only benefits a few parties are prohibited in the area such is the areas under Hima cannot be built on or used as commercial commodities (Mohd Takiyuddin, et. al., 2023). Any activities such as hunting, logging, forest fire and destroying the trees are strictly prohibited. The objective of this practice is to give benefits to the public and protect the area from any exploitation of resources. From scientific perspective, forest have many roles in conserving soil. Forest can act as restorer of the soils where it can renew the natural balances of erosion, soil formation and stream flow. Forest floors that are composed of litter and humus can act as sieve to filter the rainwater downward to the soil. It will also increase absorption of water into the soil and reduce runoff and water erosion. A moist soil will then be an optimum habitat for soil organisms that are important in soil building, soil holding and water storing. The intricate woven mass of tree roots in the forest that extend deep into the soil can act to bind the humus and soil into mat or ball that are able to resist air and water erosion (Mueller, 1938). The of protection and reservation of forest also concur with the maqasid syariah of protecting the mind, where people can retreat to the protected forest that are used for recreation purpose to calm their mind and appreciate Allah's creation and increase their *iman* (Khairul Azhar Meerangani, 2018).

Land waqf, as an Islamic concept, can be a means to achieve soil conservation from both Islamic and scientific perspectives. Land waqf involves dedicating land for charitable purposes, aligning with Islamic principles of stewardship and environmental preservation (Adzizah Yaakob, 2017). By dedicating land as waqf for soil conservation, it can be protected from degradation and ensure long-term soil quality and fertility. From a scientific viewpoint, land waqf enables the implementation of sustainable farming practices such as crop rotation, conservation tillage, agroforestry, and organic farming. These practices improve soil health, reduce erosion, enhance water retention, and promote sustainable land use. Moreover, land waqf can support the establishment of research and educational centers for soil conservation, fostering knowledge dissemination and training on sustainable soil management. By integrating land waqf and soil conservation, both Islamic teachings and scientific

principles are upheld, emphasizing responsible land management and the preservation of soil for the benefit of present and future generations.

Crop and vegetation managements are also being highlighted in both Islamic and scientific perspective. In scientific point of view, it is one of agronomic measures to conserve the soil and reduce erosion (Morgan, 2005). Crop and vegetation management are effective in reducing soil loss and runoff if compared to the soil management techniques (Maetens et al, 2012). In this practice, vegetation will act as protective layer and buffer between the soil and the atmosphere. Above ground components from trees and plants which are the stems and leaves can protect the soil surface from the impact of raindrops, reduce water runoff and protect the soil from being exposed to wind erosion. As for the below ground component which are root systems, can provide mechanical support to the soil by holding the soil together (Morgan, 2005). From the Islamic view, Shari'a obliged the agricultural land owner to cultivate the land. The government support also plays important role in providing resources for the land to be cultivated. This can be seen from the decision made by Khalifah Umar bin Al-Khattab where he provides the farmers the facilities to cultivate their agricultural land. And if the land owner is unable to cultivate the land, it is recommended for him to give the others the land to be cultivated (Ahmad Misbah, 2018). This is in line with the Hadith from Rasulullah SAW:

> *Narrated Abu Huraira: Rasulullah said, "Whoever has land should cultivate it himself or give it to his (Muslim) brother gratis…"*
>
> *(Sahih al-Bukhari, no. 533)*

Therefore, we can see that these are the practices that connects both scientific findings and Islamic teaching to find the solution for soil erosion and degradation and as practices for soil conservation.

Policy Implementation

Formation of policies and regulation are essential towards the goal of conservation. Implementation of soil conservation policies that integrates both Islamic teachings and scientific perspective can strengthen the formation of the policies to bring more benefits due to the policies formed will be more inclusive and appropriate besides it aligned with principles of environmental stewardship and sustainable development.

Integration of Islamic views in soil conservation policies can ensure community engagement and cultural sensitivities towards Muslim communities around the world. An 18% of world's population are influence by Islamic teachings and most of these population are located in the area where environmental problems are serious (Kula, 2001). This shows that there is importance in embedding Islamic teachings in policy making. For certain regions where the majority of the population are Muslim and the influence of Islamic teachings are strong, implementing conservation policies that integrate and emphasize the Islamic teaching can bring significant effects towards the communities. This integration will open the opportunities for the religious leaders to also take part in the effort of soil conservation and engage and educate the community to increase environmental literacy among the communities.

Islamic teachings which are more focused on ethical considerations and moral responsibilities will also beneficial in soil conservation policies. Islam highlights the importance of responsible stewardship and utilizing resources in the moderation manners, which are aligned with the sustainable use of soil and soil conservation efforts. Integration of the concept of earth and its resources as a form of *amanah* from Allah will foster a sense of moral responsibilities and inspires all parties including individuals, communities and organizations to adopt sustainable practices that can protect the soil resources (Dina M. Abdelzaher, 2019).

Integration of scientific part into policies of soil conservation apart from Islamic teachings are also important as scientific knowledge are able to provide evidence and data (Dotterweich, 2013). This will serve as an indicator in identifying the impacts of human soil use practices and recognizes the best practices towards soil conservation. The data and evidence will then function to identify the right policies to control and mitigate the soil erosion. The impacts of human activities on soil can also be

turned into data to provide an appropriate course of actions by the government towards the perpetrator that harm the soils.

Therefore, by merging Islamic teachings with scientific approaches, policymakers can establish inclusive and comprehensive frameworks for soil conservation policies. These frameworks consider cultural relevance, ethical considerations, and evidence-based practices, ultimately leading to effective policy implementation. This integration enhances community engagement, fosters moral responsibility, and ensures alignment with scientific best practices. Collaborative governance is also supported, allowing for the involvement of diverse stakeholders. The resulting policies have the potential to bring about transformative change, safeguarding soil health and promoting sustainable land management practices for both present and future generations.

CONCLUSION

This research conducted on soil conservation from both Islamic and scientific perspectives highlights the importance of responsible land use practices and sustainable agricultural techniques. Islamic teachings, rooted in the principles of stewardship and responsibility provide a valuable framework for promoting soil conservation.

The Islamic principles of stewardships, preservation, moderation and cleanliness are really important in emphasizing the human's responsibilities in protecting earth resources including soils. The Islamic community may aid in soil protection by applying these ideas to land management and farming. This viewpoint is supported by scientific understanding and methods in soil science and land management, which include evidence-based methods like conservation tillage, vegetation management and sustainable land managements that support soil health and fertility and are in line with Islamic principles. Islamic beliefs and scientific understanding are combined to produce a thorough strategy for soil preservation that takes into account both ethical and ecological issues.

In conclusion, the integration of Islamic principles with scientific approaches provides a holistic framework for soil conservation. Through responsible land use practices, efficient water management, and sustainable agriculture, we can work towards preserving soil health and fertility for present and future generations. By recognizing the value of soil resources and implementing effective conservation strategies, we can fulfill our responsibilities as stewards of the Earth, in both an Islamic and scientific context.

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