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# THE INTERTWINED RELATIONSHIP BETWEEN CLIMATE CHANGE AND AGRICULTURE FROM THE PERSPECTIVE OF ISLAM

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## ABSTRACT

Climate change poses a profound threat to global food security through extreme weather events and rising temperatures, while agricultural activities simultaneously contribute to the crisis through significant greenhouse gas emissions. This research aims to analyze the bidirectional relationship between climate change and agriculture and investigate how Islamic environmental ethics can provide a robust framework for sustainable agricultural practices. The study employs a qualitative methodology, utilizing library research and thematic content analysis of primary Islamic texts specifically the Qur'an and Hadith alongside contemporary scientific literature. The findings identify seven core Islamic principles: *Tawhīd, Khalīfah, Mīzān, Amānah, 'Adl wa Iḥsān, Adamu Isrāf wa Tabdhīr,* and Accountability as foundational ethical guidelines. These principles are found to be inherently aligned with sustainable practices such as agroforestry, crop rotation, rainwater harvesting, drip irrigation, and organic fertilization. By integrating faith-based insights with modern environmental strategies, this study offers a holistic approach to enhancing climate resilience and ensuring the long-term sustainability of the agricultural sector.

**Keywords:** Climate change, Agriculture, Islamic Environmental Ethics, Sustainable practices, Food security.

## INTRODUCTION

Climate change, characterized by long-term shifts in global weather patterns and rising temperatures, reached record levels in 2024, when global surface temperatures were 1.64°C higher than pre-industrial levels (Copernicus Climate Change Service, 2024). This shift creates an "intertwined relationship" with the agricultural sector, which acts as both a victim and a significant contributor to the crisis. While extreme weather events like floods and droughts cause significant yield reductions and threaten global food security (U.S. EPA, 2016), agricultural activities including enteric fermentation and synthetic fertilizer use account for substantial greenhouse gas emissions, particularly methane ($CH_4$) and nitrous oxide ($N_2O$) (Han et al., 2019).

The agricultural industry faces extreme risks that threaten global food security. Rising temperatures and erratic rainfall patterns disrupt traditional planting cycles and decrease crop productivity through heat stress. For example, maize yields in regions like Kenya face potential reductions of up to 25% due to these climatic shifts (Ritchie, 2024). Furthermore, extreme weather events such as floods and droughts accelerate soil degradation (Minos et al., 2026) and the proliferation of pests (Haider et al., 2025), leading to significant economic losses for farmers and instability in food prices (Saccoccia & Kuzma, 2024). In the Malaysian context, these challenges have already begun to impact the Muslim economy, specifically by reducing paddy yields below the minimum requirement (*nisab*) for agricultural zakat (Rahim et al., 2020).

Conversely, unsustainable agricultural practices significantly exacerbate global warming. Agriculture is one of the major contributors to human-caused methane ($CH_4$) emissions (Omotoso & Omotayo, 2024), which is a gas 28 times more potent at trapping heat than carbon dioxide (Mohd Yasim et al., 2025), stemming largely from enteric fermentation in livestock (Evangelista et al., 2024) and flooded rice cultivation. Additionally, the excessive use of synthetic fertilizers contributes to the release of nitrous oxide ($N_2O$), while large-scale deforestation for agribusiness releases vast amounts of stored carbon into the atmosphere (Millar, 2015).

Despite the gravity of these bidirectional impacts, current mitigation frameworks are often limited. Most modern approaches prioritize technological advancements and economic incentives, frequently overlooking the religious and ethical dimensions that govern human behavior. This research argues that this gap hinders the full potential of sustainability efforts, as faith-based ethical principles can shape decision-making more profoundly than material incentives alone.

This study aims to bridge the gap between contemporary environmental challenges and Islamic Environmental Ethics. While the specific terms like "climate change" or “sustainable agricultural practices” are not found in traditional texts, Islamic teachings provide a holistic framework through core principles: *Tawhīd, Khalīfah, Mīzān, Amānah, ‘Adl wa Iḥsān, Adamu Isrāf wa Tabdhīr*, and Accountability. By analyzing these principles, this research seeks to identify the intertwined relationship between climate change and agriculture, clarify the chosen Islamic ethical principles, and investigate sustainable agricultural practices that align with these principles. Ultimately, this research offers an ethical and practical framework to foster resilience and ensure the long-term sustainability of the agricultural sector.

## METHODOLOGY

This study employs a qualitative research design utilizing library research and documentary analysis. The research framework focuses on primary sources, including scientific literature detailing the bidirectional relationship between climate change and agriculture, literature explaining Islamic Environmental Ethics, alongside core Islamic epistemological texts, which are the Qur’an and Hadith. Data collection was conducted through a review of journal articles, and books to gather diverse perspectives on environmental impacts and sustainable agricultural practices. Observations were further integrated by reviewing practical sustainable techniques that embody Islamic ethical values. The data is processed using qualitative thematic content analysis to categorize findings into key themes. These themes align with the research objectives which are identifying the climate-agriculture nexus, clarifying foundational Islamic principles (such as *Tawhīd, Khalīfah, Mīzān, Amānah, ‘Adl wa Iḥsān, Adamu Isrāf wa Tabdhīr*, and Accountability), and investigating aligned sustainable practices.

## RESULTS & DISCUSSION

### The intertwined relationship between climate change and agriculture.

The relationship between climate change and agriculture is characterized by a complex, cyclical dependency. Agriculture is uniquely positioned as both a victim of environmental shifts and a significant contributor to the greenhouse gas (GHG) emissions that drive those shifts.

### Impacts of Climate Change on Agricultural Productivity

#### Rising temperature and extreme weather

Climate change, especially rising temperatures, has a major impact on the agricultural sector. Rising temperatures can reduce agricultural yields because crops become less productive due to heat stress (Kumar et al., 2025). It also accelerates spoilage and contamination of food, making it unsafe to eat (Kos et al., 2023). Extreme weather events such as floods and droughts are also becoming more frequent, disrupting food production and delivery, as well as increasing food prices in the market (Mirzabaev et al., 2023). Collectively, these compounding pressures severely undermine global food security and availability.

Rising temperatures affect agriculture by reducing crop yields in some areas, such as a 20-25% reduction in maize yields in Kenya. However, this effect depends on various other factors such as access to modern technology, quality seeds, fertilizers, and irrigation. Although crop yields are declining relative to the potential without climate change, they can still increase if mitigation measures are taken, including investment in technology and the development of heat and drought resistant crops. The existence of a large yield gap shows the potential to increase production even in challenging climate situations

(Ritchie, 2024).

Observing weather patterns in recent decades reveals that climate change has intensified dry and hot seasons, making extreme heat more frequent and prolonged. This has resulted in severe drought across parts of Malaysia, leading to water supply disruptions for both domestic and non-domestic users (Jamil, 2024). Furthermore, extreme heat accelerates soil moisture evaporation (Gu et al., 2025), leaving the ground dry, depleted of moisture, and resistant to plant root penetration (Jing et al., 2025).

At other times, rainfall becomes exceptionally heavy and more frequent, resulting in large-scale flooding. Based on climate change forecasts conducted by NAHRIM, approximately 9.4% of Peninsular Malaysia (covering 6,210 square kilometers) is projected to be exposed to a 100-year Average Recurrence Interval (ARI) flood by 2050, compared to 6% (3,918 square kilometers) in 2014 (Jamil, 2024). Floods exert a profound impact on agricultural production and productivity, as crops are frequently washed away and rendered unrecoverable. In regions prone to flash or river flooding, livestock such as cattle and goats, as well as pond-reared fish, are lost or adversely affected when pond infrastructure fails. Furthermore, grazing lands are severely damaged, and surviving livestock often contract illnesses due to exposure to floodwaters contaminated with infectious pathogens (ElJuwairiya, 2020). Flood disasters also deplete essential soil nutrients required for rice cultivation and induce zinc deficiencies in submerged agricultural soils, like the depletion of Zinc (Zn) in flooding environment (Mallick et al., 2025).

## Water Scarcity

Climate change causes water scarcity through interrelated mechanisms, as rising temperatures increase evaporation rates while erratic rainfall makes managing water resources difficult. Areas experiencing flooding lose water through surface runoff, whereas long droughts rapidly deplete groundwater and rivers. Furthermore, decreasing snowfall reduces summer water supplies from melting snow, and population growth heightens water demand across agriculture, industry, and domestic sectors. Combined with compromised ecosystems that can no longer store water effectively, these factors cause water supply instability, threatening food security and communities dependent on natural water sources.

Crops such as rice, wheat, and corn, which are staple foods for most of the world's population, are severely affected when rainfall becomes uneven and droughts grow more frequent. A total of 33% of these crops are grown in areas with very limited or unstable water supply. For rain-dependent crops such as corn, drought and erratic rainfall reduce yields, while irrigated crops like rice face increased pressure from competing sectors. This lack of water decreases farmers' incomes, drives up food prices, and forces farmers to use unsustainable methods such as pumping excess groundwater, which damages ecosystems in the long run (Saccoccia& Kuzma, 2024).

## Soil Degradation

Climate change accelerates land degradation through changes in temperature, rainfall patterns, and extreme weather events (Gopal et al., 2025). More frequent heavy rains cause soil erosion, when surface water carries fertile topsoil to other areas or bodies of water, reducing soil fertility (Biplab, 2025). At the same time, long droughts dry out the soil, reducing its moisture and organic matter content, making it more susceptible to erosion (Masroor et al., 2022). The increase in temperature accelerates the decomposition process of organic matter in the soil, reducing the soil's capacity to store nutrients and carbon (Yaseen, 2024), thus weakening the soil structure. This situation is exacerbated by human activities such as unsustainable land use and over-tillage, which add pressure to soil ecosystems. The combination of these factors causes loss of soil fertility, decreased crop yields, and increased risk of barren land, threatening food security and global ecosystems.

Plants such as rice (*Oryza sativa*), maize (*Zea mays*), wheat (*Triticum aestivum*), coffee (*Coffea* spp.), and soybeans (*Glycine max*) are greatly affected by soil degradation due to climate change. Rice is affected by soil erosion and loss of nutrients due to heavy rainfall, which reduces the harvest (Lal, 2009). Wheat suffers yield declines due to nitrogen and phosphorus deficiency in degraded soils, which is exacerbated by high temperatures (Yanagi, 2024). Coffee, which is grown in hillside areas, is affected by soil erosion which reduces soil fertility (Bunn et al., 2015). Soybeans, on the other hand, face the challenge of degraded land due to excessive use of fertilizers, causing a decrease in productivity (Sedibe et al., 2023). This situation shows how land degradation accelerated by climate change affects crop yields and threatens global food security (Fu et al., 2023).

**Pests and Diseases**

Climate change causes an increase in pests and diseases through changes in temperature, humidity, and weather patterns that affect the habitat and life cycle of pests (Alfizar & Nasution, 2024). Higher temperatures accelerate the reproduction of insect pests such as extend their active season (Skendžić et al., 2021). High humidity due to heavy rain provides an ideal environment for the spread of diseases such as fungi and bacteria on plants (Zhou et al., 2024). Changing wind and rain patterns also aid in the spread of disease vectors such as mosquitoes that carry viruses (Ma et al., 2022). Diseases such as rusts also spread faster in hot and humid conditions (Rehman et al., 2024). Climate change extends the active season of insect pests, allowing longer attacks on crops (Skendžić et al., 2021). This causes farmers to rely more on pesticides, increasing operating costs and the risk of environmental pollution (Tudi et al., 2021). As a result, agricultural yields decreased, affecting the global food supply and the economy of the agricultural sector.

### Livestock Productivity

Climate change has a negative impact on livestock productivity by increasing heat stress on animals. High temperatures disturb the physiological balance of livestock, reducing appetite, growth rate, and milk production. Constant heat stress also affects the reproductive system, causing a decrease in fertility rates. In addition, rising temperatures change water availability, with water shortages putting additional stress on livestock, reducing their health and metabolic efficiency. This effect is particularly felt in tropical and subtropical regions where livestock are more vulnerable to extreme climate change. It also affects livestock productivity by reducing the quality and availability of animal feed. Unpredictable droughts and heavy rains damage forage crops, reducing the amount and nutrients needed for animal growth. Changes in climate patterns also increase the spread of diseases and parasites that attack livestock, such as worms and flies. The disease causes decreased livestock health, increased mortality, and the need for more expensive treatment. As a result, production costs increase, and livestock yields decrease, threatening the survival of the livestock industry as well as global food security (Thornton et al., 2009).

## The Role of Unsustainable Agricultural Practices in Exacerbating Climate Change Impacts

### Deforestation for Agricultural Expansion (Agribusiness)

Deforestation for agricultural purposes refers to clearing or burning of forests to convert land to agricultural use (agribusiness), where land is cleared mainly for cattle ranching and animal feed crops (like soy farming to feed cattle). It is said that 90% of global deforestation is because of agricultural purposes (FAO, 2021). This deforestation activity is most carried out in tropical countries such as Brazil and Indonesia. The National Forestry Act 1984 in Malaysia for an instance, prohibits the deforestation on specific categories of land, namely alienated land, reserved land, mining land, and land under temporary occupation licence. However, the provisions of this act are limited to these specified types of land, leaving forests on other land types subject to different laws or regulations. Deforestation contributes to climate change because when forests are cut down, carbon dioxide stored in vegetation and soil is released into the atmosphere, increasing global warming. It also reduces the resilience of plants and animals to climate change, as the absence of trees disrupts the water cycle and reduces soil moisture, making ecosystems more vulnerable to drought and extreme weather disasters (Millstein, 2024).

**Monoculture Practices**

Monoculture refers to agricultural practices that grow only one type of crop in a large area, replacing a biodiverse natural landscape. Monocultures contribute to climate change by disrupting the water cycle, reducing water absorption by the soil, and weakening the ecosystem's ability to withstand disturbances such as droughts, floods, and extreme weather. The lack of root diversity in monocultures prevents water absorption at various soil depths, increasing the risk of water shortages during dry seasons. In addition, monoculture landscapes are also less resilient to fire and pest attacks, which can accelerate ecosystem damage and increase greenhouse gas emissions through land degradation and forest loss. This situation not only worsens climate change, but also affects water resources and agricultural products, threatening ecological and global economic stability (John, 2021).

### Overuse of Freshwater Resources

Freshwater overuse refers to the excessive use of fresh water for agriculture that exceeds the rate of natural renewal, which causes a shortage of water resources. This activity occurs a lot in countries such as China, India, the United States, and the Middle East, including countries such as Saudi Arabia and Libya. This excessive use of water exacerbates the effects of climate change as it reduces river flow, damages ecosystems such as wetlands, and causes water pollution with salts and chemicals. Furthermore, over-irrigated land often suffers from waterlogging and salinity, which reduces crop yields. As a result, crops and livestock become less resistant to climate change, such as water shortages and rising temperatures, due to dependence on already weak irrigation systems (FAO, 2012).

### Inefficient Irrigation Practices

Inefficient irrigation practices in agriculture, such as surface irrigation and flooding irrigation, contribute to climate change through water wastage and increased energy use. When water is wasted through evaporation or uneven distribution, water resources are affected (Mondal & Sarkar, 2025). To replace the lost water, additional energy is needed to pump and transport the water (Mondal & Sarkar, 2025), which often relies on fossil fuels. This causes the release of greenhouse gases such as carbon dioxide into the atmosphere, thus increasing the effects of climate change (Anabaraonye et al., 2021).

### Excessive Fertilizers Use

Crops cultivation often requires the excessive use of fertilizers due to soil degradation caused by climate change (Janah & Masjud, 2024). Rising temperatures and erratic rainfall accelerate soil erosion and the loss of essential nutrients such as nitrogen and phosphorus (Yanagi, 2024), which are vital for plant growth. Excessive use of nitrogen-enriched fertilizers exacerbates climate change primarily by serving as a major anthropogenic source of nitrous oxide ($N_2O$), which is a highly potent greenhouse gas (GHG). While nitrogen is an indispensable input for maintaining soil fertility and ensuring food security for the growing world population, its over-application directly increases the global concentration of $N_2O$. This specific gas contributes significantly to global warming, which in turn impacts all natural systems (Celikkol Erbas & Guven Solakoglu, 2017).

Beyond direct atmospheric warming, the intensive application of these fertilizers has doubled the rate of nitrogen input into the terrestrial nitrogen cycle. This human alteration of the nitrogen biogeochemical cycle leads to the increased transfer of nitrogen through various ecosystems, causing the acidification of soil and water and the loss of nutrients vital for long-term soil fertility. Because nitrogen fertilizer represents a form of indirect energy consumption, its inefficient use significantly raises the emission intensity of the agricultural sector. Furthermore, a problematic feedback loop exists between climate change and fertilizer use. Evidence suggests that temperature anomalies actually increase agricultural emissions because farmers often attempt to mitigate the negative impacts of extreme weather by increasing crop production inputs, such as fertilizers. This reactive behavior can lead to the excessive and inefficient use of nitrogen fertilizers, creating a cycle where climate-driven adjustments in farming practices inadvertently accelerate the original problem of global warming (Celikkol Erbas & Guven Solakoglu, 2017).

In conclusion, the cyclical relationship between climate change and agriculture highlights the need for comprehensive strategies that address both the vulnerabilities of agriculture to climate impacts and its role in exacerbating these issues. By understanding this interconnection, we lay the foundation for integrating Islamic environmental ethics and sustainable practices to foster resilience and sustainability in agricultural systems.

## Theoretical Framework of Selected Islamic Environmental Ethics

The global environmental crisis is increasingly recognized not merely as a technical or scientific failure, but as a profound ethical and spiritual crisis. While modern science offers technological solutions, the accelerating destruction of ecosystems is driven by a weakening of moral restraint and a materialist worldview that has lost its sacred perspective toward nature. Within this context, Islamic ecological theology offers a transformative moral vision, reframing the human relationship with the environment as a sacred obligation (Shiam et al., 2025). Islamic environmental ethics are rooted in a theo-centric worldview where the natural world is seen as a manifestation of Divine signs (*ayat*) and a sacred trust (*amanah*). The following literature review explores the core pillars of this ethical framework: *Tawhīd, Khalīfah, Mīzān, Amānah, 'Adl wa Iḥsān, Adamu Isrāf wa Tabdhī*r, and Accountability.

### ***Tawhīd*** **(The Principle of Divine Unity)**

The foundational pillar of Islamic environmental ethics is *Tawhīd*, the doctrine of Divine Unity (ISRA, 2016). In an ecological sense, *Tawhīd* establishes that God is the sole Creator and Owner of the universe, and therefore, all elements of the cosmos (biotic and abiotic) are interconnected and exist in a unified, harmonious system (Wani & Azhar, 2024).

*Tawhīd* rejects modern anthropocentrism, which places humans at the center of existence as absolute owners of nature. Instead, it insists upon a transcendent God who is utterly unlike His creation, making humans internally related to every other being as fellow creatures of the same Creator (Rizvi, 2010). The recognition of *Tawhīd* generates a perception that the entire Earth is a sacred space for worship (a "mosque") and a means of purification (Fakhar & Batool, 2022). All things in the heavens and the earth, from stars to trees and animals, are seen as entities that praise and glorify God in their own manner (Shiam et al., 2025). The Qur'an uses the term *ayat* (signs) to describe both its own verses and the phenomena of nature. This gives nature an equal status to revelation, serving as a proof of the Divine (Khalid, 2005). To exploit or destroy nature is thus seen as an affront to these Divine signs and a disruption of the sacred order (Shiam et al., 2025).

### ***Khalīfah*** **(The Principle of Stewardship)**

While *Tawhīd* establishes God's sovereignty, the concept of *Khalīfah* (vicegerency or stewardship) defines the specific role of humanity within the created order (Basri et al., 2025).

Humans are appointed as stewards or guardians of the Earth, not as its absolute masters or exploiters (Basri et al., 2025). This role is a delegative one, carrying a grave moral responsibility to manage natural resources with wisdom and justice (Shiam et al., 2025). Human stewardship must align with the *Fitra*, the primordial natural pattern on which God made mankind (Khalid, 2005). This implies that humans should act as custodians who prosper the Earth rather than clearing it for short-term gain. The Qur'anic portrayal of humans as *Khalīfah* is profoundly ecological, as it places moral constraints on how nature should be treated (Shiam et al., 2025). History provides cautionary tales, such as the tribes of Ad and Thamud, who faced destruction because they misused their power and violated God's laws regarding the Earth (Wani & Azhar, 2024).

### *Mīzān* (The Principle of Balance)

The principle of *Mīzān* refers to the divine balance, proportion, and equilibrium that God has woven into the fabric of the universe (Basri et al., 2025).

God created the universe in a state of perfect proportion and measure. Every segment of the natural ecosystem is highly integrated to maintain this state, where there is no inherent clash or imbalance (Islam, 2016). Humans are explicitly commanded in the Qur'an not to "transgress the balance" or upset the scales of justice and nature. Any imbalance caused by overconsumption, pollution, or exploitation is viewed as a spiritual and moral transgression (Shiam et al., 2025). The law of interdependency suggests that if humans abuse one element of the *Mīzān,* the entire natural world will suffer the consequences. This reflects the modern scientific understanding of ecosystems, where the removal of even one species can have disastrous effects on the whole (ISRA, 2016).

### *Amānah* (The Principle of Trust)

The environment is viewed as an *Amānah*, which is a Divine trust offered to humanity by the Creator (Islam, 2016). The Qur'an recounts that the Heavens, the Earth, and the Mountains refused the "Trust" because they were afraid of its weight, yet humanity accepted it (ISRA, 2016). This acceptance binds every individual to manage the Earth's resources with honesty and integrity (Islam, 2016).

*Amānah* embodies the requirement to protect natural resources for the benefit of both present and future generations (Basri et al., 2025). Humans do not have the right to exploit or destroy resources that belong ultimately to God. Meanwhile, utilizing the Earth's bounties is permitted, but it must be done with the understanding that these resources are entrusted to us for a limited time. This includes the responsibility to maintain the Earth as a source of sustenance and livelihood without causing its degradation.

### *'Adl wa Iḥsān* (Justice and Benevolence)

Islamic ethics mandate the establishment of justice *('Adl)* and the practice of benevolence *(Iḥsān)* in all interactions, including those with the natural world (Basri et al., 2025). Environmental justice requires equity in the distribution of resources. Mechanism like zakat (almsgiving) and waqf (endowments) are identified as tools to promote social and ecological well-being (Basri et al., 2025). 'Adl extends beyond human society to encompass the rights of non-human entities. Animals are described in the Qur'an as "communities like you," deserving of respect and protection (ISRA, 2016). Prophet Muhammad PBUH emphasized that "all creatures are like a family of God," and those who show mercy to living beings will be shown mercy by the Creator. Benevolence towards the environment, such as providing water to thirsty animals or planting trees that provide shade is considered a form of continuous charity (*ṣadaqah jāriyah)* (Shiam et al., 2025).

### *Adamu Isrāf wa Tabdhīr* (The Prohibition of Wastefulness)

Islam strictly prohibits extravagance *(Isrāf)* and wanton waste *(Tabdhīr)*, advocating instead for a life of moderation *(qasd or wasatiyyah)*. Modern ecological crises are often framed as a result of human greed and an inability to satisfy unlimited desires (ISRA, 2016). Islamic ethics structure human relations around limiting desires and rejecting a "desire-based morality" that fuels rampant consumerism (Rizvi, 2010). The prohibition of waste applies even when resources are plentiful. For instance, the Prophet instructed his companions not to waste water during ritual ablutions even if they were by a flowing river (ISRA, 2016). Consumption should be limited to satisfying legitimate needs. Excessive luxury and extravagant lifestyles are condemned as they create unwanted wastage and put undue pressure on Earth's limited resources (Islam, 2016).

## Accountability and *Akhirah* (The Afterlife)

The principle of accountability reinforces that humans are answerable to God for their treatment of the environment. On the Day of Resurrection, humanity will be questioned about the bounties they were given and how they managed the Earth. This includes treatment of animals, management of water, and preservation of the soil (ISRA, 2016). Corruption on land and sea is framed in the Qur'an as a consequence of "what the hands of people have earned" (Islam, 2016). Environmental degradation is thus a divine warning and a sign of moral failure. Fear of divine accountability serves as a powerful motivator for environmental care, often proving more effective than external legal enforcement alone (Shiam et al., 2025). This internalized motivation encourages a lifestyle naturally attuned to sustainability.

In summary, the principles of Islamic environmental ethics such as *Tawhīd, Khalīfah, Mīzān, Amānah, 'Adl, Adamu Isrāf,* and Accountability constitute a comprehensive moral framework for addressing contemporary ecological challenges. These principles establish that environmental stewardship is an integral part of servitude to God. By aligning human behavior with these foundational values, societies can transition from being predators of the Earth to being its honorable guardians, fostering a sustainable future grounded in spiritual and ethical integrity.

## Sustainable Agricultural Practices Aligned with Islamic Principles

Integrating faith-based insights with modern agricultural strategies offers a holistic framework for climate resilience. Agriculture, which functions as both a primary victim and a significant contributor to climate change, must be reimagined through the lens of Islamic

Environmental Ethics. By aligning technical solutions with core principles such as *Tawhīd* (Unity), *Khalīfah* (Stewardship), *Mīzān* (Balance), *Amānah* (Trust), *'Adl* (Justice), *Adamu Isrāf* (Avoidance of Waste), and Accountability, the Muslim community can foster a "green" culture that ensures long-term food security and ecological justice.

**Agroforestry**

Agroforestry is a sustainable approach that integrates crops, livestock, shrubs, and trees on the same land, allowing for positive biological interactions (Bhandari et al., 2026). In contrast to industrial monoculture, which clears vast tracts of land and releases stored carbon (Besar et al., 2020), agroforestry seeks to prosper the Earth by maintaining its natural diversity.

Agroforestry mimics the complexity of natural ecosystems, preserving the *Mīzān* (balance) between organisms. By maintaining trees alongside crops, farmers preserve soil moisture and provide wind protection (Hillbrand et al., 2017) mirroring the divinely ordained equilibrium of the cosmos. By practicing agroforestry instead of deforestation, the farmer acts as a *Khalīfah* (steward) who prospers the Earth rather than clearing it for short-term gain. This fulfills the divine command to settle and cultivate the land sustainably.

Managing multiple life forms simultaneously is an act of honesty *(Amānah)* in utilizing God's bounties. It respects the intrinsic value of every species, recognizing them as "communities" (6:38) that glorify God in their own manner. Agroforestry builds climate resilience, protecting the livelihoods of marginalized farmers who are most vulnerable to extreme weather (Prajapati et al., 2024). Ensuring that the land remains productive for future generations is an act of intergenerational justice for which the steward will be held accountable.

## Crop Rotation

Crop rotation involves the sequential planting of diverse crops on the same field to improve soil health, optimize nutrients, and break the life cycles of pests and weeds (Al-Musawi et al., 2025). Crop rotation respects the interconnectedness of the cosmos sustainably. Each plant has unique nutrient requirements; for example, nitrogen-heavy crops like corn can be followed by legumes that return nitrogen to the soil (Al-Musawi et al., 2025). This acknowledges the unified system of balance established by God. The Qur'an forbids "spreading corruption in the land after it has been set in order" (7:56). Corruption *(fasād)* in agriculture manifests as soil degradation caused by over-tilling and excessive chemical use (Begum, 2021). Crop rotation reduces dependence on energy-intensive synthetic fertilizers (Liang et al., 2023), thereby avoiding the pollution that disrupts ecological harmony.

By allowing the soil to recover naturally, farmers uphold the *Mīzān* of the Earth's fertility. This practice prevents the waste of the soil's inherent potential, aligning with the prohibition of *Isrāf* by using natural biological cycles rather than artificial inputs. Healthy, fertile soil is a manifestation of the "Signs of Allah S.W.T " (*Ayat*). By maintaining soil health through rotation, the *Khalīfah* ensures that these signs remain preserved for contemplation, recognizing that even the smallest particle of good is accounted for.

## Rainwater Harvesting

Rainwater harvesting involves collecting and storing rainwater, through tanks, rain gardens, or infiltration systems for future agricultural use (Velasco-Muñoz et al., 2019). The Qur'an identifies water as the origin of every living thing (21:30). This precious resource is a blessing *(ni'mah)* and a divine trust. Collecting rainwater is a manifestation of prudent stewardship *(Khalīfah)* and a fulfillment of the *Amānah*. Rainwater harvesting directly combats *Isrāf* (wastefulness) by capturing water that would otherwise be lost to surface runoff. Prophet Muhammad PBUH emphasized the prohibition of waste even during worship, a principle that mandates efficiency in utilizing water for crops.

As rising global temperatures increase evaporation and deplete groundwater, competition for water intensifies (Lu et al., 2025). By harvesting rainwater, farmers reduce pressure on dwindling common resources, ensuring that the rights of other "communities" (human and animal) to clean water are not infringed. Utilizing rainwater reduces the need for energy-intensive pumping from distant sources, lowering greenhouse gas emissions (Silva et al., 2022). In the Islamic worldview, this efficient resource management is an act of gratitude to Allah, where technical conservation becomes a form of worship *(ʻibādah)*.

**Drip Irrigation**

Drip irrigation delivers precise amounts of water and nutrients directly to a plant's root zone, saving up to 60% of water compared to traditional flooding methods (Khalid, 2026). Over-irrigation often leads to waterlogging and soil salinity, which degrades the land (Mohanavelu et al., 2021). Drip irrigation maintains the balance (Mīzān) of freshwater resources by preventing over-irrigation, thereby preserving the Earth's hydrological equilibrium. Utilizing technology that optimizes productivity without causing *fasād* (corruption) is an act of honesty *(Amānah)* in managing God's gifts. It promotes justice *(ʻAdl)* by ensuring water is not wasted while millions face food insecurity and water stress.

Drip irrigation reduces energy-related greenhouse gas emissions by decreasing the need to pump water at high pressure (Wang et al., 2026). This avoids the extravagance of excessive fossil fuel burning, which is a major factor in global warming. In regions like Kedah, Malaysia, climate-induced yield loss prevents farmers from meeting the minimum requirement *(nisab)* for agricultural zakat (Rahim et al., 2020). Drip irrigation stabilizes yields, ensuring that farmers can continue to fulfill their social ethical obligation of almsgiving to support the ummah.

## Organic Fertilization

Organic fertilization involves using natural materials, such as compost and animal waste to enrich the soil, avoiding synthetic nitrogen fertilizers that emit potent greenhouse gases like nitrous oxide ($N_2O$) (Lazcano et al., 2021).

Human stewardship must align with the *Fitra*, the primordial natural pattern on which God created mankind and the world. Organic fertilizers enhance the natural biological cycles of the soil (Khan et al., 2024), working with the "nature" of the Earth rather than attempting to dominate it through artificial chemistry. Excessive use of synthetic fertilizers results in nutrient leaching and the "corruption" of waterways (Kaletová et al., 2026). Organic practices prevent this environmental corruption *(fasād),* fulfilling the steward’s duty to protect life-sustaining systems.

Prophet Muhammad taught that "all creatures are like a family of God," and those who show mercy to living beings will receive mercy from the Creator. Organic farming supports healthy soil organisms and insects (Biswal et al., 2025), demonstrating benevolence *(iḥsān)* toward the non-human entities that praise God in their own manner. Every action toward the environment is a trust that must be fulfilled according to God's will. Choosing organic methods over polluting chemicals is a positive deed that will be witnessed on the Day of Judgment, where even an atom’s weight of good is accounted for.

## CONCLUSION

The integration of sustainable practices such as agroforestry, crop rotation, rainwater harvesting, drip irrigation, and organic fertilization represents a transformative moral vision where agriculture is viewed as an act of worship *(ʿibādah)*. Islamic environmental ethics move the human role from that of a "predator" to an "honorable guardian" of the Earth. By reviving the consciousness of *Tawhīd, Khalīfah*, and *Mīzān*, and adhering to the principles of *Amānah, ʿAdl, Adamu Isrāf,* and Accountability, Muslim societies can address the climate-agriculture nexus with spiritual and ethical integrity. This alignment of faith and science offers a robust pathway toward a sustainable future where humanity lives in harmony with the natural world, fulfilling its sacred role as the entrusted caretaker of God's majestic creation.

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