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1 **Sustainable livestock agriculture from Islamic perspective.**

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5 **Abstract**

6 With the impact of climate change becoming increasingly apparent, there have been calls for
7 world leaders to take measures aimed at mitigating the potential effect on the environment of
8 the rapid expansion in human population, urbanisation, deforestation, agricultural
9 development, industrialisation and the rampant burning of fossil fuels. This paper reviews
10 literature on the spiritual dimensions of environmental sustainability from an Islamic
11 perspective, with emphasis on the sustainable utilisation of agricultural resources linked to
12 production and consumption. The religious standpoint on stewardship of nature (*Khilafa*),
13 climate change and animal welfare are explored from within the Islamic scriptures to gain a
14 better understanding of sustainable development from an Islamic perspective, particularly with
15 regard to meat production. The description of humans as stewards or guardians of nature in
16 Islamic literature is a direct call from God for humanity to safeguard the natural capital in order
17 to maintain synergistic relationship between flora, fauna and other biodiversity.

18 **Keywords:**

19 Sustainable development; climate change; Islam; animal welfare; meat production; Halal;
20 Muslim.

21 **Review Methodology:**

22 Literature searches were conducted using the following terminologies; sustainable
23 development and Islam, vegetarianism from Islamic perspective, sustainable production,
24 sustainable consumption, animal welfare and Halal meat production, *Khilafa* (stewardship of
25 nature) and climate change in Islam. The Quran and Hadith were the main Islamic scriptures

26 used to understand an Islamic perspective of some of the key issues discussed. Searches for
27 academic literature were conducted through Google Scholar and Web of Science.

28 **1. Introduction**

29 The World Commission on Environment and Development [1] defines sustainable
30 development as development that meets present needs without negatively impacting the
31 prospects of future generations to meet their needs. It can be inferred from the above definition
32 that for development to be described as sustainable, it should not impede the prospects of future
33 generations from meeting their needs in both qualitative and quantitative terms.

34 From an Islamic perspective, all resources on earth were created by God for use by humans
35 and other creatures to meet their needs. The following two verses of the Quran emphasise
36 God's creations and some of the resources human and non-human animals need for sustenance:

37 *'It is Allah (God) who created the heavens and the earth and sent down rain from the sky and*
38 *produced thereby some fruits as provision for you and subjected for you the ships to sail*
39 *through the sea by His command and subjected for you the rivers'* (Quran 14:32, Sahih
40 International Translation).

41 *'And He subjected for you the sun and the moon, continuous (in orbit), and subjected for you*
42 *the night and the day'* (Quran 14:33, Sahih International Translation).

43 Ahmed [2] categorises human needs from an Islamic perspective into two aspects: the first is
44 spiritual need, which is achieved by trust or believing in God; the second is physical need,
45 which is met by utilising the resources in one's surroundings. It is the physical aspects that
46 need protection from reckless consumption by humans. Broom [3] points to the possible impact
47 of human activity on the availability of resources for non-human animals, reiterating the need
48 for humans to consider their obligations to animals in assessing their impact on the
49 environment. As a consequence of natural selection, it has been suggested that there has been

50 an evolution of moral systems in humans, nonhuman animals and other species [4-7], thereby
51 providing a basis for a symbiotic relationship between different species, which has led to the
52 creation of stable social groups.

53 Religion can arguably play a significant role in promoting positive interdependence between
54 humans, non-human animals and the environment, with a view to promoting sustainable
55 development. In the Islamic religion, for instance, the scriptures enjoin followers (Muslims) to
56 hold animal welfare in high regard, as well as acting as guardians of nature [8-10]. Haque and
57 Masri [8] reiterate the role of animal advocacy in promoting environmental sustainability and
58 argue that the Quran gives a holistic view of life which depends on the coexistence of humans,
59 flora and fauna. The authors suggest that there is a case for animal advocacy in Islam and
60 elaborate that the concept of animal advocacy is based on four integrated ecognitions;

- 61 • A belief that all non-human animals are viewed as a trust from God
- 62 • *Equigenic rights* exists and there is an expectation for it to be maintained
- 63 • Just like their human counterparts, non-human animals live in communities
- 64 • Non-human animals possess personhood

65 In the following verse of the Quran, God commands Muslims to avoid engaging in acts that
66 destroy the environment:

67 *'And do not do mischief on the earth after it has been set in harmony, and it will be for you if*
68 *ye have faith'* (*Quran 7:5, Sahih International Translation*).

69 There is a welfarist view that good farm animal welfare can promote environmental
70 sustainability through environmentally friendly arable and livestock farming systems [11].

71 Buller and Morris [11] also point out that, in addition to potentially promoting sustainability,
72 farm animals can also pose a threat to sustainability. Miele and Lever [12] echo the possible
73 effect of good animal welfare on sustainability by pointing out that recognition of animals as
74 sentient beings promotes a different moral standing of animals, by ensuring that farm animals

75 are not merely viewed as a means to an end. In some parts of the world, consumers are now
76 better informed about animal welfare, and the possible link between animal welfare and
77 sustainability. In the European Union, for instance, there is growing concern for animal welfare
78 and environmental sustainability by meat eaters, vegetarians and vegans [13-14]. This trend
79 can potentially influence consumer food choices in favour of production systems that are
80 perceived to offer better protection to animal welfare and the environment, thereby promoting
81 sustainable agriculture. Hoogland and colleagues [15] report that in recent years, an increasing
82 number of consumers have started demanding information on food production systems (on
83 food labels) in order to make informed purchasing decisions.

84 An Islamic perspective on sustainability is significant for two reasons. Firstly, Islam is the
85 fastest growing religion in the world, with the population of Muslims estimated to be 1.8 billion
86 [16]. Furthermore, many Muslims continue to migrate around the world. In fact, Bergeaud-
87 Blackler [17] cited the migration of Muslims across Europe as one of the factors influencing
88 the exponential growth of the Halal food market in Europe. According to Pew Research Centre
89 [18], over 3.7 million Muslims migrated to Europe between 2010 and 2016, mainly due to
90 conflicts in Muslim-majority countries. Secondly, some Muslim-majority countries have been
91 reported to emit significant amount of greenhouse gases, for instance, Saudi Arabia, Iran and
92 Indonesia were ranked among the top emitters of carbon dioxide by (country) [19]. In 2017,
93 Iran alone emitted a total of 0.6 metric gigatons of carbon dioxide. To put this in perspective,
94 this is equivalent to the combined total emissions of France and Italy. On the other hand, the
95 total gas (carbon dioxide) emissions of Saudi Arabia and Indonesia were 0.5 metric gigatons
96 each. In fact, the report identified China, the United States and India as the top 3 global emitters
97 of carbon dioxide, whilst Saudi Arabia, Indonesia and Iran were among the top 11 emitters.
98 When ranked per capita, Saudi Arabia was the top emitter [19].

99 As followers of the Islamic faith, and signatories to the Paris climate deal (COP21), one would
100 expect these Muslim-majority countries to proactively institute measures aimed at reducing the
101 emission of greenhouse gases. In this sense, Mangunjaya and colleagues [20] reported that
102 Indonesia gives strategic importance to Islam and derive guidance on important issues (for
103 instance sustainability) from Islamic scriptures. The authors explained that Islamic scholars in
104 Indonesia are highly respected and considered as role models, and to this end the Indonesian
105 government and other agencies work collaboratively with religious institutions with a view to
106 promoting sustainability through the work of scholars. With these collaborations, there have
107 been a series of *Fatwas* (Islamic legal rulings) issued on the importance of protecting the
108 environment. For instance, in 2007, the Indonesian Council of Ulama (a group of religious
109 scholars) issued a *Fatwa* to prohibit all forms of deforestation, bush fires and unapproved/
110 illegal mining [20]. Efforts made by Islamic scholars aimed at reducing the impact of human
111 activities on the environment has also been reported by Attalah et al., [21]. The authors
112 elaborated that Islamic scholars are able to disseminate information on environmental
113 sustainability to their congregants during the five daily prayers. In fact, Al-Sodi [22] conducted
114 a survey in Jordan to gauge the perception of respondents with regard to the effectiveness of
115 using Islamic scholars to disseminate information on environmental protection. The majority
116 of respondents (64%) thought Islamic scholars were the best means of communicating such
117 information, whilst 34% thought scholars were already performing the role.

118 The objective of this paper is to develop an Islamic perspective on sustainable livestock
119 agriculture, animal welfare and the stewardship of nature by drawing on insights from the
120 Quran and Ahadith. It further considers issues around animal welfare during Halal meat
121 production, sustainable consumption and production, as well as vegetarianism and veganism
122 among Muslims.

123 **2. Livestock production systems and environmental sustainability: an overview**

124 The impact of livestock agriculture on the environment cannot be underestimated. Large areas
125 of vegetation cover can be lost through overgrazing, which in turn reduces carbon
126 sequestration, affects biodiversity and causes land degradation. Grazing livestock also
127 contribute to greenhouse gas emissions, particularly carbon dioxide and methane. Bellarby and
128 colleagues [23] examined GHG emissions from the livestock sector in all 27 EU member states
129 in 2007 and concluded that the sector accounted for 12-17% of the total emissions in the 27
130 member states. Oldeman and colleagues [24] estimate that livestock agriculture accounts for
131 over 34% of the world's land degradation, a situation that is particularly worrying in Africa
132 and Australia where 49.2% and 80.6% land degradation are respectively linked with grazing
133 livestock.

134 Sustainable livestock production describes the efficient utilisation of natural resources to
135 produce animal products with minimal impact on the environment and the availability of
136 resources for future generations. Thompson and Nardone [25] suggest that sustainability can
137 be defined via two paradigms: resource availability and functional integrity. Resource
138 availability describes the rate of production and depletion of resources, whilst resource
139 functional integrity is based on the interrelationships between ecological and social processes
140 of production with emphasis on system vulnerability to environmental stress. Preston and
141 Preston and Murgueitio [26] categorise livestock agricultural sustainability into ecological (e.g.
142 reduced carbon dioxide emissions, reduced water and soil contaminations etc.), sociological
143 (increased employment) and ethological (animal welfare friendly) dimensions.

144 In the industrialised economies, many farmers and ecologists continue to explore ways of
145 minimising the impact of livestock agriculture on the environment. Increasing demand for food
146 brought about by the rapid expansion in the global human population has meant that intensive
147 agricultural production systems are increasingly common in some parts of the world. In other
148 parts of the developed world (e.g. Europe), this has necessitated the introduction of voluntary

149 environmentally sustainable farming schemes that farmers can join to reduce the impact of
150 farming on the environment. The UK's National Farmers Union (NFU), for example, recently
151 convened a seminar on livestock production and climate change to address some of the
152 challenges and interventions. The seminar brought together experts from 24 universities in
153 England and Wales and highlighted the fact that Britain has the most efficient and sustainable
154 beef and lamb production systems, with a greenhouse gas footprint of 2.5 times less than the
155 global average. This is primarily due to the use of extensive and mainly grass-based farming
156 systems. To ensure resource sufficiency and better utilisation, many farmers in the UK practice
157 rotational grazing, which involves dividing the field into segments so that animals are rotated
158 to avoid resource depletion to zero.

159 In the developing world, the work of the UN's Food and Agriculture Organisation (FAO) has
160 highlighted the role of livestock agriculture in food security [27] and conducted extensive
161 research on sustainability of production systems. Due to the economic situation in the
162 developing world, many farmers still lack the basic skills and means of investing in sustainable
163 farming systems, and the role of the FAO in these countries is therefore important in educating
164 farmers and equipping them with the knowledge and techniques needed to implement
165 sustainable farming systems. As part of the FAO's commitment to promoting sustainable
166 livestock agriculture in the developing world, a number of strategies have been suggested for
167 adoption by farmers [28]. Nonetheless, one may cautiously argue that the majority of arable
168 and livestock farming systems in developing countries are sustainable, as most farmers are
169 peasant farmers who plough their land manually or use draught animals to produce power.
170 Aside from using draught power in ploughing the land, animals are also used to pump irrigation
171 water, transport farm produce and carry out other farming operations. When compared with
172 tractors and other motorised farm machinery, animal power is cost effective and a source of
173 renewable energy with minimal carbon footprint. Dung or faecal matter are also recyclable and

174 can be used to fertilise the land; cow dung in particular is used by some communities in Africa
175 for cooking (fuel), heating and in protecting buildings. It is worth noting however that draught
176 animals do produce methane and they can trample and damage plants.

177 Douglas [29] puts forward three concepts to help explain sustainable livestock agriculture. The
178 first is a *resource sufficiency* view of sustainable agriculture, which defines agriculture as
179 sustainable if the resources (inputs) needed to carry out an agricultural activity are readily
180 available, foreseen or in-hand. The second concept, *ecological sustainability*, requires the
181 biological limits of an agricultural activity to be clearly identified and defined. The third
182 concept is *social sustainability*, which involves identification of political and ethical limits for
183 an agricultural activity. Faeth [30] explains that the resource sufficiency concept ensures that
184 farmers are able to identify their resources and define the rate of utilisation. Faeth [30] further
185 elaborates that a farming system will fail to meet its sustainability goals if any of its resources
186 are reduced to zero.

187 Understanding the scientific basis of conversion of resources in the form of feed into useful
188 products (meat) and waste (faecal matter and urine) is vital in implementing interventions
189 aimed at reducing the impact on the environment. Thompson and Nardone [25] note that
190 livestock agriculture involves the utilisation of biological inputs (feed and water), social inputs
191 (labour, capital and organisational capacity) and technology to produce meat (and other useful
192 by-products). Knowledge of these processes have enabled scientists to develop breeds, find
193 alternatives to scarce resources and (modelled) feeding systems that can ensures efficient
194 utilisation of feed and the reduction waste. Fitzhugh [31] suggests that a better understanding
195 of the rate at which meat and waste are produced can enable farmers to estimate the proportion
196 of resources (inputs) needed to satisfy product demand and meet sustainability goals. It is
197 against this background that the contribution of animal science, welfare and nutrition scientists
198 is vital in developing sustainable livestock production systems.

199 *Stewardship of nature (Khilafa) and environmental sustainability*

200 From an Islamic standpoint, sustainable development is not a new phenomenon, in fact it dates
201 back to the time of the Prophet of Islam, Mohammed (PBUH-Peace be upon him), over 1400
202 years ago. There is sufficient evidence from Quranic verses and Hadith (teachings and
203 approvals of the Prophet-PBUH) to suggest that sustainable development is an important
204 component of the Islamic faith. Due to the apparent impact of climate change on the
205 environment in recent years, there have been increased pressure from scientists, non-
206 governmental organisations, climate change activists and even the United Nations (UN) for
207 political leaders to take action. For instance, after many years of research, the UN developed
208 its 2030 agenda for sustainable development, which was adopted by all its member states in
209 2015.

210 In Islamic literature, the concept of sustainability is tied with *Khilafa* (stewardship of nature).
211 *Khilafa* is categorised as either individual or collective stewardship. Individual stewardship of
212 nature describes the duties and responsibilities of an individual in protecting the environment,
213 whilst collective stewardship is where a country or community implement measures to
214 safeguard the environment. For the purpose of this paper, emphasis is on individual
215 stewardship. The scriptures are very clear on the sustainable use of natural resources such as
216 water, flora, fauna, air, sun, light etc. In fact, the utilisation of natural resources is the preserve
217 of both human and non-human animals, and God recognises both classes of animals (man and
218 non-human animals) as the same communities in the following verse of the Quran:

219 *‘There is not an animal that lives on the earth, nor a being that flies on its wings, but they form*
220 *communities like you. Nothing have we omitted from the Book, and they all shall be gathered*
221 *to their Lord in the end’* (Quran 6:38, Sahih International Translation).

222 Describing humans and non-human animals as one community is significant in the context of
223 sustainable development and stewardship of nature [32]. First, it implies that non-human

224 animals are sentient beings (same as man); secondly, it highlights the fact that both human and
225 non-human animals have a right to the use of natural resources. Therefore, the activities of one
226 species (particularly humans) should not deny the other access to the resources. Islamic
227 scriptures emphasise that humans are given the privilege to use natural resources on the basis
228 of guardianship, this implies that humans should not mismanage or indulge in activities that
229 can potentially deplete such resources, as highlighted in the following verse of the Quran:

230 *‘And do not do mischief on the earth after it has been set in harmony, and it will be for you if*
231 *ye have faith’ (Quran 7:5, Sahih International Translation).*

232 *‘The world is beautiful and verdant, and verily God, be He exalted, has made you His stewards*
233 *in it, and He sees how you acquit yourselves’ (Muslim).*

234 In a different Hadith, the Prophet (PBUH) encourages Muslims to engage in afforestation, and
235 in the following Hadith is reported to have compared afforestation to an act of charity (an
236 important pillar in Islam):

237 *‘If a Muslim plants a tree or sows a seed, and a living being (human and non-human animals)*
238 *eats from it, such act is regarded as charitable’ (Bukhari Book Number 39, Hadith 513).*

239 The personal experience of lead author (who previously worked as a Halal auditor for one of
240 the UK’s largest Halal certification bodies) suggests that many Halal certification bodies
241 operate with little or no expertise on animal welfare and sustainability issues. Halal certification
242 bodies in industrial countries thus need to incorporate, we contend, sustainability and welfare
243 guidance in their standards (if they currently do not have such protocols) to ensure that food
244 certified as Halal is assured to originate from enhanced welfare and sustainable production
245 systems. It is worth reiterating at this juncture that animal welfare is an integral part of national
246 Halal standards in countries such as Malaysia, Indonesia and the UAE.

247 *Animal welfare*

248 In recent years, Halal meat production has attracted attention in the industrialised world for
249 two main reasons. Firstly, Muslims over index in meat consumption, which presents
250 opportunities for trading in Halal meat products. Secondly, there are animal welfare issues
251 associated with the slaughter of animals. It is worth reiterating that the ethical and welfare
252 issues associated with the slaughter of farm animals are not confined to Halal meat production,
253 but to the wider meat industry. According to research published by the UK's English Beef and
254 Lamb Executive [33], Muslims consume up to 20% of sheep meat produced in England. In
255 terms of the number of animals slaughtered, the UK's Food Standards Agency (FSA) estimated
256 that up to 70% of sheep, 20% of poultry and 3% of cattle were slaughtered in accordance with
257 the Halal rules in England and Wales in 2018 [34]. The FSA study involved all abattoirs
258 operating in England and Wales, and data were collected from the 29th of January to the 4th of
259 February 2018. Of greater significance to sheep farmers is the role of the Halal sector in the
260 mutton trade, as anecdotally the Halal market absorbs over 90% of cull ewes. The cooking
261 style of Muslim households is well suited to mutton, Muslims tend to use a lot of spices, and
262 cook for relatively longer duration [35]. The use of spices has meant that the natural flavour of
263 the meat becomes less important and texture is improved by the longer duration of cooking.
264 The importance of the Halal market is also highlighted by the fact that almost all of the
265 mainstream retail multiples have started trading in Halal meat products. Whilst most of the
266 retailers sell fresh and frozen Halal meat (usually on third party labels), Marks and Spencer
267 recently became the first UK retailer to sell Halal meat products certified by the UK's Halal
268 Food Authority on their own label.

269 As noted above, animal welfare issues at slaughter are not restricted to Halal meat production.
270 Within the EU, there is a legislative requirement for animals to be stunned prior to
271 exsanguination during conventional (non-religious) slaughter, however, there have been
272 reported instances of animal welfare compromises in conventional abattoirs. Failed stunning,

273 also termed mis-stunning, does occur in conventional abattoirs, which can significantly affect
274 the welfare of animals. It is also worth reiterating that good welfare at slaughter does not
275 depend solely on whether an animal is effectively stunned or not; pre-slaughter operations such
276 as movement to the point of stunning (or bleeding in the case of slaughter without stunning)
277 and restraining, are all novel processes (stressors) that are likely to expose animals to stress. In
278 the case of poultry stunned in electrified water baths, birds are inverted and shackled prior to
279 immersion into the electrified water, pre-stunning events that have been found to be stressful
280 [36-39] and result in broken bones [40]. It is for these welfare issues that Zivotofsky and Strous
281 [41] questioned the humaneness of water bath stunning and other electrical stunning systems
282 and called for more research to be done to find better welfare compliant methods of killing
283 animals. Fuseini and colleagues [42] recently highlighted the welfare aspects of water bath
284 stunning during Halal slaughter and suggested the need for stakeholders in the Halal sector to
285 take measures to mitigate these issues.

286 There is negative public perception around Halal slaughter in general, as a result, there have
287 been active campaigns within Europe, for instance, calling for a ban on Halal slaughter without
288 stunning on welfare grounds [43-44]. Despite the negative public perception of animal welfare
289 during Halal meat production, Islamic literature highlights the need for Muslims to safeguard
290 animal welfare at all times. To highlight the importance of animal welfare in Islam, a number
291 of authors have highlighted the significance of companion and food animal welfare in Islam
292 [8-10], the requirement to protect animal welfare in Islamic societies being outlined in the
293 Quran and Hadith. Animals play an important role in maintaining a balance in the environment,
294 protecting their welfare is therefore linked to safeguarding the integrity of some natural
295 processes. For instance, birds and insects play a role in pollinating plants, the droppings of
296 animals can be utilised by plants as manure (natural fertilisers) and carbon dioxide exhaled by
297 animals is utilised during photosynthesis (a process by which plants mature their food with the

298 aid of sunlight and chlorophyll). It is plausible to suggest that it is against this background that
299 the Prophet (PBUH) urged Muslims not to kill animals, unless it is absolutely necessary as
300 reported in the following Hadith:

301 *‘Whoever kills a sparrow or any creature bigger than that without a justifiable reason, that*
302 *person would be accountable for his actions on the Day of Judgement’* (Sunan An-Nasa’I,
303 Book of Sacrifices, Number 4445, Hassan).

304
305 In another Hadith, the Prophet (PBUH) was also reported to have said:

306 *‘A woman was punished by God for imprisoning a cat and denying the cat access to water*
307 *and food’* (Al Bukhari, 3140; Muslim, 2242).

308 Many commentators have questioned the preparedness of some Muslims to protect animal
309 welfare due to their reluctance in accepting scientifically validated ‘animal welfare friendly’
310 methods of slaughter (e.g. pre-slaughter stunning). However, this refusal or reluctance to
311 accept stunning stems from the belief that stunning does not fully comply with the Halal
312 dietary laws. Some opponents of stunning have often cited the following as reasons for their
313 rejection of the procedure:

- 314 • Stunning can lead to the death of animals before they are bled, which is contrary to
315 Halal rules. While it is true that some methods of stunning can lead to the death of
316 animals before they are bled (e.g. gas stunning/killing, electrical head to body stunning
317 and penetrative captive bolt stunning), there is no evidence that head-only stunning
318 leads to instantaneous death of animals.
- 319 • Stunning reduces the volume of blood loss at exsanguination. Muslims are prohibited
320 from consuming blood, therefore some Muslims have suggested that stunning of
321 animals cannot be accepted because it results in the retention of more blood in the
322 carcass. However, research has demonstrated that stunning of animals does not affect
323 the volume of blood loss [45].

324 • Stunning results in inferior carcass and meat quality. Again, research has demonstrated
325 that the slaughter of animals without stunning does not offer better product quality
326 when compared with animals stunned electrically or mechanically prior to bleeding
327 [46].

328 Slaughter is nevertheless an emotive issue, and efforts must be made to improve the welfare of
329 animals during transport, pre-slaughter restraint and bleeding. This can arguably be achieved
330 by introducing training programmes during Halal slaughter without stunning for animal
331 handlers and slaughterers in countries where there are no animal welfare legislations to protect
332 the welfare of animals.

333 **2.1. Islamic perspective on climate change**

334 The earth's climate or weather is the result of the exchange of gases between the earth and its
335 atmosphere, including land, water and air. Some gases do not trap heat (e.g. oxygen) whilst
336 others (e.g. carbon dioxide, methane and nitrous oxide) do. Heat-trapping gases are collectively
337 known as greenhouse gases. Greenhouse gases have an ability to absorb radiations from the
338 earth's surface and from other gases, before the trapped radiations are released as heat into the
339 atmosphere resulting in its warming. It should be noted that natural processes can also result in
340 minute changes in the earth's climatic conditions, and that greenhouse gases do occur naturally.
341 More importantly, greenhouse gases in their natural levels are required to create an equilibrium
342 on earth and ensure the proper functioning of the atmosphere to support life. For instance,
343 without naturally occurring greenhouse gases, there would be extremes of cold and warm
344 weather during the night and day respectively, and these extremes would be unlikely to support
345 life on earth. The view of the UN's Intergovernmental Panel on Climate Change (IPCC) is that
346 the main cause of climate change is human activity [47]. The IPCC is made up of scientists
347 from over 190 UN member states. Many argue that the main human activities responsible for

348 climate change include the following: burning of fossil fuels by the oil, coal and gas industries,
349 industrialisation, expansion in human population, deforestation and agricultural development.
350 Islamic jurists or scholars usually interpret the scriptures to provide guidance on important
351 issues such as climate change. It is against this background that, in August 2015, a group of
352 around 60 Islamic scholars gathered in Istanbul, Turkey, to issue what is now known as the
353 ‘Islamic Declaration on Global Climate Change (IDGCC)’. The group issued the following
354 statement:

355 *‘Our species, though selected to be a caretaker or steward (Khalifa) on the earth, has been the*
356 *cause of such corruption and devastation on it that we are in danger of ending life as we know*
357 *it on our planet. This current rate of climate change cannot be sustained, and the earth’s fine*
358 *equilibrium may soon be lost’.*

359 The above statement is based on interpretation of the Quran and Hadith and reinforces the
360 importance of protecting the environment from destruction through agricultural and other
361 activities. Among other verses of the Quran, the following emphasise how God created a
362 balance in the Heavens and earth, and a call for Muslims not to destroy the balance:

363 *‘And the Heaven He raised and imposed the balance. That you do not transgress within the*
364 *balance. And establish weight in justice and do not make deficient the balance. And the earth*
365 *He laid (ou)] for the creatures. Therein is fruit and palm trees having sheaths (dates).’ (Quran*
366 *55:7-11, Sahih International Translation).*

367 From the verse above, Muslims are commanded not to engage in activities that deplete the
368 natural capital. However, some livestock production systems, as pointed out above, result in
369 significant destruction of the environment through greenhouse gas emissions, pollution of
370 water resources from animal waste from factory farms, land degradation, destruction of
371 biodiversity and overgrazing. Despite the importance of environmental sustainability in Islam,

372 there is some evidence to suggest that price is the main factor influencing halal consumers'
373 purchasing intentions [48]. Overconsumption of animal protein by Muslims has also been
374 reported, data published by the UK's Agriculture and Horticulture Development Board
375 (AHDB) show that while 6% of the general population indicated they consume lamb at least
376 once a week, over 60% of Muslims respondents indicated that they consume lamb at least once
377 a week [49]. Nonetheless, a number of reputable Islamic organisations and charities working
378 towards environmental sustainability around the world have adopted the IDGCC, including
379 Islamic Relief, Green Faith, Global Muslim Climate Network and others. The recently
380 commissioned 'Green Mosque' in Cambridge, England, and Morocco's Koutoubia and As-
381 Sounna mosques are examples of the efforts some Muslims are making to promote sustainable
382 development. The mosque was designed to use mainly renewable or natural energy, with its
383 utilisation of sustainable timber vaulting has been estimated to have a carbon footprint of near-
384 zero.

385 *Sustainable production and consumption*

386 Sustainable production and consumption describe the efficient utilisation of resources to
387 produce food in sufficient quantities and quality, based on the principle of producing more
388 products with less input and promoting sustainable lifestyles among consumers [32]. The UN
389 [50] estimates that 1/3 of all the food produced globally is wasted on-farm, during transport, at
390 retail premises or discarded by the consumer as waste. Therefore, from a meat production
391 perspective, sustainable production and consumption would include reducing emissions (on-
392 farm), reducing soil and water contamination (on-farm), reducing diseases and death rates (on-
393 farm and during transport), reducing carcass condemnation and meat rejection (at the abattoir
394 and processing plants) and putting in measures aimed at reducing the wastage of meat by
395 consumers (at home). It is worth reiterating that sustainable production and consumption forms
396 part of goal number 12 of the UN's 2030 agenda for sustainable development. The concept of

397 sustainable consumption and production is however not a new concept; it was first recognised
398 in the Johannesburg Plan of Implementation, and was adopted at the 2002 World Summit on
399 Sustainable Development in Johannesburg.

400 As noted above, the 2030 agenda was adopted by all UN member states in 2015, however, its
401 implementation needs the support of corporate organisations, governments, non-governmental
402 organisations and consumers. If consumers are willing to change their lifestyles and
403 consumption patterns by demanding sustainably produced goods and services, this could
404 motivate producers to adopt more sustainable production systems [35]. Godazgar [51]
405 discusses two categories of consumption. The first aims at fulfilling one's basic needs, which
406 results in satisfaction of the need, whilst the second aims at fulfilling desires and wants. To
407 illustrate these, a consumer can fulfil their basic needs by owning a single car, however, having
408 up to three cars would be classified as lavish (and unnecessary) and will fall under the second
409 category of consumption outside the definition of sustainable. The two categories of
410 consumption explained by Godazgar [51] can also be illustrated via the intake of meat. The
411 UK's National Health Service (NHS) recommends the consumption of not more than 70 g of
412 cooked red meat daily [52], sufficient to supply essential proteins, vitamins and minerals. Many
413 consumers (particularly Muslims) consume over three times this recommended intake [33].
414 Whilst the consumption of 70 g of red meat may be satisfying one's basic needs (provision of
415 nutrients), the consumption of meat more than the recommended daily intake may be satisfying
416 a desire or a want.

417 The concept of stewardship of nature (discussed above) explains the Islamic position on
418 sustainable production. Muslims are described as guardians of the earth, and God warns them
419 not to cause destruction to the environment (in the Quran). These divine guidelines from the
420 scriptures seek to ensure that Muslims adopt food production systems that do not deplete scarce

421 natural resources. Sustainable consumption is an important component of the teachings and
422 ideals of the Islamic faith. God has warned Muslims to avoid wastage of food and drinks:

423 *'O children of Adam, take your adornment at every masjid, and eat and drink, but be not*
424 *excessive. Indeed, He likes not those who commit excess' (Quran 7:31).*

425 It is the view of some Muslims that wasting resources (e.g. food) is contrary to the
426 commandments of God. In the example given above of one person owning three cars, the
427 impact of this type of consumerism can be estimated by considering the financial cost, source
428 of raw materials (i.e. local or imported), the possible impact on the environment from
429 greenhouse gas emissions from the factory that produced the three cars, the emission from
430 transporting the cars to its owner, and the emissions from driving those vehicles.

431 To avoid excessive consumption and assist in feeding the poor, one of the pillars of Islam
432 emphasises the need for Muslims to give alms to the destitute in society (*Zakah*). God has
433 repeatedly reminded Muslims of their duty with regard to *Zakah* in several verses of the Quran,
434 two of which are outlined below:

435 *'And decree for us in this world (that which is) good and (also) in the Hereafter; indeed, we*
436 *have turned back to You." (Allah) said, "My punishment - I afflict with it whom I will, but My*
437 *mercy encompasses all things." So I will decree it (especially) for those who fear Me and give*
438 *Zakah and those who believe in Our verses' (Quran 7:156, Sahih International Translation).*

439 *'The believing men and believing women are allies of one another. They enjoin what is right*
440 *and forbid what is wrong and establish prayer and give zakah and obey Allah and His*
441 *Messenger. Those - Allah will have mercy upon them. Indeed, Allah is Exalted in Might and*
442 *Wise' (Quran 9:71, Sahih International Translation).*

443 The sustainable utilisation of resources is significant, not least because it ensures that resources
444 remain sufficient for present and future generations. The Quran informs Muslims that there are
445 enough provisions for mankind, that these provisions are sufficient to ensure that no one suffers
446 from hunger and thirst, but that this is only possible if resources are utilised sustainably and
447 people avoid overconsumption and misappropriation of resources:

448 *‘Indeed, it is [promised] for you not to be hungry therein or be unclothed. And indeed, you*
449 *will not be thirsty therein or be hot from the sun’* (Quran 20:118-119, Sahih International
450 Translation).

451 This situation is also reflected in food choices.

452 **3. The concept of vegetarianism and veganism in Islam**

453 It has been reported that the term ‘vegetarian’ was first suggested by The Vegetarian Society
454 in the mid-nineteenth century to refer to dietary choices that avoid products of animal origin
455 [52]. Vegans, on the other hand, avoid all animal products for food and non-food products [53].
456 Vegetarians and vegans have long argued for the positive impact of their dietary choices on
457 animal welfare and the environment. However, it appears that concern for the environment is
458 not the main reason why people opt for meat-free diets. Fox and Ward [54] conducted a survey
459 of vegetarians in the USA, Canada and the UK to examine the motivations for their dietary
460 choices, concluding that health and ethical treatments were the two main motivations for
461 respondents’ decisions to be vegetarians. Some respondents indicated a concern for the
462 environment as a motivation, however, only one of the 33 respondents indicated the
463 environment as the primary motivation for opting a vegetarian diet. Health vegetarians can
464 sometimes be part-time vegetarians, who temporarily opt for meat-free diets in order to lose
465 weight, and for other health reasons [55]. This group of vegetarians are sometimes referred to

466 as 'partial vegetarians' due to their tendencies to continue to eat meat in moderation or
467 substituting one animal protein for another (e.g. avoiding meat but opting for fish) or opting
468 for meat from humanely treated animals (e.g. opting for organic instead of intensively farmed
469 chicken). Ethical vegetarians, on the other hand, do not eat meat or products derived from
470 animals because they consider the killing of animals to be immoral or compromising animal
471 welfare [56]. This group are usually permanent or long-term vegetarians.

472 Despite these concerns, meat has been identified as an important component of the human diet
473 [57], primarily because it is a rich source of protein and other essential nutrients required for
474 the maintenance and sustenance of life [58]. Kauffmann [58] explains that meat provides the
475 human body with essential amino acids, vitamins (particularly B-vitamin), minerals (e.g. haem
476 iron), high levels of biological proteins and trace elements.

477 It is reasonable to suggest that diets that are exclusively plant-based may not provide the body
478 with all its nutrient needs. Janelle and Barr [59] compare the nutritional intakes of vegetarian
479 and meat-eating women in Western Canada, and found that vegetarian women had a relatively
480 lower intake of protein and cholesterol, but higher fibre, and a higher percentage of energy as
481 carbohydrates than respondents on meat-based diet. Further, vegetarians were found to have
482 lower intake of the following; sodium, zinc, niacin, riboflavin and vitamin B-12. Tieman [60]
483 reports that it is misleading to certify 'nutrient deficient' foods as Halal because the Quran
484 prescribes Halal and *Tayyib* (wholesome, pure, nutritional, healthy).

485 Vegetarianism has existed in some religions for centuries [35]. Fraser [61] reported that some
486 religions (e.g. Buddhism and Seventh Day Adventism) have long promoted vegetarianism
487 probably for animal welfare reasons. There is no evidence in Islamic literature to suggest that
488 the Quran or the Prophet promoted vegetarianism, however, it is widely believed that the
489 Prophet ate meat rarely or in moderation, which may explain why some Muslims have
490 consciously reduced the intake of meat whilst others have avoided meat from certain species

491 of animals, particularly poultry and beef for various reasons. The Quran is very clear on the
492 slaughter of animals and consumption of meat:

493 *'Prohibited to you are dead animals, blood, the flesh of swine, and that which has been*
494 *dedicated to other than Allah, and (those animals) killed by strangling or by a violent blow or*
495 *by a head-long fall or by the goring of horns, and those from which a wild animal has eaten,*
496 *except what you (are able to) slaughter (before its death), and those which are sacrificed on*
497 *stone altars, and (prohibited is) that you seek decision through divining arrows. That is grave*
498 *disobedience. This day those who disbelieve have despaired of (defeating) your religion; so*
499 *fear them not, but fear Me. This day I have perfected for you your religion and completed My*
500 *favour upon you and have approved for you Islam as religion. But whoever is forced by severe*
501 *hunger with no inclination to sin - then indeed, Allah is Forgiving and Merciful'* (Quran 5:3,
502 Sahih International Translation).

503 Some Islamic Scholars in the UK [48] have interpreted the verse above to mean that animals
504 cannot be stunned with any mechanical device (e.g. captive bolt guns) because the mode of
505 application of such equipment is akin to a 'violent blow', a procedure prohibited in the verse
506 above. However, captive bolt stunning is accepted in the national Halal standards of Malaysia,
507 UAE, Saudi Arabia, Qatar and others. It must be reiterated that although Muslims are permitted
508 to slaughter animals for food. The Quran and Hadith set strict rules on how animals should be
509 treated. The Prophet (PBUH) is reported to have urged Muslims to slaughter animals with the
510 most humane methods of slaughter in order to spare them unnecessary suffering as reported in
511 the following verse and Hadith:

512 *'Whoever is merciful even when it comes to slaughtering a bird, Allah will have mercy on the*
513 *person on the Day of Judgement'* (Bukhari, Adab al-Mufrad 381).

514 *‘Verily Allah (God) has prescribed Ihsan (excellence) in all things. So if you kill, then kill well;*
515 *and if you slaughter, then slaughter well. Let each one of you sharpen their blade and let them*
516 *spare suffering to the animal they slaughter’ (Sahih Muslim, Book 21, Number 4810).*

517 Whilst there is no total ban on meat consumption in Islam, the consumption of certain species
518 or groups of animals (e.g. pigs and carnivorous animals) and some slaughter procedures are
519 strictly prohibited. In his book on environmental dimensions in Islam, the Islamic scholar,
520 Mawil Izzi Dien [62] reported that Muslims have no grounds for the avoidance of meat because
521 the scriptures permit the use of animals for food. The author explained that it is contrary to
522 Islamic teachings for a Muslim to forbid anything that Allah (God) has ordained, unless it is
523 done on medical grounds to protect life. Vegetarianism on ethical (e.g. welfare) grounds is
524 therefore not permitted, he argues, because it is the prerogative of God to make decisions on
525 what is permitted or prohibited [63]. The conclusion one can draw from Izzi Dien’s suggestions
526 is that vegetarianism is un-Islamic. However, some Muslims will argue that avoiding meat on
527 welfare grounds cannot be interpreted as disrespect for God’s commandments, but as an act of
528 piety to protect God’s creations and nature. In fact, some groups of Muslims practicing
529 vegetarianism consider it an important component of belief. Mukhi [64] notes that Sufis have
530 long promoted vegetarianism, describing them as a ‘vegetarian based cult group of Muslims’.
531 Schimmel [6jj3] echo Mukhi’s observation by suggesting that Sufis (Muslims believing in
532 mysticism and members of the Chishti order) are pro-vegetarian.

533 The possible benefits of consuming a vegetarian diet (to the environment, human health and
534 animal welfare) have been discussed above. Whilst plausible reasons have been cited for
535 animal welfare and human health, one may argue that a vegetarian diet is not always a
536 sustainable diet. For instance, a typical vegetarian or vegan dish can make up of avocado from
537 Mexico, tomatoes from China and cocoa beans from Ghana. If the impact on the environment
538 from emissions from planes and other modes of transporting vegan and vegetarian foods are

539 taken into consideration, one may arrive at a conclusion that a vegetarian diet is not always a
540 sustainable diet. Therefore, the fact that Islam does not promote vegetarianism and veganism
541 cannot be interpreted to mean that Islam is an opponent of environmentally friendly diets.
542 Meat-based diets are more important in some geographical locations than in others, for
543 instance, in most developing countries, the lack of animal protein in diets has resulted in high
544 maternal and childhood malnutrition.

545 **4. Conclusion**

546 It is now widely accepted that human activity has been found to be responsible for the
547 destruction of the environment and the resultant effect on the rapid warming of the global
548 climate. Agricultural development, intensification of livestock production and urbanisation
549 have been identified as some of the activities responsible for climate change. However, it is
550 worth noting that there are some farming systems that have been shown to have minimal impact
551 on the environment, for instance, livestock agriculture in Great Britain is largely grass-based,
552 and this drastically reduces the emission of greenhouse gases and puts Britain as one of the
553 most sustainable meat producing countries in the world.

554 Religion can also play an integral role in mitigating the impact of human activities on the
555 environment. For instance, Muslims are enjoined to protect the environment and all creatures
556 that live on earth. Islamic scriptures emphasise *Khilafa* (stewardship of nature), a call for all
557 Muslims to utilise resources on earth with care, without causing its depletion so that future
558 generations can have access. *Khilafa* goes hand in hand with sustainable consumption,
559 production and animal welfare. In their quest to protect animal welfare, some Muslims (e.g.
560 Sufis) have resorted to vegetarianism, although this has been disputed by some scholars and
561 described as un-Islamic.

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