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The Effects of Climate Change on the Mental Health of Smallholder Crop Farmers in Embu and Meru Counties of Kenya

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The weather patterns and climatic conditions have been changing over the last decades. Environmental psychosocial stresses associated with the effects of climate change are known to cause mental health issues such as depression and other mood disorders, anxiety, trauma, psychosis, substance abuse, ecological grief, relational problems, and psychological distress. The purpose of this study was to investigate the effects of climate change on the mental health of smallholder crop farmers in the Embu and Meru Counties of Kenya. Consequently, a sample of 400 farmers in the smallholding category was determined using Yamane's formula then participants were selected using quota sampling. Data collection utilised the Self-Reporting Questionnaire 20-item (SRQ-20) to assess the mental health of the smallholder crop farmers and a questionnaire to examine the effects of climate change coupled with coping mechanisms explored by farmers to eventually cope with the effects of climate change and mental illnesses. The results indicate that the prevalence of mental health issues among smallholder crop farmers in Embu and Meru is at 35.2%. Correlational analysis shows that the mental health of smallholder farmers in Embu and Meru has been affected by climate changes. This study recommends that the government, agricultural agencies, and other private partnerships should help smallholder crop farmers with creative and innovative ways of dealing with climate change. Owing to the prevalence of mental illness among smallholder crop farmers, the study recommends that farmers proactively seek mental health services to help them in managing mental illnesses. Farmers should interact in seminars and workshops that equip them with effective coping mechanisms to better deal with both climate change and mental illness. Government and private entities that are able to could facilitate access to free or subsidised

mental healthcare to smallholder crop farmers since most of these farmers cannot afford mental healthcare.

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INTRODUCTION

The climatic conditions across the world have been progressively changing over the years, and a significant portion of the said changes is attributed to the steady increase in warm temperatures across the globe (Amano & Sutherland, 2013). Jaeschke et al. (2014) for instance note that from the examination of climate patterns, the temperature levels across the world have increased by 0.08 degrees Celsius each year since 1880. Clayton et al. (2017) cite that 449 cities across the world have taken a climate change risk assessment, but the adequacy of these measures in protecting human mental health is uncertain; hence more action is needed. Little has been done to understand and mitigate the climate change risk to health. According to this article, health and health-related adaptation funding in regard to climate change account for only 4-6% and 13.3%, respectively of total global adaptation spending, which is a very small percentage (Clayton et al., 2017).

There will be an increase in death rates of 250,000 per year from 165,000 between 2030 and 2050 due

to the impacts of climate change globally (Clayton et al., 2017). The impact that causes the increased death rates, according to this article, includes heat-related mortality, vector-borne diseases, respiratory illnesses, and commonly overlooked mental illnesses. Further, according to Page and Howard (2010), it was estimated that about 150,000 deaths were already occurring due to physical causes such as landslides and droughts, which are visible effects of climate change, while the invisible effects are the health impacts of climate change. There is a need to address the impact of climate change on health because the death rates are increasing and project to get worse if nothing is done.

Farmers and other survivors that continuously experience adverse effects of climate change, according to Hayes et al. (2018), experience complicated grief and recovery fatigue and may have suicidal ideations. According to Hayes et al. (2018), these negative effects may, however inspire compassion for others, altruism, optimism in life, increase a sense of meaning, and personal growth from successfully dealing with the negative experiences caused by climate change. Yazd et al.

(2019) state that farming is a stressful occupation and issues of climate change imply that farming will continue to become more stressful for farmers involved.

Africa is cited as the most vulnerable area to droughts induced by climate change because climate change has more impact on tropical regions of the world (Malhi et al., 2021). The impact of climate change is globally felt across private and public sectors and the issues of changes in agricultural productivity are cut across these two sectors (Henderson et al., 2018). Serdeczny et al. (2016) also cite that Africa has been identified as a part of the locations in the world most vulnerable to the impacts of climate change. The agricultural sector in Africa has greatly over the years depended on rainfall for farming and as climate changes occur, stresses associated with this will be on the rise. There has been a correlation between high ambient temperatures and increased all-cause mortality in Ghana and Kenya due to the impact of climate change, which calls for action to deal with the impact of climate change on human health, mental health included (Serdeczny et al., 2016).

The Ministry of Foreign Affairs Report (2018) notes that Kenya is highly predisposed to climate vulnerability with the country being ranked in position 151 among 181 countries that suffer negative climate changes. The same report projects that Kenyan temperatures will continue to increase by 0.25°C starting in 2000 all the way to 2050, with rainfall patterns dipping and getting more unpredictable. These negative effects created by climate vulnerability will undoubtedly lead to low water availability and food insecurity which will end up creating mental health challenges like anxiety and depression, especially for farmers who depend on climate predictability (Ministry of Foreign Affairs, 2018).

From the foregoing, it is clear that climate change which affects the environment in which farmers are able to effectively farm has shown some significant

influence on the mental health of farmers. The mental health issues that have come to the fore more predominantly among farmers in the USA, UK, Canada, and countries in the Eastern hemisphere appear to be depression and anxiety (Hayes et al., 2018; Kumar et al., 2018; Yazd et al., 2019). Using the SRQ-20, issues of depression and anxiety will be examined to ascertain if they fall among the prevalent mental health issues that affect farmers in Eastern Kenya. This will be important because a closer look at the global (Hayes & Poland, 2018; Henderson et al., 2018), African (Dodgen et al., 2016; Yazd et al., 2019), and Kenyan (Kumar et al., 2018) studies have not shown any specific study done to examine the effect of climate change on the mental health of smallholder farmers in Kenya using a validated tool. Thus, the study sought to investigate the effects of climate change on the mental health of smallholder crop farmers in the Embu and Meru Counties of Kenya.

LITERATURE REVIEW

Theoretical Review

Three appropriate theories and models are reviewed to anchor the study. These theories and models are The Biopsychosocial-Spiritual Models, The Wellness Model, and The Sustainable Livelihoods Approach.

The Biopsychosocial-Spiritual Model

The scholar Katerndahl (2008) is the key proponent of the Biopsychosocial-Spiritual Model, which basically expands the Biopsychosocial Model formally postulated by Engel (1977). The Biopsychosocial Model was generally grounded on the assumption that the health status of people coupled with their health outcomes should be considered within the auspices of the level of human development and existence that are premised on social, physiological and biological dynamics.

More succinctly, Borrell-Carrió et al. (2014) argued that the Biopsychosocial model integrates the

philosophical understanding that underpins clinical care with the more practical clinical guidelines. Consequently, as far as clinical care is concerned, the model underlies the way patient disease, suffering and even illnesses become predicated on psychological, biological, societal and physiological layers and then cascades to the molecular. Practically, the model identifies the subjective experience of patients and how those experiences contribute to health results, patient care and diagnosis.

Katerndahl (2008) offers a more comprehensive outlook of the Biopsychosocial model by including the spiritual element. What the scholar is thus noting is that aside from the social, physiological and biological dynamics, there is a need to consider the spiritual aspects because somehow every human being is spiritual in a manner of speaking. Consequently, the Biopsychosocial-Spiritual Model coheres with the basic arguments noted in the present study to the extent that farmers' mental health is noted to be significantly affected by climate change where the subjective experiences based on the Self-Reporting Questionnaire 20-item (SRQ-20); an instrument that largely accesses subjective data (Andreou et al., 2011) are considered. Additionally, the general exposition of the indicators of mental health that the study argues affect farmers as a result of climatic changes which is a psychosocial stressor is based on the assumption that the mental illness viewed as the absence of mental wellbeing is predicated upon elements that relate to various forces of the existence that touch on the farmer; forces that comprise of spiritual, psychological, biological, and social elements all of which constitute the basic elements of the Biopsychosocial-Spiritual Model.

Wellness Model

The Wellness Model is strongly aligned to the Biopsychosocial-Spiritual Model in so far as its exemplification of the human development dimensions as predictors of health are concerned.

However, the Wellness Model argues that a holistic view of health in terms of physical, environmental, spiritual, financial, emotional, social, and intellectual wellness is needed to finally conclude that one is healthy (Stoewen, 2017). So, while the Biopsychosocial-Spiritual Model is grounded on the assumption that the health status of people coupled with their health outcomes should be considered within the auspices of the level of human development and existence that are premised on social, physiological and biological dynamics (Engel, 1977); the Wellness model looks at those levels as characteristics of a healthy human being (Kemp et al., 2017; Stoewen, 2017).

The Wellness Model aptly applies to the present study because the dimensions asserted include emotional dimension and intellectual dimension that cohere to most mental illnesses. Further, the climate change construct that constitutes the present study's independent variables is environmental issues that fall within one of the primary dimensions of the Wellness Model. In that case, it can be said that the thrust of the present study, which is to examine the effects of climate change on the mental health of smallholder crop farmers in Eastern Kenya, significantly aligns with the many dimensions of the Wellness Model in explaining the farmers' wellbeing as well as in providing recommendations on the way forward; the extent of which the present study finds out.

The Sustainable Livelihoods Model

The Sustainable Livelihoods Approach, which was primarily developed by the Institute of Development Studies (IDS) in 1998, constitutes a framework for thinking about the nature, goals, objectives, and priorities attached to developmental actions (Serrat, 2017). It focuses on evolving thinking regarding the manner in which vulnerable members of society and communities engage in livelihood actions as well as the actions and priorities set up to support them in those livelihoods (Kollmair & Gamper, 2012). Serrat (2017) argues

that the Sustainable Livelihood Approach helps to facilitate the detection of practical priorities that lead to actions predicated upon the views and opinions of the people concerned but do not in themselves offer the panacea to all livelihood problems. Further, the approach is not meant to replace existing priority and objective actions like sector-wide approaches, participatory actions, integrated rural development actions or even devolved government initiatives (Flora & Flora, 2013). What is particularly asserted is that priority actions that touch on developmental progress must be multilevel in the sense that all relevant stakeholders from all stages of power are brought on board; must be people-centred to deal directly with those affected; must be participatory and responsive; should be done within a public-private partnership; must be dynamic and must be sustainable (Serrat, 2017).

The model is particularly aligned to the measures of the present study because climate change is part of the vulnerability context or the livelihood outcome that may either advance or hinder the livelihoods of smallholder crop farmers. Whichever practical priorities via policies and institutions may be leveraged to help better deal with climate change depends on the ability of those actions to conform to the tenets of the SLA and must thus be holistic, participatory, sustainable, dynamic, within the partnership paradigm and people-centred. The present study will thus look at the climate changes and how it integrates with livelihood options and actions available to farmers.

General Literature Review

Mental Health Status and Mental Illnesses Prevalence

Studies have been done to examine the construct of mental health across the globe. The absence of mental health wellbeing leads to mental illnesses. Collier and Grant (2018) described mental illness as health conditions that comprise alterations, often

negative in emotional, behaviour and thinking aspects or a combination of all three. Collier and Grant noted that mental illness is associated with stress or distress or disruptions in social, work, and family engagements (Collier & Grant, 2018). Also, Woolfolk (2011), on his part, noted that the mental illness construct is a complex aspect that touches on psychopathology, socio-cultural, and physiological aspects to the extent that no one definition does justice to it. However, the study observed that mental illness, when viewed as a scientific or socio-political element, is a harmful dysfunction of the general functioning of the mind, the emotion and behaviour that oscillate between the mild and the acute. Objectively therefore, the DSM-5 describes mental illness as a pattern of psychological syndromes that cause dysfunction, disability, distress, loss of autonomy, and chances for death but which excludes basic deviant behaviour that is predicated on political or social reasons (Stein et al., 2010; APA, 2013).

As far as prevalence is concerned, recent reviews have shown that in developed countries like the UK, Canada, USA, and Germany, 19%, which is about 1 in 5 people experience one form of mental illness in their lifetime and 4.1% which is approximately 1 in 24 people are basically diagnosed with some serious form of mental illness (Wainberg et al., 2017). The WHO (2018) global estimates show that in Africa, the prevalence rates of mental illness are approximately 17%, and those diagnosed with mental illness are 3.3%. The report argues that one should not mistakenly assume that the figures are lower than those from developed countries because diagnosing capacities and the level of mental health awareness in Africa to engage in mental healthcare is significantly low and thus, these figures could actually be higher. The same scenario as seen in Africa could be applied to Kenya, where recent reports show that 1 in 4 Kenyans, which translates to 25% suffer from one form of mental illness or the other (Government of Kenya, 2019; WHO, 2018). The reports further admit that owing to negative

attitudes about mental health in Kenya those reports could actually be higher.

Climate Changes

Climate change is threatening to be a defining element of social, economic, religion, politics, national stability, and cohesion. The unprecedented and unbridled national and international climate changes have created substantial havoc on the safety of national and global citizens and left governments grappling with what strategies to use to manage such dilapidating climate changes. The dynamics of climate change cover the broad spectrum of environmental degradation, climate and weather patterns and associated actors that stretch from the local events to international climate changes that have created the need for more discussions (Campbell, 2016; Collier et al., 2021). Climate change experts consider climate change as a complex construct that is sometimes difficult to define.

Nonetheless, the climate has variously been defined as the synthesis of weather patterns in a given geographical location or context within a span of 30 years (Tol, 2020). Climate underscores the general mechanism of the climatic systems that consist of the hydrosphere, lithosphere, atmosphere, biosphere, and cryosphere that operate together after being powered by the solar radiation system (Shuaibu et al., 2014). It basically works in an equilibrium format where the noted elements balance each other in a meaningful and purposeful way to create synergies and mechanisms that determine how the earth or the universe operates (Shuaibu et al., 2014; Tol et al., 2020). That said, climate changes are those alterations that occur when the equilibrium shifts as a result of changes in the power of solar radiation and changes in the structure of the components that constitute the climate force.

RESEARCH METHODOLOGY

The study was based on a descriptive survey design along with a correlational survey research design. Embu and Meru counties of Kenya were the two key geographical areas where the study was conducted. Embu has approximately 677,876 farmers, and Meru posts 762,341 farmers, of which 60% are smallholder farmers (Embu County Records, 2021; Meru County Records, 2021). Consequently, computing the 60% gives Embu 406,725 smallholder farmers and Meru 457,404. The total target population then comes to 864,129 farmers. Consequently, the study sample size was determined using Yamane's formula which provided 400 smallholder crop farmers as the study sample size (Yamane & Pázsit, 1998). Consequently, 200 smallholder farmers from each of the two counties were selected using the quota sampling technique. All the necessary permissions and approvals were received from the United States International University- Africa (USIU-A)-based Institutional Review Board (IRB) and the psychology department, coupled with permission from the National Commission for Science, Technology, and Innovation (NACOSTI).

Questionnaire formulated by the researcher to examine and assess the effects of climate change and psychological testing done using the Self-Reporting Questionnaire 20- item (SRQ-20) to assess the prevalence of mental health issues among smallholder crop farmers in the study regions. Studies have shown that the SRQ-20 has a validity score of 0.714 in the Sholte et al. (2011) study done in Rwanda and 0.81 in the Kumbar et al. (2012) study done in India. This means that the tool is highly valid and reliable and hence would serve the current study well. Accordingly, data were analysed using descriptive (Means, standard deviation, percentage and counts) and inferential statistical methods (multiple regression analysis). Inferential statistics took the form of a multiple regression analysis that tested the level to which the DV

(Mental health of farmers) was predicated by the IVs aligned to climate change level.

farmers. The outcome is from the SRQ-20 results that were used to measure the mental health of the smallholder crop farmers (*Table 1*).

RESULTS AND DISCUSSION

Prevalence of Mental Health Issues among Smallholder Crop Farmers

The study sought to ascertain the prevalence of mental health issues among smallholder crop

Table 1: SRQ-20 Results

Statements	Yes (1)		No (0)	
	F	%	F	%
1. Do you often have headaches?	245	61.3	155	38.8
2. Is your appetite poor?	145	36.3	255	63.7
3. Do you sleep badly?	139	34.8	261	65.3
4. Are you easily frightened?	133	33.3	267	66.8
5. Does your hands tremble?	60	15.1	340	88.0
6. Do you feel nervous, tense, or worried?	168	42.1	232	58.0
7. Is your digestion poor?	91	22.8	309	77.3
8. Do you have trouble thinking clearly?	212	53.0	188	47.0
9. Do you feel unhappy?	33	8.3	367	91.8
10. Do you cry more than usual?	187	46.8	213	53.3
11. Do you find it difficult to enjoy your daily activities?	185	46.3	215	53.8
12. Do you find it difficult to make decisions?	181	45.3	219	54.8
13. Is your daily work suffering?	188	45.1	220	55.0
14. Are you unable to play a useful part in life?	163	40.8	237	59.3
15. Have you lost interest in things?	68	17.0	332	83.0
16. Do you feel that you are a worthless person?	37	9.3	363	90.7
17. Has the thought of ending your life been on your mind?	137	34.3	263	65.8
18. Do you feel tired all the time?	94	23.5	306	76.5
19. Do you have uncomfortable feelings in your stomach?	197	49.3	203	50.7
20. Are you easily tired?	163	40.8	237	59.3
Average Total	141	35.2	173	64.9
Prevalence %	$P\% = \frac{141}{400} \times 100 = 35.2$			

The above-average was collaboratively used with a cut-off of 7 on the SRQ-20 to assess the number of smallholder crop farmers experiencing mental health issues. Based on the results from the SRQ-20, the prevalence of mental health issues among smallholder crop farmers in Embu and Meru stood at 35.2%. Basically, 35.2% possessed symptoms

that reflect anxiety, psychosomatic discomfort, and depression which cumulatively get grouped into the common mental disorder (CMD). The description of feelings, emotions, and behaviour by the smallholder farmers was congruent to the markers presented in the SRQ-20, and as such, it can be

concluded that mental health issues are prevalent among smallholder farmers in Embu and Meru.

Effects of Climate Change on the Mental Health of Smallholder Crop Farmers

The study sought to establish the effects of climate change on the mental health of smallholder crop

farmers. To do this, a regression analysis was done to test the level to which the DV (Mental health among smallholder farmers) is predicated by the IVs aligned to climate change level.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Err of the Estimate	Change Statistics					Durbin-Watson
					R ² Change	F Change	df1	df2	Sig. F Change	
1	.126 ^a	.576	.514	.084	.016	61.468	1	398	.001	1.489

a. Predictors: (Constant), Climate change

b. Dependent Variable: Mental health

Based on the results of the model summary, the R-value of .126^a shows a positive direction of the model, which shows that the results are statistically significant (.126^a p-value=<.005). Applicable to the present study is the adjusted R square, which is .514, which represents the result that climate change

predicted mental health outcomes among smallholder farmers in Embu and Meru at 51.4%. The fact that the p-value is .001 <0.05 shows that the result is statistically significant and that climate change had a significant effect on the mental health of smallholder crop farmers in Embu and Meru.

Table 3: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.518	1	1.518	61.468	.001 ^b
	Residual	93.419	398	.235		
	Total	94.938	399			

a. Dependent Variable: Mental health

b. Predictors: (Constant), Climate change

The ANOVA result (Table 3) shows an F-statistics of 61.468, which indicates that the model is fit and the subsequent results would be reliable and

statistically significant. To that extent, climate change had a significant effect on the mental health of smallholder crop farmers in Embu and Meru.

Table 4: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% CI for B	
		B	Std. Error				Beta	Lower Bound
1	(Constant)	-.023	.251		.090	.928	.516	.871
	Climate change	.533	.052	.526	2.543	.001	.030	.235

a. Dependent Variable: Mental health

The results from Table 4 show that at a p-value of 0.01 and a beta of .526, it can be concluded that climate change had a significant effect on the mental health of smallholder crop farmers in Embu and Meru. The confidence interval (CI 51.6%-87.1%) implies that the result that climate change had a significant effect on the mental health of smallholder farmers in Embu and Meru is reliable and valid.

The prevalence rate of 35.2% means that the respondents possessed symptoms that reflect anxiety, psychosomatic discomfort and depression, which cumulatively get grouped into the common mental disorder (CMD). This is an indication that mental health issues are prevalent among smallholder crop farmers in Embu and Meru. Looking at relevant literature, as far as prevalence is concerned, recent studies done in parts of Europe and the USA show a 19% prevalence rate of mental illnesses and a 4.1% prevalence rate of diagnosed mental illness which is 1 in 5 and 1 in 24 people respectively (Wainberg et al., 2017). The WHO (2018) global estimates show that in Africa, the prevalence rates of mental illness are approximately 17%, and those diagnosed with mental illness are 3.3%. The report argues that one should not mistakenly assume that the figures are low than those from developed countries because diagnosing capacities and the level of awareness of Africans to engage in mental treatment is significantly low; thus, these figures could actually be higher. In Kenya, the prevalence of mental health has been placed at 25% (Government of Kenya, 2019; WHO, 2018). The reports further admit that owing to negative attitudes about mental health in Kenya those numbers could actually be higher.

It should be noted that the prevalence of 35.2% of mental health issues in Embu and Meru counties in this study is significantly higher than most estimates globally, in Africa and in Kenya. However, what the prevalence highlights are that cumulatively, anxiety, psychosomatic discomfort, and depression are mental issues that significantly confront

smallholder crop farmers in Embu and Meru. Further, the SRQ-20 and the results presented show that the biological, psychosomatic, psychological, and social dimensions were examined, which led to the conclusion that mental issues were prevalent among the smallholder farmers in Embu and Meru. This aligns with the Biopsychosocial model, which is the anchor theory in this study. The Biopsychosocial Model was generally grounded on the assumption that the health status of people coupled with their health outcomes should be considered within the auspices of the level of human development and existence that are premised on social, physiological and biological dynamics (Borrell-Carrió et al., 2014; Engel, 1977).

The result that climate change had a significant effect on the mental health of smallholder farmers has support from reviewed literature. Padhy et al. (2015) noted that climate change does indeed cause mental illness, as measured using the stress and depression of farmers. However, the study was done in the Indian context and used the Perceived Stress Questionnaire, while the present study examines the Kenyan context where differences exist in climate change and response to those changes. Further, the present study being that it is more concerned with examining mental health chooses to use the Self-Reporting Questionnaire- 20 Item to access data that measure the mental health of smallholder crop farmers. This study is supported by Hayes et al. (2018), who examined the link between climate change and mental disorders among farmers in the UK. The study found a strong positive correlation between climate change and increased mental disorders among farmers than among non-farmers; that study used the Patient Stress Questionnaire to ascertain this outcome.

CONCLUSION

The prevalence of mental health issues among smallholder crop farmers in Embu and Meru stands at 35.2%, which is a significant prevalence. Also, climate change had a significant effect on the mental

health of smallholder crop farmers in Embu and Meru. This has affected the wellbeing of these farmers based on the dimensions of the wellness model and the sustainable livelihood approach. The explanation of causes, diagnosis and treatment of these mental health challenges that the smallholder farmers are facing are explained using the biopsychosocial- spiritual and wellness model, while the sustainable livelihood approach touches on the effects of climate change and how these effects combined with mental health issues affect the livelihood actions of these smallholder crop farmers. This study recommends that: Owing to the significant prevalence of mental illness among smallholder crop farmers, it is recommended that the farmers should proactively seek mental health services to help them better manage mental illnesses. Public and private partnerships should be encouraged in the mental health field to help in setting up mental health centres in Embu and Meru to help increase access to mental healthcare for smallholder crop farmers. Institutions and individuals that are able to provide pro bono or subsidised mental healthcare to the smallholder crop farmers who are limited in resources and in their ability to afford psychotherapy should find a way of providing mental health services to the farmers. The farmers need to access hospitals and other mental health organisations to take advantage of workshops and training seminars that would help them access effective coping tools. Subsequently, psychological elements like resilience, self-efficacy and mindfulness can be ingratiated into the training of smallholder farmers to help them practice good mental health. In the provision of these mental health services, the goal should be to ensure that the smallholder farmers have holistic wellbeing in line with the assertions of the biopsychosocial-spiritual and wellness models.

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