Nat. Volatiles & Essent. Oils, 2018; 5(1): 84-92
https://doi.org/10.52783/nveo.5466

NVEO
Natural Volatiles & Essential Oils

Assess The Perceptions Of Extension Officers On Climate Change And Variability

Ramasurbramaniam Shankar

Department of School of Architecture and Planning, Graphic Era Hill University, Dehradun, Uttarakhand, India 248002

ABSTRACT

Consequently, the agricultural sector will be significantly impacted by changes in average climatic conditions and the incidence of severe climatic events, which may have crucial consequences for the problem of food security. About 60% of the labor force, particularly in rural areas, is employed in agriculture, which provides 27% to GDP and supports the economy. Humanity faces a wide range of socioeconomic consequences as a result of climate change. Climate variability and climate change, which may affect weather patterns over shorter or longer time periods, can have an effect on harvests. Since then, the percentage of tube-wells that fail has risen dramatically, and new investments in tube-wells have not produced the expected returns. Even for farmers with water-producing tube wells, regular power outages limit their ability to use their irrigation systems. The soil moisture level has decreased the potential for desertification in the area. Farmers are less likely to misinterpret the direction of temperature change now that they have more access to extension services and a higher median income. In areas where rainwater collection is common, farmers may see a considerable drop in precipitation and agricultural productivity.

KEYWORDS Agriculture, household level, Smallholder farmers, climate change impacts

INTRODUCTION

Adaptation may take place either at the level of the individual, via a shift in behavior, or at the level of the community, through concerted effort and the exchange of information. "Household level behavior that aim to avoid the physical and financial impacts imposed by climate exacerbated hazards" is one definition of adaptation at the individual/household level. The drivers of a change in practice, such as the adoption of an innovative farm technique, have been the subject of a large body of empirical study. Farmers' successful adoption of new practices may be influenced by a number of variables, including farm conditions and the feature of the method itself. "Psychological factors," however, environmental impressions, such as these, have been largely disregarded in previous analyses.

About 60% of the labor force, particularly in rural areas, is employed in agriculture, which provides 27% to GDP and supports the economy. It is believed that 90% of farms in the agricultural industry are less than 2 hectares in size, making smallholder farmers the norm. When climate change-related seasonal shifts and droughts strike, smallholder farmers, who often work on family-owned farms using traditional subsistence practices, are particularly vulnerable. Agriculture is especially vulnerable to climate change because it relies on rainfed systems. The Nationally Determined Contribution of India to the Paris Climate Agreement, this is one of the country's top priorities. This is a reflection of the significance of agriculture in

helping India accomplish its climate change adaptation and mitigation obligations. Understanding the capacity development requirements of agricultural extension agents is crucial for them to carry out their critical responsibility of assisting smallholders in managing and adapting to climate change. Innovative sustainable adaption strategy (SASs) strategies are needed to mitigate climate change's negative effects on agriculture and boost crop yields at the same time. The FAO has officially acknowledged the effectiveness of SASs in combating climate change.

LITERATURE REVIEW

Ayansina Ayanlade et.al (2017) This research looks at the perspectives of smallholder farmers during the last three decades in regards to climate change, climatic variability and its effects, and the adaption measures they have used. To evaluate how well farmers' perceptions in Southwestern Nigeria reflect climatic trends, About 67% of farmers who took the survey have noticed recent weather changes. Farmers in the country have views on climate change and variability that align with scientific findings. Results from the RAI and CDI show that below-average precipitation occurred in at least 11 of the 30 years examined at each research location. Changes in weather patterns have been seen for both EGS and LGS rainfall, and the 5-year moving average suggests a decline in rainfall during the last 30 years. A delayed start to the rainy season, less EGS precipitation, and an alternating pattern of EGS and LGS precipitation were all consistent with farmer reports. Farmers' adaption tactics seem to be significantly related to their degree of experience and income. Researchers found that farmer views of climate change were consistent with meteorological studies, although based on more limited data. Most smallholder farmers lack the means to adapt to the effects of climate change, making them especially susceptible to its effects.

Andrew Manoba Limantol et.al (2016) The majority of Ghanaians, especially in the north where yearly rainfall is extremely low, rely on rain-fed agriculture for their livelihood. This study aims to compare farmers' perspectives and adaption strategies to climate change and unpredictability with actual meteorological data from the Vea watershed in the Upper East Region of northern Ghana from 1972 to 2012. 41 years' worth of climate data (1972-2012) from four locations in the catchment region were analyzed to identify the actual weather outcomes. A survey questionnaire was sent to farmers with at least 30 years of farming experience in six of the eleven agricultural enumeration regions in the 305 km2 watershed. Seventy-nine percent of the 466 farmers surveyed relied on rain-fed methods, while 21 percent relied on irrigation. According to the findings, over 94% of farmers surveyed feel that rainfall amounts, durations, intensities, and wet days have declined during the previous 30 years. Almost 96% of farmers say that reduced rainfall, droughts, and changes in the timing of rainfall events pose a significant threat to their crops. The catchment's climate data shows that temperatures are rising but yearly and monthly rainfall levels are staying about the same, suggesting that evapotranspiration might be on the rise. There were no statistically significant differences between rain-fed and irrigated agricultural types in terms of outside assistance, but there were disparities in how each type adapted to climate change. Evidently, most farmers get help, with 94% of those using rain-fed methods and 90% of those using irrigated methods receiving extension assistance. Farmers that rely on rain-fed methods adapt to

climatic variability by rotating their crops without using fertilizer, whereas farmers who rely on irrigation are more likely to use fertilizer to counteract climate variability. Both temperatures and evapotranspiration are on the rise, posing a threat to the Vea watershed. Farmers are aware of the changes in the environment and are making preparations; nonetheless, they still need assistance. Helping farmers maintain their incomes over the long term requires adequate extension services and irrigation infrastructure.

M. L. Amadou et.al (2015) Local perspectives on climate change and variability aid in understanding the impact of climate change on agricultural land-use systems. This study compares the views of farmers in four communities in Ghana's Upper East Region on the topic of climate change and variability. A total of 186 homes in these four communities were surveyed to compare farmers' impressions with weather records from the regional weather station. In addition, logistic regressions were utilized to evaluate the characteristics that determine how locals see climate change and variability. According to the results, 71% of those who responded to the survey saw a rise in temperature, which is consistent with the meteorological data. However, 95% of respondents saw a correlation between decreased rainfall and a shorter time period. There was no clear indication of a decrease in rainfall from the climatological data owing to the considerable inter-annual variability. In contrast, the duration of the growing season varies, and this variation may be attributed to the major effect of the beginning of the rainy season rather than its conclusion. The results of the binary logistic analyses showed that knowledge of the local topography and climate had an important role in shaping people's positive attitudes about climate change and variability. This means that the local environment and access to climate-related information should be prioritized in any policy aimed at encouraging farmers to take adaption measures in response to climate change.

B. Y. Fosu-Mensah et.al (2012) Farmers in rural Ghana are particularly susceptible to the environmental, economic, and social consequences of climate change since their livelihoods rely so heavily on rain. The intensity of these consequences will be determined by the degree of awareness and flexibility in response to climate change. The purpose of this study is to assess the level of adaptation to climate change among farmers in the Sekyedumase area of Ghana's Ashanti region. between-depth interviews were conducted with one hundred eighty rural families between February and October of 2009. The majority of respondents (92%) agreed that temperatures have been rising, whereas a smaller percentage (87%) agreed that rainfall has been decreasing. Crop diversification, planting short-season types, switching crop species, and moving planting dates were among the most prominent coping mechanisms observed. Logit regression analysis revealed that farmers' perspectives and adaptations are most affected by their access to extension services, loans, soil fertility, and land tenure. To a lesser extent, poverty and a lack of weather forecasting knowledge also played significant roles. Despite widespread knowledge of climate change among residents, just 44.4% of farmers have made changes to their methods in response to rising temperatures, and only 40.6% have responded to falling precipitation levels.

Bewket Amdu et.al (2013) Farmers' attitudes regarding climate change were analyzed, along with the effects that climate change is having on agriculture in their area, the most effective ways in which farmers have come up with to adapt, the factors that make it difficult or

impossible for them to do so, and so on. Data from 384 farms in the upper Blue Nile basin during the 2010–2011 growing season was used to perform the research. The three agro-ecological zones studied were the Highland, the Midland, and the Lowland. The poll found that as many as 85 percent of respondents feel that temperatures have increased. The majority of responders (61%) have seen a decline in rainfall intensity, whereas the vast majority (90%) have noticed a shift in rain patterns. Most farmers' views on rising temperatures were consistent with findings from statistical analyses of historical data. However, the trend analysis of rainfall data was in stark contrast to the beliefs of most farmers about rainfall intensity. The majority of the farmers who noticed climatic shifts used locally available strategies for adjusting to the new conditions. Planting trees, shifting planting schedules, switching crops, diversifying crop types, and modifying livestock management are some of the most often used adaptation strategies. Multinomial logit model results emphasized beneficial factors on farmers' adaptability to climate change, including regular extension visits, resource endowment, access to climatic knowledge, a big amount of productive labor, and years of farming expertise. Farmers were less likely to take action to adapt since they believed they owned fertile land.

IMPACT OF CLIMATE CHANGE ON AGRICULTURE

The effects of climate change on society and the economy will be far-reaching. One sector of the economy that stands to lose the most as a result of climate change is agriculture. Environmental shifts and swings, which may affect weather patterns over shorter or longer time periods, can have an effect on harvests. Climate change is expected to alter the sowing time and duration of growing seasons, which may necessitate reevaluating the planting and harvesting schedules of crops and varieties currently used in an area. Climate change has also been seen to alter the seasonal distribution patterns and quantity of precipitation. As temperatures increase, so does the rate of evaporation and transpiration, highlighting the need for more efficient water management. More frequent severe occurrences like heat waves, droughts, and floods may also cause a change in the ranges of weeds and insect pests. Major shifts in the local flora and fauna are possible as a result of climatic shifts.

According to the Intergovernmental Panel on Climate Change (IPCC) assessment (IPCC, 2007) and other key studies such as Parry & Carter (1989) and Dinar et al. (1998), a loss of 10–40% in overall productivity is possible by 2080–2100 because of a rise in temperature. Temperature and humidity have a major role in the distribution and abundance of both pathogens and insect populations. Changing their population density due to an increase in these factors would reduce yield. They have adapted to the fact that a region's whole plant life relies on the weather patterns that prevail there. Soil formation from parent material, plant and animal development and reproduction, and health are all affected by changes in climatic factors. As a result of these shifts, the overall sectoral makeup of the regional economy will shift significantly. Figure 1 is a visual representation of the aforementioned network architecture.

Nat. Volatiles & Essent. Oils, 2018; 5(1): 84-92
https://doi.org/10.52783/nveo.5466

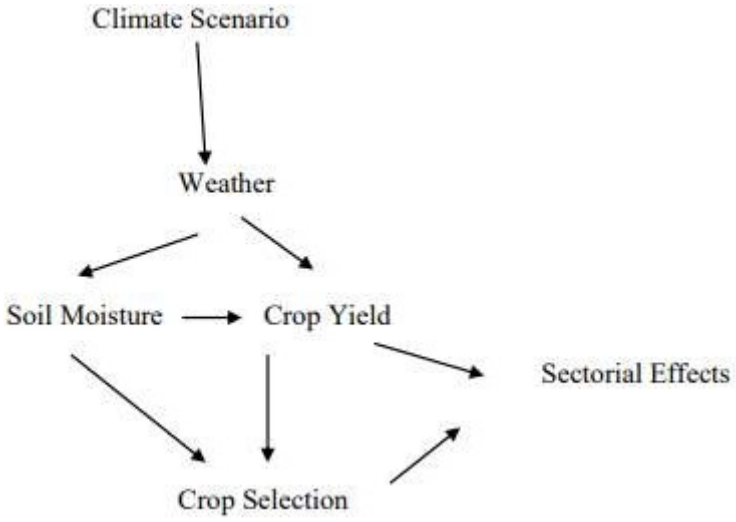

Figure 1 Pictorial showing Interlinked Impacts of Climate-Change

IMPACTS OF CLIMATE CHANGE ON AGRICULTURE: CASE OF INDORE DISTRICT

That the Indore district is particularly vulnerable to the effects of global warming has already been established. The district's cropping pattern has likewise seen a dramatic transformation. After decades of 'pag pag roti dag dag neer' (good summers and plenty of water leading to plenty of jobs), the Indore region is now experiencing droughts, extremely heavy rainfalls, heat-waves, frost, and cold waves. Wheat and soybeans have supplanted the region's formerly varied agricultural system, which relied heavily on the sustainable use of surface water. Due to a dearth of suitable surface water for irrigation, farmers in the area must instead rely on the extraction of groundwater. There have been reports of alarmingly high rates of ground water extraction in the area. In certain areas of the region, the water table is as much as 500-600 feet below present ground. Since then, the percentage of tube-wells that fail has risen dramatically, and new investments in tube-wells have not produced the expected returns. Even for farmers with water-producing tube wells, regular power outages limit their ability to use their irrigation systems. The soil moisture level has decreased the potential for desertification in the area. Thus, the district's policy-intervention in rain water gathering has only just begun. Since the region's rainfed agriculture has significant differences from irrigated agriculture in terms of cropping system, inherent climatic risk, resource base, flexibility to adapt, productivity, and farm profitability, this research intends to evaluate the efficacy of this intervention. As a result, it's crucial to investigate how climate change has affected regional farming practices in relation to the policy intervention of rain water collection.

OVERVIEW OF AGRICULTURAL PROFILE OF THE FARMERS OF THE STUDY REGION DURATION OF AGRICULTURAL YEAR –

The length of an agricultural year is the sum of the months in which a farmer is actively engaged in farming. Here, we classify participants whose engagement lasted anywhere from six months to a full year (Table 1).

Table 1 Distribution of Sample Farmers as per duration of Agricultural Practices

Duration of Agricultural Practice (Months)	Number of Farmers With RWH	Number of Farmers Without RWH
6 - 8	52 (34.66)	86 (57.33)
9 - 10	61 (40.67)	54 (36)
11- 12	37 (24.67)	10 (6.67)
Total	**150 (100)**	**150 (100)**

About 35% of farmers in the "With RWH sample" and 57% of farmers in the "Without RWH sample" are active in agricultural operations for six months or more out of the year. In addition, 41% of those in the "With RWH" sample said they were involved for 9–10 months, and 35% for 11–12 months, whereas just 36% and 7% of those in the "Without RWH" sample said the same. In the latter group, just around 7% are actively engaged in farming activities year-round. This is a resounding demonstration of how the adoption of RWH via the provision of guaranteed irrigation infrastructure has allowed farmers to extend the period of year during which they are actively engaged in agricultural activities. Most farmers who have adopted RWH can only find employment in agriculture during the wet season.

MAJOR CROPS SOWN –

Both sets of farmers have been categorized based on the primary crops they planted. Table 2 lists the many crops that are grown, such as fruits like oranges and mangoes; vegetables like garlic, onions, and potatoes; and flowers.

As seen by the fact that one hundred percent of farmers in the "With RWH" subsample and ninety-six percent of farmers in the "Without RWH" subsample engage in soybean planting, the whole study area has become a center for the crop. As a Kharif crop, soybeans need precipitation, therefore a healthy monsoon is crucial. However, groundwater from the area has been used to irrigate the crop in recent years. Soyabean is irrigated using the water that farmers have begun collecting in areas where it is possible. About 98% of farmers in the "With RWH" subsample and 90% of farmers in the "Without RWH" subsample grow wheat, another important regional crop. This means that the area formerly known as the "Cotton-Jowar" crop-zone will instead produce soybeans and wheat. In addition to these two staple crops, farmers are also cultivating one or two supplementary crops. These include flowers, fruits, onions, garlic, potatoes, and other vegetables as well as "Other crops" such as gram, maize, jowar, and pulses in smaller quantities.

Table 2 Proportion of Sample Farmers as per Major Crops Sown by them

Name of Crop	Numbers of Farmers With RWH	Numbers of Farmers Without RWH
Soyabean	150 (100)	144 (96)
Wheat	147 (98)	135 (90)
Maize	9 (6)	8 (5.33)
Gram	98 (65.33)	32 (21.33)
Jowar	2 (1.33)	0
Pulses	5 (3.33)	0
Other Crops	33 (22)	72 (48)

CROPPING PRACTICES –

Intensifying the usage of existing farmland is a viable option for increasing productivity and, by extension, the economic rewards of farming. Soybean and Wheat are the two most important crops farmed in the area year after year during the Kharif and Rabi seasons. Cotton and sugarcane, formerly staple crops in the area, have now all but vanished from the belt. Growing and rotating a wide range of crops such as gram, jowar, vegetables, medicinal crops, maize, sugarcane, cotton, flowers, and so on would be the most essential shift that could be done to progress towards a healthy, sustainable food system. In this light, questioned farmers were broken down according to whether they engaged in monoculture, crop rotation, or mixed cropping. A field or farming system that only grows one kind of crop is said to be monocultural. In contrast to a monoculture system or a system of random crop succession, polyculture, also known as mixed cropping, or crop rotation, involves the sequential cultivation of various crops in a set sequence on the same fields.

Table 3 Proportion of Sample Farmers following Different Cropping Practices

Cropping Practices	Number of Farmers With RWH	Number of Farmers Without RWH
Monoculture	113 (75.33)	110 (73.33)
Rotational	33 (22)	34 (22.67)
Mixed	7 (4.67)	6 (4)

According to Table 3, almost 75% of farmers in the area are using monoculture across both datasets. Twenty percent of farmers use a crop rotation system, whereas just around four percent engage in a mixed-cropping strategy. As a result, it's quite clear that the region's prevalence of monoculture has grown substantially. Political and economic forces are driving the move toward monoculture, and the system's payoff in the form of economies of scale is a

major element in why the Malwa zone is now known as a specialized Soya-Wheat belt in both domestic and international markets. Since the percentages are the same in both groups, it would seem that farmers have not changed their cropping strategies as a result of RWH adoption. If farmers have no other choice than to continue with the Soybean-Wheat cycle typical of the area under investigation, they must depend heavily on groundwater supplies for irrigating their crops.

Crop rotation, which often supports excellent soil health by alternating crops with various nutrient demands, thus preventing depletion of any one critical element present in the soil, is nevertheless important despite these advantages. Crop rotation, as opposed to monocultures, may boost yields by 15–20%. Soil biomass as a whole is also boosted. Lastly, it helps with weed control by supplying live leguminous mulches and preserving soil health. Therefore, a significant change towards more rotational and mixed cropping is required in the region's agricultural techniques.

CONCLUSION

The results of this research show that most farmers are aware of the rising temperatures and decreasing rainfall in their region, that pests and diseases pose a greater threat to their crops and livestock, and that there is an urgent need for more irrigation infrastructure to support modern agriculture in this area. More frequent and severe climate-related catastrophes have been experienced by the farmers in recent years. Several variables are connected to enhanced perceptual quality. Correctly perceiving climatic shifts is the foundation on which effective adaptation and mitigation strategies may be built. Thus, if these initiatives succeeded in altering farmers' perceptions, In the face of climate change, it would be a huge step toward ensuring food security in the region. However, the focus of this study was limited to the perceptions of climate change held by farmers. There has been little discussion of the actual impacts of climate change, as felt by farmers in the region, or the strategies needed to adapt to or lessen these impacts on agriculture.

REFERENCE

1. Ayansina Ayanlade et.al “Comparing smallholder farmers’ perception of climate change with meteorological data: A case study from southwestern Nigeria” Volume 15, March 2017, Pages 24-33
2. M. L. Amadou et.al **“**Comparing farmers’ perception of climate change and variability with historical climate data in the Upper East Region of Ghana” Ghana Journal of Geography Vol. 7(1), 2015
3. Limantol, A.M., Keith, B.E., Azabre, B.A. et al. Farmers’ perception and adaptation practice to climate variability and change: a case study of the Vea catchment in Ghana. Springer Plus **5**, 830 (2016). https://doi.org/10.1186/s40064-016-2433-9
4. Fosu-Mensah, B.Y., Vlek, P.L.G. & MacCarthy, D.S. Farmers’ perception and adaptation to climate change: a case study of Sekyedumase district in Ghana. Environ Dev Sustain 14, 495–505 (2012). https://doi.org/10.1007/s10668-012-9339-7

5. African Technology Policy Studies Network, ATPS 2013: Farmers' Perception and Adaptive Capacity to Climate Change and Variability in the Upper Catchment of Blue Nile, Ethiopia [Bewket Amdu, Azemeraw Ayehu, Andent Deressa], ATPS WORKING PAPER No. 77

6. Morton, L.W. 2008. The role of civic structure in achieving performance-based watershed management. Soc. Nat. Resour. 21:751–766. doi:10.1080/08941920701648846

7. Morton, L.W., J.M. McGuire, and A.D. Cast. 2017. A good farmer pays attention to the weather. Clim. Risk Manage. 15:18–31. doi: 10.1016/j.crm.2016.09.002

8. Nepveux, M. 2019. Crop planting delays reach historic levels resulting in high levels of uncertainty for 2019. American Farm Bureau Federation, Washington, DC. https://www.fb.org/market-intel/crop-planting-delays-reach-historic-levels-resulting-in-high-levels-of-unce (accessed 1 July 2019)

9. Ziska, L.H., J.R. Teasdale, and J.A. Bunce. 1999. Future atmospheric carbon dioxide may increase tolerance to glyphosate. Weed Sci. 47:608–615. doi:10.1017/S0043174500092341

10. Walthall, C.L., J. Hatfield, P. Backlund, L. Lengnick, E. Marshall et al. 2012. Climate change and agriculture in the United States: Effects and adaptation. USDA Tech. Bull. 1935. USDA, Washington, DC

11. USGCRP. 2018. Impacts, risks, and adaptation in the United States: Fourth National Climate Assessment. In: D.R. Reidmiller, C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart, editors, Vol. 2: Report-in-Brief. U.S. Global Change Research Program, Washington, DC

12. Afful DB, Oluwatayo IB, Kyei KA, et al. (2015) Contribution of public extension to food security of smallholder farmers in Limpopo Province, South Africa in an era of climate variability. Journal of Human Ecology 50(3): 205–212.

13. Akinnagbe OM, Ajayi AR (2010) Challenges of farmer-led extension approaches in Nigeria. World Journal of Agricultural Sciences 6(4): 353–359.

14. Baloyi JK (2010) An analysis of constraints facing smallholder farmers in the agribusiness value chain. Doctoral Dissertation, University of Pretoria, South Africa.

15. Berman R, Quinn C, Paavola J (2012) The role of institutions in the transformation of coping capacity to sustainable adaptive capacity. Environmental Development 2: 86–100.