



Effects of Climate Change on Poultry Production in Marathawada Region

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Abstract:

The study assesses the effects of climate change on poultry production in Marathawada region. Two hundred (200) poultry birds were interviewed to elicit relevant information. Global climate change poses a great threat to poultry production. Greenhouse gases (GHGs) such as are released through both natural & anthropogenic sources into the atmosphere. Descriptive statistics and inferential statistical tools were used for data analysis. Findings revealed that majority (93.3%) of the respondents are aware of climate change, 78%, 98.8% and 86.7% of the respondents agreed that temperature fluctuation increased in sunshine intensity and global warming has a negative effects on poultry production. 72.4% of the respondents agreed that prices of feed grains are usually high in hot and dry seasons. The findings further revealed that majority (90.4%) of the students reported that climate change has effect on distribution of poultry diseases, close to three quarter (78.3%) of the students claimed that there are more poultry diseases than in the past as result of effect of climate change. This study further revealed that majority (95.2%) of the respondents agreed that moist climatic conditions encouraged the distribution and development of diseases and 68.7% of the respondents also confirmed that climate change has led to the development of new poultry diseases in the study area. the findings also shows that there is a significant relationship between socio-economic characteristics of respondents and their level of awareness of climate change since the $p > 0.05$ ($r = 0.652$, $p = 0.001$). it is recommended extension agents and other development agencies need to educate the poultry farmers more about the effects posed by climate change on poultry production and intensify awareness campaign to poultry farmers on how to reduce the effects of climate change on poultry production.

Key words: Poultry, Climatic change, Broiler chickens, Environmental temperature, Heat stress, Thermal comfort zone, Thermoregulation & Management.

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Introduction:

The Indian poultry sector is characterized by its industrialization, faster growth in consumption and trade than any other major agricultural sectors in the world. Today, India is the third largest egg producer in the world after China and USA and the 6th largest broiler producer after USA, China,



European Union, Brazil and Mexico (FAO, 2014). Climate change is defined as deviations in the patterns of climate over a long period of time. The problem of climate change will add to the burden of heat stress (HS) usually experienced in the tropical regions of Marathawada region because of the predicted increase in global temperature. Poultry plays an important economic, nutritional and socio-cultural role in the livelihood of poor rural households in many developing countries, including India. Poultry includes fowl, turkey, duck, goose, ostrich, guinea fowl, etc. which render not only economic services but contribute significantly to human food as a primary supplier of meat, egg, raw materials to industries (feathers and waste products), source of income and employment to people compared to other domestic animals (Avila, 1985; Demeke, 2004).

Materials and Methods:

This study is conducted in Marathawada region of Maharashtra state. This study is situated at MGM hills campus of Marathawada region, Aurangabad. It is situated on 19°60' North latitude and 76°50' East longitudes at an elevation of 489 meter above mean sea level. In Marathawada, there are two main poultry production systems. Distinguishing factors between the two are associated with the scale of production, stock, management system and productivity. In terms of productivity, the commercial gives higher returns. On the other hand, the latter, also known as village or backyard poultry, is usually on small scale, stocking the locally adapted indigenous breeds of birds. In Marathawada region specially Grampriya, Vanraj, Kaveri, Pathardi this breeds are reared. The tropical climate of the state has two broadly classified seasons: rainy season that starts from April and ends in October and dry season that last between Novembers to March. It has a temperature range of 29° C – 36° C with a relatively high humidity. The annual rainfall varies from 1050 to 1200 mm in the areas. The major occupation of the people in the state is agriculture which offers 70% of employment to the people of the state. The state is blessed with environmental factors that encourage people in the state to venture into animal rearing, such as poultry, dairy and fishing (Amos, 2006). For this study, simple random sampling technique was used to a total of 200 poultry birds. A well-structured interview schedule was used as primary source of data collection from the sampled poultry unit. Data analysis was done using descriptive statistics such as frequencies distribution. Chi –square was used to test the formulated hypothesis.

Results and discussion:

Age is an important factor among the socio-economic characteristics of poultry unit students as it determines the effectiveness and competence of labour availability for production. As indicated in Table 1, 76.4% of the respondent's students are in their active age of 21 – 30 years, hence they have the ability to supply the required labour needed in the production process. On the educational level of the respondents which directly influence the student's ability to adequately keep record and make observation on how climate change influences their poultry production pattern, the table shows that 76.4 % of the respondent's have graduation level education. This is to say farmers with good educational background are most likely to have better ability to keep records and make observation on effects of climate change on their farms than the illiterates. The Table also depicts that respondents with years of farming experience of between 0 – 1 years have a total of 1.2%, hence, majority of them have good years of farming experience and this may influence their level of performance and observation on variation on climatic elements and its effects on poultry production. Close to half (89.18%) of the respondents practiced intensive system of poultry production in the study area, this may be explained by the fact that the system has much smaller impact on global warming.



Table1. Socio-economic characteristics of students in the study area

Characteristics	Frequency	Percentage
Age		
21-30	13	76.4
Educational Level		
Graduation	13	76.4
Years of Unit Exp.	1	1.2
System of poultry Mgt		
Intensive	200	89.18

Table 2. Distribution of students on perceived effects of climate change on poultry disease distribution

Effects of climate change on disease distribution	Yes Frequency (%)	No Frequency (%)
Does climate change have effect on the distribution of poultry diseases?	175 (90.4)	25 (9.6)
Are there more poultry diseases now than in the past due climate change?	165 (78.3)	35(21.7)
Moist climatic conditions encourage the distribution and development of diseases?	179 (95.2)	21(4.8)
Has climate change led to the development of new poultry diseases?	157 (68.7)	43 (31.3)

From the results in table 2, majority (90.4%) of the students reported that climate change has effect on distribution of poultry diseases, close to three quarter (78.3%) of the students claimed that there are more poultry diseases than in the past as result of effect of climate change. The results in table 2 further revealed that majority (95.2%) of the respondents agreed that moist climatic conditions encouraged the distribution and development of diseases and 68.7% of the respondents also confirmed that climate change has led to the development of new poultry diseases in the study area. High rainfall and relative humidity provides a conducive environment for breeding of parasites that causes outbreak of diseases which invariably reduces meat production (Elijah and Adedapo, 2006).



Table 3. Relationship between some selected socio-economic characteristics of respondents and their level of awareness of climate change

Variable	N	X	SD	R	Significant	Decision
Socio-economic characteristics	200	1.21	0.32	0.652**	0.001	Ho
Level of awareness of climate change	200	1.21	0.44	0.652**	0.001	Rejected

The chi-square result in table 3 shows that there is a significant relationship between socio-economic characteristics of respondents and their level of awareness of climate change since the $p > 0.05$ ($r = 0.652$, $p = 0.001$). This implies that socio-economic characteristics of the poultry farmers have influence on their level of awareness of the effect of climate change on poultry production.

Climate Change and Its Evidences in Marathwada region

Livestock subsector was viewed as a victim until it was implicated as a major contributor to global emission of greenhouse gases (GHGs) such as CO₂ and CH₄. These gases cause warming of the globe by entrapping heat on the earth crust not allowing it to be reflected to the atmosphere. Resultant global warming and climatic variability have been reported to have both direct and indirect impacts on livestock production, including reduced growth and reproductive efficiency, low quality and quantity of feed materials, and increased prevalence of disease due to rise in temperature (Renaudeau et al. 2012). Predicted temperature rise of 26–35 °C is expected over the land of Marathwada region. Day by day temperature is going on increasing. Now a day the environmental fluctuation is very rapidly change in Maharashtra state. Early in the morning there are seems very cold environment. Then after 11 am seems like very hot likewise May month Temperature. And at the time of night again seems very winter and hot also. Sometimes in March month the rainfall is fall down. So, by considering these Climate change will pose considerable risks to the livelihood of the dwellers of most aera's of Marathwada region in Maharashtra state that mainly depend on agriculture (Hummel 2015).

Impacts of Climate Change to Poultry Production

The productivity is lower with the village poultry system. Day-old chicks (broiler) are produced by the breeding farms. Commercial broiler farms raise the chicks till table size of around 2 to 2.5 kg in 6–8 weeks. The effort to genetically improve commercial stocks of broiler chickens began in earnest in the USA in the 1940s (FAO 2020). And since then, it has been the stories of great leaps in improvement of growth rate and feed conversion efficiency.

Direct Impacts

Poultry birds can adapt to hot environment. However, the mechanisms of coping subject the birds to losses and diversion of nutrients meant for production to thermoregulation. Climate change has impacts on poultry production by way of imposing stress on the homeostasis in the birds. It may come in the form of extreme climatic situations: elevated temperature, flood or drought, and water scarcity (Tiruneh and Tegene 2018). Common among these is increased global temperature. Extreme weather conditions lead to production losses (reduced growth rate, lowered egg hen-day production and increased morbidity and mortality) in poultry birds (Attia et al. 2011).



Indirect Impacts

Indirectly, climate change will impact on feed ingredient availability and quality for the poultry birds; availability of adequate good quality water and pest and diseases infestation in Marathawada region. Climate change has reared up its head in reduction in water in the ponds, streams, rivers and the seas immediately after rainy season all around Africa because of increased rate of evaporation (Alemayehu and Woldeamlak 2017). Water shortage adversely affects body weight and lymphoid organs (Mustafa et al. 2010). This will affect productivity of poultry in terms of morbidity, mortality, and the cost of vaccinations and medications.

Heat Stress and Broiler Chickens

All farm animals in the tropical region suffer from HS at one time or the other because of constant elevated ambient temperature (Altan et al. 2000). HS is an adaptive response that occurs in a bird when the rate of thermolysis is below thermogenesis and the ability to lose body heat exceeded by the heat load acquired through exposure to high ambient temperature (Al-Saffar and Rose 2002). Broiler chickens are homeothermic animals capable of maintaining the body temperature within a narrow range irrespective of the environmental temperature. The internal body temperature of adult chicken is normally between 41.2 °C and 42.2 °C (Mitchell et al. 2005). Newly hatched birds have a body temperature approximately 2–3 °C below that of the adult birds. 1 °C around adult chickens, mechan The fast-growing broiler lines are susceptible to high temperature mostly during growing-finishing phase. The high susceptibility to HS results from resultant inferior development of their cardiovascular and respiratory systems (Yahav 2000). As well, chickens do not possess sweat glands (Mitchell et al. 2005).

Negative Effects of Heat Stress in Broiler Chickens

The adverse effects of HS can be seen in decreased feed consumption, increased water intake, rise in body temperature, respiratory rate, heart rate, electrolyte imbalance, changes in hematological parameters, hormone levels and enzymatic activities in blood pH (respiratory alkalosis; Lara and Rostagno 2013).

Adaptation Options

Housing System

Ideal broiler chicken environment must meet the requirement of the birds for adequate pen temperature, relative humidity, and air circulation. Broiler houses are closed system in most industrialized countries where the temperature and humidity are fully controlled, unlike in developing countries where open-sided housing units are common. Foggers, tunnel ventilators, fans, and misters are used to cool the environment in closed systems. However, the cost of installing and maintaining fans, foggers, ventilators, misting pumps and so on in poultry houses is often beyond what most farmers can afford. Attaining the optimal range of climatic variables in the open-sided poultry houses common in the tropics is difficult and almost impossible (Abioja 2010).



- Orientation of the housing units should allow for cross-ventilation.
- Low-walled structures completed with wire mesh to ensure cross-ventilation.
- High walled structures trap heat inside and will not be applicable.
- Mud wall houses provide cooler interior than brick wall housing unit.
- Roofing style should be such that allow for proper ventilation.
- Roofing materials must be considered. Asbestos roof is preferred to corrugated iron sheet. Local materials that enable heat transfer such as palm fronds, long grasses such used for thatched roof could be used.
- Tree planting around broiler housing units will provide coolness.



Conclusion

The study revealed that majority of the respondents are aware of the climate change and hence, most likely to make observation on how it affect poultry production pattern, effects of climate change which results in temperature fluctuation, increased in sunshine intensity and global warming has a negative effects on poultry production which many at times results to high mortality rate of the chickens and meat production and prices of feed grains are usually high in hot and dry seasons as result of effects of climate change which may affect cost of production and number of birds to raise for meat production in the farm. From the findings of the study meat production pattern are affected by climate change because periods of high temperature and sunshine intensity makes the birds to drink more water and reduce feed intake which many at times results to high mortality of the chickens and low feed conversion ability of the birds to meat, hence, low meat production. The study further revealed that climatic changes influence the emergence of new poultry diseases and increased its distribution. Extension agents and other development agencies need to educate the poultry farmers more about the effects posed by climate change on poultry production. As the evidences of climate change are becoming more pronounced over Marathawada region of Maharashtra state. Various adaptation options available for broiler production in literatures include building housing systems that ensure climate amelioration for the birds, manipulations of feed and feeding systems, supplying adequate water of good quality, ensuring adequate stocking density and use of natural phytochemicals that ensure balanced oxidative status in the body system. Enlightenment programs should be organized for poultry farmers by governmental and nongovernmental agencies on the climate change mitigation, adaptation and resilience strategies in order to improve livelihood of the people in a sustainable manner.

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