



Climate Change Impact on Dairy Farming in Kurnool District of Andhra Pradesh

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ABSTRACT

The impact of climate change has become a major concern within the agricultural profession. This paper discussed the climate change impact on dairy farming is tow types i.e., direct and indirect effects. First one is direct effect on dairy farming i.e., anticipated rise in temperature. The direct effects of climate change on milk production, another one is indirect effects as well, which include climatic influences on quantity and quality of feed and fodder resources such as pastures, forages, grain and crop by-residues, and the severity and distribution of livestock diseases and parasites. This paper concluded that the traditional knowledge coping strategies adapted to reduce excessive heat loads are often expensive and beyond the means of small and marginal farmers who own most of the livestock in the district.

KEYWORDS

Climate change; dairy farming; direct effect and indirect effect

INTRODUCTION

Milk production takes place all around the world. Global demand for dairy continues to increase in large part due to population growth. Rising incomes, urbanization and westernization of diets in countries such as China and India are other factors for increasing demand. With this increasing demand for dairy, there is growing pressure on natural resources, including fresh water and soil¹. Climate change will threaten both food security and rural livelihoods through heat waves, changing patterns of rainfall, increasing incidence of extreme weather and changing distribution of diseases and their vectors. The FAO report livestock long shadow environmental issues and options 2006 climes that livestock production is a major contributor to the global animal food chain and associated land use change is estimate world's environmental problems, contributing about 18 per cent to global anthropogenic Green House Gas (GHG) emissions². However, there are large uncertainties and we cannot adequately characterize trade offs in terms of emission reduction, food production and economic development under climate change. Thus policies that are currently in place to curb GHG emissions and adapt livestock systems to climate change may prove insufficient.

The crop livestock system is one of the most important characteristics of Indian agrarian economy and livestock sector is the integral part of India's agriculture sector. More than 80 per cent of land holding are small and marginal farmers in India and their major supplementary income source is dairy farming. Indian livestock sector provides sustainability and stability to the national economy by contributing to farm energy and food security. Livestock sector not only provides essential protein and nutrition to human diet through milk, eggs, meat and by products such as hides and skin, blood, bone and fat etc., are economically valuable³. Operating on slim profit margins, dairy farmers are vulnerable to fluctuations in production costs and milk price. Climate change is expected to greatly impact dairy farmers. Crop yields will change due to variations in climate, affecting feed costs to farmers. In addition, climate change will affect energy and electricity costs⁴.

Global warming is projected to increase temperature by 2 to 3°C by 2050, with a decline in rainfall and water availability (UNDP, 2007). Recent climate change projections over the Rayalaseema predict shorter rainfall seasons associated with a later start to the season, earlier rainfall cessation, increases in mean dry spell length and reductions in rain day frequency. The rainfall change is predicted to be worse in some parts of Kurnool district i.e., normal rain fall is 665mm in 2012 but actual rain fall is 615 mm is significant variation (-50 mm). Indeed other empirical studies have shown that smallholder farmers in Kur-

nool district are experiencing changes in climate which is reducing productivity.

OBJECTIVES:

Against this backdrop it is proposed to undertake the paper that aims at systematically documentation the sustainable dairy farming followed by small and marginal farmers to cope with climate change.

- To assess the impact of the climate change on the milk production of the sample households.
- To analysis the impact of climate changes on the socio-economic conditions of sample households.
- To analysis the adaptation and mitigation strategies in dairy farming of the sample households.

METHODOLOGY

Kurnool district in Andhra Pradesh was selected to assess the impact of climate change, where the small and marginal farmers are highly vulnerable to frequent droughts as well as other climate factors. The normal rainfall is 665 mm and 28° c in the year 2011-12. in the district. In order to assess the impact of climate change a multi-stage random sampling design was employed for the selection of the sample respondents. The total sample constitutes 300 sample respondents and the needed information for the study was collected using pre tested questionnaire. The analytical tools such as percentages, averages, dispersion to analyze the data are used in the paper.

RESULTS & DISCUSSIONS

DROUGHT IMPACT ON MILK YIELDS

In Kurnool district out of the years (2000 to 2015) there were three chronic drought years which occurred during 2001, 2003 and 2006 followed by 2012 experienced severe drought. During the severe drought year, the shortfall in rainfall was 37.57 per cent as compared to normal year in the district. The major effect of the drought reflected in the yield of the milk production due to inadequate and poorly distributed rainfall.

TABLE-1
DROUGHT IMPACT ON MILK YIELD

Item	Percent loss of milk yield
Cows	43.03
Buffalos	34.09

The drought need not be a lengthier one even a dry spell during the critical growth period as short drought can cause significant damage and harm local economy. Production loss which is often used as a measure of the cost of drought is

only a part of the overall economic cost. The effect of drought on milk production yield in Kurnool district is presented in Table 1. In milk yield reduction was very high to the extent of 43.03 per cent in cows since it is a sensitive animal to drought, another one is to the extent of 34.09 per cent milk yield reduction. It is evident from Table-2 that if there was moderate deviation in precipitation there will be high reduction in the yield of milk production.

FARMERS' PERCEPTION:

The farmers' perception on the climate change was assessed using yes or no type questions and the results are presented in Table 2. Most of the farmers were not able to express their perception on climate change directly but they expressed through the effects or the changes that occurred compared to the earlier years or based on their elder's experiences. About 90 per cent of the sample respondents expressed that their net income was reduced and erratic rainfall over the years, 85 per cent of the farmers expressed that there was reduction in yield and change in climate and rainfall patterns, 80 per cent farmers expressed that there was inadequate quality of pastures, 75 per cent expressed that there was animal diseases, 54.44 per cent of the respondents expressed that the seasonal pattern is changing and 0.17 percent of the respondents expressed that they have no idea on the changes in climate. From the table it is clear that the level of farmers' perception on the climate change was good.

**TABLE-2
FARMERS' PERCEPTION ON THE IMPACT OF CLIMATE CHANGE
(in percentage)**

Factors	Marginal farmers	Small farmers	Total farmers
Reduction in yield	90.00	80.00	85
Reduction in net income	93.33	86.67	90
Disease outbreak	73.33	76.67	75
Inadequate quality of pastures	86.67	73.33	80
Erratic rainfall	100.00	80.00	90
Shifting of seasons	60.00	50.00	55
Change in climatic and rainfall patterns	86.67	83.33	85
Other factors/ no idea	0.00	0.33	0.17

REASON FOR REDUCTION IN YIELD AND NET REVENUE

The sample farmers were highly concerned about the reducing yield rate and net income since their livelihood and socio-economic status is determined by the net income. Almost 100 per cent of the marginal farmers and 96.67 per cent of the sample farmers reported that the reduction in the rainfall was the major reason for reduction in the yield levels over the period followed by the disease to the extent of 78.33 per cent and changes in temperature and seasonal patterns were quoted as the reason for the reduction in the yield by 46.67 per cent of the sample respondents. About 56.67 per cent of the farmers expressed that the lack of forages etc., and 3.34 per cent expressed that they do not have any idea for the reduction in yield over the years. It is clear that the farmers know that the yield reduction occurring continuously and to some extent they have knowledge on the reason for yield reduction also.

**TABLE-3
REASON FOR REDUCTION IN YIELD AND NET REVENUE
(in percentage)**

Factors	Marginal farmers	Small farmers	Total farmers
Change in temperature and Seasonal patterns	53.33	40.00	46.67
Rainfall	100.00	93.33	96.67
Disease	83.33	73.33	78.33
Availability of forages	60.00	53.33	56.67
Other factors/ no idea	0.00	6.67	3.34

COPING MECHANISMS:

The coping mechanism was followed to mitigate the climate

change through technologies as well as through the socio economic aspect and the results are presented in Table 4. There are many coping mechanisms which were followed by the Small and Marginal farmers of Kurnool district. The improve shelters was the major coping mechanism which was adopted by 85 per cent, followed by Behavioral process which was adopted by 50 per cent and Improved fodder/feed storage methods to the extent of 46.67 percent.

**TABLE-4
MAJOR COPING MECHANISM ADOPTED BY SMALL AND MARGINAL FARMERS
(in percentage)**

Coping mechanism	Small farmers	Marginal farmers	Total farmers
Technological mitigation			
Behavioral process	60.00	40.00	50
Improved shelters	93.33	76.67	85
Improved fodder/feed storage methods	46.67	46.67	46.67
Socio economic factors			
Reduced consumption expenditure	60.00	40.00	50
Shifting to other profession	80.00	50.00	65
Borrowing	66.67	40.00	53.34
Animal insurance	16.67	6.67	11.67
Selling of livestock	26.67	6.67	16.67
No response	6.67	23.33	15

When there is change in the climate in either rainfall or temperature from the normal condition, there would be reduction in yield and net income of the farmers. To mitigate the reduction in the net income, the farmers in the district have to adopt some socio-economic strategies to sustain their life. The major socio-economic coping is shifting the profession which is observed to the extent of 65 per cent, followed by borrowing for consumption from private money lenders was 53.34 per cent, 50 per cent reduction in consumption expenditure was observed in small and marginal farmers. Nearly 16.67 per cent of the sample farmers sold livestock, where as 11.67 per cent of the respondents adopted animal insurance as a coping mechanism.

POLICY IMPLICATIONS

- Responding to the challenge of climate change requires formulation of appropriate adaptation and mitigation options for the sector.
- The animals employ physiological mechanisms to counter the heat stress.
- However, to counter the adverse effect of climate change on animal production and health, human intervention for physical modification of the environment and improvement in nutritional management practices would be additionally required.
- Institutional interventions, either by strengthening the existing ones or initiating new ones, relating to fodder bank, custom hiring center, collective marketing, and introduction of weather index based insurance and climate literacy through a village level weather station.
- Augmentation of fodder production during droughts/floods, improving productivity of Common Property Resources (CPRs), promotion of improved fodder/feed storage methods, preventive vaccination, improved shelters for reducing heat/cold stress, management etc.

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