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A Statistical Analysis on Effects of Climate Change on Sericulture – A Study on Farm Management Data

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Abstract

Integrity of ecosystem in our rural areas mostly depends upon climate change. Increase in concentration of green house gases which consists of Nitrous Oxide, Carbon dioxide, methane influences climate change. Infact, whenever there is disturbances in the rise of the above emissions, it leads to destruction of fossil fuel, deforestation and other serious consequences. Particularly, the sericulture on the tropical environmental regions such as Telangana will be severely affected. Hence, an attempt has been made in this field study to find out the positive and negative impact of climate conditions yield and profit on sericulture. The findings have been analysed by using statistical tools such as Mean and Standard deviations, Multiple Regression and ANOVA techniques.

Key words: Climate Change, Sericulture, Multiple Regression, ANOVA

Introduction:

Umpteen research studies carried out in various parts of our country has revealed that climate conditions influence production and productivity of agricultural crops and sericulture is not an exception. Of course, the intensity of climatic effect differs from region to region and it is not uniform within the region also. Many factors directly and indirectly influences atmosphere temperature which effects sericulture. Among them, intensity of green house gases like methane, carban dioxide and nitrous oxide etc are most important in reducing crop yield and inturn profit.

Review of Literature:

Climate changes pose significant challenges for production of quality of silk leading to flourishment of silk industry[1]. Silk the queen of textiles is preferred in comparison to other fibers due to its properties like scroop, heat resistance, water absorbency, cluster dyeing efficiency etc. In other words, erratic and wide fluctuations in climate change are dangerous for silk worm growth[2].

Further, it is observed that biotic and abiotic factors are crucial for the growth, development of silk worm[3]. A number of research studies have revealed that good and quality multivoltine cocoons are produced at optimum temperature of 22-27°c and above these levels its quality deteriorates[4]. It has been also proved that due to frequent erratic fluctuations in an environmental conditions, wide spread of diseases effects the enhancement of cocoon crop[5]. Further, the light of different intensities not only effects laurel weight but also effects its mortality[6]. It rearing is carried out in complete darkness, silk worms showed effects on the life cycle. Free flow of fresh air is required during rearing to bring down the amount of accumulated Carbon monoxide, Carbon-dioxide, Sulphur dioxide and ammonia in the rearing and improves the rate of digestion, laurel and cocoon characters[7]. Silk moisture percentage and humidity has to be maintained to help in digestion, assimilation of nutrient components in the silk worm body[8]. Hence, climate changes poses a significant challenges for the production of quality silk[9]. The above studies have shown that to maintain sustainable silk worm development should not only identify the genes intake heat shocking protein for influencing yield and profit in sericulture.

Need of the present study:

Oblate a number of research studies carried out in different parts of Telangana State on the effect of climate change on sericulture have not analysed it's effect by using statistical tools such as Mean and Standard deviation, ANOVA and Regression Analysis.

An attempt has been in this study to find out the impact of favourable climate factors and unfavourable factors which influenced yield and profit in raising sericulture.

Research Methodology Adopted:

a) Selection of the Villages:

The study has been carried out in four villages representing Hanumakonda and Karimnagar districts of Telangana State during the year 2022. Gollapalli and Muttaram are two villages from Hanumakonda and Katnapalli and Godur from Karimnagar district. Further, we have selected one climate faourable and another is not favourable within that sample villages only. Favourable villages are clubbed as village 'A' and 'B' and unfavourable villages as 'C' and 'D' for our convenience purpose.

b) Selection of the Sample size:

An altogether we have interviewed 100 farmers representing 25 from each village. Fifty farmers are in favourable climate zone and another 50 unfavourable zones. Farmers are belonging to all categories such as marginal, small, medium and big involved in sericulture cultivation.

Objectives of the study:

The study has been carried with the following objectives.

i. To assess the impact of climate change on sericulture by adopting multiple regression technique;
ii. To analyse the impact of climate change by adopting mean and standard deviation; and
iii. To study the result on yield and profit by using ANOVA technique.

Hypotheses Formulated:

To test the above objectives, two hypotheses have been formulated which are as follows:

i. Favourable climate change will have positive impact on production and productivity of sericulture.
ii. Impact of climate change differs from area to area and season to season.

Results Analysis by Statistical Tools:

Table-1 and Table-2 throws light that Mean values in all the climate favourable areas are higher than the Mean values in the unfavourable areas. But the standard deviations in unfavourable areas relatively higher than the standard deviations in other areas which shows greater variables in the yield in this village.

The profit of farmers is much higher in the climate favourable areas which indicates that the stumbling blocks for reducing productivity such as methane, carbon-dioxide and nitrous oxide etc. are not much visible due to untiring efforts put try the sericulture department in influencing the farmers to adopt the methods of cultivation according to its atmosphere. Farmers could get awareness adopted the techniques to be adopted to control adverse climate factors in raising production and inturn to get good profit.

Table-1: Mean and Standard Deviation Climate favourable of Silk rearing in the Study Areas

Status	SM	Village -A	Village -B
Yield	MV	2318.1	2210.10
	SD	335.2	65.13
Profit	MV	1110.05	990.75
	SD	345.07	303.65

SM: Statistical Measures; MV: Mean Value; SD: Standard Deviation

Table-2: Mean and Standard Deviation in the Unfavourable Climate Areas

Status	SM	Village -A	Village -B
Yield	MV	2010.07	1817.0
	SD	715.12	33.57
Profit	MV	650.75	691.17
	SD	450.25	947.01

SM: Statistical Measures; MV: Mean Value; SD: Standard Deviation

Similarly an attempt has been made to assess the multiple regression on yield as dependent variable and seven independent variables such as village, season, farmers category, acres, seeds, manures and pesticides which had been carried out in both climate favourable and unfavourable villages of the selected areas in Hanumakonda district of Telangana State.

Table-3 depicts that R^2 value is very high which is equal to 0.99. Among the independent variables, village, season and farmers category are negatively associated with yield variable.

Further, it has been observed that the analysis of variance with regression as a source of variation has a high F value reflecting that the independent variable chosen for the regression explain a greater part of variations in the yield results due to the existence of different climate conditions in the study areas.

Table-3: Multiple Regression Analysis: Dependent Variable: Yield

Variable	βP	Std. Error	Score	2-tail sig.
Intercept	721.7719	215.190	3.5015	0.005
VLG	-220.63.02	38.14	-4.5813	0.000
Season	-352.6530	105.121	-3.4151	0.004
FACT	-113.4632	55.153	-1.6231	0.008
ACRS	595.1507	168.721	3.885	0.001
SEEDS	5.080	1.002	3.060	0.000
MANS	1.6506	0.4254	3.144	0.000
PEST	17.1314	1.2069	14.5433	0.000
R-Squared = 0.9944 R-Squared adjusted for DF=0.9942				

Table-4: Analysis of the Variance for the Yield Dependent Variable: Yield

Source	SS	DF	MS	F	Probability
Main Effects					
VLG	52457188	3	2054066.89	24.6156	0.000
Season	25085227	2	25085227.62	131.44	0.000
FACT	23367436	1	1324.5673	131.057	0.000
Interactions					
VLG by Season	4381010.1808	3	13736.73	1.5759	0.2229
VLG by FACT	2054303.071	3	33046.845	3.8889	0.0005
Season by FACT	206878.062	2	103934.03	1.1857	0.3053
Residual	18151227.401	2	86312.33		

The ANOVA for yield in Table-4 shows that the source of variations due to climate factors of the villages, season and type of farmers are all statistically significant. Infact this has been influenced by the stringent steps taken to control adverse effect of climate factors and it has been proved among all the sources of varieties. The interactions like village by season, village by farmers, season by farmers, however shown that only village by farmers category is statistically significant ± depicting that yield varies with respect to the climate changes in the villages.

Table-5: Analysis of the Variance for the Profit Dependent Variable: Profit

Source	SS	DF	MS	F	Probability
Main Effects					
VLG	6457778.55	3	2014388.38	27.3458	0.000
Season	13539181.14	1	15538171.58	21.816	0.000
FACT	15598106.718	2	5794603.67	77.567	0.000
Interactions					
VLG by Season	252344.33	3	77460.4423	1.1202	0.3367
VLG by FACT	1787018.12	2	21303.184	4.044	0.0008
Season by FACT	316684.123	2	10537.081	1.3998	0.2468
Residual	16172870.58	2			

Even the Table-5 denotes the ANOVA for profit, again the climatically favourable village alone is considered statistically significant in comparison to other factors.

Conclusion:

Statistical analysis on the farm management data for sericulture has shown that multiple regression on yield as dependent variable and in comparison to other variables depicted that R^2 value is equal to 0.99 in the climatic favourable areas. The farmer's category could not be found statistically significant. Even the analysis of variance has a high F value reflecting that independent variable has a greater variations in the yield results. The ANOVA result has shown that suitable climatic conditions facilitated in influencing much. This tendency has been observed in the case of profit also. Hence, the study has revealed that climate change pose significant challenges for production of quality silk leading to flourishment of silk industry in the Telangana State, which has been proved in statistical tools such as Standard deviations, Mean values, Multiple Regression Analysis and ANOVA.

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