**Critical Report**

Thesis entitled: **Statistical Modelling for Production, Cost and Profit Functions of Foodgrains : A Quantile Regression approach**

In this study, the estimation of production , cost and profit function of rice, wheat and maize crops at national level as well as for Jammu region have been done through Quantile Regression (QR) approach due to the presence of outliers, multicollinearity, autocorrelation etc. using Cobb-Douglas and also compared with Ordinary least square method (OLS). The chapter wise comments on the thesis are as under:

Chapter-1(Introduction) is perfect in which the theme of the dissertation is reported fully and clearly, the objectives of the study and limitations of the study have been discussed. Further, in the thesis forecast of rice, wheat and maize crops have been done. But, it has to be mentioned in main objectives of the study. It may be included at 1.2(VII) if possible.

Chapter-2(review of literature) few references are missing. Yoginder et al. (1980) do not mentioned the name of crops under study. Further the references of the crops other than rice, wheat, and maize and food grain may be ignored if possible.

Chapter-3(Materials and Methods) is perfect and well elaborated.

Chapter-4(Results) is well discussed and represented through graphs and tables wherever is required.

Chapter-5 (Discussion) the significant parameters identified for main crops i.e. Rice, Wheat and Maize for National levels are identified through QR at different quantiles and results are compared with the OLS as per the objectives in Chapter I. The significant parameters to increase the production of rice are its area, quality of seeds and sale of power tillers whereas for the cost of cultivation, the variables cost of machine labour& insecticides are minimized the cost of cultivation. The profit of rice may be increased by reducing the cost of seed, insecticides etc. The variables area, fertilizer consumption and electricity consumption are main factors to increase the production of wheat. For cost of cultivation of wheat, cost of machine labour &seed and irrigation charges are to be minimized. The profit of wheat may be maximized by reducing the cost of seed &irrigation charges. The production of maize may be increased by improving the irrigation facilities. Its cost of cultivation may be reduced by reducing the cost of fertilizers and manure, insecticides and irrigation charge.

Similarly, same methods have been applied for analysing primary data on two patterns: rice-wheat and maize-wheat to identify the variables which play significant role to maximize the production of rice, wheat and maize. The variables such as cost of transplanting and fertilizer may minimize the overall cost of cultivation of rice. Cost of seed may minimize the overall cost of cultivation of maize. Similarly, the variables e.g. costs of seeds, harvesting, threshing and winnowing may minimize the cost of production of wheat. It has been observed that the estimates of parameter through QR are more efficient than the estimates from OLS on the basis of sign, size and significance which reflect the failure of the assumptions of the estimation. It has been also observed that the validity of the results have been done through two approaches statistics as well as through economics which is one of the most important part of the thesis. Further, forecasting model(s) through Box Jenkins Methodology for the production, cost and profit of rice, wheat and maize crops have been developed and forecasted value for the coming years is estimated. The model(s) have been proposed in the chapter 6(summary and conclusion). Discussion is required a conclusion at the end of each section. Constraints faced by farmers (Section 5.8) are very useful for future planning’s.

Chapter-6(Summary and conclusions) is well explained and concluded that Quantile regression is more robust in the presence of outliers, influential observations and also in the failure of assumptions of OLS. Moreover, the exogenous variables have been identified which can maximize production, profit and minimize the cost of rice, wheat and maize for National level as well as for Jammu region. Also, those exogenous variables has been identified which are common to both National level as well as for Jammu region. Moreover for doubling the farmers income by 2021-22, but it has been observed that the forecasted values on the basis of past data, there may not be a chance to double the production, cost and profit of wheat and maize crops but may possible to double the profit of rice crop.

The thesis is a well written and the research work carried out is commendable. The study is very useful and plays a key role for future planning and policy making. It is therefore recommended that the thesis submitted by the Student (PHD9A)-19 is accepted and considered for conducting oral examination to award the **Doctor of Philosophy in Statistics**.

Dr. Sharad Bhatnagar

Professor (Retd.), Statistics