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Research Journal of Agricultural Sciences  
An International Journal

P- ISSN: 0976-1675

E- ISSN: 2249-4538

Volume: 12

Issue: 03

Res Jr of Agril Sci (2021) 12: 1046–1049

# Crop Yield and Production Assessment of Temperate Peach Cultivation in Western Himalayan Region of Kashmir Valley

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Received: 07 Apr 2021 | Revised accepted: 31 May 2021 | Published online: 16 Jun 2021  
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## ABSTRACT

In temperate regions of Kashmir valley, Peach is the important stone fruit crop and is considered as economically profitable crop due to its value-added products and financially viable which has a tremendous potential for processing of primary products and creates livelihood opportunities which ensures sustainability in the study area. The present study aims to examine the growth in area, production and yield of peach in Kashmir valley since 2007-008 to 2016-17 and forecast area, production and yield of peach for year 2018-25 in Kashmir valley. For this study regression model was used to examine the best fitted model. From the result which shows that Peach area and production has been increasing and productivity reflects decreasing trend from 2007-2017 due to unfavourable climate fluctuations from last one decade. It has been observed that for cubic trend R-square (0.989) which can be used for prediction purpose. Therefore, effective interventions by the Government along with supply chain collaborations and induce preharvest and postharvest technologies to improve productivity of peach crop.

**Key words:** Peach, Temperate zone, Kashmir, Horticulture, Regression Model

Peach is temperate and economically important fruit crop and is in third position among temperate fruits after apple and pear. Most countries that produce peaches are China, Italy, Spain and the USA [1]. In Brazil peach has a great socio-economic importance. It is consumed in fresh form and processed drinks for commercial purposes [2]. Among the stone fruit Peach is the most important temperate in nature. It probably developed in Persia and is the native of China [3-4]. Peach is grown widely and enjoys a ready market nationally as well as internationally [5] and is a rich source of carbohydrates, vitamins, minerals, organic acids, phenolic compounds, carotenoids and volatile compounds which give flavour and aroma to it [6]. Mostly it is used in fresh form but can preserve it in cans and prepare jams and jellies from it. Peach production in India was 1.5 lakhs tonnes, because of its valuable functions and qualities particularly health promoting ones, refreshing and delicious nature and is popular all-over northern India [7]. The peach fruit are of great economic importance and are rich source of carotenoids and minerals [8].

By developing various supply chains, peach producers can make their orchards and the farms more economic feasible to the market. One way of achieve this is through direct marketing to the increasing population in the state where local farmers are interested in producing food locally [9-10]. The peach producers can add value to their products by adopting methods of integrated pest management and Supply Chain Collaborations [11-12]. In Utah, peach production witnessed a 12% reduction in peach producing acres decreasing from 1792 to 1594 acres. However, yield per acre increased from 2.87 tons to 3.53 tons/acres. Thus, a change in overall peach production from 4200 tons to 5300 tons annually within the state as each year urbanization increases [13]. Peach covers an area of 35531 hectares in India and total production over the area is 237921MT [14].

Regression Model to study the growth rates of crops in India during the period 1987 to 2001 [15-16]. Peach cultivation in India is mostly found in Himachal Pradesh, Jammu and Kashmir, Uttarakhand and northeastern states. J&K is the fourth largest peach producer in India with 4.5% production capability of overall capacity [17]. Peach is one of the most popular fruit consumed worldwide. It has a nutritious value and economically viable which is not only consumed but also processed into juices, jams and sliced or dried product [18]. In India Peach is cultivated upto an altitude of 1000ft and is mostly cultivated in West Asia, Europe and Himalayas [19]. China is the largest producer of peach fruits in the world with 11.9 million metric tons [20]. Trend Analysis of crops is useful for planning and decision-making purposes of appropriate policy measures [21].

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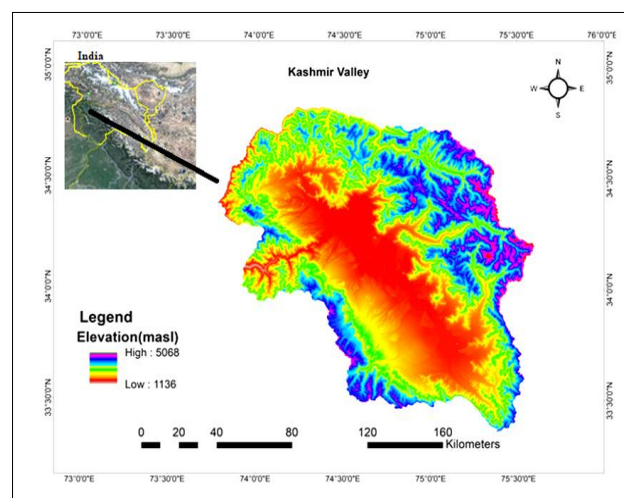
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## MATERIALS AND METHODS

The state of Jammu and Kashmir is the north-westernmost part of India. It is located between 32°17'N and 37°5'N Latitudes and 73°26'E and 80°30'E Longitudes. Horticulture is an important sector in the Jammu and Kashmir and is considered as the backbone of the state economy. Kashmir is Agro climatically suited for the cultivation of almost all kinds of temperate fruits. Peach is basically a temperate zone plant. It is grown on a commercial scale in mid hills of Jammu and Kashmir, Himachal Pradesh Uttarakhand, as well as in a limited scale in north-eastern states [22]. It has been observed that peach production in Kashmir valley has been increased from 2007-08 to 2016-17 which reflects positive growth rate (Directorate of Horticulture, Jammu and Kashmir). Therefore, conducting a research study in the region of Kashmir valley to assess the predominance of peach cultivation is not only becoming important from the viewpoint of potential income generating activities, but also as the key contribution to the GDP of the J & K economy.

The present study is based on secondary sources of data. The main sources of data collection include Economic survey 2016-17, Directorate of horticulture J & K, magazines, reports and Digest of statistics. For analyzing the area and production of peaches, regression analysis was used. Regression Analysis is a form of predictive modelling technique which gives us the relationship between dependent

variable and independent variable and is used for finding casual effect relationship between the variables. The focus of the study are area, production and productivity of Peach with respect to year wise from 2007-2017. The data collected was analyzed, tabulated and interpreted statistically using statistical software SPSS (Version 20) which is shown in (Table 1).



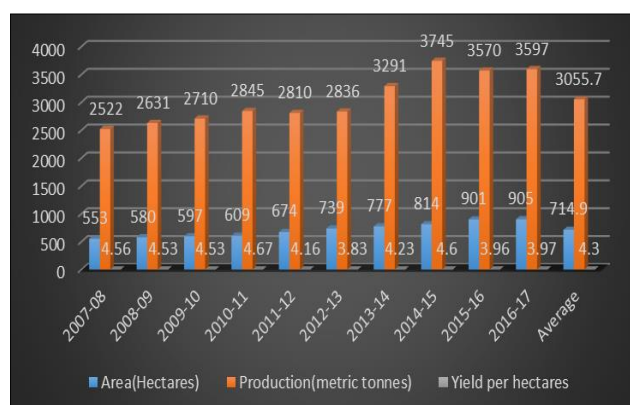
Source: USGS Earth explorer

Fig 1 Location map of study area

Table 1 Model summary and parameter estimates

Dependent Variable: Area									
Equation	Model summary					Parameter estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.969	252.359	1	8	.000	479.267	42.842		
Logarithmic	.807	33.552	1	8	.000	470.947	161.511		
Inverse	.526	8.862	1	8	.018	815.798	-344.483		
Quadratic	.981	179.446	2	7	.000	520.017	22.467	1.852	
Cubic	.989	179.135	3	6	.000	574.900	-26.211	12.407	-.640
Compound	.978	356.527	1	8	.000	506.383	1.062		
Power	.844	43.320	1	8	.000	497.485	.230		
S	.570	10.625	1	8	.012	6.703	-.500		
Growth	.978	356.527	1	8	.000	6.227	.060		
Exponential	.978	356.527	1	8	.000	506.383	.060		
Logistic	.978	356.527	1	8	.000	.002	.942		

The independent variable is year wise



Source: Directorate of Horticulture, Jammu and Kashmir (2016-17)

Fig 2 Area, production and yield of peach in Kashmir Valley (2007-08 to 2016-17)

## RESULTS AND DISCUSSION

For analyzing the area, production and productivity of peaches, regression analysis establishes relative strength between independent and dependent variable. The crop considered for analysis is peach where variable used for study are area, production and productivity of peach which is response variable (dependent variable) and time is explanatory variable (independent variable). The model summary and parameter estimates are given in (Table 1). From (Fig 2) we observe that with increase in number of years, area and production of peaches also increases and yield depicts a fluctuation and decreasing trend which show uneven pattern of trend from 2007-2017. The area under peach cultivation in Kashmir valley has increased from 553 hectares in 2007-008 to 905 hectares in 2016-17 which is shown in (Fig 2). Production under peach cultivation is largely attributed to the area under peach cultivation, rather than productivity of peach. The productivity shows signs of increasing trend from 2007-2010 and then dipping again from 2011 to 2017 as illustrated in (Fig 2). The productivity trend of peach which is 4.5 metric tons in 2007-008 to 3.9 metric tons in 2016-17 in (Fig 2). The

value of coefficient of determination  $R^2$  which has a value between 0 and 1 is often used as an indicator of how well the statistical model fits the data. The value near 1 indicating a

good fit and the value near 0 indicating a poor fit. The influenced value  $R^2 = 0.989$  is obtained by implementing the regression analysis for the data in (Table 1).

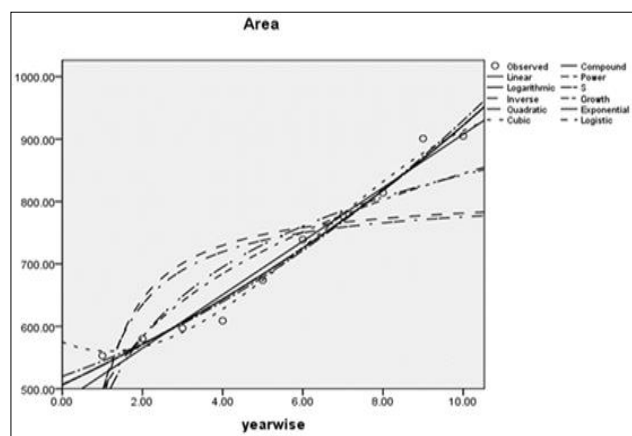


Fig 3 Trend line of peach area year wise (2007-2017)

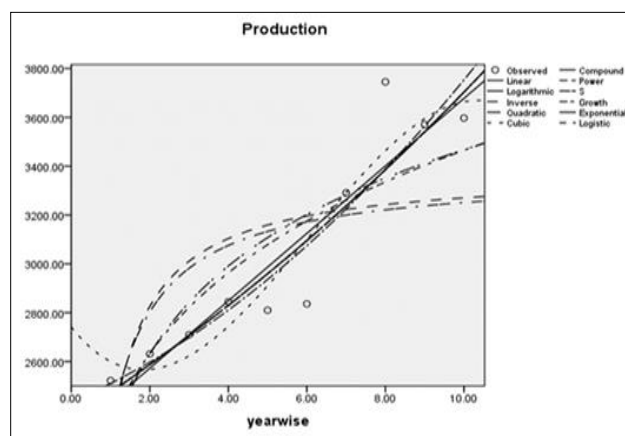


Fig 4 Trend line of peach production year wise (2007-17)

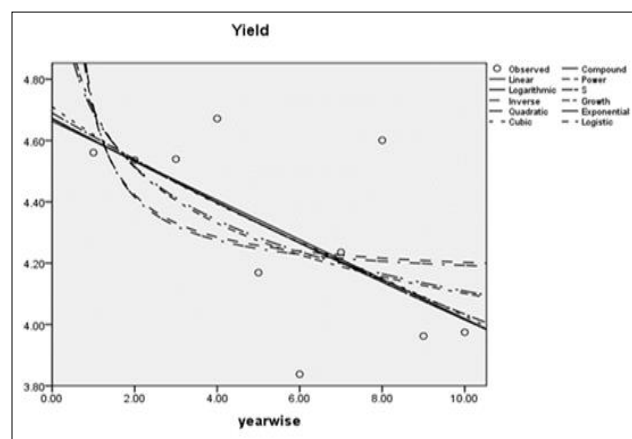


Fig 5 Trend line of peach productivity year wise (2007-2017)

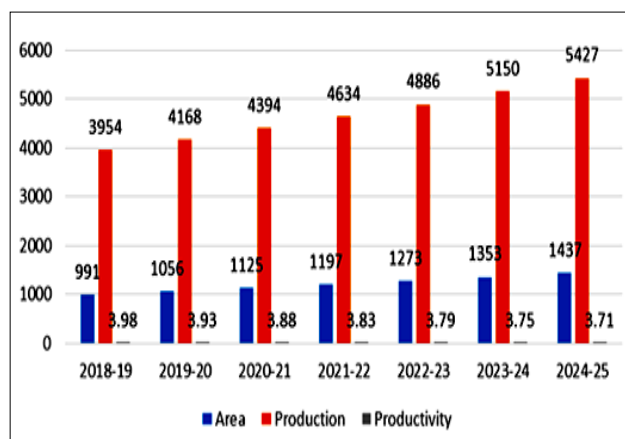


Fig 6 Forecasted value of are, production and productivity of peaches if Kashmir Valley (2018-25)

Data depicted in (Fig 3-5) shows trend line in terms of area, production and yield of peaches respectively for years 2007-008 to 2016-17. Trend line represents best-fit straight line which shows trend analysis of peach area, production and productivity in Kashmir valley. The model with higher value of  $R^2$  is used for prediction purpose as higher value of coefficient of determination  $R^2$  (Root Mean Square Error) is an indicator of a better goodness of fit for the observations. The (Fig 6) shows the forecasted values for area, production and yield of peach in Kashmir Valley from 2018-25. Here the focus of regression technique such as cubic trend are used for data mining function that predicts a number and are useful in predicting the area, production and yield of peach crop in Kashmir valley. It has been observed from graph that there is an increasing trend in area, production and yield though to a small extent. For the analysis of the data appropriate statistical models were used. Forecasting was done on the basis of best fitted model. To check the best fitted model, we use coefficient of determination  $R^2$ .

Regression model focuses on data analysis which plays an important role in decision making and problem solving of crops. As far as area and production of peach is concerned that has been increasing from last 10 years 2007-2017 which reflects a positive growth rate that is an indicator of use of farming knowledge, farm investment and suitable price policy. Productivity in peach is most often assessed by measures of

crop yield and show that peach productivity in Kashmir valley is associated with changes and fluctuations due to erratic rainfall patterns and unpredictable high temperature spells affects peach productivity. and its productivity depends on climate, soil, topography, irrigation facilities, orchid management and pesticides [23]. To increase the productivity, there is need for strengthen the efforts and maintaining the increasing production of peach and to strengthen preharvest and postharvest technologies for improvement of productivity of peach [24].

## CONCLUSION

From the aforementioned analysis of the data, it could be concluded that peach cultivation in the Kashmir valley has witnessed positive growth both in terms of area and production during the last one decade. As far as yield of peach is concerned which indicates fluctuations and decreasing trend from 2007-2017 due to unseasonal rainfall patterns and pests (aphids) which affects productivity of peach in study area. Processing of peach crops in Kashmir valley give a huge opportunity for entrepreneurship development in horticultural economy due to its value chain products which has enormous scope and potential for further improvement in future with suitable Agro climatic conditions of the study area by inducing preharvest and post-harvest technologies.

Introduction of high yielding and diseases resistance varieties of peach farming and effective supply chain collaborations for improving productivity which plays an important role for sustainable development of region.

#### Acknowledgement

The authors are grateful to Directorate of Horticulture J & K, Directorate of Economics and Statistics J & K for providing timely data in formation of manuscript.

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