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Factors affecting production and marketing of ginger in the hill and plain regions of Assam

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Abstract

The present study was conducted in two topographically different regions of Assam, namely, the hill district of Karbi Anglong and the plain district of Jorhat to find out the growth rates in area, production and productivity and study the factors affecting the production and marketing of ginger in both the districts. Secondary data used in the study were taken from various government official sites while primary data were taken from ginger growers using Multistage Stratified Random Sampling making a sample of 126 respondents. The findings revealed that the growth in area, production and productivity of ginger in both the districts and in the state were positive over the years from 2005-06 to 2019-2020. The major factors that affected production positively and significantly at 1 percent level of significance in the hill district were Operational Land and Human Labor while in the plain district, it was Operational Land only. The most important factor that affected the marketable surplus negatively and significantly in both regions was production kept for home consumption, seed and feed. Hence, production can be enhanced by using better production technologies and proper market linkages should be done.

Keywords: Ginger, Assam, regression, production, marketing

Introduction

Ginger is one of the earliest known oriental spices and has been grown in India for centuries as both a fresh vegetable and a dried spice. It is the world's most popular hot, fragrant kitchen spice. Throughout history, ginger has been used for both culinary and medicinal purposes (Mathew *et al.*, 2018) [9]. India is a major producer of ginger, accounting for approximately 35-40% of global production, and produced about 2224.8 thousand tonnes from an area of 204.8 thousand hectares with a productivity of 10.86 tonnes per hectare for the year 2020-21 (Soni *et al.*, 2023) [18]. The green belt of India, also known as the "Land of Forests and Tribes," encompasses the entire North Eastern region, and is abundant in natural resources, minerals, and, most significantly, valuable forests (Momin *et al.*,2018) [10]. The region has diverse agroclimatic and geophysical features. The entire northeastern India is divided into four distinct physiographic units namely, the eastern Himalayan region, the eastern mountain region, the Meghalaya-Mikir tableland, and the Brahmaputra valley, that have a high potential for the development of spice crops (Devi and Raj, 2021) [4]. In the present context, the state of Assam is the largest producer of spices in the region, contributing about 339 thousand metric tonnes in an area of 103 thousand hectares (GoIa, 2021) [1] while Ginger ranks 4th in production nationwide (GoIb, 2021) [2]. Maran, Bhola and Jorhat Local of Assam are some of the indigenous varieties of ginger that have been reported to be equally good in rhizome yield as well as size (Jha *et al.*, 2017) [6]. Approximately, 70-80% of the total production of ginger is available as marketable surplus from the region. Although ginger has a strong pungency, it fades over time. It is estimated that 10.5 percent of the harvest is lost during handling and transportation (Lotha *et al.*, 2020) [8]. However, during the peak season, the majority of producers sell their products at low prices to the local market or to the commission agents. Farmers have always been forced to sell the harvest at a minimum price. In the present study, an attempt has been made to find out the growth rate in area, production and productivity of ginger in the state as well as in the two topographically distinct regions of Assam, i.e. in the hill district of Karbi Anglong and the plain district of Jorhat and also to study the factors affecting the production and marketing of ginger and make a comparison among the two regions.

Methodology

To have a representative study of the ginger growers, an attempt has been made to collect the primary data by interviewing farmers using a pre-tested structured schedule.

Two districts, one each from hills and plains, with the highest numbers of ginger farmers, were selected purposively. On that basis, Karbi Anglong and Jorhat representing hills and plains districts were selected for the study. Two blocks from each district, namely Lumbajong Block and Langsomepi Block from Karbi Anglong and Jorhat Central Block and Jorhat East Block from Jorhat were also selected purposively based on the highest number of farmers producing ginger. Two villages from each of the blocks were selected randomly with the help of simple random sampling without replacement method. To draw a meaningful conclusion, the lists of farmers growing ginger in more than 1 bigha were collected from the concerned departments of both the districts and 15 percent of the total farmers or respondents were then selected using Multistage Stratified Random Sampling, with sample being allocated proportionally, using Random number table. A total number of 126 respondents were selected for the study. The secondary data were collected from Horticulture Statistics Division, Department of Agriculture & Farmers Welfare, Directorate of Horticulture and Food Processing, Govt. of Assam, www.nhb.gov.in, Spices Board, India etc.
The Analytical tools and techniques used in the study are listed below

1. Compound Annual Growth Rate (CAGR)
The CAGR was obtained using the following formula:

$$Y = ab^t \quad (1)$$

The logarithmic transformation of equation (1) is given as:

$$\text{Log } Y = \text{Log } a + t \log b \quad (2)$$

where,
Y = Area/production/productivity of spices
t = Number of years
a = Constant
b = Regression coefficient or trend value

Hence, the Compound Annual Growth Rates (CAGR) has been defined as:
CAGR = (Antilog b - 1) x 100

2. Cobb-Douglas Production Function
Cobb-Douglas Production Function was used to analyze the factors that affected the production of ginger considering the value of the total quantity of production in quintals per farm as the dependent variable.

$$Y = aX_1b_1\ X_2b_2\ X_3b_3\ldots\ldots X_ne^{ui} \quad (1)$$

Where,
Y = Total quantity of Production (Quintals per farm)
a= Constant or Efficiency Parameter
X_1=Operational land (ha)
X_2= Human Labour (Man-days)
X_3= Manures (Quintals) in Hill, Seed Rhizome (Quintals) in Plain
X_4= Plant Protection Chemicals and Fertilizers (Quintals)
X_5= Credit use (₹)
b_i= Elasticity coefficient
u_i = Stochastic, disturbance term, or error term
Equation 1, on taking log becomes,

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 \ldots\ldots + \log_e u_i$$

Using OLS (Ordinary Least Square) Method, the coefficients are then estimated.

3. The Multiple Linear Regression Analysis
A Multiple Linear Regression model was used to determine the factors that affected production of ginger considering the value of total quantity of marketable surplus in quintals per farm as the dependent variable.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + u_i$$

Where,
Y= Quantity of Marketable surplus (Quintals per farm)
β_0 = Intercept Coefficient
β_i = Slope Coefficients (i= 1 to 5)
X_1= Production kept for Home Consumption, Seed and Feed (Quintals)
X_2= Selling price (₹/q)
X_3= Transportation Cost(₹/q)
X_4=Total Marketing Cost (₹/q)
u_i = Stochastic, disturbance term, or error term

Results and discussion
The Compound Annual Growth Rate (CAGR) of area, production and productivity of ginger
The growth rate in area, production, and productivity of ginger from the year 2005-06 to 2019-2020 in the state and both districts were found to be positive. Significant growth in the production and productivity of 3.07 percent and 2.78 percent, respectively, could be seen in Assam. This indicated an acceleration in the growth of ginger production and productivity in the state. An insignificant growth rate of 0.29 percent in terms of area could also be found. However, an increase in the productivity in the state's ginger cultivation had influenced production to rise over the years. A similar study by Lal and Rohtas (2022) [7] showed a positive and significant growth rate in area, production and productivity of ginger from the year 2001-02 to 2017-18 in the state of Haryana. However, Rajanbabu *et al.* (2022) [11] also found a positive and significant growth rate in area, production and yield over the period of 1990-91 to 2018-19 in the country.

Table 1: Growth rate in Area, Production and Productivity of Ginger from 2005-06 to 2019-2020

Region	Area (%)	Production (%)	Productivity (%)
Assam	0.29	3.07***	2.78***
Karbi Anglong	2.26*	6.86***	4.50***
Jorhat	5.34***	9.60***	4.04

***= 1% level of significance, *= 10% level of significance

In Karbi Anglong, the area, production, and productivity of ginger have all increased significantly over the years. The district outperforms the state in terms of area, production, and productivity, with CAGRs of 2.26 percent, 6.86 percent, and 4.50 percent, respectively. An increase in productivity in the district's ginger cultivation had also influenced to an

increase in production over the year. However, the growth rate of 5.34 percent and 9.60 percent in terms of area and production in Jorhat is found to be higher than Karbi Anglong, which could be because area and production under ginger cultivation in Karbi Anglong decreased from the year 2013-14 to 2015-16. The conversion of land to other commercial crops or the use of shifting cultivation in the hill region could be the reason for declining area and production in the district. However, an increase in the area of the plain district's ginger cultivation had also influenced production to rise over the years. An insignificant growth rate in productivity of 4.04 percent is also found in the district.

Factors affecting production of Ginger

In the production of ginger across the state, farmers have limited access to inputs, so their goal is to maximize output from the available resources they have. As a result, they make a few adjustments in the allocation of their resources. In the hill district of Karbi Anglong, operational land and human labor were the two important factors that have positively and significantly affected the production of ginger. With very few employment opportunities for ginger growers, most of them were sustaining their livelihoods as shifting or Jhum cultivators. A similar study showed that among the different factors of ginger production, ginger seed and human labor have contributed a large share in ginger production across the hilly states of the Northeastern regions (Singh *et al.*,2020) [14]. Farmers use a portion of the previous year's harvest as seeds for the present season, making ginger cultivation organic by default. Thus, there is a negligible impact of plant protection chemicals and fertilizers on ginger production. Contrary to the present study, fertilizer had a positive and significant effect on the value of the productivity of ginger in the hilly state of Himachal Pradesh (Singh and Dhillon, 2015) [17]. However, dry manure is commonly applied in ginger growing fields, thus showing a positive and significant relationship with the production of ginger as presented in Table 2. In hilly states like Meghalaya and Himachal Pradesh, a combination of farmyard or organic manure with inorganic fertilizers enhances the production and productivity of ginger (Sharma and Guha, 2018) [13]. Credit availability and use by ginger growers had a negative effect on the production of ginger, similar to the study conducted by Singh *et al.* (2023) [16] which showed that factors like credit availability, years of farming experience and contact with extension agents had negatively explained the technical inefficiency in pineapple production in the hilly state of Meghalaya. In the plain district of Jorhat, operational land was an important factor that has positively and significantly affected the production of ginger. As compared to the hill region, plant protection chemicals and fertilizers were used by the farmers during ginger cultivation in the plain region, thereby showing a positive and significant relationship with the production of ginger. A similar kind of study was conducted by Gohain *et al.* (2020) [5] in Tinsukia district of Assam which showed that use of plant protection was significant at 5 per cent whereas fertilizer at 10 per cent and thus, indicated a positive impact on the income derived from growing ginger. In the plain district, human labour and use of manures also showed a positive impact on ginger production, significant at 5 per cent and 10 per cent, respectively as presented in Table 2.

Table 2: Estimated Production Function Model for Ginger

Variables	Ginger			
	Karbi Anglong (Hill)		Jorhat (Plain)	
	Coefficients	Standard error	Coefficients	Standard error
Operational Land (X_1)	0.7340***	0.2745	0.8197***	0.1129
Human Labor (X_2)	1.3022***	0.5844	0.3846**	0.3209
Manures (X_3)	0.1377**	0.1502	0.1203*	0.1138
Plant Protection Chemicals and Fertilizers (X_4)	0.0004	0.0081	0.0703**	0.1022
Credit Availability and Use(X_5)	-0.0009**	0.0052	-0.1019*	0.1145
	R^2 = 0.9032, Adjusted R^2 =0.8790		R^2 = 0.8782, Adjusted R^2 =0.8352	

*** = 1% level of significance, **= 5% level of significance, *= 10% level of significance

Factors affecting marketing of Ginger

The ginger growers' sole purpose in both regions was to sell the harvested raw ginger in the market. Processing of ginger in both regions was not found among the growers. However, the marketed surplus was quite higher in the hill region as compared to that of the plain region because of the large farm holdings of ginger growers in the hills than in the plain. This reason was also cited by Sharma *et al.* (2018) [12] while studying the economics of marketed and marketable surplus of Wheat production in Gwalior district of Madhya Pradesh. They observed that marketed surplus of wheat increased as the farm size increased. However, they also found that for small farm size, the quantity of produce kept for home consumption was maximum as compared to the large farm size. Thus, production kept for home consumption, seed and feed had a negative and significant impact on the marketable surplus of ginger in both regions. As the study was conducted during the time of Covid-19 pandemic, the selling prices of ginger was quite low and farmers had to sell off the produce at a very low price. Thus, they sold off the produce either to the local trader or wholesaler at any price as asked by the local traders or the wholesalers and hence, the selling price of ginger in the hill region had a negative and significant impact on the marketable surplus. A similar reason was found in the case of large cardamom growers in Arunachal Pradesh where the farmers sold the produce at any time to the wholesaler or retailer in Hayuliang market as per their financial need. Furthermore, the lack of direct communication and market availability encouraged local traders to act as the dominant pillar in price control in the district (Bordoloi and Bhuyan, 2022) [3]. However, the selling price did not affect the marketable surplus of ginger in the plain region. Total marketing cost had a positive and significant impact on the marketable surplus of ginger in both the regions as presented in Table 3.

Table 3: Regression estimates for Ginger

Variables	Ginger			
	Karbi Anglong (Hill)		Jorhat (Plain)	
	Coefficients	Standard error	Coefficients	Standard error
Intercept	-36.2090	33.1559	-37.4690	28.2958
Production kept for Home Consumption, Seed and Feed (X_1)	-18.5338***	1.3473	-16.3086***	1.2308
Selling Price (X_2)	-0.0028*	0.0015	0.0029	0.0031
Transportation Cost (X_3)	-0.3289	0.3750	0.288	0.1576
Total Marketing Cost (X_4)	0.5950**	0.2750	0.2522*	0.2127
	R^2 = 0.8476, Adjusted R^2 =0.8365		R^2 = 0.8285, Adjusted R^2 =0.8158	

*** = 1% level of significance, **= 5% level of significance, *= 10% level of significance

Conclusion

The production and productivity of ginger in the state have been increasing positively and significantly over the years from 2005-06 to 2019-2020. The growth rate of productivity of ginger in the hill district of Karbi Anglong had surpassed the productivity of the state. The major factors that affected production positively and significantly at 1 percent level of significance in the hill district were Operational Land and Human Labor while in the plain district, it was Operational Land only. The most important factor that affected the marketable surplus negatively and significantly in both the regions was production kept for home consumption, seed and feed. Due to Covid-19 pandemic, selling price had a significant negative impact on marketable surplus of ginger in hill district. Though production of ginger in the state is quite satisfactory, thrust should be given upon increasing the productivity through better mechanisation and technology dissemination. Ginger prices should also be regulated, and steps should be taken to ensure that producers receive the fair price.

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