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ASPECTS IMPACTING SMALLHOLDER FARMERS' BEAN PRODUCTION AND DISTRIBUTION OF FOOD PRODUCT TO THE GLOBAL MARKET IN INDIA

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Abstract The most likely found food in India is Common bean (Phaseolus vulgaris L).Hence by increasing the yield production of the beans in the market, it would spiral up the economy of the agricultural sectors in India. This study uses the stratified random sampling and the econometric models to mainly focus on the production and distribution of the beans in the food industry.By data, it is observed that the limitation of sales to the market is due to shortage of efficient resources, irrigation techniques, scarcity of advanced selection of seeds and insufficient use of fertilizers.Thus if we take necessary precautions and try to enlarge the beans quantity produced, then surely it would lead to favorable results. Using STATA software, the parameters of the model were estimated version 11.Variables were put into a regression matrix and hence collinearity tests were conducted. To examine the tolerance level of the multi-collinearity for the model, Variance Inflation Factor (VIF) was used.

1 Introduction

The common bean is a largely grown crop in India. If we focus on improving the production of growing this crop then it would be very beneficial to the small rural farmers' livelihood and income. However, there are various restrictions that become a problem to the farmers such as insufficient resources, crop-attacking insects and illness, impoverished approach to advanced germ-plasm , deficient marketing system ,down labor efficiency and undependable climatic circumstances and situations. Due to these reasons, it affects the yield of beans and its distribution to the consumer market. The yearly amount of new product launches with pulses as an ingredient in India has gradually declined from 474 products in 2014 to 269 products launched in 2018(Mintel, GNPD 2019).so in order to maintain the equilibrium we need to implement good strategies and working techniques.

By putting effort to improve the agricultural production, Government implemented poverty diminishable programmes from Fourth Plan onwards like), National Rural Employment Programme (NREP), Marginal Farmers and Agricultural Labour Development Agency (MFAL, Rural Landless: Employment Guarantee Programme (RLECP) Jawahar Rozgar Yojana (JRY), Small Farmers Development Agency (SFDA), Jawahar Crami Samriddhi Yojana for 5 years (JCSY), Sampoorna Grameen Rozgar Yojana (SCRY) etc. Also the Pradhan Mantri Krishi Sinchai Yojana (PMKSY) that gives a good system structure for the development of as well as systematic uptake of water irrigation.

In recent decades and trends it is found that the use of technology has lead to the widespread distribution of the target product around the world. By opting these modern methods and skill in farming sectors it can create tremendous impact of supplies across the global market. Using Genetically Modified (GM) technologies and others inventions, farmers have switched over to these trends to expand their market as market participation and transaction costs play a very

important role in the smallholders' farmers supply. Therefore, the model, interprets the crucial criteria that affect the amount of beans yielded and also distributed in India.

2 METHODS AND MATERIALS

Sampling procedure and study area: The research was organized in seven top bean production states of India. A stratified sampling procedure that was done on a multi-stage platform was utilized. In the study, it was discussed to choose two districts or localities and also the three markets in every locality a purposive sampling was used, to envelope the crucial bean crop producing geographical areas .The simple random sampling method in statistics had been utilized in secondary phase or level to acquire a specimen of 470 small-holder farmers. This paper significantly focuses more on these small hold-farmers in order to apprehend the prolific and marketing strategies across India.

Collection, analysis and procedure of data: The first hand data were acquired through structured interview schedules from the farmers. During the formal conversation, it could be notices that the smallholder farmers were facing some social-economic issues. There were problems related to the production and marketing constraints, capital amount expenditure, cropping and farming techniques, the approach to the bean market, etc.

Econometric models: To check the contribution of the rate of various influential factors on the bean production, the modified Cobb Douglas production function was benefited. Also a supply function was carried out to find the relationship between the factors affecting and the supply of the food product. To analyze, the Cobb Douglas production function's general form can be given as follows,

$$\phi_i = \theta\lambda_1\alpha_1\lambda_2\alpha_2\lambda_3\alpha_3\lambda_4\alpha_4 \cdots \lambda_n\alpha_n \tag{2.1}$$

Where

$$\begin{aligned} \phi_i &= amountofoutputI \\ \lambda &= \text{changing resource vector with } j = 1, 2, 3 \ldots n \\ \theta &= \text{constant} \\ \alpha k &= \text{coefficients along with k= 1,2,}\ldots\text{,n} \end{aligned}$$

which evaluate the elasticity of transformation ratio for λ that we used as an input. Constant estimation and coefficients for the operation of elasticities incorporated transformation of the Equation 1 to the logarithmic linear function as shown in Equation 2.2.

Actually, using Douglas function ,it becomes very beneficial to measure and calculate the variation of the input values that affect the bean production while keeping the others factors or values constant. This becomes very convenient for further calculations. Thereby using the co-efficient ,the production of beans can be monitored and concluded. The factors that control the volume of beans produced can also be conveyed in equation 2.2.

$$\begin{aligned} ln\phi_c = ln\,\theta + \alpha_1 ln\lambda_1 + \alpha_2 ln\lambda_2 + \alpha_3 ln\lambda_3 + \alpha_4 ln\lambda_4 + \alpha_5 ln\lambda_5 + \\ \alpha_6 ln\lambda_6 + \beta_1\phi_1 + \beta_2\phi_2 + \beta_3\phi_3 + \cdots + \beta_6\phi_6 + \varepsilon \end{aligned} \tag{2.2}$$

Where

ϕ_c = total amount of beans(Kgs)

θ = Constant

λ_1 = total size of farm given to beans(ha)

λ_2 = amount of fertilizer used in bean production (kg - both Calcium Ammonium Nitrate (CAN) and Di-Ammonium Phosphate (DAP)

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λ_3 = total manual work used in bean production (Mandays)

λ_4 = value of efficient resources (BIF)

λ_5 = age(years)

λ_6 = price of market (BIF)

ϕ_1 = household head gender (dummy, 1 = female and 0 = male)

ϕ_2 = credit access (dummy:1 = no access and 0 =access)

ϕ_3 = approach to extension messages (dummy: 0 = access and 1 = no access)

ϕ_4 = association/group/team membership (dummy: 0 = membership and 1= otherwise)

ϕ_5 = production/yield losses (dummy: 1 = high 2 = medium, 3 = low)

ϕ_6 = seed variety (1.0 = local, 2.0 = improved)

ε = error term

A supply function can be utilized to help find out presumed amounts of a product that will enter the market platform, if we know the price of the market, cost of the inputs and other variables. The beans that are produced, are not all taken to the market for distribution to the customer but some parts of it is used for home consumption, for obtaining dry beans etc. So thereby this function is used to consider that amount of beans that are distributed to the stores. The supply function can be given as follows,

$$\pi_i = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_T D_T + \alpha_s D_s + \varepsilon \tag{2.3}$$

Where

π_i = amount marketed

X_1 = amount of beans produced (kg)

X_2 = length to the market (km)

X_3 = amount consumed at home (kg)

X_4 = amount given as gifts (kg)

X_5 = size of household(number of persons)

D_T = transportation losses (dummy: 1 = low, 2 = medium 3 = high)

D_s = loss of storage (dummy: 1 = low, 2 = medium 3 = high)

ε = random error

Variables had been put into regression matrix and hence co-linearity tests were conducted wherein this test is used to solve our hypothesis of the given model. The variance inflation factor evaluates about how much the coefficient of regression variance is inflated due to multi-co-linearity in the model. The variance inflation factor is used as a way to detect multi-co-linearity in regression analysis as we do in statistics. Multi-co-linearity is used when there is a correlation between the

predictors (i.e. independent variables) in a given model and so if it present then it can severely affect the results of regression. If it is found out that the average VIF is of less than 10 then is shows and confirms that the variables have no serious multi-co-linearity in the model. Moreover, the Durbin Watson (DW) statistic which is a statistical test was used for auto-correlation in the residuals from a statistical regression analysis.

3 RESULTS AND DISCUSSION

Generally, by looking at the table 1,it is clear that Gujarat produces more beans production than the others states. Also its contribution of share of beans production is also comparatively high. It is observed that farmers grow the bean plant because most of the part of the plant is being used or consumed. Andhra Pradesh and West Bengal have contributed low share of 6.1% globally. It is assumed that in majority of the places, the production of beans is supplied very low by small hold farmers and also that these beans are used for consumption more than distribution. But however, this only holds true if the production rates are low but if the production rates are high then their share to the beans market is more likely to happen(table 1).

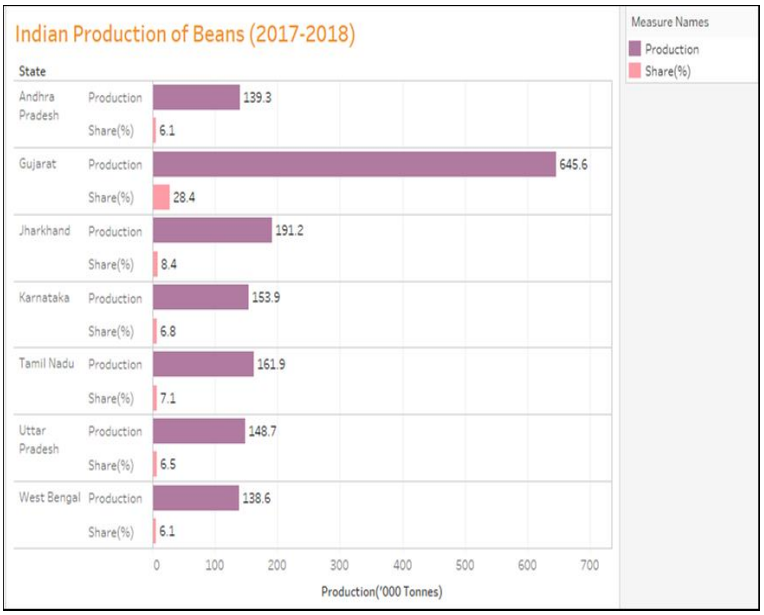

Figure 1. Table 1:The production of beans of selected 7 states (Andhra Pradesh ,Gujarat ,Jharkhand ,Karnataka ,West Bengal ,Uttar Pradesh , Tamil Nadu)

It is found that the land size influences the production of beans in the market. It is also observed that if we increase the land where beans is cultivated then the production also increases and also along with the yield. There would be more crops available for consumption as well as distribution. It is also observed that by increasing the land by a unit, would increase the production by 43%.which means that land size can be essential in playing an important role in the enlargement of the beans production. By doing so in each state ,it would be desirable to see changes in the supply by small hold farmers. The ability to expand productivity by means of improved, better, hybrid and advanced varieties and management techniques and systematic practices has not yet been thoroughly fully implemented and conducted by the small-holders farmers in the country.

Even the efficient resources play a potential role to the supply as indicated by the efficient resources elasticity (Table 3). The resources and machineries included machetes, wheelbarrows, weeding/wheeling hoes, tills and tractor vehicles. It is clear that those farmers that had assets used to produce more bean production than those who did not have enough assets to run their farming. By using these assets ,It showed improved growth of beans production. But some small hold farmers used human labor than assets to produce the crop. The economical problem led

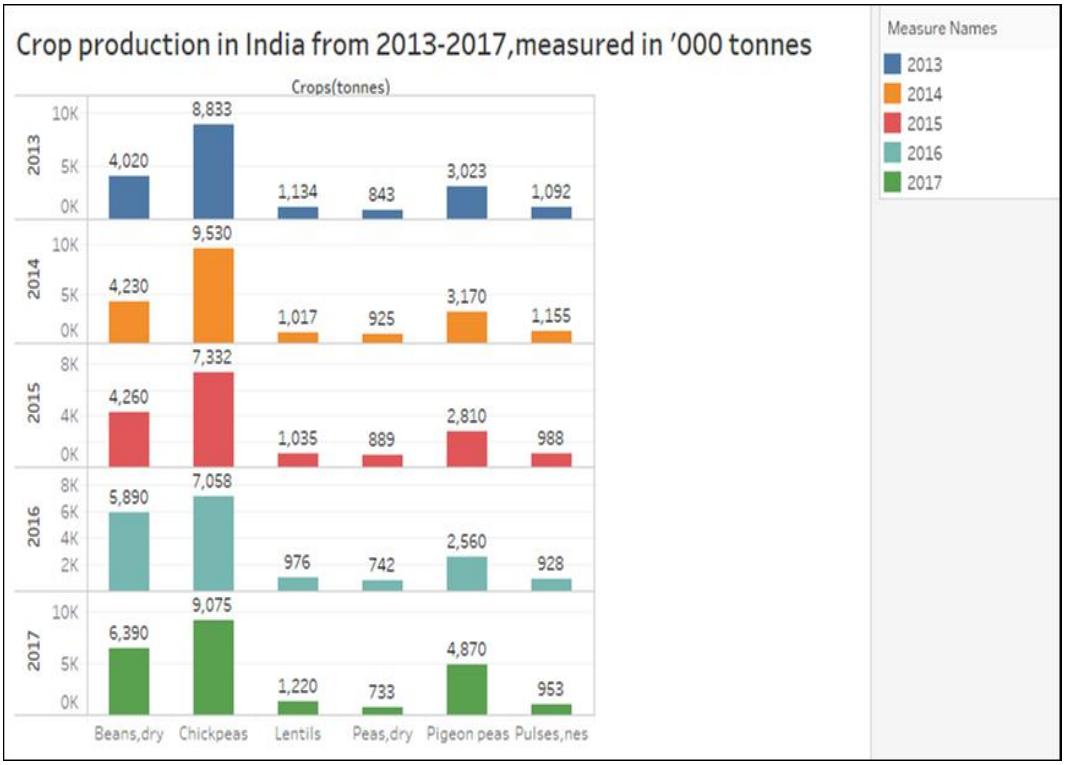

Figure 2. Table 2: Crop Production In India over the recent years The table 1 and table 2 were drawn by using Tableau software .The factors that influence the output of the production of bean and its market supply as shown in the table 3 and table 4 respectively.

Variable	Unit	S.E	Coefficient	t-value
Constant	.	1.999	2.037	1.019
Age	Years	0.006	-0.072	-1.446
Gender	Dummy	0.14	0.007	0.161
Land size	Ha	0.07	0.434	6.508*
Production assets	BIF	0.095	0.097	1.942**
Variety of seeds	Dummy	0.381	0.331	1.725**
Fertilisers	Kgs	0.117	0.079	1.782**
Labour	Mandays	0.22	0.05	1.23
Market Price	BIF	0.234	0.009	0.18
Group Membership	Dummy	0.179	0.146	3.141*
Extension	Dummy	0.143	-0.023	-0.49
Credit	Dummy	0.313	0.043	0.863
Production losses	Dummy	0.095	0.09	1.783**

Figure 3. Table 3:Dependent Variables: Total output(Kgs) , Production losses (1=High,2=Medium,3=Low);Variety(1=Local,2=Improved) , S.E= standard error , *significant at 1% , ** significant at 10% , $F_C(0.05, 13.379) = 6.534, R^2 = 42\%, DW = 1.472, VIP = 1.174$

Variable	Unit	S.E	Coefficient	t-value
Constant	.	120.224	-43.691	-0.355
Storage Losses	Dummy	16.043	-0.023	-0.532
Transportation losses	Dummy	40.444	0.155	2.624**
Distance to the market	Kilometers	11.774	0.014	0.271
Bean price	BIF	0.078	-0.066	-1.925
Household size	Persons	5.322	-0.043	-0.787
Quantity produced	Kgs	0.022	0.198	5.474**
Quantity consumed	Kgs	0.123	0.001	0.018
Quantity retained for seeds	Kgs	0.007	-0.045	-1.117
Quantity stored for food	Kgs	0.38	-0.176	3.635**

Figure 4. Table 4: Transport losses and storage losses (1.0=low, 2.0=Medium, 3.0=High), * , ** significance at 1% and 10%

to this condition by those farmers. So, by inheriting a good asset backup, it would give more favorable produce to the market. Thereby, by putting an adjustable investment into the system, it would surely yield more production that is very evident from the table 3 as it shows a robust relation between the efficient resources and the level of production of bean.

These smallholder farmers in India usually tend to use those seeds that are available in the seed bank or they also tend to use the seeds that are grown on their fields. Due to inaccessibility the farmers dont used proper hybrid seeds of improved variety which subsequently leads to the low production levels. By these low levels, it causes less output and yield to the agricultural system ,Thereby the produce cannot be used for distribution purposes because of the low quantity produced in the field. So by using proper and optimum seed and their variety, it could cause an increase in quantity. When considering a new seed variety, it was found that the coefficient of value was highly significant from Table 3.By using indigenous seeds is found that the farmers are not getting enough outputs (table 3).so if improved varieties of seeds are used then these seeds can gain resistance from the adverse effects of drought, pest and other diseases that may harm the growth of the plant. So thereby using improved seed it would be betterment for the plant produce.

It is found that the utilization of fertilizers by 1% increase resulted in 7.9% increment in the production of bean (Table 3).The chemicals utilized as per the study are di-ammonium phosphate along with calcium ammonium nitrate. As we know, the use of fertilizers surely enhances the yield of the beans. Thus the utilization of the potential minerals can provide effective plant growth.

Group membership is directly proportional to the bean production(Table 3).When considering the production of beans it is done by single farmers as well as group farmers. It was observed that group farmers had more production and they had more efficient supplies since their collective interaction can be a good investment for the supply market strategy. Moreover, having many members is an added benefit to the system as they can share ideas and input in into the system for favorable results. However from data group farmers were about 14% but still the balance is not yet in equilibrium. Thus having group membership contributes to the 14% raise in production.

Actually the production losses, have been continuously observed and is inferred that the loss in inevitable at some situations like weather condition etc but however by considering the losses and taking into account, the yields can be increased as we can correct the losses and it can help us reduce the loop holes for production. The 0.090 elasticity also conveys that work put in to

deduce crop-attacking insects and diseases caused by the insects and the effect of climatic conditions reveal can make the output reach to a higher value and range (P<0.1).Which also says that the assumed losses are mostly in the same manner to negatively and cynically affect the level of production of beans. And also considering the other criterias like extension service provision, household head age/gender, labor, price of credit and the price of market did not essentially affect the amount of bean crop harvested.

About the estimates of determinants, the table 4 illustrates about the market supply. There are transport losses, price of bean, quantity stored and quantity produced that as factors and variables that affect the supply in the market. There has been a cynical relationship between the quantity of beans produced in market and price of bean sold(P<0.01),which means that if the supply is more, then the cost becomes less which is usually endured during high harvest period.

The transport losses were surely a foremost obstruction to bean market (Table 4).The significance was P(<0.1) and also it shows that the farmers were unable to use transportation to deliver the crop. It's significant that even if there were no much transportation losses but it effected the beans contribution in the field of marketing as shown in table 1.

4 CONCLUSION

The paper discloses that the factors that influenced the output are the loss of production, size of land, efficient resources, group/team membership and types of hybrid seeds variety planted while transportation losses, amount utilized at home, amount reserved as food crop affected even more. To outgrow the harvests of beans crop, the small-hold farmers can increase the yield within their existing land allotments, enlargement of proportion of area under the beans commodity and dynamically indulge in farmer group's operations for simple, straightforward and better approach to the markets.

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