

Journal of Economics Library

www.kspjournals.org

Volume 6

September 2019

Issue 3

Determinants and cost of production of dates in Pakistan: An analytical study

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Abstract. Present study is an attempt to analyse the production determinants and the cost of production of dates using causal approach of Ordinary Least Squares Methods using secondary data. The costs associated with the agriculture production are computed from labour costs, expenses incurring on the pesticides and fertilizers and the cost of seeds and amount of rent when the piece of land is acquired on contract basis. Provision of credit facility to the farmers and growers can play a major role in softening the constraints of the farmers and motivate them to enhance production of dates. Moreover, technical and technological advancement and adoption of the cost saving technology by farmers can also help farmers improve quality and per acre yield of their production. The findings of the study suggest that the employment in agriculture sector is the most important factor affecting production of dates followed by mechanization and technological advancement and third is the credit to the farmers. All coefficients have significance of less than 0.05 with substantially large generalizability power.

Keywords. Production, Technology, Credit, Dates, Finance, Growers, Labour, Costs, Fertilizers, Pesticides, Seeds.

JEL. D24, J08, Q16, H81.

1. Introduction

In agriculture sector of Pakistan the production of dates is an important cash crop. Not only it is the source of livelihood but also a major source of foreign exchange from its exports. It would be important to look in to the costs associated with the production patterns, availability of the financial support from banking sector and the degree of mechanization in the sector. The use of advanced technological machinery and adoption of the cost saving technology by farmers can help farmers to improve quality and to increase per acre yield of their production. Further the costs allied with the agriculture production may be calculated from costs of labour,

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cost of seeds, expenses on pesticides and fertilizers and amount of rent when the piece of land is on contract.

The agriculture dependent developing countries manages to fulfill the needs of farmers in short term and long term strategies through their agriculture financial institutions which are focused mainly to provide Credit facility to the farmers and growers which can play a major role in softening the constraint of the farmers and encourage them to enhance production of dates.

In Pakistan, dates are the source of export earnings for the date growers. Haider (2014) evaluated that population of the area always engaged in the economic, social and environmental activities. Since thousands of years, it has been researched that more than 5000 date palm cultivars are found in the world and 325 cultivars are present in Pakistan (Shaikh, 2016). According to (Shar, 2011) the top 10 date producing countries of the world are Iraq, Iran, Saudi Arabia, Egypt, Pakistan, Aljazayer, UAE, Sudan and Libya as about 90% share of dates production goes in their account throughout the world.

Table 1 presents the rank of top 7 countries as far as the area harvested, yield in tons per hectare and production in tons during 2010 and 2014 is concerned.

Table 1. Top 7 countries by harvested area (hectares), yield (tons per hectare) and production (tons) during 2010 & 2014.

	Algeria	Iran	Iraq	Saudi Arabia	Pakistan	Egypt	Oman
2010-2014	Average						
Area Harvest	186667.6	183123.4	166460.4	146434.2	90724.6	40812	33105
	Egypt	Oman	Iran	KSA	Pakistan	Iraq	Algeria
Yield	339788.6	88244.2	71311.4	67109.6	58849.6	40752.4	48173.8
	Egypt	Oman	Iran	KSA	Pakistan	Iraq	Algeria
Production	1384019	1093818	978538.2	788313.6	636171.6	533977	292441.6

Source: Calculated Date as per FAOSTAT 12-27-2016.

According to Table-1 Algeria has the highest area under harvest for date production with 186667.6 hectares followed by Iran (183123.4), Iraq (166460.4), KSA (146434.2), and Pakistan 90724.6) and so on. In terms of the yield (tons per hectare), Egypt tops the rank with 339788.6 tons per hectare followed by Oman with 88244.2 tons per hectare and Iran 71311.4 and so on. Pakistan ranks 5 in terms of the yield in tons per hectare. In terms of total production in tons, Egypt, Oman and Iran rank in top three respectively with 1384019, 1093818 and 978538.2 tons respectively. Pakistan ranks number 5 with total production of 636171.6 tons.

Some scholars have explored that due to the technical limitations, lack of awareness and non-availability of scientific machinery the post-harvest activities in this important crop suffer a lot, which results in noncompliance with the International Regulations and Standards for export. Further, the lack of trained labour in the sector also affects the export sector badly (Hadrami, 2012).

1.2 Dates production in Pakistan

According to (Jatoi, 2009) mostly districts Khairpur and Turbat of Pakistan are top in export of dates. It is researched that production of dates in these districts are 10% to 15% whereas the export is 85% to 90% which is either consumed locally or wasted. About 80-90% of dried dates (Chuhara) are being exported by the date markets of Khairpur and Sukkur export to India While main importers of Pakistani dates are Afghanistan, USA, UK, Germany, Denmark, Japan, Australia, Nepal, and Bangladesh. Shar (2011) and Shaikh (2016) evaluated that Date Palm is cultivated in all four provinces of Pakistan and major producing partners are Sindh and Baluchistan provinces followed by Southern Punjab. Khairpur district of Sindh Province is especially famous for producing dates (almost 85% of the province's dates are produced by Khairpur).

Markhand (2010) assessed that major dates producing Districts of Sindh Province are Khairpur and Sukkur; and throughout the Pakistan the Kech, Kalat, Makran, Punjgurand Turbat districts of Baluchistan; Bannu, D.I. Khan districts in KPK and Multan, Jhang, Muzaffargarh the Southern parts of Punjab are famous areas for dates producing. The varieties Aseel, Karbalian, Began Jhangi, Mazawati, Halwai, Rabie, Zahidi, Fasli and Dhakkiare important and familiar in growers for marketing (Shaikh, 2016).

Therefore, present study has been initiated to focus on the production patterns, analysis of yield per acre during last 36 years (1980- 2016) and the income per acre of the farmers. Further the study is about the impact of employment, mechanization and the credit provision in agriculture on the production of dates in the country. Qualitatively, assessments are done whether the farmers have any awareness about the export of the dates.

1.3 Data collection and analysis

As the secondary data sources are very important to find proper information which is already researched, evaluated and proved. This study also includes the secondary data on production, technology and credit availability to agriculture sector and date farm growers of Pakistan.

The following data is collected for the theoretical purpose from various databases i.e. FAO (Food and Agriculture Organization) of the United States and ILO (International Labour Organization), SBP (State Bank of Pakistan), UNDP (United Nations Development Program), Pak. Bureau of Statistics, IMF (International Monetary Fund, World Bank, UN and Eco. Surveys and Annual Reports of PARC (Pakistan Agriculture Research Council), DPRI, SALU/Libraries as well as Annual reports of various National and International Institutes.

1. Per ton cost of production (last 30 years).
2. Technological and scientific improvements (in terms of hybrids, byproducts, mechanization, knowledge level of farmers, skill and government intervention etc.).
3. Credit responsiveness: (Annual loan provided to the agriculture sector specially to the date growers (last 30 years).

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4. Per acre yield (Last 30 years).

2. Literature

2.1. Financial credit

Sarker, (2015) analyzed using simple regression model, the role of banking-sector to inclusive growth through inclusive finance in Bangladesh and identified the effective relationship of financing by banking sector in agriculture which results in the increase in output at national level. The study recommends the continuity of financing policy measures of banking sector to face the challenges in agriculture in Bangladesh.

Bashir (2008) researched that not only the agriculture sector is contributing 21% to GDP but also the provinces are getting employment of nearby 43% of the workforce and supplying raw material to the industrial sector (specially to textile industry of Pakistan. The study suggests that credit is an important tool to increase the productivity of the small farms. This study investigates the problems faced by small farmers to get and repay the credit which is main problem in agriculture sector. The study was conducted in Faisalabad district only due to the scanty time and financial constraints.

The study survey found that 61% respondents told that banks' procedure is lengthy and burdensome, 77% cried for high interest rates on loans, 45% were found not satisfied with the concerned officials, 72% were complainant that they were not allowed loan in time and above 55% respondents informed that procedure of repayment was too rigid.

2.2. Production

Al-Marshudi, (2002) researched on Oman Traditional Date Palms: Production and Improvement of Date Palms in Oman stating that Date production in the world is limited to a small number of countries, among them the Arab Countries are in majority. Still the date industry in the Arab world is not yet fully developed and purposeful activities are still needed to fully utilize the huge date tree potential as a commodity that can be expended in the local market or processed for export.

Date palm is considered most important crop as its production is about 82% of total fruit crop and its cultivation occupies about 42% area of total agricultural land in Oman, which meets the domestic food demand as well as exported to gain sufficient revenue. During the last two decades there is notable development in cultivation and increase in production is also exiting. However, it is estimated that contribution of dates is found to be low against the total agriculture export.

This study analysis date palm crop in terms of its traditional practice and economic development in Oman. The results show that there is more need to improve the standard of quality of dates; hence the profit for producers is not up to the satisfactory level. After the production of Oil, the traditional national role of dates crop is leading source of income for Oman.

It is further analyzed that Oman has adopted some drastic changes that have impacted consumption patterns, introduction of technology has changed the socio-economic conditions including continuous change in urban ideas and improvement in living standards of people.

Another study (Shaikh, 2016) elaborated that the growers unanimously were found unaware as it is very much clear from the results that 137 growers among 202 replied that they have no any knowledge regarding trade of dates (export and import), 86 answered that they have no sources/relations, 40 were of the opinion that there is no Govt. Support/Facilities or License for the export and 15 could not express saying that there are lot of problems, the results show that the growers have no awareness regarding export of dates. The dates are mostly growing in hot climate and dry regions of the world and a great source to generate revenue for growers and the society. It is believed as an important life time crop in most of the world's desert areas. Globally the date production has been increasing since last three decades.

Ata (2012) evaluated the factors hampering the production of dates in district Dera Ghazi Khan, Punjab province of Pakistan conducting the structured interviews 120 to collect the qualitative and quantitative data from dates growers and key informants. The awareness on production of technology among the farmers was also evaluated selecting the variables of knowledge about varieties, application of irrigation and fertilizer, sucker transplantation and diseases of date palm. The study has also reported that unawareness of farmers regarding production technology which becomes main cause of reduction in production as well as income of growers, further the agriculture extension staff is ineffective and non-informative for distribution of date palm production technology. Concluding the study suggests that there is an urgent need to train farmers about irrigation and fertilizer application, disease and pest management, sucker transplanting and processing of dates.

In world production of dates Pakistan stands on seventh position (FAO, Statistics, 2011). In Pakistan and Sindh, the 90.1 and 32.7 thousand hectares' area are under cultivation and production was 522.2 and 268.6 thousand tons, respectively in 2010-11 (Shaikh, 2016). With cultivated area of 82 thousand hectares and annual production of 496.6 thousand tons Pakistan is the 5th largest date producer in the world. The Aseel, Dhakki and Begum Jhangi varieties are famous and considered as the best of all date varieties grown in Pakistan (Shaikh, 2016).

The important dates producing areas are Khairpur and Sukkur in Sindh, Makran and Panjgoor in Baluchistan, D.I Khan of Khyber Pakhtunkhwa and Jhang, Muzafargarh, Bahawalpur and D.G. Khan from Punjab provinces of Pakistan (Shaikh, 2016).

Ayaz (2011) has analyzed the level of production efficiency of the farming sector in Faisalabad district of the Punjab province of Pakistan. in 2009 a farm level survey was conducted for which 300 farmers were

interviewed and technique of Stochastic Frontier Analysis (SFA) was utilized to get the proper results.

The overall mean effectiveness score was 0.84 indicating 16 percent inefficiency of the sample farmers. The SFA estimation method also illustrated the parameters for the inefficiency. Farming experience, education, access to farming credit, herd size and number of cultivation practices showed constructive and significant effect on the farmer's technical efficiency. The variable of credit showed highest coefficient value (-0.14) indicating the importance for the agricultural credit showing that availability of credit to farmers was much more important than any other factor to improve the resource use efficiency in agriculture sector.

Some authors evaluated that the processing, categorizing, sampling and packing of Dried Dates (*Chuhara*) by women in rural areas of Khairpur Sindh indicated that significant opportunity for empowering rural women. This study was conducted randomly selected 100 women processors from the study area. Data analysis was done using descriptive statistics, Net Farm Income (N.F.I) and Data Envelopment Analysis (D.E.A) models (Phulpoto, 2012).

Ata (2011) in his study "to explore the date palm market chain and its role in food security and livelihoods of farmers in the South Punjab" has expressed that in the semi-arid and dry areas the tree Date palm has great importance due to its natural capability to provide healthful food having carbohydrates, vitamins, p minerals along with fuel, shelter and manufacturing of various handicrafts.

This study is conducted in 4 union councils among the 34 rural UC's of District Dera Ghazi Khan and purposively selected 3 villages from each union councils at random. Ten (10) respondents having at least 20 date trees in the field were selected as respondents from each village through simple random sampling technique. The 120 respondents were interview randomly whereas qualitative data were carried out through key informants and focus group interview. The respondents of qualitative data were selected through snow ball and convenient sampling techniques. The qualitative data were analyzed using content analysis technique. The study evaluated that people of area are getting handsome profit by preparing various products locally and utilizing the fruit within household and marketing its fruit, getting more profit to improve the living standard as this tree has great potential to improve economic conditions and food safety for growers. After analyzing the data using the (SPSS) software he emphasized to provide training opportunities to farmers, the study recommends that government should finance the growers and to provide improved varieties for growth of date palm and to enhance the income of date farmers.

In Haider *et al.*, (2012) conducted study on ripening of dates from rutab stage to ripe dehydrated dates and to achieve this objective the Aseel variety was utilized which contains 75-80% sugars. Comparing the traditional dehydration process with Oven drying and solar dehydration

technologies and found improved physicochemical and sensory characters, obtaining high quality dates with desired level of moisture content, freedom from infestation, spoilage bacteria and moulds and found ideal for prolonged shelf life and time saving procedure is Oven drying. On the other hand in traditional drying there is loss of fruit due to unhygienic environmental conditions which contaminate the dates with bird droppings and insect infestation fruit in traditional dehydration, the study also resulted that this is time saving process as the conversion of raw dates into table dates occurred in 4-5 days in traditional dehydrating, on solar in 2-3 days are required while the electric dehydrator process requires only 20-22 hours, having a delicious taste and excellent texture (Haider, 2012).

3. Methodology

3.1. Secondary data handling and analysis

This highlights the findings based on the questionnaires, semi structured interviews and observation of groups of growers used for this study. The questionnaire, semi structured interviews, observation data were collected through survey visits in the study area.

The Annual time series data has been taken for this study for the period of last 30 years from 1996 to 2015. The different sources have been approached; such as the World Bank indicators for Pakistan, Federal Bureau of Statistics, State Bank of Pakistan and data of FAO Pakistan and FAO of the United States. To analyze the data of production, cost of production, usage of modern technology and provision of credit to growers/businessmen, the different factors have been examined; a simple linear regression model is used with ordinary least square method (OLS).

3.2. Model Specification

Two sets of regression equations are estimated:

Set I: Estimating impact of cost variant on the per acre production of dates

$Q = f(\text{TC})$ Estimating "Standardized Beta, T-values, Estimates"

Set II: Estimating impact of Credit availability and Technological improvement on total Cost:

$\text{TC} = f(\text{Credit, Tech})$ Estimating "Standardized Beta, T-values, Estimates"

4. Findings and regression results

There is 1 regression equation where Total Production of dates is Dependent Variable and the Independent Variables are Credit to Agriculture Sector and 2nd Independent Variable is Employment in Agriculture in (1000) and 3rd is Tractors².

² In case of intercropping only

Table 2. *Determinants of Dates Production*

Models	Dependent Variable: Total Production of Dates			
	R ²	Bs		F-Stat
		Unstandardized	Standardized	
A:Credit to Agri	0.661	0.621 (0.00)	0.413	124.02 (0.000)
B: Emp.Agri (1000)	0.972	0.518 (0.00)	0.854	226.175 (0.000)
C: Tractors	0.891	0.213 (0.00)	0.124	331.475 (0.000)

The Tractors are the indicators of mechanization or technological employment in Agriculture sector we can see that values of R² (R Square) for all are large, after values of R² we can see Unstandardized and Standardized beta values where the Unstandardized beta values signs are (+) plus that shows that as the independent variables are improving; the dependent Variable of dates production will improve and standardized beta values are showing which independent variable is more important in our case 2 values for example employment in Agriculture sector has standardized beta values of 0.854 which is highest and 2nd is credit to agriculture and last is Tractors so this confirms that Credit to Agriculture is important but more important is Mechanization and Employment in the Agriculture sector; all models that we have included are having large (f) value and all models are significant at less than 0.5 degree of probability.

Table 3. *Cost of Production in Agriculture*

Models	Dependent Variable: Total Production of Dates			
	R ²	Bs		F-Stat
		Unstandardized	Standardized	
A:Credit to Agri	-0.961	-0.251 (0.00)	-0.813	67.02 (0.000)
B: Nitro	-0.912	-0.182 (0.00)	-0.214	26.15 (0.000)
C: Potash	-0.935	-0.113 (0.00)	-0.226	31.355 (0.000)
D: Phosphate	-0.941	-0.116 (0.00)	-0.131	13.456 (0.000)

Then we have other set of equation where we have estimated cost of production's link with Credit to Agriculture, Nitrogen use, Potash use and Phosphate use as fertilizer inputs in agriculture sector, so here again if we look at R² we have large R² values for all Independent variables and mostly the signs for unstandardized beta values are (-) minus that shows that when credit to agriculture sector is improved the cost of production decreases that means if credit is coming from official sources to the farmers then they are not borrowing money from private lenders. Private Lenders are charging high interest rates comparing to Govt. Institutions, so in our case if more credit is provided to farmers in agriculture sector the cost of production is less. 2nd is use of these fertilizers of Nitro, Potash and Phosphate, the regression results are confirming that these 3 have (-) negative link with cost of production that means when Cost of Production is rising when use of these fertilizers is rising then cost of production is falling. Most important factor in reduction in cost of production is Credit to Agriculture because most of the times the farmers are facing shortage of funds and they are borrowing money at very high rates from the private

money lenders and then the 3 are coming which are approximately almost of same magnitude and all models have (f) significant at less than 0.05 or 5% degree of probability.

5. Conclusion

Present study was an attempt to estimate the causal link between production of dates and technology and mechanization through presence of tractors and harvesters etc, availability of credit to the farmers in agriculture sector.

The study results from empirical analysis suggest that first and second most important factors determining the production of dates are employment and technology. The third most important factor affecting the production is availability of credit to the farmers.

As it is already researched that if the government supports for providing credit facilities, to fix the rates of fruit, to reduce the illegal commissions of market men, to provide of improved varieties and processing facilities will be beneficial for the growers (Shaikh, 2016).

In case of the cost of production, the credit to agriculture sector is the most important factor affecting the cost of dates production keeping in view the high interest amounts charged by the private money lenders from farmers.

The study will have a significant influence on the policy corridors regarding improvements in the date palm sector with the use of modern technology, reduction in cost of production, provision of credit facility and other challenges faced by the growers.

6. Policy recommendations

Based on the findings of the study, following recommendations may be put forward to the government and other institutions to enhance production of dates in Pakistan.

1. Specialized financial institutions may be established for credit provision and capital funding to the agriculture sector particularly the date palm sector.

2. The process of mechanization and installation of machineries like tractors and combines threshers and harvesters should be expedited to enhance production in the date palm sector.

3. Facility centres may be established close to the date palm fields and regions to spread awareness about export opportunities and facilitate the farmers in meeting ISO quality, packaging and storing standards.

Skills based trainings to the growers and farmers regarding cropping of dates and inter cropping.

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