Research Article

Resource Use Efficiency in Dates Production in Sindh Pakistan

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Abstract | This paper investigates resource use efficiency in dates production at three farm size levels by using primary and secondary data for the year 2015-16 by employing Policy Analysis Matrix (PAM) methodology. Relevant indicators were employed to gauge and compare resource use efficiency of two dates products (fresh dates and dried dates) produced by farmers. The finding of positive Private Profitability and Private Cost Ratio (PCR) value less than 1 argues farm level competitiveness under small, medium and large farms in the study area. Fresh Dates has more competitiveness with less PCR value 0.62 compared to dry dates with PCR value 0.75.There is also influence of farm size on cost efficiency and competitiveness level. Domestic Resource Cost (DRC) ratio less than unity reveled overall resource use efficiency in dates production, however fresh dates (0.39) had more comparative advantage as compare to dried dates with DRC value (0.72). The measures of protection showed that there was more dis-protection for fresh dates as compared to dried dates. Despite more resource use efficiency in the fresh dates only 16 percent produce was processed as fresh dates remaining 84 percent produce was converted into dried dates. This finding implicates that the overall dates production system secure low domestic resource use efficiency in the production of dates in the study area. Lack of modern processing and value addition technologies there is overwhelming dependence on traditional sun drying methods for processing of dates remained main source of low resource use efficiency of the system. Policy interventions needed to enhance the resource use efficiency in the production and processing of dates in study area through investment in research and development for processing and value addition technologies.

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Introduction

Pakistan Horticulture Sector is promising sub sector of agriculture economy of Pakistan with great potential of multiple employment opportunities throughout the supply chain and increasing export earnings. Lack of value addition, under developed value chains and limited market opportunities remained a foremost post-harvest management challenge of horticulture sub sector in the country. Now it is well recognized fact that due to issues in post-harvest management of horticulture sector post-harvest losses ranges from 20-40% of fresh produce. There is also lack of storage facilities and efficient marketing system in agriculture commodities which allowed large number of market actors involved in shifting agricultural produce from growers to consumers (PHDEB, 2008; Mohy-ud-Din and Badar, 2011).

Date Palm (*Phoenix Dactylifera* L.) is a most important food for human in number of countries of the world

particularly in tropical and subtropical regions. Dates Palm recognized as important domesticated fruit trees because of its implications in human societies, productive capacity in arid environment and continued an important agricultural activity in many countries which improves foreign exchange earnings for them (Lemlem et al., 2018). Date palm as a labor intensive industry contributes in income generation and also contributing in food security of many countries (Hodder and Hodder, 2016). It has also strategic importance in development of the some countries (Amor et al., 2015). The date sector is one of the most important activities in Arabian Peninsula (Dhehibi et al., 2018). Agricultural resource use efficiency in the Middle Ghors region in Jordan can be enhanced with the planting of *Medjool* date palm because dates have comparative advantage(Altahat, 2015).Pakistan is among top six date producers in world. Due to post harvest management issues in dates the quality remained low and a portion remained uneatable for human (El-Sayed et al., 2002).

Date farming occupied a prominent position in some parts of Pakistan. Sindh province of Pakistan is top dates producers with 60 percent of the country produce. District Khairpur and Sukkurproduce 97 percent of Sindh production and about 46 percent national production. Ecological and livelihood importance of date palm cultivation is well recognized where it is grown traditionally (Hodder and Hodder, 2016). Increasing resource use efficiency becomes critical issue on the policy agenda for enhancing overall competiveness of the domestic resources and its measurement (Masters and Winter-Nelson, 1995). Competitiveness mean secures efficiency in domestic resource use in production of commodity in the global context.

Based on the post-harvest processing, Pakistan produced two distant products i.e. fresh dates and dried dates (*Chohara*) in study area. Due to the importance of the commodity this research assesses farm level resource use efficiency of date's production and processing system with the motivation by two reasons: the interest in knowing the differences between the competitive advantage in both the commodities i.e. fresh dates and dried dates on the profitability and efficiency of this production and processing system. Competitiveness of agriculture covers a number of factors includes exchange rate, relative prices of inputs and outputs and cost of production (Dohlman et al., 2003).

Pakistan ranks among the five largest exporters of dates (FAO, 2018). During the period under analysis Pakistan was the net exporter of dates (GOP, 2016). Due to the importance of the commodity this research assesses farm and national level resource use efficiency in date's production system (for fresh and dried dates).

Material and Methods

This research uses primary farm level data on inputs and outputs variables collect from dates fruit catchment area Khairpur and Sukkur Districts, Sindh through structured questionnaire from 114 dates farmers randomly selected. On the basis of operational holding the farmers were categorized into small (<12.5 acre), medium (12.5<25 acre) and large(≥25acre). The secondary data was collected from different national and international sources. To address the resource use efficiency issue in the study area a comparison of three farm size levels (small, medium, large) and two dates products (i.e. fresh dates and dried dates) were included in the analysis.

Resource use analysis at farm level was conducted by using the methods of (Monke and Pearson,1989). The required ratios were deduced from PAM framework to measure the farm level resource use efficiency of the date's products in the target area. In recent past number of studies used this analysis (Akhtar, et al., 2016; Akhtar et al., 2007; Khan and Akhtar, 2006). The input and output of dates farming in PAM framework are divided into two systems the tradable and non-tradble variables as suggested by (Monke and Pearson,1989; Appleyard, 1987)

The PAM model provides different indicators which are practicable to assess resource use efficiency at farm and national level of any farming system, these are as under.

Private profitability D=A-(B+C)

Represent private efficiency and it indicates how much one can afford to pay domestic factor and still remained competitive (Monke and Pearson,1989).

Profitabilityat efficiency prices H=E-(F+G)

Represent foreign exchange earned by exports of the commodity. A positive value indicates the production is adding to national income.

Table 1: *Policy Analysis Matrix (PAM) Framework.*

	Revenue	Costs		Profit
		Tradable inputs	Domestic factors	
Market Prices	A= pd_i	$B = \sum_{j=1}^{k} a_{ij}\, pd_j$	$F = \sum_{j=1}^{k} a_{ij}\, pd_j$	D=A- (B+C)
Efficiency Prices	E= pb_i	$F = \sum_{j=1}^{k} a_{ij}\, pd_j$	$G = \sum_{j=k+1}^{n} a_{in}\, ps_n$	H=E- (F+G)
Divergence	I=A-E	J=B- F	K=B- F	L= D- H

Source: *Monke and Pearson (1989).*

Where; *pd_i= Market price of commodity under consideration; pd_n=Non-tradable inputs n price used in the production the commodity; pb_i = Efficiency Priceis world prices (export parity price) at comparable location; a_{ij}=j^{th} traded inputs quantity required to produce a unit of commodity; j=1…k =directly traded and traded elements of non-traded inputs used in production of commodity under consideration; n=k+1…n Primary inputs plus non-traded elements of non-traded inputs obtained after decomposing the non-traded items into non-tradable.*

Table 2: *Resource use efficiency in dates farming in Sindh.*

Products	Fresh dates (16 percent of total quantity of dates processed)				Dried dates (84 of total quantity of dates processed)			
Farm category	Profit on efficiency prices (US$./acre)	DRC	Private Profit (US$./acre)	PCR	Profit on efficiency prices (US$./acre)	DRC	Private Profit (US$./acre)	PCR
Small (79%)	2678	0.41	1034	0.65	859	0.71	658	0.78
Medium(11%)	3661	0.33	1217	0.61	1115	0.65	1011	0.68
Large (10%)	3982	0.33	1357	0.59	988	0.69	847	0.73
All (100 %)	2964	0.39	1157	0.62	825	0.72	708	0.75

Source: *Authors analysis using survey and secondary data by PAM approach, US$=104.24 PKR.*

Table 3: *Protection coefficient and incentive of dates production in Sindh.*

Products	Fresh dates				Dried dates			
Indicators	NPC	EPC	OT (US$./acre)	IT (US$./acre)	NPC	EPC	OT (US$./acre)	IT (US$./acre)
Small (79%)	0.65	0.65	-1621	-37	0.97	0.98	-88	-37
Medium (11%)	0.57	0.57	-2421	-40	1.00	1.01	-5	-40
Large (10%)	0.57	0.56	-2660	-57	0.97	0.99	-101	-57
All (100)	0.64	0.63	-1818	-50	0.98	1.00	-59	-50

Source: *PAM results processed using survey and secondary data.*

Nominal protection coefficient(NPC) =A/E

NPCO is ratio between domestic market price to parity price at farm gate, If NPCO <1 then it indicates that the producers are implicitly taxed on the product. If NPCO >1 then producers positively protected. If NPCO equals 1 it indicates a neutral situation. It is the measure of policy distortion or market failure effects. PAM framework has ability to capture the policy effects by default.

Effective protection coefficient (EPC)= (A-B)/(B-F)

EPC measures the effect of intervention both in input and output market. EPC is the ratio of value added measured at market prices (A-B) to the parity prices(E-F). An EPC >1 suggests the government policies market scenario provide positive incentives to producers or net subsidy to value added (Beghin and Fang, 2002), while EPC<1, indicates that producers are dis- protected effect of all policies and market failures effects.

Domestic resource Cost=G/(E-F)

DRC is extensively used in developing countries to measure efficiency of domestic production in term of international cost competitiveness or comparative advantage. It reflects the domestic resource efficiency of the farming system at efficiency prices. DRC ratio is defined as the shadow value non-tradable factors inputs used in any activity per unit of tradable value

added. DRC indicator showed that whether the use of domestic factor is alternatively profitable(DRC<1) or not (DRC>1).

Private cost ratio=C/(A-B)

Resource use efficiency of cost competitiveness at farm level can be measured through PCR. This measured is used to evaluate competitiveness at farm level of any agricultural commodity. (Joubert and van Schalkwyk, 2000) argued that PCR is a measure which tells how much cost the sector can afford to pay for domestic factors of production and still remain competitive. If the value of PCR <1, then the system will be competitive. In this research competitiveness is the ability of the Date palm growers to produce and process a product at so low cost that the production activities are profitable at the market prices or it survive in domestic market it is also a measure of competitive advantage. All the ratios are interlinked in the framework of policy analysis matrix.

Results and Discussion

The date growers were divided into three categories to facilitate a detailed analysis. The results of random sample distribution showed that in the sample there was 79 percent small, 11 percent medium and 10 percent large farmers. In the study area from date fruitthere were two types of dates products were processed by primary processing i.e. fresh dates dried date. The harvesting season of dates in the study area clashes with the monsoon rains. To avoid the monsoon rain damage the farmers harvest fruits at khalal stage (before ripening) to make dried dates (*Chohara*) through the process of boiling and sun drying this practice is induced by risk reduction is done by processing of commodity into dried dates to secure something out of produce rather facing a great loss. This also implicates that there is lack of appropriate dates drying/processing technologies which result a large portion of the dates commodity (84 percent) is processed into dried dates and only 16 percent of the farm produced was converted into fresh dates. The result revealed that all farm categories attained positive private profitability both the dates products under study. This finding argues that the date's production system has secure competitiveness at farm level. However fresh date product has secured more competitiveness with less PCR value 0.62 as compared to dry dates with PCR value 0.75. This result also showed economy of scale in the processing of fresh dates. The DRC or comparative advantage indicator is less 1(0.39) for fresh dates and 1(0.72) for dried dates, which means that the production and processing of both products secure resource use efficiency has a comparative advantage. Fresh dates have more efficiency in the use of domestic resource as compared to dried dates. Farm size has little bit influence in resource use efficiency. However, the extent of indicators implicates low level of competitiveness and resource use efficiency far below its potential.

Nominal Protection Coefficient (NPCs) was 0.64 on fresh dates and 0.98 on dried dates less than 1. This implicates that there is implicit taxation on output for both products however fresh dates face more dis-protection as compared to dried dates. Similarly, EPCs were less than 1(0.63), implying that the combined effect of transfers and tradable inputs is reducing the private profitability or competitiveness of the fresh dates. It implies that under the existing market conditions, there is a net disincentive to producers of fresh dates in the study area. It is obvious that government policy has impact on prices of inputs and outputs, farm profitability, resource use efficiency, technology and trade variables this all come under policy environment. Negative value of output transfers(OT) revealed that dates producers are not protected and resources are coming out from commodity system to economy through policy environment and market conditions. Negative values of input transfer (IT) revealed that producers received a subsidy on cost of tradable inputs but it could not offset the dis-protection in the commodity system. Therefore, the overall impact of the policy was not in the favor of the producers.

Conclusions and Recommendations

Dates production system in the study area is resource use efficient at margin based on the current level of technology, prices of inputs and outputs and policy environment. However, fresh dates had more efficiency as compared to dried dates. The study also indicates that there is presence of economies of scale in the prevailing production system of dates. However overall the system has low level of resource use efficiency at farm and national level as only 16 percent of the farm produce was converted into fresh dates which was relatively more resource use efficient product as indicated by estimated ratios i.e. PCR and DRC in this research. A number of

factors i.e. high post-harvest cost, low quality and low level of price are the sources of low level of resource use efficiency in dried dates. Protection coefficients determined through this research revealed that policy environment or prevailing market conditions had no positive impacts on dates growers and its even reduced competitiveness of date's production at farm level. This situation reflects policy distortion because prices of inputs, output and trade variables are sensitive to government policy. Protection coefficient reveled that growers bear negative incentives in the production and marketing of both products in the present policy scenario. This implicates that under free trade, producers of dates could make more profit in contrast to the existing policy environment. Farmer's incentives can be enhanced by removing existing implicit taxation by policy support. Post-harvest technologies for processing and value addition in the date fruit is recommended to enhance overall efficiency of the dates production system in the study area.

Author's Contribution

Waqar Akhtar: Conceived the idea, overall management of the article, initiated and finalized the paper.
Munir Ahmad: Provided technical input, supervised the research work, provided technical input at every step.
NadeemAkmal: Data analysis, technical input.
Hassnain Shah: Technical Input, Write up.
Asif Ali Mirani: Data collection and References.

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References

Altahat, E.S. 2015. Analysis of Agricultural Policies Affecting Medjool Date Palm Cultivation in Jordan. J. Agric. Sci. 7(4): 129. https://doi.org/10.5539/jas.v7n4p129

Akhtar, W., M. Sharif, A.H Qureshi, K.M Aujla and M.A. Khan. 2016. Competitiveness of tomato production in Punjab, Pakistan. Pak. J. Agric. Res. 29(2). https://doi.org/10.22200/pjpr.2016133-36

Akhtar, W., M. Sharifand N. Akmal. 2007. Analysis of economic efficiency and competitiveness of the rice production systems of Pakistan's Punjab. Lahore J. Econ. 12(1): 141-153.

Amor, B.R., E. Aguayo and M. de Miguel-Gómez. 2015. The competitive advantage of the Tunisian palm date sector in the Mediterranean region. Span. J. Agric. Res. 13(2): e0101. https://doi.org/10.5424/sjar/2015132-6390

Appleyard, D. 1987. Comparative advantage of agricultural production systems and its policy implications in Pakistan (No. 68). Food Agric. Organ.

Beghin, J. and C. Fang. 2002. Protection and trade liberalization under incomplete market integration. Am. J. Agric. Econ. 84(3): 768-773. https://doi.org/10.1111/1467-8276.00335

Dohlman, E., S. Osborne and B. Lohmar. 2003. Dynamics of agricultural competitiveness: Policy lessons from abroad (No. 1490-2016-127474).

Dhehibi, B., M.B. Salah and A. Frija. 2018. Date palm value chain analysis and marketing opportunities for the Gulf Cooperation Council (GCC) countries. Agric. Econ. Intech. Open. https://doi.org/10.5772/intechopen.82450

Joubert C. and H.D. van Schalkwyk. 2000. The effect of policy on the South African valencia industry. Agrekon. Vol. 39: No. 1. p. 8. https://doi.org/10.1080/03031853.2000.9523569

Hodder, A.J. and A. Hodder 2016. FAO support to date palm development around the world: 70 years of activity. Emirates J. Food Agric. 1-11.

El-Sayed, H.M., M.A. El-Ashry, H.M Metwally, M. Fadel and M. Khorshed. 2002. Effect of chemical and biological treatments of some cropresidues on their nutritive value: 3-Digestion coefficient, Rumen and blood serum parameters of goats. Egypt. J. Nutr. Feedstuffs. 5(1): 55-69.

FAO Statistics Division. 2018. Production, harvested area, import and export of dates in world http://faostat.fao.org

GoP. 2017. Economic survey of Pakistan- 2016-17. Finance division, economic advisor wing, Islamabad, Pakistan.

GOP. 2016. Fruits, vegetables and condiments statistics of Pakistan, 2015-16, Minist. Nat. Food Sec. Res. Islamabad.

Khan, N.P. and J. Akhtar. 2006. Competitiveness

and policy analysis of potato production in different agro-ecological zones of northern areas: Implications for food security and poverty alleviation. Pak. Dev. Rev. 45: (4 Part II). 1137–1154. https://doi.org/10.30541/v45i4IIpp.1137-1154

Lemlem, A., M. Alemayehu and M. Endris. 2018. Date palm production practices and constraints in the value chain in afar regional state, Ethiopia. Adv. Agric. https://doi.org/10.1155/2018/6469104

Masters, W.A. and A. Winter-Nelson. 1995. Measuring the comparative advantage of agricultural activities: domestic resource costs and the social cost-benefit ratio. Am. J. Agric. Econ. 77(2): 243-250. https://doi.org/10.2307/1243534

Mohy-ud-Din, Q. and H. Badar. 2011. Marketing of agricultural products in Pakistan: theory and practice. Higher Education Commission.

Monke, E. A. and S. R. Pearson. 1989. The policy analysis matrix for agricultural development (No. 04; HD1415, M5.). Ithaca: Cornell University Press.

PHDEB. 2008. Dates marketing strategy. Pakistan horticulture development and export Board.