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Comparative Economic Analysis of Hybrid Tomato v/s Conventional Tomato Production in District Tando Allahyar Sindh, Pakistan

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Abstract
The present study was conducted in district Tando Allahyar Sindh to assess the economic analysis of tomato production and changes in socio-economic status of the farmers. Thus the tomato farmers in study area incurred that on an average per Farm spent a sum total fixed cost was 20900.00 Rs/acre in Hybrid tomato and total fixed cost was 20900.00 Rs/acre in Conventional tomato. Total fixed cost includes Land Rent, Land tax, and water charges and total variable costs for Hybrid tomato were (64420.00 Rs/Acre) while in conventional tomato the total variable costs ware (61620.00 Rs/Acre). On an average higher yield was obtained in hybrid tomato 94.00 Mds /acre from Hybrid tomato while 76.00 Mds /acre average obtained by conventional tomato. As for prices concerned, the Hybrid and Conventional tomato growers received Rs. 1520.00/ Mds and Rs. 1480.00/ Mds respectively. Total revenue of tomato production was calculated and found that hybrid tomato growers received Rs. 142880.00/acre, while conventional tomato growers Rs. 112480.00 /acre. The tomato growers in selected study area who cultivates Hybrid tomato obtained higher gross revenue (Rs.142880.00Per/acre), whereas gross margin of conventional tomato growers who seem to be lower (Rs. 112480.00Per/acre). The Net Return of tomato production was calculated and found that Hybrid tomato growers received higher Net Return which was (57560.00 Rs/acre), where as Net Return of Conventional tomato grower who seem to be lower (29960.00 Rs/acre). Therefore they availed in hybrid farms input output ratio of 1:1.67, cost benefit ratio of 1:0.67while 1:1.36 input output ratio and 1:0.36 from conventional tomato farmers in the study area.
Keywords: Tomato, hybrid, conventional, net return, cost benefit ratio, Tando Allahyar.

1. Introduction

Agriculture sector is the backbone of Pakistan's economy employing about 45 % of the work force. Nature has blessed Pakistan with an ideal climate for growing a large variety of vegetables and fruits. According to rough estimates about 30%-40% of vegetables/fruits are wasted due to negligence and lack of cold chain / processing facilities, which could convert them into non-perishable form, permitting its transportation and storage without wastage. With the spread of education, change inhabits of populace, growth in working women force and increase in per capita income &urbanization, the demand for processed vegetable/fruit products is increasing progressively (GOP, 2014).

Balochistan province produces a range of fruits and vegetables almost around the year. It is the largest producer of temperate fruits, dates, onions and tomatoes. Among vegetables, Tomato is the second major vegetable produced in the country. Area under its cultivation was 46,200 hectares with production of 468,146 MT during 2013. Balochistan province, over last two years has emerged as major producer of tomato with 42% share in national production, followed by KPK 34.5%, Punjab 14.5% and Sindh 9% share. Killa Saifullah district is the leading producer of tomato in the Balochistan Province as well as in the country. Therefore, the proposed site for the plant is Muslim Bagh in Killa-Saifullah. Food processors are major consumers of tomato paste in the local market, followed by hotels & restaurants and then household. Establishment of a tomato paste plant in the country will not only produce a quality product but would significantly reduce the dependence of local ketchup industry/hotels on imported paste and thus save valuable foreign exchange (GOB, 2013).

The domestic consumption and demand for tomato is growing due to increase in population. Moreover it is available at low price as compared to other vegetables. It is consumed in every home in different modes, such as vegetable, salad, ketchup, chatni and it is part of every delicious cuseine. Due to wide seasonal variations in Pakistan tomato is available throughout the year. Pakistan produces two crops annually first in spring and second in autumn. However, in southern Pakistan tomato can be grown throughout the year. Pakistan produced 560,700 tonnes tomatoes in 2008-9. Production/hectare was 10.50 tones. During 2008-09 total area under cultivation were 53, 400 hectares (Agric Stat, 2008-09).

Pakistan devoted 0.34 million hectares to produce 4.8 million tones of vegetables and condiments during 2003-04 (Government of Pakistan, 2004). Besides, Pakistan also earned valuable foreign exchange to the tune of $ 128.4 million by exporting different vegetables across the world including Middle East and South Asia during 2004-05 and $109.6 million in the previous year 2003-04, showing 17 percent increase. Major buyers of vegetables and fruits from Pakistan were Dubai, India, Afghanistan, Saudi Arabia and United Kingdom (EPB, 2006).

Balochistan is the largest tomato producing province on Pakistan. Within Balochistan, Killa Saifullah is a district in the north west of Balochistan province of Pakistan. a sub tribe of Kakar Sunzerkhel. A part of Zhob was named after him because of his bravery. Killa Saifullah is one of the central city of Balochistan. It has great value because of its agricultural products. Killa Saifullah district is among the main tomato producing areas. Therefore, one of the Killa Saifullah is meant for trading in tomatoes. Tomatoes are generally packed in baskets for the nearest market and in wooden crates for the distant markets (FAO, 2006).

With the increasing affluence of the world, its demand has increased very rapidly resulting in wide scale development of tomato industry for production of tomato. On the supply side, onion, tomato and chilies are important crops. These crops provide high profits to farmers and employment opportunities to rural laborers as these crops require more labor inputs as compared to other crops.

2. Objectives

1. To review present status of tomato production in Killa Saifullah district Balochistan Pakistan.
2. To find out socioeconomic factors of tomato farmers in the study area.
3. To determine production costs, physical productivity and net return of tomato farms in the study area.
4. To identify the issues and suggest the policy measures for of tomato farms production.

3. Review of literature

Khokar *et al.* (2012) found that Cash recorded a maximum yield of 2081.76 kg/plant, plant height (152.40 cm), branch number (14.07), flowers per inflorescence (8.00) and fruit setting percentage (83.96 g) and cost benefit ratio of 1:4.04, followed by Arka Ahuti and Arka Ahish, respectively. The minimum days to flowering (51.33), days to ripening (90.33), plant height (81.67 cm) and highest yield (24.17 t/ha) was recorded in TT0302, whereas maximum fruit set cluster (71.62 %) and number of fruit/kg (24.33) were recorded in Swat local. Keeping in view, the importance of different Tomato hybrids and their ability to produce higher yields, the present study was therefore, carried out to evaluate the performance of different exotic tomato hybrid varieties.

Ameer *et al.*(2008) highly significant data revealed that maximum yield (9639.3 kg ha-1) was obtained in T-7010, closely followed by T-7012 and T-7008 with 8002.7 and 7897.9 kg ha-1, respectively and all these hybrids showed a non significant behavior against each other. Statistical alike results were reported for T-7030 and TP-002 with 6121.7 and 5473.5 kg ha-1,. PTM-1603 showed minimum yield per hectare of 1375.7 kg followed by 68-F1 producing (3006.6 kg/ha). Being much better fertilizer and environmental responsive hybrids, these hybrids including T-7010, T- 7012 and T-7008 produced better yield.

Hussain *et al.* (2001) the data shown revealed highly significant results for yield per plant (kg) amongst the different, tomato hybrids. T-7010 showed maximum yield per plant (1.92 kg) very closely followed by T-7008, T-7012 and T- 7030 producing 1.64, 1.44 and 1.25 kg per plant respectively and all these hybrids produced a non significant result against each other. Statistically similar result for the yield was recorded for T-7001 and TP-002 with 1.10 and 0.99 kg/plant respectively. Whereas, hybrid PTM-1603 showed minimum yield per plant (0.25 kg) followed by 68-F1 scoring 0.54 kg tomato fruit yield per plant. Once again, tomato hybrids viz, T-7010, T-7008, T-7012 and T-7030 showed better performance in fruit yield per plant as they got maximum food assimilation, fruit size and average fruit weight, as compared to the other hybrids. This also shows that these hybrids are much more suitable to the local environmental, as they are showing consistence performance regarding better tomato yields.

Hossain *et al.* (2004) reported that tomato variety BARI 7 produced the highest yield (57.02 t/ha) and BARI 5 produced the lowest yield (51.38 t/ha). Neeraja *et al.* (2004) evaluated seven promising tomato cultivars and found that DT-39 was the earliest to flower (53.5 days), HYT-1 recorded the highest fruit yield of 41.05 t/ha which was at par with that of Selection-7 (35.31 t/ha) and RHRT-33-1 recorded the longest shelf life (15 days), followed by RHRT-6-1(14 days).

Zahoor *et al.* (2006) evaluated three tomato lines along with a local cultivar in Swat, Pakistan. The survival percentage of the different lines was non- significant. The maximum days to flowering (58.33) were recorded in TT 0202 and the minimum in TT 0302 (51.33), TT 0302 took the minimum days (90.33) to ripening from transplanting, while TT0202 took the maximum days (102.00). Number of flowers per cluster were the highest in TT0202 (5.83) and TT0102 (5.54), and the lowest in Swat local (4.25). The maximum fruit set per cluster (71.62%) was recorded in Swat local, while the minimum (32.12%) fruit set was recorded in TT0202. Plant height was maximum (81.67 and 77.33 cm) in TT0302 and Swat local, respectively, while it was minimum

(71.75 cm) in TT0202. Number of fruits/kg was high (24.331) in Swat local and low (13.33) in TT0302. The highest yield (24.17 t/ha) was recorded in TT0302 and the lowest (12.50t/ha) in Swat local, TT0302 is recommended for high yield. Tomato performance has also been different under rain fed and irrigated conditions.

Adenuga *et al.* (2013) reported that tomato is one of the major fruit vegetables in Nigeria. In view of its seasonal availability and the need to make it available all-year round, effort must be made to increase efficiency of its production especially during the dry season. A study was therefore carried out to examine the economics of dry season tomato production in Kwara state, Nigeria. It estimated the costs and returns and assessed the technical efficiency of dry season tomato production. A two-stage random sampling technique was used to select 105 respondents for the study. A well-structured questionnaire was used to collect data from the respondents. Major tools of analysis used for the study were the gross margin analysis and the stochastic frontiers model. Results of the study showed that a gross margin of N 18,956.75/ha (US$ 120.74/ha) was realized from dry season tomato production. Furthermore, the result of the stochastic frontier model shows that age, education status of the farmers and access to credit had significant effect on the efficiency of dry season tomato production. This study therefore highlights the need for government to invest in public education and to make credit available to farmers as a way of reducing the burden of high cost of production.

Agbabiaje (2012) in his study economics of tomato production in the wet and dry seasons were examined with special reference to the efficiency of input use and varietal suitability for production seasons. Two varieties of tomato, TI-563 and TI-570 were used and gross margin analysis was employed to compare the performance of the two varieties. Inputs were valued at farm gate prices while farm products were valued at prevailing market prices. Simple linear regression was used to relate input-yield interaction per season. There was fruit yield difference between the two seasons in both varieties. Total production cost was higher in the dry season as a result labour required for irrigation. There was a negative returns-to-scale for labour on land preparation, water and insecticide applications in the dry season. All economic indices considered indicated that the profitability of varieties TI-563 and TI-570 was higher in the wet and dry seasons respectively. The consideration of economic factors in classifying varieties into wet and dry season types was emphasized

Ayesha *et al.* (2012) reported that reflects the overtime changes in global tomato production and export trends, market destinations for Pakistani tomato, regional acreage comparison, country's share in tomato export and revealed comparative advantage (RCA) of tomato. Pakistan's share in world tomato exports was negligible in 2000.The results of global and domestic tomato production and export trends depict that the export share in production for the world and Pakistan increased significantly since 2007. At present, Pakistan has no RCA in tomato trade as the value of RCA is much below the unity. However, keeping in view the 8% growth rate in tomato area and 5% in production, there are opportunities in tomato production for export from Pakistan. At present Pakistan's exports are heavily focused on Middle East and Afghanistan markets. Therefore, there is a need to look for other markets to increase the tomato exports during the glut supply season.

4. Methodology

Primary purpose of this chapter is to explain various tools and techniques in the selection of sample, collection, analysis and interpretation of data relating to research. Intend of this study was to investigate the existing tomato production in district Tando Allahyar Sindh. Planned strategy was used to study the area, type and number of respondents without which it would be an ineffective effort. Therefore, it is essential to define variables included in the research to make it more scientific and objective.

4.1. Study Area

The study was restricted generally to gather primary data from district Tando Allahyar Sindh. It was selected as the universe of the study because it represents a good case study for tomato production activities. The district is gifted naturally with fertile soil. Canals and tube wells are major source of irrigation. Wheat, sugarcane, cotton, and vegetables are the major crops grown in the area.

Due to small land holding most of people are connected to mixed farming. Tomato growers has become an organized industry over the years and has got the attentions of farmers having small or large land holding due to high scope of income and rising prices of tomato fruit. Farmers now days, grow cash crops like tomato on their land to generate income.

4.2. Sample Size

The sample was supposed to contain tomato farmers. A sample size of 60 respondents was selected through random sampling.

4.3. Data Collection

As described above, the data was collected from district Tando Allahyar, Villages and respondents from this area were randomly selected.

4.4. Questionnaire Development

Interview schedule was based on a well designed questionnaire. Comprehensive information was obtained face to face from the farmers involved in tomato farming and the tomato business and documented by the interviewer. Questionnaire was prepared in English language while the interview with respondents was done in local language i.e. Sindhi. Different features were covered in the questionnaire.

4.5. Data Analysis

Collected data had both quantitative and qualitative information. For data analysis Microsoft Office Excel software package and SPSS package were used.

4.6. Descriptive Statistics

The data was categorized according to the study objectives, analyzed statistically and represented in tabular form. Statistical techniques that were used during data analysis are given below:

4.6.1. Averages

Averages were calculated by applying following formula:

Average = $\sum Xi / n$

Where,

$\sum Xi$ = sum of independent variables

n = number of observation in data

4.6.2. Percentages

Percentage is the proportion of fraction articulated in hundredth. It was computed by

Percentage = F / N* 100

Where,

F =Respondents of desired class

N = Total number of respondents

4.7. Estimation Methods

Data were analyzed by developing equations for estimating fixed costs, variable costs, total cost of production, total revenue, net revenue Input-Output ratio and benefit cost ratio. A brief description of each term is given as follows:

4.8. Estimation of Land Inputs

For estimation of land inputs for tomato on the sample farms, the following formula was used.

Lit =(As x Cr) + As x Rui) / As.

Where ,

Lit =Land input per unit of tomato.

Cr =Contract rent per unit / acre.

Rui =Rate of usher and irrigation charges

As =Area sown under tomato.

4.9. Estimation of Labour Cost

The extent of labour inputs for various cultural operations involved in tomato production was estimated by applying the following formula:

Lit =(Mn x Hc) + Mwd xWr) + (Bwd x Hc) / As.

Where ,

Lit =Labour input per unit of tomato.

Hc =Hiring charges.

Mn =Machine work hour.

Mwd=Man work day.

Wr =Wage rate

Bwd=Bullock work day.

As =Area sown under tomato.

4.10. Estimation of Capital Inputs

The following formula was used to compute per unit (acre/ hectare) cost of the capital inputs.

Cipu = (Qs x Pr) + (Of x Pr) + Qi x Pr) / As.

Where ,

Cipu = Capital inputs per unit of tomato

Qs = Quantity of used.

Pr = Price per unit of input.
Qf = Quantity of fertilizer.
Qi = Quantity of insecticides / pesticides.
As = Area sown.

4.11. Marketing Cost

The marketing cost was estimated by using the following formula:
Mc = Qm (Rl + Tr + Oc + Rui / As
Where ,
Mc = Marketing cost.
Qm = Quantity of produce marketed.
Rl = Rate of loading.
Tr = Transportation rate.
Rut = Rate of unloading of tomato.
As = Area sown

4.12. Estimation of Returns

The estimation of returns was developed by using the following formula:
VP = (Qs x Pr) / As
Where
VP = Value of Product.
QS = Quantity Sold.
Pr = Price per unit.
As = Area

4.13. Total Cost of Production

Total cost of production was estimated by using the following formula:
TC=TFC+TVC
Where
TC = Total Costs of Production

4.14. Net Returns

Net returns were estimated by using the following formula:
NR = TI- TC
Where
NR = Net Returns
TI = Total Income
TC = Total Cost

4.15. Input-Output Ratio

The input-output was estimated by using the following formula:

$$IO_R = \frac{T1}{TC}$$

Where
IO_R = Input-Output Ratio

4.16. Cost-Benefit Ratio

Cost-Benefit Ratio was estimated by using the following formula:

$$CBR = \frac{NR}{TC}$$

Where
CBR = Cost Benefit Ratio

5. Results

The general objective of study was to find out the yield gap of Hybrid and Conventional tomato production. Hybrid and Conventional tomato were performed in study area. Most of the farmers focused to adopt Hybrid tomato; they get greater benefits from Hybrid tomato than Conventional tomato are discussed here.

5.1.Current Status of Tomato in Pakistan

The area of tomato cultivation in Pakistan is given in Table-1 the area under tomato fruit has increased from 27 to 54 thousand hectares. To obtain a potential yield, high yielding varieties and improved production technology have to be adopted.

Table 1: Area of Tomato cultivation (000' Hectares) in Pakistan (2000 to 2012)

Area of Tomato cultivation (000' Hectares)					
Year	**Sindh**	**Punjab**	**KPK**	**Baluchistan**	**Pakistan**
2000-01	6.1	4.4	13.6	3.8	27.9
2001-02	5.8	4.5	14.1	5.0	29.4
2002-03	6.1	4.8	14.6	5.5	31.0
2003-04	6.2	5.2	15.1	12.5	39.0
2004-05	6.1	5.1	15.8	14.4	41.4
2005-06	9.4	5.3	16.1	15.4	46.2
2006-07	8.7	5.3	16.1	17.0	47.1
2007-08	10.9	5.5	16.1	20.6	53.1
2008-9	12.3	5.6	16.5	19.0	53.4
2009-10	12.2	6.0	13.1	18.7	50.0
2010-11	14.6	6.7	12.6	18.4	52.3
2011-12	15.63	6.9	13.62	18.7	54.8

Source: Agricultural Statistics of Pakistan, Government of Pakistan (2013)

The area of tomato average yield/production in Pakistan is given in Table-2 the area under tomato fruit has increased from 268 to 538 thousand hectares. To obtain a potential yield, high yielding varieties and improved production technology have to be adopted.

Table 2: Production of Tomato (000' Hectares) in Pakistan (2000-01 to 2011-12)

Production of Tomato (000' Hectares)					
Year	**Sindh**	**Punjab**	**KPK**	**Baluchistan**	**Pakistan**
2000-01	32.9	60.8	140.0	35.1	268.6
2001-02	32.8	62.2	146.2	52.9	294.1
2002-03	35.0	65.2	148.3	57.8	306.3
2003-04	35.7	64.0	157.5	155.6	412.8
2004-05	34.0	63.7	146.9	181.6	426.2
2005-06	48.3	64.6	161.6	193.6	468.1
2006-07	60.5	64.8	160.8	216.2	502.3
2007-08	91.8	70.1	162.0	212.3	536.2
2008-9	100.9	72.5	161.8	226.7	561.9
2009-10	100.4	77.9	119.3	179.2	476.8
2010-11	114.8	87.8	113.2	213.8	529.6
2011-12	118.9	89.4	115.3	214.7	538.3

Source: Agricultural Statistics of Pakistan, Government of Pakistan (2013)

5.2.Socio-Economic Characteristics

5.2.1.Age Group

Age is one of the important characteristics of the community. Its plays a significant role in any kind of business, particularly in agriculture, because the use of child labours on the farms is quite high.

Table 3: Distributions of farmers according to their age group

Age Group	**Hybrid Tomato**		**Conventional Tomato**	
	No. Respondent	**Percentage**	**No. Respondent**	**Percentage**
Young (< to 30)	12	40.00	06	20.00
Middle aged (30-50)	10	33.34	11	36.66
Old (> 50)	08	26.66	13	43.34
Total	30	100.00	30	100.00

Table-3 shows that 40.00 percent Hybrid and 20.00 percent conventional tomato farmers were belonged to age group up below30 years, while about 33.34 percent Hybrid 36.66 percent Conventional farmers belonged to age group 30-50 years. About 26.66 percent Hybrid and 43.34 percent Conventional farmers' belonged to age group above 50 years.

5.2.2.Education Level

Education is always considered as an important factor of understanding and learning skills. It is education which changes the behavior of human beings. Education changes moral character, thinking pattern and make learn how to talk and behave with other people. It helps in making the decisions on right direction.

Table 4: Distributions of the farmers according to their education level

Education Level	Hybrid Tomato		Conventional Tomato	
	No. Respondent	Percentage	No. Respondent	Percentage
Illiterate	05	16.66	07	23.34
Primary-middle	13	43.34	12	40.00
Metric	06	20.00	07	23.34
Collage-University	06	20.00	04	13.34
Total	30	100	30	100

Table-4 shows that 16.66 percent Hybrid tomato and 23.34 percent Conventional tomato farmers were illiterate, while about 43.34 percent Hybrid, 40.00 percent of Conventional farmers were Primary-middle level of education, 20.00 percent farmers of Hybrid and 23.34 percent farmers of Conventional farmers were matriculation. College/University education is 20.00 percent Hybrid and only 13.34 percent of Conventional.

5.2.3.Marital Status

Marital status is the condition of being married, unmarried, divorced or widowed. Marriage is a legal contract between people called spouses.

Table5: Distributions of respondents according to marital status

Marital Status	Hybrid Tomato		Conventional Tomato	
	No. Respondent	Percentage	No. Respondent	Percentage
Single	08	26.67	11	36.67
Married	19	63.33	17	56.67
Widow	2	6.66	1	3.33
Total	30	100	30	100

Table-5 shows that in Hybrid tomato there were 26.67 percent were single marital status, 63.33 percent were married marital status, and 3.33 percent were widow and 6.66 percent were divorced. While in case of Conventional tomato farmers were 36.67 percent were single marital status, 56.67 percent were married marital status, and 3.33 percent were widow, and 3.33 percent were divorced.

5.2.4.Family Type

Joint family set-up, the workload is shared among the members, often unequally. Extended family defines a family that extends beyond the nuclear family, consisting of grandparents, aunts, uncles, and cousins all living nearby or in the same household. A single-family detached home, also called a single-detached dwelling or separate house is a free-standing residential building

Table 6: Distribution of respondents according to family type

Family Type	Hybrid Rice		Conventional Rice	
	No. Respondent	Percentage	No. Respondent	Percentage
Joint	11	36.67	14	46.66
Extended	03	10.00	05	16.66
Single	16	53.33	11	36.67
Total	30	100	30	100

Table-6 Shows that in Hybrid tomato there were 36.67 percent were joint family system, 10.00 percent were extended family type and 53.33 percent were single family type. While in case of Conventional tomatoes were 46.66 percent were joint family system, 16.66 percent were extended family type and 36.67 percent were single family type.

5.2.5.Farming Experience

Experience in cultivation of land is always count as an important tool. Farmers having experience of crop production are always regarded as an asset in the farmer's community.

Table 7: Distributions of the farmers according to their farming experience

Farming Experience(years)	Hybrid Rice		Conventional Rice	
	No. Respondent	Percentage	No. Respondent	Percentage
Up to 10	07	23.33	11	36.66
11-20	09	30.00	06	20.00
Above 20	14	46.66	13	
Total	30	100	30	100

Table-7 reveals that 23.33 percent Hybrid tomato farmers and 36.66 percent Conventional tomato farmers had up to 10 years of farming experience, while 30.00 percent hybrid farmers and 20.00 percent

Conventional farmers had 11-20 years farming experience. 46.66 percent Hybrid farmers and 43.33 percent Conventional farmers had above 20 years of farming experience.

5.2.6.Farm Size

A farm is an area of land and the basic production facility in food production.

Table 8: Distributions of respondents according to agricultural farm size (acres)

Farm Size	Hybrid Tomato		Conventional Tomato	
	No. Respondent	Percentage	No. Respondent	Percentage
Less 5 acres	09	30.00	08	26.66
5-10 acres	13	43.34	12	40.00
Above 10 acres	08	26.66	10	33.34
Total	30	100.00	30	100.00

Table-8 shows that Hybrid tomato were 30.00 percent were less 5 acres, 43.34 percent were 5-10 acres and 26.66 percent were above 10 acres farm size, while in case of Conventional 26.66 percent were less 5 acres, 40.00 percent were 5-10 acres and 33.34 percent were above 10 acres farm size.

5.3.Information

Information, in its most restricted technical sense, is a sequence of symbols that can be interpreted as a message. Information can be recorded as signs, or transmitted as signals. Information is any kind of event that affects the state of a dynamic system.

Table 9: Distributions of the farmers according to their source of information

Source of information.	Hybrid Tomato		Conventional Tomato	
	No. Respondent	Percentage	No. Respondent	Percentage
Relatives	10	33.34	30	100.00
Media	09	30.00	--	--
Seed Dealer	08	26.66	--	---
Ext. Deptt:	03	10.00	--	--
Total	30	100.00	30	100.00

Table-9 shows that Hybrid there were 33.34 percent were getting information about Hybrid tomato from Relatives, 30.00 percent were from Media, 26.66 percent were from Seed dealer and 10.00 percent were getting information about Hybrid tomato from Extension Department while in case of Conventional 100.00 percent were getting information about conventional tomato from Relatives and families.

5.4.Varieties Planted

The tomato varieties are the most vital and important input for crop production, Quality seed is one of the ways to increase the productivity

Table 10: Distributions of the farmers according to Varieties planted

Hybrid Tomato		Conventional Tomato	
Varieties	No. Respondent	Varieties	No. Respondent
NSTo-1	26.72	Moneymaker	33.34
NSTo-2	33.30	Rio Grande	40.00
NSTo-3	24.71	Roma VF	16.66
NSTo-4	15.27	Tropic	10.00
Total	100.00	Total	100.00

Table-10 shows that varieties under cultivation from hybrid group were 26.72 percent of NSTo-1, 33.30 percent of NSTo-2, 24.71 percent of NSTo-3 and15.27 percent of NSTo-4. The area of conventional varieties found on farmer's field were 33.34 percent of Moneymaker, 40.00 percent of Rio Grande, 16.66 percent of Roma VF, 10.00 percent of Tropic varieties were cultivated.

5.5.Seed

The seed is the most vital and crucial input for crop production, one of the ways to increase the productivity without adding considerably to the extent of land now under cultivation by planting quality seed.

Table 11: Distributions of the farmers according to Seed Sources

Seed Sources	Hybrid Tomato		Conventional Tomato	
	No. Respondent	Percentage	No. Respondent	Percentage
Seed dealer	30	100.00	3	10.00
Extension dept	0	0.00	0	0.00
Co-Farmers	0	0.00	2	7.00
Progressive farmer	0	0.00	9	30.00
Researcher	0	0.00	2	8.00
Own	0	0.00	14	45.00
Total	30	100.00	30	100.00

Table-11 shows that the 100.00 percent hybrid tomato growers purchased seed from seed dealers and in case of conventional farmers purchase seed 10.00 percent from seed dealer, 7.00 percent from co-farmers, 30.00 percent from Progressive farmers and 8.00 percent from researcher, whereas 45.00 percent of farmers use own saved seed of conventional tomato.

5.6.Planting Time

Planting time plays an important role in the growth and yield of any crop. During the survey it was noted that growers usually plant their crop earlier for getting better market prices.

Table 13: Distributions of the farmers according to planting Time

Planting Time				
Season /Month	Hybrid Tomato		Conventional Tomato	
	No. Respondent	Percentage	No. Respondent	Percentage
Early Season (July)	7	23.34	5	16.66
Mid Season (September)	8	26.66	11	36.66
Main Season (November)	15	50.00	14	46.68
Total	30	100	30	100

Table-13 show that Hybrid tomato there were 23.34 percent respondents planted in month of July, 26.66 percent were in September and 50.00 percent were planted in month of November. While in case of Conventional tomato 16.66 percent respondents were planted in Month of July, 36.66 percent were in September and 46.68 percent of respondents were planted in month of November.

5.7.Planting Methods

Tomato is usually planted as seedlings and then transplanted in to field. Growers usually raised seedlings for 20 to 30 days. During this period the grower take care of the seedlings for their survival.

Table 14: Distributions of the farmers according to planting methods

Sowing Method				
Particulars	No. Respondent	Percentage	No. Respondent	Percentage
Transplanting	30	100.00	30	100.00
Total	30	100.00	30	100.00

Table-14 shows that in-case of hybrid tomato overall, 100 percent farmers raised nursery and then transplanted to the field. Whereas in Conventional tomato same practices of sowing methods i.e. transplanting was found 100 percent, so this method dominant in both hybrid as well conventional tomato crop.

5.8.Total fixed costs

Total fixed costs are the costs that do not change with the level of production. For example, the cost of owning a building is incurred regardless of whether the building is empty, half full, or overflowing.

Table 15: Total Fixed Costs of Hybrid and conventional

Particular	Hybrid Tomato	Conventional Tomato
Land Rent	20000.00	20000.00
Land tax	200	200
Water charge	700	700
Total	20900.00	20900.00

Table-15 shows that the total fixed cost was 20900.00 Rs/acre in Hybrid tomato and total fixed cost was 20900.00 Rs/acre in Conventional tomato. Total fixed cost includes Land Rent, Land tax, and water charges.

5.9.Total Variable Costs

Total variable costs are the costs that change in direct proportion to changes in volume. Variable costs can be avoided by not producing. Variable costs includes costs of cultivation, costs of labour, cost on seed (seed price and seed treatment), costs of fertilizers, costs of intercultural practices, costs of irrigations, Weedicides and pesticides costs, cotton picking cost etc.

Table 16: Total variable costs of Hybrid and Conventional Tomato

Particulars	Hybrid Tomato			Conventional Tomato		
	Quantity	Price/Unit	Total (Rs/Acre)	Quantity	Price/Unit	Total (Rs/Acre)
Ploughing	7	1500.00	10500.00	6	1500.00	9000.00
Seed (Kg)	4	1200.00	4800.00	7	500.00	3500.00
Bed making No.	3	250.00	750.00	3	250.00	750.00
Sowing/ Transplanting (Man/day)	7	250.00	1750.00	7	250.00	1750.00
Fertilizers (Bags)	3	2440.00	7320.00	3	2440.00	7320.00
F.Y.M(Trolley)	3	2050.00	6150.00	3	2050.00	6150.00
Irrigations /day)/day) (No.)	15	250.00	3750.00	15	250.00	3750.00
Pesticides (No.)	3	800.00	2400.00	5	800.00	2400.00
Harvesting cost (man/day.)	10	250.00	2500.00	10	250.00	2500.00
Picking	10	250.00	2500.00	10	250.00	2500.00
Packing	8	250.00	2000.00	8	250.00	2000.00
Transportation	5	2500.00	12500.00	5	2500.00	12500.00
Commission	1	5000.00	5000.00	1	5000.00	5000.00
Load/unload	10	250.00	2500.00	10	250.00	2500.00
Total variable costs (Rs/Acre)			Rs.64420.00			Rs.61620.00

Table-16 shows that the total variable costs for Hybrid tomato were (64420.00 Rs/Acre) while in conventional tomato the total variable costs ware (61620.00 Rs/Acre).

5.10.Total revenue

Total revenue is the total money received from the sale of any given quantity of output. The total revenue is calculated by taking the price of the sale times the quantity sold.

Table 17: Physical Productivity and Total Revenue

Particulars	Hybrid Tomato	Conventional Tomato
Yield Mds/acre	94.00	76.00
Price Rs/Mds	1520.00	1480.00
Total Revenue (Rs/acre)	142880.00	112480.00

Table-17 Overall high yield was obtained 94.00 Mds /acre from Hybrid tomato while 76.00 Mds /acre average obtained by conventional tomato. As for prices concerned, the Hybrid and Conventional tomato growers received Rs. 1520.00/ Mds and Rs. 1480.00/ Mds respectively. Total revenue of tomato production was calculated and found that hybrid tomato growers received Rs. 142880.00/acre, while conventional tomato growers Rs. 112480.00 /acre.

5.11.Gross Margin and Net Return

The analysis of gross margin is derived from the difference between total revenue and total variable costs. Total variable costs are calculated from the summation of total labor costs and total factor cost. Net Return is the value that remains after all costs; it is calculated by Gross Revenue subtracted by total costs. (Net Return = Gross Revenue- total costs.)

Table 18: Gross Margin and Net Return of Hybrid and Conventional Varieties

Particulars	Hybrid Tomato	Conventional Tomato
Gross Revenue	142880.00	112480.00
Fixed Costs	20900.00	20900.00
Variable Cost	64420.00	61620.00
Total Cost	85320.00	82520.00
Net Return	57560.00	29960.00
Input-output Ratio	1 : 1.67	1 : 1.36
Cost benefit Ratio	1 : 0.67	1 : 0.36

Table-18 shows that tomato growers in selected study area who cultivates Hybrid tomato obtained higher gross revenue (Rs.142880.00Per/acre), whereas gross margin of conventional tomato growers who seem to be lower (Rs. 112480.00Per/acre). The Net Return of tomato production was calculated and found that Hybrid tomato growers received higher Net Return which was (57560.00 Rs/acre), where as Net Return of Conventional tomato grower who seem to be lower (29960.00 Rs/acre). Its therefore they availed in hybrid farmers input output ratio of 1:1.67, cost benefit ratio of 1:0.67and 1:1.36 input output ratio and 1:0.36 from conventional tomato farmers in the study area.

6. Discussion

The findings of the study revealed that the economic analysis tomato production in district Tando Allahyar Sindh indicated that the farmers on average of the age group up below30 years, while about 33.34 percent Hybrid 36.66 percent Conventional farmers belonged to age group 30-50 years. About 26.66 percent Hybrid and 43.34 percent Conventional farmers' belonged to age group above 50 years.

Thus the result showed that 16.66 percent Hybrid tomato and 23.34 percent Conventional tomato farmers were illiterate, while about 43.34 percent Hybrid, 40.00 percent of Conventional farmers were Primary-middle level of education, 20.00 percent farmers of Hybrid and 23.34 percent farmers of Conventional farmers were matriculation. College/University education is 20.00 percent Hybrid and only 13.34 percent of Conventional.

Hazarika and Phookan (2006) found that Cash recorded a maximum yield of 2081.76 kg/plant, plant height (152.40 cm), branch number (14.07), flowers per inflorescence (8.00) and fruit setting percentage (83.96 g) and cost benefit ratio of 1:4.04, followed by Arka Ahuti and Arka Ahish, respectively. Zahoor *et al.,* (2006) found minimum days to flowering (51.33), days to ripening (90.33), plant height (81.67 cm) and highest yield (24.17 t/ha) was recorded in TT0302, whereas maximum fruit set cluster (71.62 %) and number of fruit/kg (24.33) were recorded in Swat local. Keeping in view, the importance of different Tomato hybrids and their ability to produce higher yields, the present study was therefore, carried out to evaluate the performance of different exotic tomato hybrid varieties.

The results showed that tomato farm the respondents were in Hybrid tomato there were 26.67 percent were single marital status, 63.33 percent were married marital status, and 3.33 percent were widow and 6.66 percent were divorced. While in case of Conventional tomato farmers were 36.67 percent were single marital status, 56.67 percent were married marital status, and 3.33 percent were widow, and 3.33 percent were divorced. There were 36.67 percent were joint family system, 10.00 percent were extended family type and 53.33 percent were single family type. While in case of Conventional tomato was 46.66 percent were joint family system, 16.66 percent were extended family type and 36.67 percent were single family type.

Thus the tomato farmers 23.33 percent Hybrid tomato farmers and 36.66 percent Conventional tomato farmers had up to 10 years of farming experience, while 30.00 percent hybrid farmers and 20.00 percent Conventional farmers had 11-20 years farming experience. 46.66 percent Hybrid farmers and 43.33 percent Conventional farmers had above 20 years of farming experience. And hybrid tomato were 30.00 percent were less 5 acres, 43.34 percent were 5-10 acres and 26.66 percent were above 10 acres farm size, while in case of Conventional 26.66 percent were less 5 acres, 40.00 percent were 5-10 acres and 33.34 percent were above 10 acres farm size. The information getting hybrid tomato there were 33.34 percent from Relatives, 30.00 percent were from Media, 26.66 percent were from Seed dealer and 10.00 percent were getting information about Hybrid tomato from Extension Department while in case of Conventional 100.00 percent were getting information about conventional tomato from Relatives and families.

Thus table showed that varieties under cultivation from hybrid group were 26.72 percent of NSTo-1, 33.30 percent of NSTo-2, 24.71 percent of NSTo-3 and15.27 percent of NSTo-4. The area of conventional varieties found on farmer's field were 33.34 percent of Moneymaker, 40.00 percent of Rio Grande, 16.66 percent of Roma VF, 10.00 percent of Tropic varieties were cultivated. The hybrid tomato growers purchased seed from seed dealers 100.00 percent and in case of conventional farmers purchase seed 10.00 percent from seed dealer, 7.00 percent from co-farmers, 30.00 percent from Progressive farmers and 8.00 percent from researcher, whereas 45.00 percent of farmers use own saved seed of conventional tomato.

Hybrid tomato there were 23.34 percent respondents planted in month of July, 26.66 percent were in September and 50.00 percent were planted in month of November. While in case of Conventional tomato 16.66 percent respondents were planted in Month of July, 36.66 percent were in September and 46.68 percent of respondents were planted in month of November. The tomato farmers 100 percent farmers raised nursery and then transplanted to the field. Whereas in Conventional tomato same practices of sowing methods i.e. transplanting was found 100 percent, so this method dominant in both hybrid as well conventional tomato crop.

Thus the tomato farmers in district Tando Allahyar Sindh are incurred that on an average per Farm spent a sum total fixed cost was 20900.00 Rs/acre in Hybrid tomato and total fixed cost was 20900.00 Rs/acre in Conventional tomato. Total fixed cost includes Land Rent, Land tax, and water charges and total variable costs for Hybrid tomato were (64420.00 Rs/Acre) while in conventional tomato the total variable costs ware (61620.00 Rs/Acre).

Adenuga *et al.* (2013) reported that tomato is one of the major fruit vegetables in Nigeria. In view of its seasonal availability and the need to make it available all-year round, effort must be made to increase efficiency of its production especially during the dry season. A study was therefore carried out to examine the economics of dry season tomato production in Kwara state, Nigeria. It estimated the costs and returns and assessed the technical efficiency of dry season tomato production. A two-stage random sampling technique was used to select 105 respondents for the study. A well-structured questionnaire was used to collect data from the respondents. Major tools of analysis used for the study were the gross margin analysis and the stochastic frontiers model. Results of the study showed that a gross margin of N 18,956.75/ha (US$ 120.74/ha) was realized from dry season tomato production. Furthermore, the result of the stochastic frontier model shows that age, education status of the farmers and access to credit had significant effect on the efficiency of dry season tomato production. This study therefore highlights the need for government to invest in public education and to make credit available to farmers as a way of reducing the burden of high cost of production.

On an average higher yield was obtained in hybrid tomato 94.00 monds/acre from Hybrid tomato while 76.00 monds/acre average obtained by conventional tomato. As for prices concerned, the Hybrid and Conventional tomato growers received Rs. 1520.00/monds and Rs. 1480.00/monds respectively. Total revenue of tomato production was calculated and found that hybrid tomato growers received Rs. 142880.00/acre, while conventional tomato growers Rs. 112480.00 /acre.

The tomato growers in selected study area who cultivates Hybrid tomato obtained higher gross revenue (Rs.142880.00Per/acre), whereas gross margin of conventional tomato growers who seem to be lower (Rs. 112480.00Per/acre). The Net Return of tomato production was calculated and found that Hybrid tomato growers received higher Net Return which was (57560.00 Rs/acre), where as Net Return of Conventional tomato grower who seem to be lower (29960.00 Rs/acre). Its therefore they availed in hybrid farmers input output ratio of 1:1.67, cost benefit ratio of 1:0.67and 1:1.36 input output ratio and 1:0.36 from conventional tomato farmers in the study area.

7. Conclusion

It can be concluded from the present study was carried out to compare the economics of Hybrid tomato and Conventional tomato based on the field survey in the tomato cropping area district Tando Allahyar Sindh. The information was collected from selected Hybrid and Conventional tomato growers. The data was collected through personal interviews. Number of analytical techniques has been used to access comparative economic analysis of hybrid v/s conventional tomato production i.e. farm cost analysis, Net Return analysis; gross margin analysis.

Present study clearly indicates that Hybrid tomato farmers were increasing farm yield and farm profit compared to Conventional tomato. Hybrid tomato production offers farmers an excellent aid in better managing production, gross margin and increase net returns, as well as reduces net return variability from year to year, to the farming operation. Farmers were focusing to increase the Hybrid tomato area. Hybrid tomato production opens opportunities for rural employment. However, the analysis shows that hybrids have contributed very minimally to the improvement of tomato yield.

Therefore, it is suggested that to adopt more and more Hybrid tomato, through which farmers should be increase the production, gross margin and increase net returns. By increasing Hybrid tomato production farmers were improve the living intended. Farmers were unaware of proper combination of inputs and sowing time they either underutilized the inputs or over utilized and sow seed either very early or late of the season.

Traditional cultural practices are being followed by the farmers so, it is necessary to provide information regarding proper time of sowing, seed rate, fertilizer dose, etc. to the farmers. It may be difficult to cultivate this crop for the poor/small farmers as it requires high amount of cash. Thus, emphasis can be given to reduce cash cost through input subsidy. In other way, capital may be supplemented to the poor/small farmers for hybrid tomato cultivation through credit giving agencies with low interest rate. The related institutions should made hybrid seed available in time to the farmers as seed played a significant role on yield. Although hybrid

tomato is a profitable crop, but it is very cash cost incentive crop and thereby high cash involvement may restricted tomato area expansion. A good opinion came out from the sample farmers in the study areas that higher yield and income encouraged them for continuing tomato cultivation.

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