

## Economic Implications of Tomato Production in Naushahro Feroze District of Sindh Pakistan

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### Abstract

In the present study, attempt was made to explore the economic implication of tomato in Naushahro Feroze Sindh. For this purpose 60 growers were selected from different villages of District Naushahro feroz of Sindh province during the year 2013 using survey method of study. The data on various costs, physical and revenue productivity were collected from 60 randomly selected tomato farmers. Result revealed that the education level of selected growers was in order of 25.00% primary (5years), 36.66% of middle (8years), 16.66% matriculate (10years) 3.33% educated from college and university, 1.70% graduate the 18.33% of tomato respondents were illiterate. Results further indicate that farmers incurred an average per hectare fixed costs. Rs 33187.00 include Rs 700.00 for land tax, Rs 32487.00 for rent of land. The results revealed that tomato farmers incurred an average per hectare cost of Rs 19780.75 as labor cost. An average per acre marketing cost of 30457.65 on tomato capital input used, and an average per acre marketing cost was Rs. 4191.73 On an average per acre spent a total cost of production of Rs. 87617.13. An average per acre Physical productivity was 186.00 in mounds. An average per acre Revenue productivity was Rs.158750.00 and the Net income was 71133.00 an availed input output ratio 1:1.81 it means that with the investment of Rs.1.00 in tomato enterprises they yielded Rs.1.81. The cost benefit ratio of the cultivation of tomato at 1:0.81 it means that the tomato growers fetched Rs.0.81 on each rupee investment of tomato. The poor production implies that the soil quality, inadequate canal water, insect pest and poor extension services could be the causes this low production. The empirical result indicates that significant increase in input of tomato in the study area could be traced mainly to use of latest technology.

**Keywords:** Tomato, cost, fruit yield, labor, net returns, and cost-benefit ratio.

### Introduction

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegetables worldwide. As it is a relatively short duration crop and gives a high yield, it is economically attractive and the area under cultivation is increasing. Tomato belongs to the Solanaceae family. Tomatoes contribute to a healthy, well-balanced diet. They are rich in minerals, vitamins, essential amino acids, sugars and dietary fibers. Tomato contains vitamin B and C, iron and phosphorus. Tomato fruits are consumed fresh in salads or cooked in sauces, soup and meat or fish dishes. They can be processed into purées, juices and ketchup. Canned and dried tomatoes are economically important processed products. Yellow tomatoes have higher vitamin A content than red tomatoes, but red tomatoes contain lycopene, an anti-oxidant that may contribute to protection against carcinogenic substances. On a global scale, the annual production of fresh tomatoes accounts for approximately 159 million tonnes. However, more than a quarter of those 159 million tonnes are grown for the processing industry, which makes tomatoes the world's leading vegetable for processing. Tomato production in Pakistan was 530 thousand tones during 2011. The nine largest producing countries account for 74.2 % of the world's yearly production -2013 (GOP, 2013).

Tomato is a vegetable crop of significant economic value in Pakistan. Generally speaking annual export of tomatoes from the country averaged about 9832 tonnes during the past 5 years. Yearly exports are given in Table 1. The lowest export figures in 2006/07 and 2007/08 are attributed to bad crop harvest and rendering exports un-economical. Pakistan exported tomatoes to a quantum of 5692 tonnes, and earned rupees 77 million during 2012. The area, production and average yield of tomatoes in Pakistan. Since 2000-01 to 2012, the area under tomato crop has increased from 27.9 to 50 thousand hectares and production has increased from 268.8 to 476.8 thousand tons. The present national yield of tomatoes based on ten years average is 10.1 tonnes/ha which is quite low. To obtain a potential yield, high yielding varieties and improved production technology have to be adopted (MINFAL, 2013)

Sindh's tomato production was recorded at 141,586 metric tonnes as compared to 114, 771 metric tonnes the previous year, according to official figures. Tomato has a three months crop cycle. Growers prepare its nursery in July for early sowing and then its harvest continues as late as February next year with a few gaps. On the supply side, onion, tomato and chilies are important crops. Pakistan's share in world tomato exports was

negligible in 2011. 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 (Ayesha *et al.* 2012).

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).

Despite the remarkable progress made in increasing world food production at the global level, approximately half of the population in the third world does not have access to adequate food supplies. There are many reasons for this. For instance food losses to pests, diseases, lack of awareness of modern production practices, seed selection and post harvest problems. Evidence suggests that these losses tend to be highest in countries where the need for food is greatest (Babalola *et al.* 2008).

Tomato, onion and chilies are most common and important kitchen items cooked as vegetables, used as condiments and salad. The consumption of tomato and onion has high income elasticity of demand. Thus, there will be more demand for these vegetables with population growth, economic growth, and urbanization. The per capita consumption of vegetables in Pakistan is very low. People in upper income strata consume well above the national calculated average, while the bulk of the rural population and large percentage of the poorer strata among the urban population consume very few vegetables. Furthermore, Pakistan has a potential to export these products with trade liberalization under the regime of World Trade Organization. Production of these vegetables is profitable provided produced efficiently; nevertheless, it requires more labor work. Furthermore, it provides income support especially to small farmers and employment opportunity for landless laborers in rural areas. Production of these vegetables is complex process where different inputs with different combinations are used. It is a function of farm inputs including land, labor, capital, management practices and other factors. Production not only depends on these resources only but the combinations of different inputs have a great contribution in total productivity. The differences across farms in use of various factors of production and various combinations of factors of production cause the changes in crop yields (Hassan, 2004).

Tomatoes are grown as fresh market and as processing tomatoes. They are important for food industry as they serve as raw material for production of value added products (Soe, 2003). The domestic consumption and demand for tomato is growing due to increase in population. It is very important vegetable with substantial nutritional value. 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 cuisine. 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. While Gilgit-Baltistan produced 6,455 metric tons tomatoes. Of which 3194 MT were consumed, 2293 MT were marketed, and 968 M.T were wasted. While, in Gilgit-Baltistan tomatoes were cultivated on 805 hectare (Agric Stat, 2009).

Vegetables produced in different zones by using different production technologies during different seasons are traded across regional markets of Pakistan in order to meet consumer demand across the country. Eighty percent of vegetable production in Pakistan is marketable surplus. While it is reported that the surplus was 86 percent of production, of which 25-35 percent is wasted due to post harvest losses. Loses are due to different factors like harvesting at inappropriate time, improper packing and packaging and inadequate infrastructure for storage and transportation (Mukhtar, 2004).

Optimum production of tomato requires intensive management practices that conserve and manage soil nutrients needed for maintaining soil fertility and water quality and for sustaining tomato production (Yafa *et al.* 2000).

A research study was carried out on scientific line can only reveal the best combination of inputs to be applied to tomato crop to harvest higher yield. The tomato growers are hesitating to adopt new technology or make extra efforts unless they are sure that the additional cost incurred by them were repaid to them form higher production. A study of input-output analysis of tomato production can incline farmers for the adoption of modern cultural practices. This state of affairs tempted the researcher to carry out a study on tomato in the field of production economics.

### Objectives

1. To analyze the current status of tomato production with the growth.
2. To find out the economic implications of tomato production in the study area.
3. To compute input, output and cost benefit ratio availability of tomato growers in the study area.

4. To identify the issues and suggest policy measures for sustainable tomato production.

## **Material and Methods**

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 Naushahro Feroze 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.

## **Research Design**

### **Study Area**

The study was restricted generally to gather primary data from district Naushahro Feroze 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.

### **Sample Size**

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

### **Data Collection**

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

### **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.

### **Data Analysis**

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

### **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:

Averages

Percentages

#### **Averages**

Averages were calculated by applying following formula:

$$\text{Average} = \frac{\sum Xi}{n}$$

Where,

$\sum Xi$  = sum of independent variables

n = number of observation in data

#### **Percentages**

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

$$\text{Percentage} = F / N * 100$$

Where,

F = Respondents of desired class

N = Total number of respondents

#### **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:

#### **Estimation of Land Inputs**

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

$$\text{Lit} = (\text{As} \times \text{Cr}) + \text{As} \times \text{Rui} / \text{As}$$

Where,

Lit = Land input per unit of tomato.

As =Area sown under tomato.

Cr =Contract rent per unit / acre.

Rui =Rate of usher and irrigation charges

#### **Estimation of Labour Cost**

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

$$Lit = (Mn \times Hc) + Mwd \times Wr + (Bwd \times Hc) / As.$$

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.

#### **Estimation of Capital Inputs**

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

$$Cipu = (Qs \times Pr) + (Of \times Pr) + Qi \times Pr / As.$$

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.

#### **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

#### **Estimation of Returns**

The estimation of returns was developed by using the following formula:

$$VP = (Qs \times Pr) / As$$

Where,

VP = Value of Product

QS = Quantity Sold.

Pr = Price per unit.

As = Area

#### **Total Cost of Production**

Total cost of production was estimated by using the following formula:

$$TC = TFC + TVC$$

Where,

TC = Total Costs of Production

#### **Net Returns**

Net returns were estimated by using the following formula:

$$NR = TI - TC$$

Where ,

NR = Net Returns

TI = Total Income

TC = Total Cost

#### **Input-Output Ratio**

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

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

Where  $IO_R$  = Input-Output Ratio

#### Cost-Benefit Ratio

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

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

Where,

$CBR$  = Cost Benefit Ratio

#### Results

This chapter provides results of the study including current status of tomato crop production practices and issues of tomato farmers. Analysis and interpretation of data are the most important step in scientific research. Without these steps generalization and prediction cannot be achieved which is the target of scientific research. Generalization and conclusion are drawn on the basis of characteristics and attitudes of the respondents.

#### Current Status of Tomato Sub-Sector

The area, production and average yield of tomatoes in Pakistan is given in Table-1. Since 2000-01 to 2011-12, the area under tomato crop has increased from 27.9 to 50 thousand hectares and production has increased from 268.8 to 476.8 thousand tons. The present national yield of tomatoes based on ten years average is 10.1 tonnes/ha which is quite low. To obtain a potential yield, high yielding varieties and improved production technology have to be adopted.

**Table 1: Area production and average yield of tomatoes in Pakistan (2000 to 2012)**

Year	Area(000, ha)	Production(000, tonnes)	Yield(tonnes/ha)
2000-01	27.9	268.8	9.6
2001-02	29.4	294.1	10.0
2002-03	31.0	306.3	9.9
2003-04	39.0	412.8	10.6
2004-05	41.4	426.2	10.3
2005-06	46.2	468.2	10.1
2006-07	47.1	502.3	10.7
2007-08	53.2	536.2	10.1
2008-09	53.4	561.9	10.5
2009-10	50.0	476.8	9.5
2010-11	53.8	611.5	10.8
2011-12	54.1	636.8	10.9

Source: Agricultural Statistics of Pakistan, Government of Pakistan, (2012-13).

#### Socio-Economic Characteristics

##### Age

Age is very important demographic factor which influences the efficient allocation of resources' it shows the ability to do work, efficiency, willingness to make progress and attitude towards various social and economic aspects of life.

**Table 2: Distributions of the respondents according to their age**

Age	No. of farmers	Percentage
21-30 years	13	21.66
31-40 years	15	25.00
41-50 years	19	31.66
More than 50 years	13	21.66
Total	60	100

Table-2 shows the association of the age of the respondents with the percent of tomato farmer age group. In age group of 21-30 years, 21.66%, 31-40 years, 25.00%, 41-50 years, 31.66% of tomato farmer age group. With more than 50 years old farmers, the percentage of tomato farmer age group 21.66%.

##### Education

Education in its general sense is a form of learning in which the knowledge, skills, and habits. The education system in Pakistan is generally divided into five levels: primary (grades one through five); middle (grades six through eight); high (grades nine and ten, leading to the Secondary School Certificate or SSC); intermediate

(grades eleven and twelve, leading to a Higher Secondary (School) Certificate or HSC); and university programs leading to undergraduate and graduate degrees.

**Table 3: Distribution of the respondent according to their education level**

Education level	No. of farmers	Percentage
Illiterate	13	21.66
Primary	15	25.00
Middle	20	33.33
Matriculation	10	16.66
Collage/University	02	3.33
Total	60	100.00

Table-3 shows education level 21.66% farmers were illiterate, 25.00% farmers were Primary level of education; the 33.33% were middle, 16.66% of matriculation and 3.33% farmers of the bachelor/master education in the study area.

#### **Farming experience**

Poultry farm experience mean, which includes monitoring the welfare of the birds, feeding them and ensuring fresh drinking water is always available. Farmer are also responsible for maintaining the site, ensuring it is kept clean and tidy at all times and that it complies with the relevant health and safety regulations.

**Table 4: Distributions of the respondents according to their farming experience**

Farming Experience	No. of farmers	Percentage
Up to 10 years	25	41.66
11-20 years	08	13.33
21- 30 years	15	25.00
Above 30 years	12	20.00
Total	60	100.00

Table-4 shows the respondents having farming experience of up to 10 years; they had 41.66%, 11-20 years of farming experience had 13.33%, 21-30 years of farming experience possessed 25.00% of tomato farming. Similarly, farmers with more than 30 years of farming experience had 20.00% of tomato farming.

#### **family size**

A fundamental social group in society typically consisting of one or two parents and their children. Two or more people who share goals and values, have long-term commitments to one another, and reside usually in the same dwelling place.

**Table 5: Distributions of the respondents according to their family size**

Family size	No. of farmers	Percentage
5-10 Members	15	25.00
11-15 Members	28	45.66
More than 15 Members	07	11.66
Total	60	100.00

Table-5 shows about the family size of the respondent. Their family size of 5-10 members and they had 25.00% of the tomato farming, 11-15 Members and they had 45.66% of the tomato farming and More than 15 Members they had 11.66% of the tomato farming.

#### **Farm Size**

A farm is an area of land. It is the basic production facility in food production. Farms may be owned and operated by a single individual, family, community, corporation or a company.

**Table 6: Distributions of respondents according to farm size in the study area**

Farm size	No. of farmers	Percentage
Up to 30 acres(small)	17	28.33
31-60 acres(medium)	29	48.33
Above 60 acres(large)	14	23.33
Total	60	100.00

Table-6 shows about the number of small farm were 28.33%, 48.33% and 23.33% were medium and large farm in the study area.

#### **Farmer Status**

A farmer is a person engaged in agriculture, raising living organisms for food or raw materials. A farmer might own the farmed land or might work as a laborer on land owned by others, but in advanced economies, a farmer is usually a farm owner.

**Table 7: Distributions of respondents according to farmer status in the study area**

Farmer status	No. of farmers	Percentage
Owner	19	31.6
Rent	41	68.4
Total	60	100.00

Table-7 shows that there were 31.6% farmers who have owner ship and the remaining 68.4% are those, who have hired their farms on rent.

**Health Status**

When used in this guide, refers to your medical condition (both physical and mental illnesses), claims experience, receipt of health care, medical history, genetic information, evidence of insurability (including conditions arising out of acts of domestic violence), and disability.

**Table 8: Distributions of respondents' health status of dependent in the study area**

Health Status	No. of farmers	Percentage
Good	12	20.00
Better	22	36.66
Poor	15	25.00
Very Poor	11	18.33
Total	60	100.00

Table-8 shows that tomato farmer there were 20.00% were health condition is good of respondents, 36.66% were health condition is better, 25.00% were poor health

**Irrigation Source**

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.

**Table 9: Distributions of respondents' irrigation source in the study area**

Irrigation Source	No. of respondents	Percentage
Canal	49	81.66
Tube well	11	18.33
Total	60	100

Table-9 shows that there were 30.00% farmers who have canal water, 18.33% farmer who have use tube well.

**Fixed Cost**

Fixed costs are expenses that are not dependent on the level of goods or services produced. They tend to be time-related, such as tax, rents being paid per month/year, and are often referred to as overhead costs. This is in contrast to variable costs, which are volume-related.

**Table 10: Per acre expenditure incurred on fixed costs in the study area**

Particulars	Mean	S.D Error
Land Tax	700.00	0.11
Rent of Land	32487.00	367.53
Total	33187.00	367.64

Table-10 indicated that on an average per acre tomato growers spent a sum of Rs. 32487.00 in district Naushahro Feroze during the 2013 this included Rs. 700.00 for land tax, Rs. 33187.00 for rent of land.

**Labour Inputs**

A labour input refers to all outlays incurred to engage labour for production. Labour inputs were employed for all cultural operations during the period of lemon cultivation in study area. These operations are ploughing dry ploughing, leveling, sowing and inter-culturing, application of fertilizer harvesting, weeding and threshing.

**Table 11: Per acre expenditure incurred on labour inputs in the study area**

Particulars	Mean	S.D Error
Dry Ploughing	2334.23	24.23
Clod crushing	1761.33	22.17
Lay Out	653.46	13.22
Making of bunds and channels	672.96	9.44
Soaking dose	613.58	7.54
Operating	857.62	23.33
Planting	887.27	14.40
Irrigation	966.15	10.35
Weeding	859.13	8.75
Digging pits and planting of suckers	1787.50	5.82
Application of FYM,	689.88	9.43
Watch and ward	665.53	3.39
Tank silt and Chemical fertilizers	1897.02	72.10
picked fruit/Cutting/ harvesting	5140.73	54.85
Total	19780.75	273.24

Table-11 depicted that the Rs 19780.75 on an average area of 4.19 acres during study year, which includes Rs. 2334.23 on dry ploughing, Clod crushing Rs. 653.46, Lay out Rs. 672.96, making of bunds and channels Rs. 672.96, soaking Rs. 613.58, operating charges Rs. 857.62, sowing Rs. 887.27, irrigation Rs. 859.13, weeding Rs. 559.13, application of FYM Rs. 689.88, Weedicides Rs. 559.13, tank silt and Chemical fertilizers Rs. 1897.02 and harvesting Rs. 5140.73 respectively in the study area.

#### Capital Inputs

Capital input measures the services derived from the stock of physical assets and software used in production. The assets included are fixed business equipment, structures, inventories and land.

**Table 12: Per acre expenditure incurred on capital inputs in the study area**

Particulars	Mean	S.D Error
F.Y.M	6871.42	62.19
Seed /plants	5239.83	65.76
Insecticide/Pesticides	7114.45	52.30
Urea	11233.83	32.80
Total	30457.65	211.34

Table-12 shows that each selected tomato grower of Naushahro Feroze on an average per acre of tomato spent a sum of Rs. 30457.65, that included Rs. 6871.42, Rs. 5239.83, Rs. 7114.45 and Rs. 11233.83 on FYM, seed, insecticide/pesticide and urea respectively.

#### Marketing of Tomato

The improvements in the functioning of commodity markets as well as the improved performance of the marketing system are now generally recognized as important, strategic elements in agricultural and economic development. Changes of attitude to marketing have come about particularly during the last decade, when many developing countries have had to undergo stringent economic reforms (Mittendorf, 1992).

#### Marketing Costs

The total cost associated with delivering goods or services to customers. The marketing cost may include expenses associated with transferring title of goods to a customer, storing goods in warehouses pending delivery, promoting the goods or services.

**Table 13: Per acre expenditure incurred on marketing cost in the study area**

Particulars	Mean	S.D Error
Loading	872.22	0.89
Transportation	2334.26	112.92
Unloading	985.32	0.89
Total	4191.73	114.70

Table-13 it is clear from result that each selected tomato grower in Naushahro Feroze area on average per acre spent a sum of Rs.4191.73, this included Rs. 872.22 for loading, Rs. 2334.26 for transportation and Rs. 985.32 of unloading.

#### Total Cost of Production

TCP defined as sum of fixed cost plus variable costs make the total cost of production.

**Table 14: Per acre total cost of production in the study area**

Particulars	Mean	S.D Error
Fixed Cost	33187.00	367.64
Labour Cost	19780.75	273.24
Marketing Cost	4191.73	114.70
Capital Inputs	30457.65	211.34
Total	87617.13	965.02

Table-14 the results showed in this table that the selected tomato grower in Naushahro Feroze area on average per acre spent a total cost of production of Rs. 87617.13 during 2013 this included Rs.33187.00, Rs.19780.75, Rs.4191.73 and Rs.30457.65 on fixed cost, labour costs marketing costs respectively on capital inputs.

**Physical Productivity**

The yield when expressed in terms of physical weight is known as physical productivity. It is generally expressed in terms of unit weight of production obtained. In other words physical productivity of tomato farm is the same as the total yield obtained of other crop by farmers.

**Table 15: Per acre physical productivity in the study area**

Particulars	Mean	S.D Error
Tomato fruit	186.00	1.86
Total	186.00	1.86

Table-15 it is clear from the result each tomato grower obtained per acre 186.00 in maunds on an average.

**Revenue productivity**

The value of farm production of gross profit it refers to money income accruing to the farmers from the sale of their production. It is calculated by multiplying the physical productivity (yield) obtained with the price, it is sold.

**Table 16: Per acre revenue productivity in the study area**

Particulars	Mean	S.D Error
Tomato fruit	158750.00	116.51
Total	158750.00	116.51

Table-16 depicted that each selected tomato growers in Naushahro Feroze area on revenue per acre earned of Rs. 158750.00 that obtained by the grower of tomato.

**Net - Farm Income**

Net farm income is gross profits remains cash operating expenses and depreciation cost of machinery and equipments costs could be obtained by subtracting the gross revenue from cash operating expenses. Net farm income Averages output or gross income after subtracting all farm expenses. Net income is calculated to judge the efficiency of farm business as a whole.

**Table 17: Per acre net income in the study area**

Particulars	Mean	S.D Error
Gross Income (Rs) A	158750.00	116.51
Total Expenditure (Rs) B	87617.13	965.02
Net Income (Rs) A-B=C	71133.00	1081.53

Table-17 the tomato growers on an average per acre earned during study, Rs. 71133.00 on net income, Rs. 158750.00 on gross income and Rs. 87617.13 on total expenditure in the study area.

**Input – Output ratio**

The input-output ratio is calculated by dividing total income with the total cost of production.

**Table 18: Per acre input-output ratio in the study area**

Area sown	Gross Income(Rs.)	Total Expenditure(Rs.)	Input-output ratio
Acre	(A)	(B)	A/B=C
1	158759.00	87617.13	1:1.81

Table-18 showed that the selected lemon growers on an average per acre gross income Rs. 158750.00 and total expenditure is Rs. 87617.13 in Naushahro Feroze area therefore they availed input output ratio of 1:2.46 from tomato growing in the study area,

**Cost Benefit ratio**

The cost benefit ratio refers to net returns as compared to the cost of production. It is calculated by dividing net returns with cost of production.

**Table 19: Per acre cost benefit ratio in the study area**

Area sown	Net income(Rs.)	Total Expenditure(Rs.)	Input-output ratio
Acre	(A)	(B)	A/B=C
1	171133.0	87617.13	1:0.81

Table-19 showed that the selected tomato growers on an net income per acre earned Rs.128382.87 and total expenditure Rs. 87617.13 in Naushahro Feroze area therefore they availed input output ratio of 1:2.46 from tomato growing in the study area,

### Discussion

In this study, identified a number of factors that believed would be influential in determining the farming area of in district Naushahro Feroze, Sindh sustainability. The results indicate that proposed model provides an acceptable fit on the data.

The economic analysis describes the methods used in analyzing economic behavior and the application of the results obtained to solve economic problems. Economic analysis became sterile as did mere logic-consistency theorems dealing with general equilibrium, aggregate production functions and social welfare functions, devoid of any empirical content "OR" relevance (Marshall, 1999).

The object of economic analysis is to verify the use of various inputs of production and income incurred. There are many economic measures to determine the profitability of farm business. Yet, none of them is perfectly suitable for all the time and for all purposes, some criteria are most suitable to derive certain conclusions. The most important criteria which are commonly used to analyze efficiency of agricultural enterprise are consumption of net returns and determination of input-output ratio. These criteria were used to determine the input-output analysis of tomato production around in district Naushahro Feroze, Sindh.

The results of present study conducted to determine the economic implications of tomato production in district Naushahro Feroze Sindh indicated that the farmers on average cultivated 4.24 acre of land. They spent Rs.32487.00 per farm land rent per acre and also paid Rs. 700.00 per farm land tax per acre.

Thus the tomato growers in district Naushahro Feroze, Sindh are incurred total fixed cost of Rs. 33187.00 per farm per acre, respectively. However, the selected tomato growers paid variable cost of Rs.63288.45 per farm per acre. The labour cost paid by the selected tomato growers was Rs. 19780.75 per farm. As far as marketing expenses are concerned the selected tomato growers incurred Rs. 4191.73 per farm .capital input by the selected growers was Rs: 30457.65 per farm.

Thus the selected tomato growers in district Naushahro Feroze incurred a total average cost of production of Rs. 87617.13 per farm. It was also observed that the selected tomato growers in the Naushahro Feroze area earned a total physical productivity of per acre (186.00 in maunds) and earned a gross income of Rs. 158750.00 per farm per acre from. It was further estimated that the selected tomato grower after incurring all expenditure and sale of produce earned net income of Rs. 71133.00 per farm at a benefit cost ratio of 1:0.81.

### Conclusion and Suggestions

The research study on Economic Analysis of tomato Production District Naushahro Feroze Sindh can well be concluded for the findings during 2013 were the most efficient to cultivate the tomato at remunerative level. The agricultural infrastructure is the web of personal, economic, social and legal relationships that support the production of agricultural commodities. It includes, most visibly, agricultural input suppliers and output processors. However, it also includes the formal and informal business relationships between individual farms. Infrastructure provides access to input and output markets, access to agricultural services ranging from continuing education to consulting, as well as including institutional arrangements, such as the legal and monetary systems.

In Naushahro Feroze district is fertile in agricultural production. Thus, the district can have a potential to produce more wheat for meeting the staple food demand of growing population, there is also need for study the efficient tomato fruits production practices and issues in the production process for policy making.

It is important to note that economics analysis can only be estimated if the inefficiency effects are stochastic and has a particular distribution specification (Battese and Coelli, 1996). Technical efficiency is estimated using Limdep (Green, 2002). In the specification of the stochastic frontier production function, the model allow for specification of two equations on the right hand side. One equation specifies the main factors of production such as seed, fertilizer and labor and the other equation specifies the variables that are assumed to cause inefficiency such as access to credit and the gender of the household head. This is done in a one-stage process.

The present study uses the stochastic frontier production function approach to measure the economics implications of tomato production. In the analysis of farmer efficiency/ inefficiency, it is not the average of observed relationships between farmers' inputs and outputs that is of interest but the maximum possible output that is obtainable from a given combination of inputs. Thus, Frontier production function can be defined as the

maximum feasible or potential output that can be produced by a firm with a given level of inputs and technology.

The new technology must result in greater production per unit of inputs than the existing technology provides in farmers environment. The given cost, prices, tenure, and possible market discrimination, which exists for particular individuals of location, the technology must result in higher returns to family owned resources than existing technology and the inputs, credit and market facilities. If the growers have know how about the soil fertility and market conditions, the growers must return to higher profit by minimum expenses, through the efficiency taking by growers.

### Suggestions

Based on the findings of the study the following policy implications were made. The information such as total holding, area under tomato, physical and revenue productivity obtained from tomato enterprises were enquired from the respondents. Data so collected was processed, tabulated, analyzed and interpreted in the previous chapters. Investigate the quantitative and qualitative aspect of various inputs as incurred by the producer to cultivate per unit (acre) of tomato in the area. The present study has been carried out the means to increase per hectare yield and consequently the income of farm; therefore the following suggestions are put forwarded as under;

1. Since the land is fixed, the government of Sindh should be encourage the use of fertilizer, and it can do this by providing incentives in order to provide fertilizers to households at an affordable price, so as to increase the level of production.
2. Growers may be educated about soil status market conditions to get better profit of tomato fruit.
3. The current scenario surrounding the low tomato production in Sindh requires the government to provide credit facilities that will enable households to access such credit at a reasonable cost.
4. The government should encourage private sector to invest in credit facilities like small-scale banks to offer credit to farmers at affordable rates. This should be through legislation to facilitate credit creation.
5. Good quality seed/plants and high yielding varieties may be introduced to get maximum benefit from tomato production. Marketing management may be made available by the government.
6. Government should improve its method of gathering and dissemination of information that is vital for households; this also requires government to increase its current level of extension services

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