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An analysis of cost, return, profitability and resource use efficiency in onion cultivation

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Abstract
Onion is an important vegetable crop with tremendous export potential. India ranks first in area and second in production of onion in the world particularly in Konkan region of the state, onion is grown by cultivators in certain pockets only. The present study entitled "Economics of production and disposal of onion in Sindhudurg district (Maharashtra)" was undertaken with following specific objectives *viz*., 1) To study cost, returns and profitability in onion cultivation. 2) To work out the resource use efficiency in onion cultivation.

This study was completed with cross sectional sample of 60 onion growers selected randomly. The selected onion growers were classified in to three groups, *viz*. (I) Small farmer (0 to 0.01 ha), (II) Medium farmer (0.01 to 0.03 ha) (III) Large farmers (above 0.03 ha).

It is observed from the study that, the average size of holding of the sample farmers was 0.30 ha. At overall level percentage share of area under paddy was 57.50 percent. Cropping pattern was dominated by *kharif* crop. At overall level 5.00 percent of cultivated area was under onion crop. The cropping intensity was 160.00 percent.

Per hectare physical input utilization pattern indicated that higher utilization of input such as total human labour, bullock labour, irrigation, FYM and fertilizer for onion.

Per hectare cost of cultivation of onion worked out to Rs. 43104 of the total Cost A accounted to 33.11 percent and Cost B to 69.19 percent. So the net return was worked out to Rs. 13,279 with benefit cost ratio of 1.30.

To estimate the contribution of various inputs on crop yield, Cobb-Douglas production function was fitted. The variation in yield explained by the various inputs used in crop production was 61 percent. The ratio of MVP to MC of human labour, bullock labour, irrigation and fertilizer was less than one indicating excess utilization of these resources.

At overall level, production of onion was 33.23 q/ha. It was observed that, at overall level, 11.02 percent of produce was retained for home consumption, 6.71 percent of produce was utilized for gift to relatives and friends, 2.66 percent were losses due to spoilage and improper handling at the time of harvest and remaining produce was disposed of through various agencies. It has high nutritive value, as it contains carbohydrates (11.0 gm), proteins (1.2 gm), fiber (0.6 gm), minerals (0.4 gm), thiamine (0.08 mg), vitamin 'c' (11 mg), calcium (180 mg), phosphorus (0.50 mg), iron (0.7 mg), nicotinic acid (0.4 mg), riboflavin (0.01 mg), moisture (86.6 gm), per 100 g of edible protein.

Keywords: Cost, return, profitability, onion cultivation, FYM

Introduction
Onion (*Allium cepa*) is an important and indispensable item in every kitchen as condiment andvegetable. The green leaves, immature and mature bulbs are eaten raw or used in preparation of vegetables. It is valued much on account of its special characteristics of pungency. An onion is used in soups, sauces and for seasoning foods. Therefore, attention is given to crispness, juiciness, pungency and keeping quality of the bulbs. The small bulbs and shallots are pickled in vinegar or brine. Dehydrated bulbs or onion powder is in great demand, which reduces transport cost and storage losses in international and domestic market. Dried onion flakes can be reconstituted by cooking in water at the time of use.

Onion has many uses as folk remedies and recent reports suggest that onion play a part in preventing heart diseases and other ailments (Augusti, 1990) [23]. Onion has several medicinal properties. Some of the medicinal properties of onion are: it is diuretic and can be applied on bruises, boils and wounds. Bulb juice is used as smelling on hysterical fits in faintness. It is used to relieve insect bites and sour throat.

Onion is an important crop in all continents and is commercially cultivated in various countries. However, about three fourth of global production is accounted by 24 countries in the world. The important are China, India, USA, Russia, Spain, Iran, Turkey, Brazil, Japan etc.

Onion is one of the most important commercial vegetable crop grown in India. Onion has been proved and preferred as spinner of foreign currencies by exporting onion and its by products to various countries of the world.

India is exporting onion to Dubai, Kuwait, Saudi Arabia, Bahrain and other Gulf countries, Mauritius, Singapore, Qatar, Malaysia, USA, UK, Russia, Hong Kong, Kenya, Seychelles, Maldives, Sri Lanka, Nepal, Bangladesh, etc. where large number of people living from Indian origin.

India after meeting the needs of domestic markets export sizable quantity, thereby, earning valuable foreign exchange of Rs. 229,490.94 lakhs by exporting 1,822,760.00 MT of onion in the year 2012-13 and in the year 2013-14 (up to October, 2014). India exported 1,358,193.00 MTof onion worth Rs 287,713.00 lakhs (IJDR, 2014).

A global review of area and production of major vegetables shows that onion ranks second in area and third in production of the total vegetables in the world. China is the first in area and production while India occupies second position in the production. It occupies an area of 1051 thousand ha, with production of 16813 thousand tonnes. In India, three crops of onion are grown i.e. *rabi* (March-June), *kharif* (October-December), and late *kharif* (January-March).

Table 1: Year wise area, production and productivity of onion in India

Sr. No.	Year	Area ('000 HA)	Production ('000 MT)	Productivity (MT/HA)
1.	2001-02	495.8	5252.1	10.6
2.	2002-03	424.7	4209.5	9.9
3.	2003-04	553.8	6267.6	11.3
4.	2004-05	613.8	7760.6	12.6
5.	2005-06	703.6	9432.5	13.4
6.	2006-07	768.0	10847.0	14.1
7.	2007-08	821.0	13900.0	16.9
8.	2008-09	834.0	13565.0	16.3
9.	2009-10	756.2	12158.8	16.1
10.	2010-11	1064.0	15118.0	14.2
11.	2011-12	1087.2	17511.1	16.1
12.	2012-13	1051.5	16813.0	16.0

Source: Indian Horticulture Database, 2013.

It is revealed from the Table 1 that area and production has continuously increased from 2002-03 to 2012-13. The total area under the cultivation of onion crop was 1087.2 thousand hectares in year 2011-12 and declined to 1051.5 thousand hectares in year 2012-13. The total production of onion in year 2011-12 was 17511.1 thousand tons and declined in year 2012-13 up to 16813.0 thousand tons. The total area under cultivation during the year 2012-13 declined due to falling of prices during year 2011-12 which is the after match of supply response to the fall in prices of onion during the period. As a result exhibiting rise in the prices in 2013-14 in domestic market.

Production in India

Most of the onion production in India comes from the state of Maharashtra, Karnataka, Gujarat, Uttar Pradesh, Bihar, Andhra Pradesh, Madhya Pradesh. The state wise area and production is given in Table 2.

Table 2: Statewise area, production and productivity of onion

States/UTs	2012-13		2013-14		Average Productivity (MT/Ha)
	Area (IN '000 HA)	Production (IN'000MT)	Area (IN '000 HA)	Production (IN'000MT)	
Maharashtra	260.00	4660.00	468.00	5867.00	14.3
Karnataka	159.60	2395.90	164.30	2466.40	14.4
Madhya Pradesh	111.73	2691.00	117.31	117.31	117.31
Gujarat	28.85	704.38	72.6*	1858.00*	24.9
Bihar	53.02	1107.84	54.32	1304.15	22.0
Andhra Pradesh	86.67	1560.06	89.72	1525.18	17.2

Source: State Horticulture Departments $ Prov. *As per Rabi estimates

It is observed that Maharashtra State ranks first in both area and production.

Production in Maharashtra: Onion crop has a very important place in the economy of Maharashtra. Maharashtra has the distinction of being the largest contributor accounting for nearly 30 percent to the national production with only 24 percent of the total area under onion. Main onion growing district are Nasik, Pune, Ahmednagar, Solapur, and Dhule. District wise area and production of onion is given in Table 3.

Table 3: Distribution area, production and productivity of Onion

District	Area (‘000 HA)	Production (‘000 T)	Productivity (kg/ha)
Ahmednagar	51.0	7647.45	15000
Nasik	65.8	1052.8	16000
Pune	19.0	245.1	12900
Dhule	9.9	42.8	373
Solapur	1.99	24.03	12.08
Buldhana	0.8	16.3	16.308

(**Source:** Epitome of Govt. of Maharashtra 2004, 05, 06, 07, 08, 09)

This crop is grown in both seasons *viz*, kharif season and rabi season. For kharif season, the seeds are sown in May-June, transplanted in July-August and harvested between September and December. The *kharif* crop is grown in rainy season. It has a very low shelf life of about a month due to high moisture content. For the late kharif season seeds are sown in August-September, transplanted in September-October and harvested in January-February. Forthe *rabi* season (which is the main season for onion production), seeds are sown in October-November, transplanted in December-January and harvested in April-May.

A number of onion cultivars have been evolved in India. They can be grouped on the basis of size, skin colour, pungency, maturation etc. According to colour of skin the cultivars classified into three groups such as red skin cultivars (N-53, Baswant-780, N-404, N-451, Pusa red etc.), white cultivars (N-257-9-1, Phule Safed, N-5-7-1,Pusa white flat etc.) and yellow cultivars (Phule suvarna, Early Grano, Bermada Yellow). The red cultivars are comparatively more pungent, keep better in storage and have good market value, but not suitable for preparation of dehydrated products. Yellow cultivars have no demand in market.

While onion has potential in terms of processed products such as dehydrated flakes, granules and powder because of its white color flesh, high insoluble solids, high degree of pungency and good storage qualities. Dehydrated onion has become a standard ingredient in nearly every product in which raw onions can be used. Dehydrated onion is highly competitive in international market. Despite its rich potential, the dehydrated products are exported in small quantity. Fortunately, the processing units are coming up in the states of Maharashtra and Gujarat.

Objectives

1. To study cost, returns and profitability in onion cultivation.
2. To work out the resource use efficiency in onion cultivation.

Scope of the study

1. The study was restricted to Vengurle, Sawantwadi and Dodamargtahsils of Sindhudurg district as the area under onion cultivation is maximum. The study will reveal the existing cultivation, storage and disposal practices followed by the onion growers and the constraints faced by them there in.
2. There is still much scope to carry out systematic research in onion cultivation and production improvement in Konkan region. The area under onion crop is increasing day by day.
3. The results of study would provide guidelines for planners and concerned agencies to prepare future programme of vegetable development in this district.

Methodology

In order to arrive at useful conclusions in any scientific investigation, it is necessary to adopt the appropriate methods and procedure for conducting the research. This chapter outlines briefly the methods adopted in the selection of samples, the nature and sources of data, the various statistical tools and techniques employed in the analysis of data and evaluation of the results.

Sampling design

Since the study was aimed at finding out the economics of production and disposal of onion, as stated above, the sample for the study necessarily involved the selection of cultivators for gathering the relevant data on the above aspects of the study.

A multistage sampling technique was used in this study for selection of onion cultivators. Tahsil as a primary unit, village as a secondary unit and onion cultivators as a final unit for the study.

Selection of study area: Onion is an important commercial vegetable crop becoming popular in konkan region. The area under onion in Sindhudurg district is increase in day by day and no study held in conducted on this crop. Therefore Sindhudurg district selected purposively.

Selection of tahsil

All the eight tahsils of Sindhudurg district were arranged in descending order on the basis of area under onion crop and first three tahsils were selected for the study. The tahsil wise data of area under onion were obtained from the office record of the Agricultural Department of Zilla Parishad.

Selection of villages

A list of villages growing onion crop was obtained from the tahsil office and two villages from each tahsil were selected randomly.

Selection on onion cultivators

For the selected villages, the list of onion growers were obtained from revenue records of the selected villages.From each selected villages a sample of 10 onion growers were selected randomly. The details a given below.

Table 4: List of villages from each tahsils

Sr. No.	Name of Tahsils	Name of Villages	No. of cultivators
1.	Vengurla	Matond	10
		Hodawada	10
2.	Sawantwadi	Charate	10
		Banda	10
3.	Dodamarg	Vajare-Girode	10
		Ambadgao	10

Thus, the final sample was consisted of three tehsil, six villages and 60 onion cultivators.

Collection of data

The necessary data were obtained from the selected farmers with the help of pretested structured schedule using survey method. The farmers were personally interviewed to ensure accuracy and comprehension.

General information

Information about the cultivator regarding age, education, land utilization, cropping pattern, irrigation structure, and expenses on irrigation, inventory of farm assets, cultural practices followed for onion cultivation of onion and receipt occurred thereof, general view of farmers regarding onion season, constraints and storage of onion cultivation was collected.

Physical input-output data

Detailed information about the physical quantities of input namely, human labour (family and hired), bullock labour, seed, plant protection equipment, fertilizers and manures used

and their costs, yield and returns in respect of onion was gathered from the sample cultivators.

References period
The information and data for present study are pertained to year 2013-2014. Selected onion cultivators were interviewed during the month of February, 2015.

Analysis of data: The collected data were analyzed for arriving at useful conclusions.
The selected farmers were classified into three group as per the land holding. The standard classification for formation of groups was not done because area cultivated under this crop was very low. After collection of data, farmers were grouped as shown below in Table 5.

Table 5: Distribution of sample of onion cultivators

Category	Holding size (ha)	No. of cultivators
Small	0 to 0.01	17
Medium	0.01 to 0.03	29
Large	0.03 and above	14
Total no. of farmers	-	60

Tabular analysis
The data were processed for arriving at desired and useful conclusions. The data were arranged in suitable tables and cross tables. Simple statistical tools such as arithmetic mean, average, percentage, ratios and frequency distribution were worked out. For working out cost of production, standard cost concepts *viz*., cost-A, cost-B, cost-C were used.

Cost concept used in analysis
Cost concepts used in analysis
To know, whether the net price received by producer is sufficient to cover the production cost or otherwise, the per quintal cost of production of bitter gourd vegetable was worked by using Standard cost concept followed in farm management studies.

1. **Cost A:** Cost "A" included expenses incurred on hired labour, manures, chemical fertilizers, plant protection, irrigation, land revenue and other ceases, repairing charges, depreciation on implements and interest on working capital.
2. **Cost B:** Cost "B" included cost "A" + interest on fixed capital and rental value of owned land.
3. **Cost C:** Cost "C" included Cost "B" + imputed value of family labour and supervision charges.

The input output ratios were also worked out for judging the economic efficiency of bitter gourd cultivation on different farms.

Functional analysis
The empirical evidence from previous studies suggest that amongst the many mathematical functions Cobb-Douglas type of production function is the most appropriate one for the study.

The model
$Y= a\ X_1^{b1}\ X_2^{b2}\ X_3^{b3}\ X_4^{b4}\ X_5^{b5} e^u$

Where,
Y = per hectare yield of onion in quintal.
a= Intercept term
X_1 = Human labour in days
X_2 =Bullock pair in days
X_3 = Seed in kg
X_4 =Fertilizers in (kg)/ha
X_5 =Irrigation in (kg)/ha

b_1 to $b_5$are the production elasticities of respective resources.
In this functional form 'Y' is the dependent variable and X_1 X_2 X_3……X_5 are independent variables were considered on per farm basis. The regression coefficients obtained from this function are also called as elasticities of production. The sum of coefficient of regression i.e. b_1 b_2 b_3.b_5 are indicates return to scale.

Estimation of Marginal physical product (MPP)
The MPP of different inputs was estimated by taking first order partial derivative of output (Y) with respect to concerned input appearing in production function.

Estimation of marginal values
Marginal Physical Produce (MPP) and Marginal Value Product (MVP) were calculated by using the following formulae.

a) $MPP = \frac{\hat{biyi}}{\overline{X}}$

Where,
bi = Production elasticity of i^{th} input
$\hat{y}$ = Estimated y at geometric mean levels of Xi
$\overline{X}$ = Geometric mean of i^{th} input

b) MVP = MPP X unit value of y (output)

Estimation of MPP and MVP
The MPP of different input was estimated by taking 1st order partial derivative of output (Y) with respect to concerned input appearing in production function.

$Y= b_0 x_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} e^u$

MPP of x_1 is

$Dy/dx1 = b_0\ b_1 x_1^{b1-1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} e^u$

$Dy/dx1 = bi\frac{Y}{Xi}$

i) Marginal physical product (MPP)

$MPP_{xi} = b_i \frac{Y}{Xi}$

Where,
dy/dx_1= MPP of X_1 input
b_i=Production elasticity's of i^{th} input
Y = Geometric mean of output
Xi = Geometric mean of i^{th} input

ii) Marginal value product (MVP)
MVP_{xi}= Price per unit of output.

iii) Marginal factor cost (MFC)
MFC = Price per unit of the input.

Resource use Efficiency
After estimating the MVP, the resource use efficiency of different resources will be judged with the help of MVP to factor price (Px) ratio under,
MVP/MFC = 1Optimum use of resource,
MVP/MFC < 1Excess utilization of resource,
MVP/MFC > 1Underutilization of resource

Terms used in the study
Input cost
Hired labour: The cost of hired labour was calculated by considering the actual wages paid by the selected farmers to the hired labour.

Family labour
It was calculated on the basis of wages paid for hired labour.

Other input
For purchased input like manures, fertilizers etc., actual purchase price was taken whereas, for home produced input the opportunity cost was considered.

Interest on working capital
It was worked out at the rate of 6 percent annum on working capital for the crop period.

Interest on fixed capital
It was worked out at the rate of 10 percent per annum on fixed investment made on the farm for production of bitter gourd.

Rental value of land
Rental value of owned land was worked out as one sixth of the gross returns from bitter gourd crop whereas, for leased in land the actual rent was considered.

Depreciation on tools, implements and machinery
Generally, small hand tools implements, netting, and shading materials were used for bitter gourd cultivation. Therefore, considering the average life of these hand tools, implements, netting and shading material, the depreciation was worked out by using following formula.

$$\text{Annual depreciation} = \frac{\text{Original value} - \text{junck value}}{\text{Expected life (yrs.)}}$$

Cost of cultivation per quintal
The per quintal cost of cultivation was computed by using following formula.

$$\text{Per quintal cost of cultivation} = \frac{\text{Total cost} - \text{Value of by product}}{\text{Total output (kg)}}$$

Benefit-cost ratio (B: C ratio)
To judge the profitability of bitter gourd production B:C ratio worked out with the help of following formula.

$$\text{Benefit-cost ratio} = \frac{\text{Total returns}}{\text{Total cost}}$$

Results and Discussion
The success of any enterprise in the business of agriculture can be judged on the basis of economic benefits accrued to entrepreneur from a particular crop or livestock enterprise. In the present age of competition, the farmer is experiencing the impact of the interplay of various economic forces. It has become necessary for him to look upon agriculture as a commercial proposition. This cannot be achieved unless the farmer is conscious about various aspects of crop production and marketing, such as yield, prices of inputs and output, costs, returns, profitability, disposal of onion, etc.
This chapter deals with presentation and discussion of the quantitative assessment of these issues with respect to onion crop by using farm level primary data from the selected onion farmers of Sindhudurg district for the *rabi* season of 2013-14.

General information about sample cultivators
The general information about sample cultivators pertaining to age educational score, occupation and size of family is given in Table 6

Table 6: Size group wise information of sample farmers

Sr. No.	Particulars	Small (N=17)	Medium (N=29)	Large (N=14)	Overall (N=60)
1.	Age (years)	54.47	53.51	54.92	54.11
2.	Educational score	7.9	8.5	9.0	8.12
3.	**Occupation**				
A. Main					
4.	Farming	17	29	14	60
B. Subsidiary					
5.	Business	3(17.64)	6(20.68)	3(21.42)	12(20.00)
6.	Service	2(11.76)	3(10.34)	2(14.28)	7(7.00)
7.	No subsidiary occupation	12(70.60)	20(68.96)	9(64.28)	41(68.33)
8.	Total	17(100.00)	29(100.00)	14(100.00)	60(100.00)
9.	**Average size of family**				
Male					
10.	Below 14 years	1.12	1.11	1.14	1.12
11.	Above 14 years	1.82	1.96	1.78	1.85
12.	Sub-total	2.94(50.51)	3.07(52.12)	2.92(51.22)	2.97(51.29)
13.	Female				
14	Below 14 years	1.12	1.07	1	1.06
15.	Above 14 years	1.76	1.75	1.78	1.76
16.	Sub-total	2.88(49.48)	2.82(47.87)	2.78(48.77)	2.82(48.70)
17.	Total	5.82(100.00)	5.89(100.00)	5.7(100.00)	5.79(100.00)

(Figures in parentheses indicate percentages to total)

Age
It is noticed from Table 7 that the average age of the sample farmers from small, medium and large size groups was 54.47 years, 53.51 years, 54.92 years respectively. However, it was 54.11 years at overall level.

Education
Education is important factor influencing managerial and technical ability in the farm business. The educational score is evaluated by giving zero point to illiterate cultivator and one point for every standard of education attained by them. The average educational score was 7.9, 8.5 and 9 in small, medium and large group, respectively with an overall average of 8.12.

Occupation
It is seen from Table 7 that all cultivators had farming as their main occupation and service, business as subsidiary occupation. However in large group business and service were the major subsidiary occupations, with 21.42 percent and 14.28 percent contribution respectively. In case of small, medium and large group farmers 70.58 percent, 68.96 percent, and 64.28 percent, respectively did not have any subsidiary occupation. At an overall level, cent percent sample cultivators had farming as main occupation.

Family members
Size of family is the important factor influencing supply of farm labour in the farm business. At overall level the number of family member in small, medium and large group was 5.82, 5.89 and 5.70 respectively. At aggregate level total family size was 5.79. The size group wise detail classification of family member is showed in Table 7.

Land utilization
Land utilization of onion growers is presented in Table 7
Table 7 indicated that total operational holding varied from 0.25 ha in small size of farms to 0.39 ha on large size of farms with an average holding size of 0.30 ha.
The proportion of cultivated area to total operational holding was found increased from 80.00 percent in small group to 82.05 percent in large group. It was 81.25 percent at overall level. The proportion of fallow land and grazing land had varied from nearly 20.00 percent to 17.94 percent within different size groups. At overall level it was 15.62 percent.

Table 7: Per farm operational land holding and land utilization

Sr. No	Particulars	Small (N=17)	Medium (N=29)	Lagre (N=14)	Overall (N=60)
1.	**Net cultivated land**				
2.	Unirrigated	0.13(52.00)	0.19(57.57)	0.22(56.41)	0.18(56.25)
3.	Irrigated	0.07(28.00)	0.08(24.24)	0.10(25.64)	0.07(25.00)
4.	Sub-total	0.20(80.00)	0.27(81.81)	0.32(82.05)	0.25(81.25)
5.	Fallow land	0.02(8.00)	0.03(9.09)	0.04(10.25)	0.02(6.25)
6.	Grazing land	0.03(12.00)	0.03(9.03)	0.03(7.69)	0.03(9.37)
7.	Total operational holding	0.25(100.00)	0.33(100.00)	0.39(100.00)	0.30(100.00)

(Area in ha)(Figures in parentheses indicate percentages to total)

It is seen from Table 8 that, the average size of total operational holding includes cultivated land i.e. irrigated and unirrigated, fallow land and grazing land. The average size of total operational holding was 0.25 ha, 0.33 ha and 0.39 ha in small size group, medium size group and large size group respectively, with the overall average of 0.30 ha. At overall level the net cultivated area was 81.25 percent.

Cropping pattern
Cropping pattern is another important factor influencing the level of total annual expenses on the farm as well as returns from business, as the level of running expenses changes with crop diversification due to variation in quantities of input used. The cropping pattern followed by sample farmers is given in Table 8.

Table 8: Cropping pattern on sample farms (Area in ha)

Sr. No.	Particulars	Small	Medium	Large	Overall
1.	***Kharif* Season**				
2.	Paddy	0.17(50.00)	0.25(58.13)	0.29(60.41)	0.23(57.50)
3.	Sub-total	0.17(50.00)	0.25(58.13)	0.29(60.41)	0.23(57.50)
4.	***Rabi*/Summer Season**				
5.	Onion	0.01(2.94)	0.01(4.18)	0.04(8.33)	0.02(5.00)
6.	Dolichus bean (Wal)	0.05(14.70)	0.08(18.60)	0.05(10.41)	0.06(15.00)
7.	Radish	0.08(23.52)	0.07(16.27)	0.07(14.58)	0.07(17.5)
8.	Sub-total	0.14(41.17)	0.16(37.20)	0.16(33.33)	0.15(37.5)
9.	**Perennial crops**				
10.	Coconut	0.03(8.82)	0.02(4.65)	0.03(6.25)	0.02(5.00)
11.	Gross Cropped area	0.34	0.43	0.48	0.40
12.	Net cultivated area	0.20(100.00)	0.27(100.00)	0.32(100.00)	0.25(100.00)
13.	Cropping intensity (%)	170.00	159.25	150.00	160.00

(Figures in parentheses indicate percentages to total cropped area)

It is observed from the Table 8 that, the gross cropped area was 0.34 ha, 0.43 ha, 0.48 ha and 0.40 ha at the small size group, medium size group, large size group and overall size group level, respectively. And net cultivated area on small size group, medium size group, large size group and overall size group level was 0.20 ha, 0.27 ha, 0.32 ha and 0.25 ha respectively. Out of the gross cropped area paddy was only *Kharif* crop grown in small size group, medium size group, large size group and overall size group grown on 0.17 ha (50.00%), 0.25 ha (58.13%), 0.29 ha (60.41%) and 0.23 ha

(57.50%). In small size group area under *Rabi season* was 0.14 ha (41.17%) in which onion, wal and radish grown. Respective area in medium and large group was 16.00 ha and overall level it was 0.15 ha (37.50%).
Under perennial crop coconut was grown in all the groups. At overall level 5 percent area was found under coconut. It is also observed that, the cropping intensity was 170 percent, 159 percent, and 150 percent on small, medium, large size group, respectively. With overall average of 160 percent. The analysis of cropping pattern showed that, the small farmer in the study area used land resources with more intensity as indicated by higher cropping intensity than medium and large farmers.

Farm assets
The farm assets are very important as they indicate the economic position of farmer. The farm assets included investment in land, building, livestock, implements and machinery, irrigation structure and electric motor with pump set. The investment in farm asset in different size groups is given Table 9.

Tables 9: Per farm investment in farm assets: (Amount in Rs.)

Sr. No.	Particulars	Small	Medium	Large	Overall
1	Buildings(Residential +Cattle shed + poultry shed)	107020(70.81)	182773(80.09)	241361(83.05)	177051(79.28)
2	Irrigation structure	32500(21.50)	33454(14.65)	37428(12.87)	34461(15.45)
3	Implements, machinery and hand tools	6349(4.20)	6212(2.72)	6243(2.14)	6268(2.80)
4	Livestock	5257(3.49)	5770(2.54)	5573(1.94)	5533(2.47)
5	Total investment	151126(100.00)	228209(100.00)	290605(100.00)	223313(100.00)

(Figures in parentheses indicate percentages to total)

It is seen from Table 9 that the total investment in farm assets was Rs. 1,51,126 Rs. 2,28,209 and Rs. 2,90,605 in small, medium, large group of farms, respectively. At the overall level the total investment in farm assets was Rs. 2,23,313. Of the total investment the share of buildings in the total farm assets was maximum which varied from70.81 percent in small size group, 80.09 percent in medium and 83.05 percent in large size group.
At the overall level, the percentage share of buildings in total value of farm asset was 79.28 percent, followed by irrigation structure (15.45%), implements, machinery and hand tools (2.80%) and livestock (2.47%)

Resource use pattern
Input utilization and cost structure of onion
The information about per hectare physical input utilization and their cost and profitability of the crop provide the idea about technical ability and skill of the farmer to increase the farm profit. The detail regarding per hectare operation-wise labour utilization, per hectare physical input utilization, per hectare cost of cultivation and profitability of onion is discussed below.

Per hectare operation-wise labour utilization pattern
Labour is an important input in cultivation of onion as its cultivation is labour intensive. The important operations involved in the onion cultivation are ploughing, clod crushing, preparation of seedling, application of fertilizer and FYM, irrigation, plant protection, and harvesting.
The size group-wise details of operation-wise labour used for onion cultivation are showed Table 10. For small group, medium group, and large group, was separately.
Regarding operation-wise labour utilization, at the overall level it was found that, the maximum human labour was used for harvesting (12.27%) followed by preparation of seed bed (10.30%), leveling (10.06%), preparation of seedling (9.99%), transplanting (9.94%), application of FYM (9.44), weeding (8.74%), irrigation (8.44%), clod crushing (7.99%), fertilizer application (7.10), plant protection (3.33%) and ploughing (2.45%). In addition to this 3.98 and 3.45 pair days of bullock labour were used for ploughing and clod crushing respectively. Within the groups the labour utilization pattern was almost more or less similar.

Table 10: Per hectare operation wise labour used for onion production on sample farms

Sr. No.	Operation	Family labour (days)			Hired labour (days)			Total labour (days)	Total bullockpair (days)
		M	F	T	M	F	T		
1	2	3	4	5	6	7	8	9	10
1	Ploughing	3.25	-	3.25	-	-	-	3.25(2.45)	3.98
2	Clod crushing	3.30	1.94	5.24	2.81	2.54	5.35	10.59(7.99)	3.45
3	Leveling	4.40	3.42	7.82	2.05	3.45	5.5	13.32(10.06)	
4	Preparation of Seed bed	4.36	3.70	8.06	3.26	2.32	5.58	13.64(10.30)	
5	Preparation of seedling	3.88	3.65	7.53	2.47	3.23	5.7	13.23(9.99)	
6	Application of FYM/compost	4.24	3.15	7.39	2.71	2.40	5.11	12.5(9.44)	
7	Transplanting	3.93	3.39	7.32	2.65	3.20	5.85	13.17(9.94)	
8	Irrigation	4.17	2.12	6.29	2.34	2.42	4.76	11.05(8.34)	
9	Weeding	4.45	3.95	8.4	-	3.18	3.18	11.58(8.74)	
10	Fertilizer application	4.35	2.59	6.94	2.46	-	2.46	9.40(7.10)	
11	Plant protection	4.41	-	4.41	-	-	-	4.41(3.33)	
12	Harvesting	5.14	5.35	10.49	2.34	3.42	5.76	16.25(12.27)	
13	Total	49.88(37.67)	33.26(25.12)	83.14(62.79)	23.09(17.44)	26.16(19.75)	49.25(37.20)	132.39(100.00)	7.43

Among the various operations followed in the onion cultivation harvesting was labour consuming operation.

Per hectare physical input utilization
The group-wise detail information about per hectare input used for onion is presented in Table 11.

Table 11: Per hectare physical input utilization for onion cultivation

Sr. No.	Particulars	Units	Small	Medium	Large	Overall
1.	**Hired labour**					
2.	Male	Days	12.62	21.42	27.00	22.99
3.	Female		22.84	21.11	31.45	26.16
4.	Total	Days	35.46	42.53	58.45	49.25
5.	**Family labour**					
6.	Male	Days	37.70	57.67	47.51	49.88
7.	Female		33.11	37.68	30.75	33.26
8.	Total	Days	70.81	95.35	78.26	83.14
9.	**Total human labour**					
10.	Male	Days	50.32	79.09	74.51	72.87
11	Female	Days	55.95	58.79	62.20	59.42
12.	Total	Days	106.27	137.88	136.71	132.39
13.	Bullock labour	Days	7.81	4.36	5.69	5.46
14.	Seed	kg	10	10	10.48	10.22
15.	F. Y. M.	Q	10.73	16.33	19.00	15.35
16.	**Fertilizer**					
17.	N	kg	17	34.04	29.8	26.94
18.	P		17	34.04	29.8	26.94
19.	K		11.05	31.07	38.09	26.73

It was observed from the Table 11 that, at the overall level 132.39 days human labourers were utilized for per hectare cultivation of onion, out of which 72.87 human days and 59.41 human days were found to be male and female, respectively, however, out of the total labour man-days 83.14 day were found to be hired labour, and remaining 49.15 days found to be family labours. While per hectare bullock labour used was 5.46 days.

While at overall level, the per hectare fertilizer used was 26.94 kg of N, 26.94 kg of P, 26.73 kg of K, per hectare. The per hectare FYM used were15.35 q and per hectare seed used were 10.22 kg.

On small size farms,106.27 days human labour per hectare were utilized for cultivation of onion, out of which 50.32 human daysand55.95 human days were found to be male and female, respectively, however, out of the total labour man-days 35.46 day were found to be hired labour, and remaining 70.81 days found to be family labours and per hectare bullock pair used was 7.87 days.With the per hectare fertilizer used was 17 kg of N, 17 kg of P, 11.05 kg of K, while per hectare FYM used was 10.73 q and per hectare seed used were 10 kg.

At the medium size farm level 137.88 days human labour were utilized for per hectare cultivation of onion, out of which 79.09 human days and 58.79 human days were found to be male and female, respectively, however, out of the total labour man-days 42.53 day were found to be hired labour, and remaining 95.35 days found to be family labours and per hectare bullock pair used was 4.36 days. With an overall the per hectare fertilizer used was 34.04 kg of N, 34.04 kg of P, 31.07 kg of K, while per hectare FYM used was 16.33 q and per hectare seed used were 10.48 kg.

At the large size farm level 136.71 days human labour were utilized for per hectare cultivation of onion, out of which 74.51 human days and 62.20 human days were found to be male and female, respectively, however, out of the total labour man-days 58.45 day were found to be hired labour, and remaining 78.26 days found to be family labours and per hectare bullock pair used was 5.69 days. With an overall the per hectare fertilizer used was 29.8 kg of N, 29.8 kg of P, 38.09 kg of K, per hectare while per hectare FYM used was 19 q and per hectare seed used were 10.48 kg. Amongst the all size groups, it was observed that, quantity of FYM and human labour is increasing and chemical fertilizer (NPK) declined with size of farms while sample farmers were used more of FYM with increase in size of holding. It was also observed from the Table 11 that, seed has no much variation within the size groups.

From the foregoing discussion, it can be concluded that, with larger the area under cultivation, there was better resource management on the sample farms.

Per hectare cost of cultivation of onion

The item-wise and size group-wise per hectare cost of cultivation of onion is presented in Table 12

It was observed from the Table 12 that, total cost of cultivation (cost 'C') of onion was worked out to Rs. 29,727, Rs. 43,600 and Rs. 49,592 in small group, medium group and large group, respectively. At the overall level, it was worked to Rs. 43,104. This revealed that, the cost of cultivation of onion showed an increasing trend with increase in the area under onion *i.e.,* the cost 'C' was maximum in large group than in medium group and small group. However, cost 'B' was worked out to Rs. 18,541 in small group, Rs. 28,792 in medium, and it was maximum Rs. 37,048 in large group. At the overall level, it was worked out to 29,825. Cost 'B' also increased with size of holding. Proportion of cost 'A' was worked out to Rs. 9,749 in small size group, Rs. 13,179 in medium size group and Rs. 14,788 in large size group with overall level Rs. 14,272.

It was observed from Table 12 that, at the small size group, in the total cost of cultivation, the item-wise maximum cost (50.85%) was incurred on human labour (Family and hired) followed by cost of FYM and fertilizers (6.28%), cost of seed (1.23%), cost of bullock labour(5.25%) and cost of irrigation (2.41%).

At the medium size group, in the total cost of cultivation, the item-wise maximum cost (44.72%) was incurred on human labour (Family and hired) followed by cost of FYM and fertilizers (7.80%), cost of irrigation (3.02%), cost of seed (2.43%) and bullock labour (1.89%).

At the large size group, in the total cost of cultivation, the item-wise maximum cost (38.82%) was incurred on human labour (Family and hired) followed by cost of FYM and fertilizers (6.01%), cost of seed (2.50%), bullock labour (2.29%) and cost of irrigation (1.39%).

At the overall level, in the total cost of cultivation, the item-wise maximum cost (43.25%) was incurred on human labour (Family and hired) followed by cost of FYM and fertilizers (6.37%), cost of seed (2.64%), cost of bullock labour (2.53%) and cost of irrigation (2.10%).

Table 12 indicated that, the cost was foundincreased with increase in the area under onion were mainly result of increase in proportion of expenditure on wages of hired labour to carryout different operation in onion cultivation.

Table 12: Per hectare cost of cultivation of onion

Sr. No.	Particulars	Small group	Medium group	Large group	Overall
		Value (Rs.)	Value (Rs.)	Value (Rs.)	Value (Rs.)
1	2	3	5	7	9
2.	Hired labour				
3.	Male days	1893(6.36)	3213(7.36)	4050(8.16)	3448(7.99)
4.	Female days	2969(9.98)	2744(6.29)	4086(8.23)	3400(7.88)
5.	Bullock pair days	1562(5.25)	872(1.89)	1138(2.29)	1092(2.53)
6.	Seed (kg)	366(1.23)	1062(2.43)	1240(2.50)	1140(2.64)
7.	FYM (q)	1610(5.41)	2850(6.53)	2450(4.94)	2302(5.34)
8.	Fertilizers (kg)				
9.	N	109(0.36)	214(0.49)	191(0.38)	171(0.39)
10.	P	109(0.36)	214(0.49)	191(0.38)	171(0.39)
11.	K	46(0.15)	129(0.29)	158(0.31)	111(0.25)
12.	Irrigation (Rs.)	718(2.41)	1318(3.02)	690(1.39)	908(2.10)
13.	Input cost	9336(31.40)	12616(28.93)	14197(28.62)	13701(31.78)
1	2	34	56	78	910
2.	Depreciation on implement and machinery	133(0.44)	185(0.42)	165(0.33)	160(0.37)
3.	Interest on working capital	280(0.94)	378(0.86)	426(0.85)	411(0.95)
4.	Cost A	9749(32.79)	13179(30.22)	14788(29.81)	14272(33.11)
5.	Interest on fixed capital (@ 10% on fixed capital)	635(2.13)	621(1.42)	627(1.26)	626(1.45)
6.	Rental value of land (1/6th of gross value)	8157(27.43)	14992(34.38)	21633(43.62)	14927(34.63)
7.	Cost B	18541(62.37)	28792(66.03)	37048(74.70)	29825(69.19)
8.	Family labour				
9.	Male days	5655(19.02)	8651(19.84)	7127(14.36)	7482(11.09)
10.	Female days	4304(14.47)	4898(11.23)	3998(8.06)	4323(10.02)
1.	Total	10259(34.51)	13547(31.07)	11124(22.43)	11805(27.38)
12.	Supervision charges (10% of input cost)	927(3.11)	1261(2.89)	1420(2.86)	1474(3.41)
13.	Cost C	29727(100.00)	43600(100.00)	49592(100.00)	43104(100.00)

Summary and Conclusion

Vegetables play an important role in agricultural economy. The vegetables have been popular with farmer for centuries because they confer a number of advantages to individual households and of the agricultural system in India. Within the vegetables Onion (*Allium cepa*) is one of the most important commercial vegetable crop grown in India. Onion has been proved and preferred as spinner of foreign currencies by exporting onion and its products to various countries of the world. India after meeting the needs of domestic market, export sizeable quantity, earning valuable foreign exchange of Rs. 229,490.94 lakhs by exporting 1,822,760.00 MT of onion inthe year 2012-13 and in the year 2013-14 (up to October, 2014). Onion is grown in Sindhudurg district, disposal of produce has assumed greater importance. No adequate and systematic efforts have been made so far to study production and disposal of onion in this district. Therefore, an attempt is made to study economic of production and disposal of onion in Sindhudurg district of Maharashtra with following objectives.

1. To study cost, returns and profitability in onion cultivation.
2. To work out the resource use efficiency in onion cultivation. Vengurle, Sawantwadi and Dodamargtahsil of Sindhudurg district was selected purposively for the present study. Three stages random sampling technique was used for selection of farmers in the study area. A list of villages growing onion crop was obtained from the tahsil office and two villages from each tahsil were selected randomly. From each village ten farmers were selected purposively. The onion cultivators were classified into three categories, *viz.* (I) Small farmer (0 to 0.014 ha), (II) Medium farmer (0.014 to 0.03 ha) (III) Large farmer (above 0.03 ha).

Keeping in view of objectives of the study, the data were analyzed. Cobb-Douglas production function was fitted to find out the factors influencing the yield of onion for the study.

The size of holding of sample farms varied from 0.25 ha on small size of farm to 0.039 ha on large size of farms, with an overall 0.30 ha. The proportion of cultivated area in the holding was 80.00 percent in small group to 82.05 percent in large group while it was 81.25 percent at overall level. The overall level of fallow land and grazing land was 6.25 percent and 9.37 percent.

In case of cropping pattern, area under the rice crop was higher in large size group (60.41 percent) than that of small (50.00 percent) and medium (58.13 percent) groups of farms. At overall level, cropped area was 57.50 percent in *kharif* season, and 37.50 percent in *rabi* season and remaining cropped area was under perennial crops (5.00). The area under onion was highest in large size group (8.33%), area under dolichus bean highest in medium size group (15.00%) and radish was highest in small size group (17.50%). Area under onion crop increased with an increase in size of land

holding.

The per hectare total labour required for onion was the highest in medium size group (137.88 man days) followed by large (106.27 man days) and small (136.71 man days) size groups. The proportion of family human labour was maximum in medium size group, while it was minimum in small size group. It was observed that raising of seedlings and preparation of seedbed, transplanting, irrigation, intercultural operations and harvesting were main labour consuming operations for cultivation of onion crop. The total bullock labour required for onion crop was maximum on small farms (7.81 days) followed by large (5.69 days) and medium (4.36 days) size of farms. The total expenditure in wages was highest in medium size group (Rs. 19,504) followed by small size group (Rs. 15,121) and large size group (Rs. 19,260).

With an overall the per hectare fertilizer used was 26.94 kg of N, 26.94 kg of P, 26.73 kg of K, per hectare. The per hectare FYM used were 15.35 q and per hectare seed used were 10.22 kg.

Per hectare expenditure incurred on purchase of inputs was highest on large size of onion farms (Rs. 14,197) followed by medium (Rs. 12,616) and small (Rs. 9,273) farms. Among the different inputs proportions of cost of manures and fertilizers were the seed and irrigation and plant protection chemicals.

The per hectare cost of cultivation of onion was the highest on large farms (Rs. 49,592) followed by small (Rs. 29,727) and medium (Rs. 43,600) with an overall average (Rs. 43,104). The per hectare yield of onion crop was the maximum on large size farms (43 q) as compared to medium (38.2 q) and small (18.5 q) size of farms with an overall average (33.23 q). The benefit cost ratio was the highest in large size farms followed by medium and small size farms. The per quintal cost of onion cultivation was highest in small farms (Rs. 1,606) followed by large (Rs. 1,153) and medium (Rs. 1,141) size of farms with an overall average (Rs. 1,294).

The functional analysis was carried out to know the contribution of independent variables in yield of onion. From the estimated Cobb-Douglas type protection function, it was observed that on intensive use of variable i.e. seed (X_3) would enable to enhance the productivity of onion. It is observed that fertilizer, irrigation, human labour and bullock labour used in onion cultivation were in excess and there was need to curtail their use by the growers of onion to prevent loss in returns.

References

1. Akhter A, Niazi MA. Comparative analysis of cost and return of potato, onion and tomato in upland Balochistan. Sarhad Journal of Agriculture. 2005;21(4):785-791.
2. Amarnath S. Economics of production and marketing of capsicum in Kolar district in Karnataka. Unpublished M. Sc. Thesis submitted to M.P.K.V. Rahuri, Maharashtra; c2005.
3. Atkale SG. Economics of production and marketing management of dry chilli in Nanded district Unpublished M.Sc. thesis submitted to M.P.K.V. Rahuri, Maharashtra; c2002.
4. Bendre AB, Newaskar VR. The study of trends in exports of onion from India International Journal of Development Research. 2014;4(8):1559-1561.
5. Dey G. Optimum allocation of resources in vegetable cultivation. Journal of Crop and Weed. 2011;7(1):77-80.
6. Dumbre KT. Production and marketing of green chillies in Thane district. Unpublished M. Sc.(Agri), thesis submitted to M.P.K.V, Rahuri, Maharashtra; c2004.
7. Gopal KD. Economics of production and marketing of bell pepper *Capsicum annum* Linn. On Sanghamner and Narayangon area of Western Maharashtra. Unpublished M.Sc. thesis submitted to M.P.K.V, Rahuri, Maharashtra; c1998.
8. Haque MA, Moniruzzaman M. Profitability of onion cultivation in some selected areas of Bangladesh. Bangladesh Journal of Agricultural Research. 2011;36(3):427-435.
9. Khunt KA. Economic evalution of production and marketing of vine vegetables in South Gujarat. Agricultural Banker. 1997;21(2):12-16.
10. Korikanthimath VS, Hiremath GM. Economics of mixed cropping of Byadagi chilli and cotton. Karnataka Journal of Agriculture Science. 2002;13(1):73-78.
11. Korikanthimath VS, Gowardhanrao GM. Resource productivities and their optimum utilization in chilli-based mixed cropping system an economic analysis. Indian journal of Horticulture. 2000;57(1):83-86.
12. Lohar NS, Bansode SD. A study on costs and returns of chillies in Gadhingalaj area of Kolhapur district (M.S.) Agriculture Banker. 1984;7(1):47-48.
13. Mohapatra SC. Production and marketing of onion in Bolangir district of Orissa. Ind. Jour. Agril. Mktg. 1999;13(1):40-43.
14. Naik AD. Production and marketing of onion in Bijapur District, Karnataka-an Economic analysis. Unpublished thesis submitted to UAS, Dharwad (Unpublished); c1993.
15. Naikade NJ. Comparative Economics of production and marketing of potato and onion in rabbi season in Khedtehsil of Pune District. Unpublished M.sc. (Agri). Thesis submitted to M.P.K.V, Rahuri, Maharashtra; c1999.
16. Olekar JN, Gaddi GM. Resources use efficiency in sunflower production. Agriculture Banker. 1996;19(4):18-21.
17. Parit RN. Production and marketing of important vegetables in Raigad district of Maharashtra. M. Sc. (Agri) Unpublised thesis submitted to Konkan Krishi Vidyapeeth, Dapoli (unpublished); c1996.
18. Patil S. Economics of production and marketing of capsicum in Thane district. Unpublished M.Sc. (Agri) thesis to P.D.K.V. Akola, Maharashtra; c2003.
19. Sailaja D, Rao DVS. Resource productivity and resource use efficiency on vegetable farms.BThe Andhra AgricultureJournal. 1998;45(3&4):164-166.
20. Salunkhe D. Production and marketing of watermelon in Raigad district. M.Sc (Agri). Unpublished thesis submitted to Konkan Krishi Vidyapeeth, Dapoli, (unpublished); c1990.
21. Sarfraz A, Saddozai KN. An investigation into cost and revenue of onion production in Azad Jammu Kashmir. Sarhad Journal of Agriculture. 2008.24(4):737-743.
22. Suryawanshi DP. Resource use productivity and cost structure of onion. Unpublished M.Sc. (Agri.) Thesis submitted to the MPKV, Rahuri; c2000. p. 83.
23. Augusti G, Borri C, Gusella V. Simulation of wind loading and response of geometrically non-linear structures with particular reference to large antennas. Structural Safety. 1990 Jul 1;8(1-4):161-179.