ANALYSIS OF SUSTAINABLE PRACTICES FOLLOWED IN STRAWBERRY CULTIVATION

By

Mr. MUJAWAR REHAN HASAN
(Reg. No. 014/196)

A Thesis submitted to the

MAHATMA PHULE KRISHI VIDYAPEETH

RAHURI - 413 722, DIST. AHMEDNAGAR

MAHARASHTRA, INDIA

in partial fulfillment of the requirements for the degree

of

MASTER OF SCIENCE (AGRICULTURE)

in

AGRICULTURAL EXTENSION

DEPARTMENT OF EXTENSION EDUCATION

POST GRADUATE INSTITUTE

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Approved By

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MAHATMA PHULE KRISHI VIDYAPEETH
RAHURI - 413 722, DIST. AHMEDNAGAR
MAHARASHTRA, INDIA
2016

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part
thereof has not been submitted
by me or any other person
to any other University
or Institute for
a Degree or
Diploma

Place: MPKV, Rahuri
Date: / /2016

(R.H. Mujawar)

Dr. S. B. Bhange

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Maharashtra (India)

C E R T I F I C A T E

This is to certify that the thesis entitled, **ANALYSIS OF SUSTAINABLE PRACTICES FOLLOWED IN STRAWBERRY CULTIVATION,** submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra (India), in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL EXTENSION,** embodies of results of piece of bonafide research work carried out by **MR. MUJAWAR REHAN HASAN,** under my guidance and supervision and that no part of the thesis has been submitted to any other University for degree or diploma.

The assistance and help received during the course of this investigation and sources of reference have been duly acknowledged.

Place : MPKV, Rahuri **(S.B.Bhange)**

Dated : / /2016 Research Guide

Dr. B. R. Ulmek
Associate Dean,
Post Graduate Institute,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413 722, Dist. Ahmednagar,
Maharashtra, (India)

C E R T I F I C A T E

This is to certify that the thesis entitled, **ANALYSIS OF SUSTAINABLE CULTIVATION PRACTICES FOLLOWED IN STRAWBERY CULTIVATION,** submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra (India), in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL EXTENSION,** embodies of results of piece of bonafide research work carried out by **MR. MUJAWAR REHAN HASAN,** under the guidance and supervision of **Dr. S. B. Bhange**, Head, Agril. Extn., Department of Extension Education, Mahatma Phule Krishi Vidyapeeth, Rahuri and that no part of the thesis has been submitted for any other Degree or Diploma.

Place : MPKV, Rahuri
Dated : / /2016 **(B. R. Ulmek)**

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"Coming together is beginning, carrying together is progress and keeping together is success", this phrase comes to be true, while completing the post graduation. Therefore, at the outset, it is necessary to shape my feeling in words even though carrying of feelings in words are difficult, still a little effort is being done to access the never ending helping hands.

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Place :

Date: ***(R. H. Mujawar)***

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ABBREVATIONS USED

et al	:	et alli (and other)
etc.	:	etcetra
Fig.	:	Figure
ha	:	Hectare
i.e.	:	idest (That is)
MPKV	:	Mahatma Phule Krishi Vidyapeeth
PGI	:	Post Graduate Institute
Rs.	:	Rupees
S.D.	:	Standard Deviation
viz.	:	Vide licet (Namely)
%	:	Percentage
Agril	:	Agricultural
WBCIS	:	Weather based crop insurance scheme
NAIS	:	National crop insurance scheme
Educ.	:	Education
Extn.	:	Extension
J.	:	Journal
Res.	:	Research
Unpub.	:	Unpublished

ABSTRACT

ANALYSIS OF SUSTAINABLE PRACTICES FOLLOWED IN STRAWBERRY CULTIVATION

By

Mr. Mujawar Rehan Hasan

A candidate for the degree

of

Master of Science (Agriculture)

MAHATMA PHULE KRISHI VIDYAPEETH,

RAHURI-413 722

2016

Research Guide	**:**	**Dr. S.B. Bhange**
Department	**:**	**Extension Education**

The strawberry is a widely grown hybrid species of the genus *Fragaria* . It is cultivated worldwide for its fruit. The fruit is widely appreciated for its characteristics aroma, bright red color , juicy texture and sweetness.

The present study on analysis of sustainable practices followed in strawberry cultivation was undertaken in Mahabaleshawar tehsil of Satara district region of western Maharashtra State with sample size of 110 respondents from 6 villages. Data were collected on personal, socio-economic, communicational and psychological profile of farmers and knowledge and adoption sustainable practices was certain by using exploratory design of social research.

Data from the respondents were collected by personally interviewing with the help of present and well structured interview schedule. Thus, data was collected and appropriated to statistical analysis.

The results showed that, 48.18 per cent of respondents belonged

middle age category It was found that, 40.00 per cent of the respondents were educated up to secondary school level. About 44.55 per cent of respondents were medium lands holding. Majority of the respondents 68.18 per cent had Rs. 237453 to 599912 of annual income.. It was found that, about 63.63 per cent of respondents had medium source of information. It was observed that, 41.82 per cent of respondents had fair cropping pattern. It was found that, 53.64 per cent of respondents had medium cropping intensity. It was observed that, 88.18 per cent of respondents had medium crop productivity. It was found that, 48.18 per cent of respondents had fair marketing behaviour. In the dependent variable particularly knowledge greater per cent of respondents 62.72 per cent have medium level of knowledge about the sustainable cultivation practices followed in strawberry cultivation. About 61.82 per cent of the respondents have medium level of adoption about sustainable cultivation practices followed in strawberry cultivation.

In the correlation analysis regarding the knowledge and adoption it is evident that, amongst personal, socio-economic, communicational and psychological characteristics age of respondents was negatively correlated with knowledge and adoption at 1.00 per cent and 5.00 per cent level respectively, while, education, annual income, and source of information exhibited positively and significant relationship with knowledge and Adoption of respondents. While, land holding , crop productivity and marketing behaviour exhibited non-significant relationship with knowledge and adoption.

The cropping intensity was exhibited positive and significant relationship with knowledge and adoption.

Majority of respondents had faced constraint of Lack of knowledge about biological control measures of insect pest and disease management, Shortage of irrigation water during summer season, High cost of manures and fertilizer and Lack of technical knowledge about doses of manure fertilizers and pesticides and insecticides.

Majority of the respondents that, Adequate provision for obtaining remunerative prices be made available, Information about market prices of different markets should be made available, The subsidies on drip irrigation system may be increased, Availability of bio-insecticide and bio- pesticides at cheaper rate and The practical knowledge regarding plant protection and fertilizer application at proper time be imparted

1. INTRODUCTION

The strawberry is a widely grown hybrid species of the genus *Fragaria*. It is cultivated worldwide for its fruit. The fruit is widely appreciated for its characteristics aroma, bright red color, juicy texture and sweetness. It is consumed in large quantities, either fresh or in such prepared food as preserved fruit juice, pies, ice creams, milkshakes and chocolates. Artificial strawberry flavor and aroma also widely used in many products like lip gloss, candy, hand sanitizers, perfumes and many others.

One serving (100g) of strawberries contains approximately 33 kilocalories, is an excellent source of vitamin-C, a good source of manganese and provide several other vitamins and dietary minerals in lesser amount. Strawberries contain a modest amount of essential unsaturated fatty acids achene (seed) oil. Strawberries consumption decreases cardiovascular disease risk, lowers rates of hypertension, inflammation cancer, lowers cholesterols levels.

Globally, strawberries are grown in huge quantities in Australia, the U.S.A. (California and Florida), Italy, Germany, Spain and France.

Strawberry is important fruit crop of India and its commercial production is possible in temperate and subtropical climate. In India it is generally cultivated in the hills. Strawberry is also successfully cultivated in plains also in Maharashtra around Pune, Nashik and Sangali districts of Maharashtra. It is cultivated commercially in Himachal Pradesh, Uttar Pradesh, Maharashtra, West Bengal, Nilgiri

hills, Delhi, Haryana, Kashmir valley and Punjab. Main centres of strawberry cultivation are Nainital (Himachal Pradesh), Deharadun (Uttarakhnd), Mahableshwar (Maharashtra), Kashmir valley, Benglore, Kalimpong (West Bengal).

In India area under fruit crops in 1991-1992 was 2874 ha which increases in 2013-2014 up to 88977 million tonnes. The growth rate of fruit crops production is 9.5 per cent in 2013-2014. (National Horticulture Database 2014).

In Mahabaleshwar Tahsil area under strawberry cultivation was 850 ha. in which 1800 farmers were engaged which produces 20000 tonnes of strawberry which have an worth goes above 100 crore. The strawberry from Mahabaleshwar region which also awarded the 'Geographical Indication' status (GI) as name of 'Mahableshwar strawberry' which has protected the features of strawberry from this area. Around 80.00 per cent of total strawberry production in India is only in Mahableshwar tahsil and Panchgani of Satara district, topping in terms of size, test, quality, delicate and highly perishable commodity. Around 80.00 per cent of the production is for dinner table and 20.00 per cent for commercial food production like jam, ice-cream, juices, squashes through some big players like MAPRO, Mala's, mostly based in and around Satara district.

There is an urgent need to develop farming technique, which are sustainable from environmental, production and socio-economic point of view. The means to guarantee sufficient food production in the next decades and beyond is critical because modern term. The agriculture community is thus setting it hopes on sustainable agriculture,

which will maintain the cycle of input-output and ecosystem balance.

Sustainable agriculture is that form of farming which produces sufficient food to meet the needs of present generation without eroding the ecological assets and productivity of life supporting system of future generation.

Definition of FAO (1991) , “seems appropriate in this context sustainable rural development is the management and conservation of natural resources base and the orientation technological and institutional change in such a manner as a assure the attainment and continued satisfaction of human needs for the present and future generations”.

The success in promoting sustainable agriculture can be achieved through genetic diversity, crop diversification, integrated nutrient management, and sustainable water management.

The concept of sustainable development therefore, helps us to understand our limitations in the world we live in. It helps to understand that we cannot establish our authority on the earth and its resources. Also, we cannot exploit or overuse them in a way that they affect the need of generation to come, a hundred or thousand year later. The problem that we are facing today’s world are complex, serious and we need to address them. The issue of sustainability raised in agricultural practices also. Whatever advances we have made in agriculture, we should think that we exploit our soils, and other natural and manmade resources available as input in agricultural production to such an extent , that the quality and profitability from such resources in on decline worldwide.

Nations have started addressing the issue of sustainability in agriculture, but a lot more needed in India. A mix of technologies that lead to environmental, economical and social sustainability is required for overall sustainable agricultural development.

1.2. Scope and importance of the study

It has been observed that researcher in social sciences particularly in extension education has most of their research studies related adoption of package of practices or recommended practices of different agronomical and horticultural fruit crops. However, scanty efforts of studies in the area of sustainable cultivation of strawberry have been made on this background.

The research mainly focussed on the knowledge and adoption of farmers regarding the sustainable cultivation practices and their problems in adopting such practices. It is expected that the study provide a feedback to the concerned scientist working in Agricultural Universities, extension functionaries and policy makers of development departments associated with rural development programmes. The present study will also help to extension workers those who are working with the strawberry growers in general and plan and transfer of messages about sustainable cultivation

1.3 Objectives of the study

1.3.1 General objectives of study

The general objectives of the present investigation is to study the knowledge level and extent of adoption of sustainable cultivation practices followed by strawberry growers in Mahabaleshwar tahsil of Satara district.

1.3.2 Specific objectives of the study

1. To study the profile of the respondents.
2. To study extent of knowledge about sustainable practices followed by the respondents.
3. To study extent of adoption about sustainable practices followed by respondents.
4. To study the relationship of profile of respondents with knowledge and adoption.
5. To elicit constraints and obtain suggestions experienced by respondents.

1.4 Hypothesis

1.4.1. There exist relationship between knowledge level about sustainable cultivation practices followed in strawberry cultivation practices and personal, socio-economic, situational, communication and psychological characteristics of strawberry growers.

1.4.2. There exist relationship between adoption level about sustainable cultivation practices followed in strawberry cultivation practices and personal, socio-economic, situational, communication and psychological characteristics of strawberry growers.

1.5. Limitations of the study

Present study was carried out in six villages of Mahabaleshwar tahsil. So that the finding would be more applicable to this area only. However, the finding would be also useful in the areas having similar environmental, socio-economic and ecological condition of area.

Though, the interview schedule was carefully designed to obtain accurate responses, variation might have

cropped up because of responses based on memory of the respondents.

1.6. Layout of the thesis

The report of the present research study entitled " Analysis of sustainable practices followed in strawberry cultivation" has been presented in five chapters.

The first chapter "Introduction" comprises the information about its importance in human diet, scenario of strawberry, scope and importance of study, Objectives, Limitations have also been presented in this chapters.

The second chapter deals with "Review of literature" in which relevant literature and findings of various past research studies conducted in different locations on the same or similar topics have been summarized.

The research methods, techniques, tools used and procedures followed in present investigation have been presented in the third chapter on "Research Methodology". The findings of the study have been presented, interpreted and discussed in fourth chapter "Result and Discussion".

A brief summary of the investigation, conclusions, Implications and suggestions for further research have been given in the fifth chapter on "Summary, Conclusions and Implications". The literature cited , interview schedule and other schedules, formats and vitas are appended at the end of this thesis.

2. Review of literature

An intensive scrutiny of available literature is valuable in gaining an insight and understanding of research problem. The review of literature was collected keeping in view the specific objectives of the study. Though, very few number of studies were conducted in the past regarding knowledge, adoption and constraints in adoption of sustainable practices strawberry in general recommendations, there was a paucity of literature on sustainable cultivation with respect to characteristics of farmers and the association of characteristics with knowledge and adoption. Hence, in addition to directly related to literature, other closely related studies were also reviewed in line with the objectives. The review of literature of present investigation has been presented under the following headings.

2.1. Personal, socio-economic and situational attributes of the respondent strawberry growers.

2.2. Knowledge of strawberry growers about sustainable cultivation practices

2.3. Adoption of strawberry growers about sustainable cultivation practices.

2.4. Relationship between selected independent and dependent variables of the strawberry growers.

2.5. Constraints faced by the respondents strawberry growers in adoption of sustainable cultivation practices.

2.6. Suggestions made by the strawberry growers to overcome the constraints in adoption of sustainable cultivation practices.

2.1. Personal, socio-economic and situational attributes of the respondent strawberry growers.

2.1.1.Age

Anonymous (2000) from AGRESGO Report of the Department of Extension Education, observed that the pomegranate growers were from the age group between 31 to 45 years, followed by 32.72 per cent in the age group of 46 or more in age and 20.19 per cent of them were young i.e. up to 30 years of age

Kapse (2001) reported that the 65.33 per cent of the respondent were found in middle aged, while 19.34 per cent and 15.33 per cent respondents were in old and young age category.

Gangurde (2003) reported that, 53.33 per cent of the respondent belong to middle age group (35-50 years) followed by 33.59 per cent of them in young age group (up to 35 years) and only 18.75 per cent belonged to old age group (Above 51 years).

Sonawane (2005) observed that, more than one-half (54.55 %) of the grape growers were belonging to middle age group, followed by old age (30.90 %) and young age (14.55 %), respectively.

Patil (2008) reported that nearly half (49.33 %) of the respondents belonged to middle age group of 36-50 years, followed by 26.00 per cent in young age group and more than 50 years belonged to old age group.

Tekale *et al.* (2013) observed that, 64.00 per cent of the orange growers belonged to middle age group (36 to 50 years) and 12.33 per cent and 23.67 per cent of the respondent belonged to young and old age group respectively.

Kharat (2014) observed that, nearly half (48.21 %) of the pomegranate growers belonged to young age group followed by middle age 47.32 per cent, however only 4.46 per cent belonged to old age group.

2.1.2 Education

Sonawane (1996) reported that the 69.67 per cent of strawberry growers were educated. Majority of growers received primary education, while 28.00 per cent of growers had secondary and higher education and 2.33 per cent are illiterate.

Singh (2000) found that most of the respondents fall in medium to high category of education i.e. 85.00 per cent to medium level of education and 13.00 per cent were having high level of education. The remaining 2.00 per cent of the farmers possessed low level of education.

Patil (2004) reported that 65.33 per cent of the reader of Krishidarshini had higher education while about 35.67 per cent had secondary school education.

Howal (2008) observed that 37.50 per cent of pomegranate respondents has received secondary education , while 26.50 percent of them received higher secondary education

Kharat (2014) observed that 40.83 per cent of the pomegranate growers were educated up to high school level ,

followed by 21.67 per cent of the respondents who could reach up to middle school level education

Nikam *et. al.* (2015), it was observed that, 37.80 per cent of members had studied up to higher secondary level followed by graduation (34.40 %) and 27.80 per cent of respondent had primary and secondary education.

2.1.3 Land Holding

Sonawane (1996) observed that 38.00 per cent of the strawberry growers had small farm size , less than 0.50 ha where as ,46.00 per cent had medium farm size of 0.51 to 0.85 ha and remaining 16.00 per cent of growers had large farm size.

Patil (2004) observed that more than one third of reader farmers(38 %) had medium size of land holding (4.01-5 ha) about 22.67 per cent of farmers had large (5.01 and above).

Chavai (2004) observed that, 46.00 per cent of the respondents were semi-medium farmers who possessed land between 2.01 to 4.00 hectares. However (16.00 %), (23.34 %) and (11.33 %) of the respondents belong to medium, small and marginal category respectively

Santoshkumar (2008) observed that 35 per cent of the respondent were semi medium farmers 26.62 per cent were small farmers 10 per cent and 12.50 per cent respectively were marginal and big farmers.

Kharat (2014) observed that, more than one third (38.39 %) of the pomegranate growers had land holding between 1.01 to 2.00 ha, about one third (31.25 %) of them had land holding between 2.01 to 4.00 ha and 17.85 per cent

and 8.03 per cent of respondents had land between 4.01 to 10.00 ha and up to 1.00 ha respectively. Only (11.60 %) of pomegranate growers had size of land holding 10.01 ha and above.

2.1.4 Annual Income

Anonymous (2002) from AGRESCO report on technological gap in pomegranate cultivation, Department of Extension Education indicated that about 46.86 per cent of the pomegranate growers had annual income of Rs. 100001 to 250000 while 24.57 per cent of the farmers had annual income up to Rs. 10000. Only 14.86 per cent of the farmers had annual income Rs. 40000 and above while 13.71 per cent of respondent had in between Rs. 25000-40000.

Kapase (2001) reported that 58.00 per cent of respondents had medium level of annual income and 22.66 per cent of respondents had high level income while 19.34 per cent of respondent had low level of income.

Kalra *et al.* (2008) indicated that, majority of the peach growers (52.73 %) were from medium annual income category Rs.70000-150000 followed by (28.18 %) of respondents from high income category Rs. 150000-400000 and remaining (19.09 %) of respondents from low income category.

Howal (2008) observed that 27.34 per cent of pomegranate growers had annual income between Rs 10001-200000 while 20.30 per cent and 24.31 per cent of pomegranate cultivators had annual income up to Rs.100000 and 200000 to Rs. 300000 respectively while 28.05 per cent of respondent had annual income more than Rs. 300000.

Patil (2008) reported that one third of respondent (32.67 %) had income between Rs. 200001 to 300000. It had followed by 22.67 per cent respondent who were found to have annual income between Rs 300000 to 400000 and 44.66 per cent of respondent had more than Rs. 400000 annual income.

Kharat (2014) observed that about more than one third of respondent (38.33 %) had annual income between Rs. 400000 to 700000. It was followed by 21.67 per cent respondent were found to have annual income Rs 100000 and above and about 60.00 per cent of respondent had annual income less than 400000.

2.1.5 Source of information

Sonawane (1996) observed that 32.67 per cent of strawberry growers had low use of sources of information.46 per cent medium and 21.33 per cent high.

Natikar (2001) found that cent per cent of subscriber farmer of farm magazine read extension literature followed by participation in field days (66.25 %) participation in krishimela (65.00 %), participation agricultural exhibition (62.50 %).

Khaire (2005) reported that 67.50 per cent respondent had medium source of information, while 17.55 percent of respondent had high source of information, and only 15.00 per cent of the respondent had low source of information.

Deshmukh *et al* (2007) observed that majority of respondents had medium (79.52 %) extension contact; while 13.89 per cent had high and 6.59 per cent had low extension contact.

Hawale (2009) observed that, about 74.00 per cent of the respondents were using medium sources of information, where as 15.56 and 10.35 per cent of them had used low and high sources of information, respectively.

2.1.6 Cropping pattern

Waghmare (2001), in his study on, indigenous technological knowledge about fruit crop, observed that majority (about 80.00 %) of the farmers were medium category , while 11.67 per cent and 8.33 per cent of them were from high and low category cropping pattern.

Nirban (2004) reported that a 70.00 per cent of farmers from the konkan region and 86.00 per cent of respondent from western Maharashtra had fair cropping pattern while their respective figures in poor category were 19.00 per cent and 6.00 per cent, respectively.

Anonymous (2008) reported that a 72.50 per cent of the respondents preferred annual crop. In kharif 49.17 per cent of farmers cultivate the seasonal crop.

Wankhede (2008) observed that 63.18 per cent of respondent banana growers had fair cropping pattern, followed by the remaining 31.59 per cent and 05.23 per cent of them having good and poor cropping pattern respectively.

Bite (2009) reported that 71.67 per cent belonging to medium cropping pattern, 15.00 per cent had high cropping pattern and 13.33 per cent had low cropping pattern.

2.1.7.Cropping intensity

Aher (2000) concluded that the cropping intensity of the small, medium and large size farms of rainfed region

was 120.50, 101.70 and 102.69 per cent respectively. While, that of the farms of the irrigated region was 113.04, 108.21, 110.82 per cent, respectively.

Nirban (2004) reported that 43.00 per cent of cropping intensity of the konkan farmers farm was in medium category (104 to 192) followed by 29.00 and 28.00 per cent in low (upto 103) and high (193 and above) categories, respectively.

Wankhede (2008) observed that 49.77 per cent respondent banana growers had medium cropping intensity with the remaining 44.55 per cent and 05.68 per cent of them having high and low cropping intensity respectively.

2.1.8 Crop productivity

Bhange (2005) observed that, change in crop productivity was maximum in tomato (45 to 50 q/ha) followed by onion (43 to 45 q/ha). The vegetable crops had dominated other crops in productivity. In other words, change in crop productivity was observed in maize (12 q/ha) followed by gram (7 to 8 q/ha) and jowar (6.50 to 7.00 q/ha) while minimum change in crop productivity was observed in mung , tur and pea.

Shivappan (2005) revealed that, crop productivity of major crops had increased from 21.9 per cent to 31 per cent sorghum and 109 per cent for maize.

Gopichand *et al.* (2011) observed that, the maximum of productivity was recorded in integrated nutrient management of 50 per cent nutrient supply through FYM and 50 per cent through chemical fertilizer, though it was

comparable with the potato productivity under recommended dose of fertilizer only though chemical fertilizers.

Nikam *et al.*(2015) It was found that, most of the mahagrepe growers belongs to medium level of productivity (50.00%) followed by 18.90 per cent to high and 7.80 per cent to very high and 6.70 per cent of respondent and 16.70 per cent of respondent had low and very low crop productivity.

2.1.9 Marketing behaviour

Sonawane et. al. (2002) revealed that majority (92.91 %) of the respondents engaged in nursery management were selling the seedling to wholesalers in their own village while the retail selling of produce from nursery was done by 84.62 per cent of the respondents themselves.

Maghade (2007) revealed that 38.33 per cent of the respondents onion growers sold their produced in the market, while 8.33 per cent of them had sold in the district market i.e. Ahmednagar and 26.67 per cent of them had sold in the Lasalgaon and Pune market each.

Howal (2008) observed that 9.37 per cent pomegranate cultivators sold their produce in the local market while 5.47 per cent of them had sold their produce in the district market, while 17.97 per cent of them had sold their produce within the state market and 67.19 per cent of respondent pomegranate cultivators sold their produce to the other state market.

Hawale (2009) observed that 42.23 per cent custard apple cultivators sold their produce in the local market i.e. Saswad, while 66.69 per cent of them had sold in the district market i.e. Pune, 68.17 per cent of them had sold their produce within the state market i.e. Washi (Mumbai).

Johnson *et. al.* (2009) observed that 47.78 per cent of respondents with new gardens had medium level of marketing behaviour, closely followed by high (33.33%) and low (29.89%). 24.54 per cent old garden owners (71.11%) had medium level of marketing behaviour, followed by low (24.45%) level of marketing behaviour and 4.44 per cent of respondent had high level of marketing behaviour.

2.2. Knowledge of strawberry growers about sustainable cultivation practices

2.2.1 Knowledge

Sonawane (1996) noticed that 48.00 per cent growers have medium level of knowledge, while 28.00 per cent and 26.00 per cent have high and low level of knowledge respectively.

Babann (2002) reported that 44.20 per cent of the respondents were having medium level of knowledge regarding mother palm selection, manuring, plant protection measures ,followed by 35.00 per cent and 20.80 per cent were having high and low level of knowledge respectively.

Ghadge (2005) observed that, 71.67 per cent of the pomegranate growers had medium knowledge while 17.50 per cent and 10.83 per cent of them had low and high level of knowledge respectively about recommended practices for control of oily spot disease

Raut (2006) revealed that, more than half (53.33 %) of the orange growers had medium level of knowledge, followed by low (28.89 %) and high (17.78 %) medium level of knowledge about orange cultivation.

Patil (2008) concluded that, most of the respondents had knowledge about shape of berry (99%), followed by arrangements of berry in bunch (98%), look of bunch (98%) average length of berry (97%), whereas, (95.00 %) of the respondents had knowledge about shape of bunch, cover of berry and acid content.

Howal (2008) observed that 59.37 per cent of the Pomegranate respondents had medium level of knowledge and followed by 25.78 per cent Pomegranate cultivators had low knowledge level and only a 14.85 per cent had high level knowledge.

Kharat (2014) reported that 45.83 per cent respondent had high level of knowledge followed by 35.83 per cent of respondent had medium level of knowledge and 18.34 per cent of respondent had low level of knowledge.

2.3. Adoption of strawberry growers about sustainable cultivation practices.

2.3.1 Adoption

Rangari *et al* (2000) observed that almost all respondent used the recommended varities, grafted treatment and fertilizers , plant protection measures were used 72.50 per cent by pomegranate growers.

Katkar (2001) observed that 68.67 percent of mango growers have 'medium' level of adoption of recommended practices. There were 17.33 per cent of the growers having 'high' extent of adoption and remaining 14.00 per cent of growers were having 'low' extent of adoption of recommended package of practices.

Ghadge (2005) observed that most of the pomegranate growers (79.17 %) had adopted the recommended practices to the medium extent, while 15.00 per cent and 5.83 per cent of them had adopted low and high respectively.

Roy *et al.* (2007) indicates that 70.00 per cent of the respondent were found in lying in medium level of adoption, 12.50 per cent in high level of adoption and 17.50 per cent in low level of adoption.

Rathod (2005) reported that, 68.92 per cent of respondent has medium level of knowledge while one fourth respondents (32.08 %) had high level of knowledge.

Marak (2014) found that, 42.00 per cent of respondent had low level of adoption, 35.00 per cent of respondent had medium level of adoption and only 23.00 per cent of respondent had high level of adoption.

2.4. Relationship between selected independent and dependent variables of the strawberry growers.

2.4.1.Knowledge : its relationship with variables.

2.4.1.1 Age and knowledge

Anonymus (2005) showed that age and knowledge were found to have non-significant correlation.

Sonawane (2005) indicates that the relationship between the size of land holding and knowledge level of grape exporters and non-exporters was negative and non-significant.

Deshmukh (2013) The relation between age and knowledge level of the respondent was found to be negative and statistically significant.

2.4.1.2 Education and knowledge

Shanta sheela and seetaraman (2002 c) observed non-significant association between knowledge of brinjal growers on plant protection and education.

Chavai (2004) found that the relationship of education of the farmers with their knowledge was positively significant.

Anonymus (2005) stated that education and knowledge level about recommended mango technology exhibited negative and non-significant correlation.

Moulasab *et. al.* (2006) found that education of farmers with their knowledge level was positive and non-significant.

Deshmukh (2013) observed that the education and knowledge level of the respondents had positively significant relationship.

2.4.1.3 Land holding and knowledge

Bhople *et al.* (1996) revealed that the land holding had positive and significant relationship with knowledge level of farmers.

Anonymus (2005) found that the land holding had positive and highly significant relationship with knowledge level of farmers.

Sonawane (2005) found that positive and significant relation observed between farm size and grape exporters.

2.4.1.4 Annual income and knowledge

Chavai (2005) reported that the relationship of annual income of farmers with their knowledge level was positively significant.

Anonymus (2005) found that the annual income had positive and highly significant relationship with knowledge level of mango growers.

Deshmukh (2013) observed that, the relationship between annual income and knowledge level of pomegranate growers about plant protection measures of the respondents found to be positive and statistically significant.

2.4.1.5 Source of information and knowledge

Chavai (2004) (a) reported that personal contact source of information had positive and highly significant relationship .

Chavai (2004) (b) observed that the group information source was positively associated with knowledge level of respondents.

Chavai (2004) (c) observed that the mass contact information source was positively associated with knowledge level of respondents.

Wankhede (2008) found that source of information was positive and highly correlated with knowledge.

Deshmukh (2013) observed that personal contact , group contact and mass contact sources used by pomegranate respondent was found to be significant and positive.

2.4.1.6 Cropping pattern and knowledge

Wankhede (2008) observed that the relationship of knowledge and cropping pattern of banana growers had positive and significant.

Howal (2008) observed that the relationship between knowledge and cropping pattern of pomegranate growers was negative and significant at 0.01 per cent level.

2.4.1.7 Cropping intensity and knowledge

Wankhede (2008) observed that the relationship of knowledge and cropping intensity of banana growers had positive and highly correlation with knowledge.

2.4.1.8 Marketing behaviour and knowledge

Wankhede (2008) observed that relationship of knowledge and marketing behaviour of banana growers had positive and significant correlation with knowledge.

2.4.2.Adoption : its relation with variables.

2.4.2.1 Age and adoption

Katkar (2001) reported that age of mango growers and their level of adoption of the mango cultivation practices was negatively significant.

Ghadage (2005) found that relationship between age of the pomegranate growers and their adoption level of pomegranate cultivation technology is negative and non-significant.

Sonawane (2005) indicates that the relationship between age and adoption level of grape growers was non-significant

Patil (2005) observed that relationship between the age of grape growers and their level of adoption of

recommended grape production technology was positively significant.

Singh (2009) it indicates that relationship between age and adoption of mango growers negative and non-significant.

Mule (2012) The relationship between age and adoption level of sweet orange cultivation practices was negative and significant at 0.01 level of probability.

2.4.2.2 Education and adoption

Ahire (1997) noticed that ‘ there was positive and significant relationship between education level grape growers and adoption behaviour.

Sonawane (2005) indicates that the relationship between the size of land holding and adoption level of grape exporters and non-exporters was positive and significant.

Patel (2009) it was observed that, relationship between education and adoption level of recommended kagzilime production technology had significant and positive.

Deshmukh (2013) observed that relationship of the education and adoption level of respondents had positively significant.

Sajeev (2013) observed that the relationship between the education and level of adoption had positive and significant.

2.4.2.3 Land holding and adoption

Kulhal (2004) observed that relationship between farm size and adoption level of pomegranate growers was non-significant.

Sonawane (2005) indicates that the relationship between the size of land holding and adoption level of grape exporters was positive and significant.

Deshmukh (2013) shows that , land holding and adoption level of pomegranate growers was found to be highly significant and positive.

Matouleibi *et al* (2013), it was found that the relationship between land holding and adoption level of pineapple cultivation is highly significant and positive.

Marak (2014) it was observed that , Land holding had positively significant correlation with adoption of pineapple production technology.

2.4.2.4 Annual income and adoption

Bhosale (2003) found that the relationship between the annual income and adoption level of the pomegranate growers was positive and highly significant.

Deshmukh (2013) found that the relationship between annual income and adoption level of pomegranate growers about plant protection measures of the respondents was found to be positively and statistically significant.

2.4.2.5 Source of information and adoption

Ingale (2003) showed that there was significant and positive relationship between the sources information

channels used by the ber growers in adoption of recommended practices of ber cultivation.

Bhosale (2003) stated that there was positive and highly significant relationship between sources of information used by pomegranate growers and their adoption level.

Kulhal (2004) observed that there was highly significant relationship exist between sources of information used by pomegranate growers and their adoption level.

Mule (2012) a highly significant relationship observed between sources of information utilized by sweet orange growers and their adoption level regarding recommended practices of sweet orange cultivation at 0.01 level of probability.

Deshmukh (2013) relationship between personal source, group contact and mass contact sources and adoption level of the pomegranate growers about various plant protection measures was positive and significant.

2.4.2.6 Cropping intensity and adoption

Bhati (2002) reported that, relationship between cropping intensity and adoption was negative and non-significant.

2.4.2.7 Marketing behaviour and adoption

Singh *et. al* (2013) it was observed that the relationship between marketing behaviour and adoption of recommended chilli production technology had had non-significant.

Marak *et al* (2014) reported that the relationship between marketing behaviour and adoption of pineapple

production technology was positively significant correlation at 1 per cent of level of significance.

2.5. Constraints faced by the respondent strawberry growers in adoption of sustainable cultivation practices.

Kunjir (1993) concluded that less price in local market, non-availability of information about rates of fig fruits and lack of storage facilities where the fruits are sold in the final market. These were the problems faced by the fig growers.

Sonawane (1996) in the study of strawberry growers from mahableshwar tahsil found that the major constraints reported by the respondent were lack of availability of manures and fertilizers , non matching materials, lack of knowledge about nursery management, disease , pest and their control and about fruit processing and preservation. The lack of storage and marketing facilities were the other constraints.

Kadam *et al.* (2001) indicated that the important constraints faced by the majority of sweet orange growers were high cost of transportation charges (87.50 %), lack of transport facility (65.00 %), low price of produce if given on lease basis (70.62 %), and delayed payment from contractors (60.00 %). The other constraints were non-availability of cold storage facility (43.75 %), and non-availability of fruit processing unit.

Bhosale (2003) reveals that unmunerative prices for fruits (96.30 %), excessive price fluctuation (95.63 %)and higher commission charges (35.00 %) were the major

constraints faced by the pomegranate growers in respect of market rates and selling of fruits.

Wadkar *et. al.* (2006) conducted the study of resource use efficiency in alphanso mango production in Sindhudurg district reveals that major problem in mango production have been identified as high cost inputs (91.67 %) followed by high cost of transportation (74.17 %), heavy incidence of pest and disease (68.33 %), lack of technical guidance (60.00 %) , high market charges (56.00 %) and lack of market information (54.00 %). Many mango growers reported an unfavourable climate condition during the peak season as severe problem during the recent past.

Kalra *et. al.* (2008) revealed that main constraint in adoption of recommended practices of peach were lack of knowledge lack of inputs, costly input and skilled labour.

Howal (2008) observed that the majority of the pomegranate cultivators faced the problems about lack of knowledge about oily spot disease management practices (76.56 %), fluctuation in prices of fruits (71.09 %), lack of knowledge about application of plant protection measures (66.40 %), constraints in availability of healthy seedlings from disease free nurseries (65.50 %), lack of knowledge about micro nutrient (60.95 %), middlemen takes more commission (60.93 %), high prices of plant protection measures (59.33 %), scarcity of water during summer (44.53 %) and harvesting practices (36.71 %).

2.6. Suggestions made by the strawberry growers to overcome the constraints in adoption of sustainable cultivation practices.

Katkar (2001) reported the requirement of practical knowledge regarding the plant protection and the fertilizer application of proper time be imported.

Bhosale (2003) concluded that about 63.33 per cent of pomegranate suggested that government should provide minimum support price and also 43.75 per cent farmers suggested information and guidance about export potential be made available.

Thorat *et al.* (2004) concluded that most (89.44 %) of the respondents suggested that technical information in respect of latest technologies should be given to the farmers followed by demonstrations of improved varieties be conducted on farmers field (57.22 %), planting material of improved varieties be made available (85.55 %) and low cost technology of sugarcane cultivation be generated by the University (53.89 %) and there should be close linkage between scientists and farmers (37.22 %).

Shinde (2004) reported that the practical knowledge regarding plant protection measures be improved (71.00 %) was one of the important suggestion other suggestion were financial assistance in the form of subsidies (65.00 %) Making available good quality seed (63.50 %) timely supplied of seeds (57.00 %), fertilizers (53.00 %) and pesticide (51.50 %).

Patil (2008) concluded that major problem faced by the respondent lack of plant doctoral advisory service at field (81.33 %), lack awareness about latest technologies (73.33 %), inadequate credit/facilities (64.66 %), complexity in messages and difficulty in their interpretation (60.00 %), irregular field visit by concerned authority (58.66 %), lack of participation in

different extension activities (56.66 %) and location of research station far away from reach (54.66 %).

3. METHODOLOGY

The chapter methodology deals with where and how the study was carried out. For scientific study of any research problem, the researcher has to adopt appropriate materials, methods and procedures in order to arrive at useful conclusions. Keeping this view in mind, this chapter deals with where and how research work was carried out, how to construct the interview schedules, methods used for the selection of the respondents, way adopted for the quantification of qualitative data and preparation of primary and secondary tables. The details of the procedure used in this study are given here as under.

3.1 Locale of the study

In Maharashtra state the strawberry is being grown on larger area in Mahabaleshwar tahsil of Satara district. Mahabaleshwar tahsil comprises larger area under strawberry cultivation and 80.00 per cent share in total production of strawberry in India and hence it was selected for the present study.

3.1.1 Geographical location

The study was conducted in Mahabaleshwar tahsil of Satara district. Mahabaleshwar tahsil is located in the western part of Maharashtra. The Mahabaleshwar tahsil lies between 17.56^{o} N and 73.43^{o} E longitude. It is situated on elevation of 1353 m above the mean sea level. Mahabaleshwar is a vast platue measuring 150 km^{2} , bounded by valleys on all sides. Mahabaleshwar is a famous hills station situated in Sahyadri ranges of western Maharashtra. It is well known for its beauty, cool air and heavy rainfall.

3.1.2 Area and Population

The total geographical area of the Satara district is 10480.00 square kilometers. Apart from this, the total geographical area of Mahabaleshwar tahsil is 529.85 Sq. Km. According to 2011 census, the total population of Mahabaleshwar tahsil is 72830 and population density is 137 people/km^{2}, while female male ratio is 937/1000 and literacy rate is 78.00 per cent.

3.1.3 Soil and climate

Different types of soil are prevalent in Satara district. The soil has varied texture ranging from light, sandy to medium black and deep black along the river banks while in Mahabaleshwar tahsil Laterite soil is available.

The maximum and minimum temperature varies from 23.87 and 15.35 ^{o}C respectively. Climate of the area is suitable for cultivation of strawberry. The temperature is generally humid and even. Except the hot months of March, April and May, the climate is free from extremes of hot and cold. The average rainfall of Mahabaleshwar tahsil is 2223.00 mm and total days of rainfall is 116.

3.1.4 Source of irrigation

Well is the main source of irrigation in Mahabaleshwar tahsil. In Satara district, the total area under irrigation is 9103 ha. The river Krishna are the main source of irrigation. The origin of the Krishna river is Mahabaleshwar that flow across Maharashtra, Karnataka, Telangana and Andhra Pradesh.

3.1.5 .Geographical Indication

The all India strawberry growers association proposed the registration of Mahabaleshwar strawberry under the Geographical Indication of Goods act, 1999. The Mahabaleshwar strawberry granted the GI status in 2010.

3.1.6 Export

Strawberry from Mahabaleshwar is exported in large quantities to countries like France, Belgium, Malaysia and Middle east. The fruits are frozen before export.

3.1.7 Transport and communication facility

In Mahabaleshwar Tahsil, state transport buses are the significant means of transportation. Major towns and villages are linked mostly by metal roads. National highway No.4 (pune to Banglore) is also passes through the Satara district which is 50 kn from Mahabaleshwar. Other means of transportation are trucks, tempos, private jeeps, autos etc. Post offices and telephone, mobile facilities are available in almost all the villages.

3.1.8 Other facilities

The educational institutes, hospitals, nationalized banks, credit co-operative societies, cold storage facilities, co-operative sugar factories, fair price shops and other such

village organizations are also available in Mahabaleshwar tahsil on large scale and with effective manner.

3.2 Sampling procedure

Sampling is the method of selecting a fraction of the population in such a way that the selected sample represents the population. For selection of sample for the study, four steps namely selection of district, taluka, selection of villages and selection of respondents was followed.

3.2.1 Selection of tahsils

For the present study, Satara district is purposively selected as it has highest area under strawberry cultivation. In Satara district , the highest area in under strawberry cultivation in Mahabaleshwar tahsil, hence it was selected.

3.2.2 Selection of villages

The list of Strawberry growing villages of Mahabaleshar tahsil was obtained from Taluka Krishi Adhikari. Six villages were selected for the study on the basis of the highest area under Strawberry crop.

3.2.3 Selection of respondents

The list of Strawberry growers from the selected villages was obtained from Agricultural assistant and agricultural supervisors of the respective villages. Total 110 respondents were selected by proportionate random sampling method for the present study as detailed below.

Table 1: List of selected tahsils and villages

Sr. No.	Name of villages	Farm family cultivating strawberry	No of respondents selected
1	Khingar	644	22
2	Bhose	350	12
3	Bhondarwadi	318	11
4	Bhilar	837	28
5	Ghoteghar	609	21
6	Ghureghar	476	16
	Total	3234	110

3.2.4 Research design

The expost-facto research design was used for the study. This design was considered appropriate because we are studying the phenomenon that has already occurred. It is systematic empirical study in which the researcher does not have any direct control of independent variables because their manifestation have already occurred.

3.3 Preparation of interview schedule

The structured questionnaire serves as a tool for collection of data. In view of this, questionnaire was prepared on the basis of objectives of the study, which includes relevant questions for seeking information in respect of independent and dependent variables. Efforts were also made to formulate a questionnaire with clear and easy questions. The questions were asked to respondents in both Marathi and English language in order to get accurate response of the respondents.

3.4 Pretesting of interview schedule

The questionnaire was tested prior to its finalization by the researcher. It was pretested by interviewing 10 Strawberry growers who were non-respondents, from the sample area to know whether the Strawberry growers furnish the required information.

The pre-testing of the interview schedules of 10 Strawberry cultivators helped the researcher to make modifications and alternations in order to get spontaneous responses from the respondents. After making the required changes in the interview schedule, it was finalized and used for data collection.

3.5 Procedure of data collection

The researcher personally interviewed the respondents included in the sample. The help of local leaders and progressive farmers were sought for establishing rapport with the sampled Strawberry growers. The farmers were contacted during the time which was convenient to them. This facilitated to obtain free and natural responses from them to the various questions/items included in the schedule. The respondents were assured that the information collected from them will only used for the research purpose. The replies of the respondents were recorded while the interviews were in progress. The questionnaire thus filled in was checked before closure of interview for its completion in all respects.

3.6 Compilation of data

The information collected through interview was processed into primary table and then into the secondary

tables. The qualitative data were quantified and later the quantified data were converted into frequency, percentages and different scores in order to find out the correlation between dependent and independent variables were worked out for further needs.

3.6.1 Working of scores and grouping of respondents

As earlier mentioned the qualitative data were converted into quantitative data by giving scores. The scores obtained by each Strawberry cultivator respondent in respect of particular characteristics under the study were worked out.

The respondent Strawberry cultivators were thus classified logically into different categories on the basis of score obtained by them.

3.7 Variables and their empirical measurement

The variables are the characteristics or conditions that can be observed, manipulated or controlled by the researcher. With this understanding the variables included in the present study were selected as per the study.

The variables included in the study were selected on the basis of an extensive review of literature, discussion with expert and preliminary study conducted in the area of investigation. Only those variables which were considered to be having some relevance to the investigation were selected.

I. Independent variables

The phenomenon or characteristics hypothesized to be the input or ante decent variable is called independent variables. It presumed to cause the dependent variable and it selected, manipulated or measured prior to measuring outcome of dependent variables.

II. Dependent variables

Dependent variable may be defined as the phenomenon of characteristics hypothesized to be outcome affect, consequence or output of some input variables. Its occurrence depends on some other variables which had preceded In time. The list of variables studied along with instrument used for measuring them are given below

Table 2 The independent and dependent variables considered for the study.

Sr. No.	Variable	Empirical measurement
A	**Independent variables**	
1	Age	Chronological age of the respondents completed in year.
2	Education	Number of school graded completed by the respondent.
3	Land holding	Number of hectare owned by the respondent.
4	Annual Income	Annual family income from all sources will be considered.
5	Source of Information	As per procedure followed by Sonawane (2006) with some modification.
6	Cropping pattern	Schedule was developed
7	Cropping intensity	As per procedure followed by Nrban 2004.
8	Crop productivity	As per procedure followed by

		Bhange (2004) with some modification.
9	Marketing behaviour	Schedule was developed.
B	**Dependent variables**	
1	Knowledge	Knowledge about sustainable practices followed in strawberry cultivation.
2	Adoption	Adoption of sustainable practices followed in strawberry cultivation.

3.7.1 Operationalization and Measurement of Variables

Documentation of sustainable cultivation practices followed in strawberry was done through discussion with farmers, strawberry experts working at different research stations and extension personnel of Mahatma Phule Krishi Vidyapeeth, Rahuri. Extensive help was also taken from published reports, success stories of farmers. In addition, several secondary sources were also referred to, for the detailed understanding of strawberry. Research articles, case studies were also referred in specific websites.

3.7.2 Measurement of sustainability of different cultivation practices followed in strawberry cultivation.

The sustainable cultivation practices in strawberry cultivation farming system was analyzed using sustainet parameters of sustainability. The sustainet parameters include; Ecological, social and cultural dimension parameters. These are given in appendix I.

A. Measurement of Independent variables

1. Age

Age is a characteristic of an individual which is linked with his maturity of thoughts, physical fitness and productivity. The chronological age of the respondent at the time of interview was taken into consideration for the present study.

According to their age in years the respondents were categorized into three age groups as below.

Sr. No.	Category	Age group
1.	Up to 35 years	Young
2.	Between 35 and 55 years	Middle
3.	56 years and above	Old

2. Education

Education can be defined as the number of years of formal education completed by the strawberry respondent. According to the govt. educational standard, the strawberry growers were classified into five categories.

Sr. No.	Category	Level of education
1.	Illiterate	No education
2.	Primary	Up to 4th standard
3.	Secondary	5th to 10th standard
4.	Higher secondary	11th to 12th standard and Diploma
5.	Graduation	Above 12th standard

3. Size of land holding

It refers to number of hectares of land owned, cultivated and managed by the respondent strawberry growers and managed by the respondent strawberry cultivators under the present study. According to the extent of land possessed by the respondent strawberry growers, they were classified into following categories based on existing norms of land holding in Maharashtra state.

Sr. No.	Category	Land holding (ha)
1	Marginal	Up to 1.00 ha
2.	Small	1.01 to 2.00
3.	Medium	2.01 to 4.00
4.	Large	4.01 and above

4. Annual Income

This refers to the total annual income in rupees obtained from agricultural and other sources by the respondent Strawberry cultivators. The gross family income as reported by the respondents was taken into consideration to measure this variable On the basis of total income, the respondent were classified in to three categories by using statistical analysis method mean $\pm$ S.D.

Sr. No.	Category	Annual Income (Rs.)
1.	Low	Below 237452
2.	Medium	237453 to 599912
3.	High	599913 and above

5. Sources of information

It refers to the use of sources of agricultural information for various recommended cultivation practices used or consumed by the respondent strawberry growers. The respondents were asked to record the consulting pattern used by them, considering three levels:

- Always : 2 score
- Sometimes : 1 score
- Never : 0 score

Thus total score was worked out and the respondents categorization was done on the basis of mean ± S.D. into following categories. In that the maximum score obtained by respondent is 38 and minimum score is 0.

Sr. No.	Category	Information sources (scores)
1.	Low	Up to 12 scores
2.	Medium	13 to 17 scores
3.	High	18 and above scores

6. Cropping pattern

It refers to yearly sequence and spatial arrangement of crops and fallow on a given area by the respondent farmer. In other words, it denotes the crop grown by the respondent in *kharif , rabi* and summer season as well as, annual and perennial crops on his her land. This variable measured with help of procedure followed by Nirban (2004). One score was given for growing crop in each of the three season, while four score was given for annual crops grown and five score was assigned for perennial crop grown by the

respondents. On the basis of cropping pattern, the respondent were classified into three categories by using statistical analysis method mean ± S.D.

Sr. No.	Category	Cropping pattern
1.	Poor	Up to 4 scores
2.	Fair	5 to 6 scores
3.	Good	7 and above scores

7. Cropping intensity

Cropping intensity is the proportion of area under different crop including double and triple cropping to net cultivated area. Cropping intensity operationally defined as the proportion of area under different crops including double and triple cropping to the net cultivated area under strawberry cultivation.

Cropping intensity in the present study was calculated by using formula

$$\text{Cropping intensity} = \frac{Total\ croppred\ area}{net\ cultivable\ area} \times 100$$

Following categories of cropping intensity were made considering the mean and standard deviation.

Sr. No.	Category	Cropping pattern(score)
1.	Low	87 and below
2.	Medium	87 to 165
3.	High	Below 166

8. Crop productivity

Crop productivity refers to crop yield per unit area of a crop expressed in qtls. per hectare. All the crops grown by the beneficiary farmers were taken into consideration. The average per hectare yield of crop in the district was taken as a base for scoring. Accordingly, one score was given to 'below average' yield, two score was given for average yield, while three score was assigned for more than average yield. Thus, the score assigned to all the crops grown by the beneficiaries farmer were summed up to indicate his crop productivity score. Accordingly, the score obtained was computed for all the beneficiary farmers under investigation.

9. Marketing behavior

Marketing is defined as those activities which are conductive for getting better returns or higher profits to the farmers produce.

The respondent strawberry growers sold their produce to various markets. The sources are grouped in number of questions in which gives 1 score for 'Yes' and 0 score was given to 'No' preference to their marketing behavior.

B. Measurement of Dependent variables

1.Knowledge

The term knowledge is operationalized as a result of information possessed by a respondent in respect of sustainable practices followed in strawberry cultivation.

The sustainable practices followed in strawberry cultivation, listed in the interview schedule were given scores. 2 score was given for Complete knowledge, 1

score for Partial knowledge and 0 score for No knowledge of a practice.

The categorization was done on the basis of mean ± S.D.

Sr. No.	Category	Knowledge (score)
1.	Low	Up to 176
2.	Medium	177 to 187
3.	High	188 and above

2. Adoption

Adoption is the mental process through which an individual posses from the first hearing of an innovation to its ultimate use. Rogers (1983) defined adoption as a decision to make full use of an innovation as the best course of action available

The sustainable practices followed in strawberry cultivation, listed in the interview schedule were given scores. 2 score was given for Complete adoption, 1 score for Partial adoption and 0 score for No adoption of a practice.

The categorization was done on the basis of mean ± S.D.

Sr. No.	Category	Adoption (score)
1.	Low	Up to 104
2.	Medium	104 to 110
3.	High	111 and above

3.8 Statistical method used

3.8.1 Percentage and frequency

Percentage was used in descriptive analysis for making simple comparisons.

For calculating percentage, the frequencies of particular cell was multiplied by 100 and divided by the total number of respondent in their particular category to which cell they belonged.

3.8.2 Mean

The arithmetic mean (X) is the quotient that results when the sum of all the items in the series is derived by the number (N) of items.

The mean will be calculated by using formula

$$\bar{X} = \frac{\sum Xi}{N}$$

Where,

$\bar{X}$ = Mean,

N = Total number of observation

Xi = Value of observation

3.8.3 Standard Deviation

The standard deviation will be obtained by the square root of the average of the square deviation from mean by the following formula:

$$S.D = \sqrt{\frac{\sum(Xi - \bar{X})^2}{N}}$$

Where,

S.D.= Standard deviation,

X_i = Individual score of the i^{th} respondent

$\bar{X}$ = Mean of the sample

N = Total number of respondents

3.8.4 Coefficient of correlation

To find out the relationship between the selected independent and dependent variable Karl Pearson's coefficient of correlation 'r' use by following formula.

$$r_{xy} = \frac{\sum XY - \frac{\sum X - \sum Y}{N}}{\sqrt{\frac{\sum X^2 - (\sum X)^2}{N} \times \frac{\sum Y^2 - (\sum Y)^2}{N}}}$$

Where,

r = Coefficient of Corrélation

X = Value Independent variables

Y = Value of dependent variables

N = Number of respondents

$\sum X^2$ = Sum of the squares of X variable

$\sum Y^2$ = Sum of the squares of Y variale

After calculating 'r' value, its significance at 0.05 and at 0.01 levels is tested to decide the association if any between the dependent and independent variables.

3.9 Operational definitions and terms used

1. Age: Age refers to the chronological age of the selected respondent Strawberry grower at the time of interview.

2.Education: Education is a level of formal education completed by the respondent.

4. Size of Land holding: It is considered as the total area of land possessed by the respondent strawberry grower.

5.Annual income: It refers to the total annual income obtained from agricultural and other sources by the respondent grower.

6. Source of information: It refers to the various information sources of communication channels used by the respondent strawberry grower for getting information regarding sustainable practices followed in strawberry cultivation.

7. Cropping pattern: It refers to yearly sequence and spatial arrangement of crops and fallow on a given area by the respondent farmer.

9. Cropping intensity: Cropping intensity is the proportion of area under different crop including double and triple cropping to net cultivated area.

10. Crop productivity: Refers to crop yield per unit area of a cop expressed in qtls per hectare.

11. Knowledge: The term knowledge refers to the extent of information known by the respondent about the recommended sustainable practices of strawberry.

12. Marketing behavior: It means how the respondent strawberry grower dispose their produce through various marketing channel.

13. Socio-economic profile: It refers to the social and economic position of the respondent grower under study in the community.

14. Profile: It also refers to an outline of any human face. In other words, it is the representation of outline of the human face or human being.

15. Attributes: These are qualities, characteristics or traits possessed by the respondent pomegranate grower.

4. RESULTS AND DISCUSSION

This chapter deals with the presentation of the results of investigation and critical discussion of the results presented. The data collected from 110 strawberry growers of 6 villages from Mahabaleshwar tahsil of Satara district were compiled in to primary tables. Later, they were transferred into secondary tables in view of the objectives of the study. Appropriate statistical tests were used to analyze the data in order to draw the inferences.

The results of investigation are presented and discussed in this chapter under following heads.

4.1 Personal, socio-economic profile and situational attributes of the respondents strawberry growers.

4.2 Knowledge of strawberry growers about sustainable cultivation practices

4.3 Adoption of strawberry growers about sustainable cultivation practices.

4.4 Relationship between selected independent and dependent variables of the strawberry growers.

4.5 Constraints faced by the respondents strawberry growers in adoption of sustainable cultivation practices.

4.6 Suggestions made by the strawberry growers to overcome the constraints in adoption of sustainable cultivation practices.

4.1 Personal, socio-economic profile and situational attributes of the respondents strawberry growers.

4.1.1 Age

Age denotes the chronologically completed calendar years by the strawberry growers at the time of interview. It influences behavior of an individual by exposing to varied situation number of times. Thus, it becomes an essential aspect to consider age of the respondents in this study. The information pertaining to the age of the strawberry growers was collected, tabulated and analyzed. The results are presented in Table 2.

Table-2 Distribution of the strawberry growers according to their age

Sr. No.	**Age group (Years)**	**No of the respondents (N =110)**	**Per cent**
1.	Young (Up to 35)	44	40.00
2.	Middle (36 to 55)	53	48.18
3.	Old (56 and above)	13	11.82
	Total	**110**	**100.00**

The Table 2 and fig 2 revealed that 48.18 per cent of the respondents strawberry growers belonged to the middle age group (36 to 55 years), followed by 40.00 per cent of them in young age group (up to 35 years). Only 11.82 per cent the respondents strawberry growers were belonged to old age group (56 years and above) category.

From the above finding, it is concluded that nearly half of the respondents were from middle age group (36 to 55 years). Hence they are well mature to gain knowledge and adoption in strawberry cultivation which are the responsible section of farming community respondents to technology with rational thinking and action, it will be certainly successful.

This finding were in line with the finding of Patil (2008) nearly half of the respondents belonged to middle age group of 36 to 50 years.

4.1.2 Education

The level of formal education attained by an individual tends to influence the extent to which they are exposed to new ideas and information. It plays an important role in problem solving capacity of strawberry growers. The information pertaining to the education of the strawberry growers was collected, tabulated and analyzed. The results are presented in Table 3.

Table-3. Distribution of the strawberry growers according to their level of education

Sr. No.	Education level	No of the respondents (N=110)	Percentage
1	Illiterate	03	2.73
2	Primary Education (up to 4th Standard)	11	10.00
3	Secondary Education (5th to 10th Standard)	44	40.00
4	Higher Secondary Education (11th to 12th Standard)	28	25.45
5	College (Above 12th Std.)	24	21.82
	Total :	**110**	**100.00**

The Table 3 fig 3 revealed that 40.00 per cent of the respondents strawberry growers were educated up to

secondary school level, while 25.45 per cent of the respondents had received college education, remaining 21.82 per cent of the respondents were educated up to higher secondary and 10.00 per cent of the respondents had received primary education and only 2.73 per cent of the respondents were illiterate.

Thus, it is concluded that, a more than one third of the strawberry growers had received secondary education.

This finding is consistent with the finding of Howal (2008) and Kharat (2014).

4.1.3 Size of land holding

The information related to the size of land possessed by the respondents. It is observed that farm size is another important factor in acceptance or rejection of improved farm practices, since large size of farm provide a favorable condition for adoption of innovation. The results on this aspect are presented in table 3.

Table-4 Distribution of the respondents strawberry growers according to their size of land holding

Sr. No.	Size of land holding (ha)	No. of the respondents (N=110)	Percentage
1.	Marginal (up to 1.00 ha)	20	18.18
2.	Small (1.01 to 2.00 ha)	22	20.00
3.	Medium (2.01 to 4.00 ha)	49	44.55
4.	Large (4.01 and above)	19	17.27
	Total	**110**	**100.00**

It is observed from the Table 4 and fig 4 that, 44.55 per cent of the strawberry growers had medium size of land holding between 2.01 to 4.00 hectares, while 20.00 per cent of them had small size of land holding 1.01 to 2.00 ha followed by 18.18 per cent of them had marginal size of land holding up to 1.00 ha and only 17.27 per cent of respondent had large size of farm holding more than 4.01 ha.

Hence it is concluded that, substantial proportion of the strawberry growers (44.55 %) had medium size of land holding between 2.01 to 4.00 ha.

The finding were in line with the finding of Sonawane (1996) and chavai (2004).

4.1.4 Annual income

Expenditure on farming and allied occupation, standard of living and lifestyle of an individual are mostaly influenced by the annual gross income of the respondents. Annual income is a major determination of the economic well being of an individual. The information about annual income of the respondents strawberry growers were collected, tabulated and analyzed. The results are presented in Table 5 on the basis of Mean ± S.D.

Table-5 Distribution of the respondents strawberry growers by their annual income

Sr. No.	Annual income (Rs.)	No. of the respondents (N = 110)	Percentage
1.	Low (up to Rs. 237452)	15	13.63
2.	Medium (Rs. 237453 to 599912)	75	68.18
3.	High (Rs. 599913 and above)	20	18.19
	Total	**110**	**100.00**
Mean = 418681.8		S.D. = 181230.1	

From Table 5 and Fig 5, it was observed that, 68.18 per cent of the strawberry growers had medium annual income in between Rs. 237453 to 599912/-, while 18.19 per cent of them had high annual income of Rs. 599913 and above and Only 13.63 per cent of them had low annual income up to Rs. 237452/-.

From the above data, it is concluded that a two third of respondents strawberry growers had medium annual income between Rs. 237453 to 599912/-.

This finding is consistent with the finding of kapase (2001).

4.1.5. Sources of information

Source of information play important role in the transfer of technology from technocraft to farmers. Particularly, when farmer is unable to contact to the change agent frequently, media comes to some extent by taking the

role of bringing the timely information to the cultivars. The more to exposure to media by a farmer the more would be the gain in awareness, knowledge and information. Hence, it becomes necessary to know how far the respondents farmer utilize the various media. The information regarding the different sources of information used by the respondents strawberry growers was collected, tabulated and analyzed. The results are presented in Table 6 on the basis of Mean ± S.D.

Table 6 Distribution of the respondents strawberry growers by their level of sources of information used

Sr. No.	Sources of information	No. of the respondents (N = 110)	Percentage
1.	Low (up to 12 score)	26	23.63
2.	Medium (13 to 17 score)	69	62.72
3.	High (18 and above score)	15	13.65
	Total	**110**	**100.00**
Mean = 15.01		S.D. = 2.46	

From the Table 6 and Fig 6 it was observed that 62.72 per cent of the respondents were using medium sources of information, where as 23.63 per cent and 13.65 per cent of them had used low and high sources of information, respectively.

Thus, it is concluded that, more than half of the respondents strawberry growers had used medium sources of information.

This finding were in line with the finding of Khaire (2005) ,more than half of the respondents had medium level of source of information.

4.1.6 Cropping pattern

It denotes the crops grown by the strawberry growers in *kharif*, Rabi and summer season as well as annual and perennial crops in his farm. So it gives ideas about the importance of strawberry crop than other crops. The information about cropping pattern of the respondents strawberry growers were collected, tabulated and analyzed. The results are presented in Table 7 on the basis of Mean ± S.D.

Table 7 Distribution of the respondents strawberry growers by their cropping pattern used

Sr. No.	Cropping pattern	No. of the respondents (N = 110)	Percentage
1.	Poor (up to 2)	29	26.36
2.	Fair (3 to 6 score)	46	41.82
3.	Good (7 and above score)	35	31.82
	Total	**110**	**100.00**
Mean = 4.17		S.D. =2.06	

From the table 7 and fig 7 It was observed that, 41.82 per cent of the respondents strawberry growers had fair cropping pattern, while 31.82 per cent of them had good cropping pattern and 26.36 per cent of respondent had good cropping pattern.

Hence it is concluded that, one fourth of the respondents had poor cropping pattern.

This finding were in line with the finding of Wankhede (2008).

4.1.7 Cropping intensity

It gives an idea about the area actually cultivated by the respondents in year in per cent. It also gives picture about uncultivated land and actually cultivated land in a year by the respondents Strawberry growers. The distribution of Strawberry growers by their cropping intensity is presented in table 8.

Table 7 Distribution of the respondents strawberry growers by their cropping intensity

Sr. No.	Cropping Intensity	No. of the respondents (N= 110)	Percentage
1.	Low(up to 87)	27	24.54
2.	Medium (88 to 165 score)	59	53.64
3.	High (166 and above score)	24	21.82
	Total	**110**	**100.00**
Mean= 126.69 S.D.=39.09			

The result presented in the table 8 fig 8 indicates that, more than half of the (53.64 %) the respondents strawberry growers had medium cropping intensity with remaining 24.55 per cent and 21.82 per cent of them having low and high cropping intensity respectively. However it is found that average cropping intensity was 126.

Thus, it can be inferred that half of the respondents strawberry growers had medium cropping intensity.

This finding were in line with the finding of Wankhede (2008).

4.1.8 crop productivity

Crop productivity refers to crop yield per unit area of a crop expressed in qtls. per hectare. All the crops grown by the beneficiary farmers were taken into consideration. The information about crop productivity of the respondents strawberry growers were collected, tabulated and analyzed. The results are presented in Table 9 on the basis of range.

Table 9 Distribution of the respondents strawberry growers by their crop productivity

Sr. No.	Crop productivity	No. of the respondents (N = 110)	Percentage
1.	Low(up to 0.79 score)	97	88.18
2.	Medium (0.79 to 1.43 score)	00	00
3.	High (1.44 and above score)	13	11.82
	Total	**110**	**100.00**
Mean= 1.11		S.D.=0.32	

The result presented in the table 9 and fig 9 indicates that, majority of the respondents had medium level of crop productivity with remaining 11.81 per cent of the respondents had high level of crop productivity while there is no any the respondents had low level of crop productivity.

Thus, it can be inferred that majority of the respondents strawberry growers had medium crop productivity.

This finding were in line with the finding of Nikam *et al.*(2015).

4.1.9 Marketing behaviour

Marketing behaviour of the farmer affects directly to the economic status of respondent, which ultimately reflects in the income from the produce. The information about marketing behaviour of the Strawberry growers were collected, tabulated and analyzed. The results are presented in Table 10.

Table-10.Distribution of the respondents strawberry growers by their marketing behaviour

Sr. No.	Marketing behaviour	No. of the respondents (N = 110)	Percentage
1.	Low (up to 1.34 score)	31	28.18
2.	Medium (1.35 to 3.64 score)	53	48.18
3.	High (3.65 and above score)	26	23.64
	Total	**110**	**100.00**
Mean = 2.49		S.D. = 1.15	

From the Table 10 and fig 10 , it was observed that near about half of the respondents strawberry growers (48.18 %) had medium level of marketing behaviour, followed by 28.18 per cent and 23.64 per cent of them had low and high level of marketing behaviour , respectively.

Thus it was observed that near about half of the respondents (48.18 %) have medium level of marketing behaviour.

This finding were in line with the finding of Johnson *et. al.* (2009).

4.2 Knowledge of strawberry growers about sustainable cultivation practices followed in strawberry cultivation.

The data in respect of the knowledge level of strawberry growers about sustainable cultivation practices were collected and analyzed. From the analyzed data they were categorized on the basis of score obtained.

Table 11 Distribution of the respondents strawberry growers by their level of knowledge about sustainable cultivation practices.

Sr. No.	**Knowledge**	**No. of the respondents (N = 110)**	**Percentage**
1.	Low(up to 176)	21	19.09
2.	Medium (177 to 187 score)	69	62.72
3.	High (188 and above score)	20	18.19
	Total	**110**	**100.00**
Mean=181.85 S.D.=5.71			

It is observed from table 11 and fig 11 that a 62.72 per cent of strawberry growers had medium level knowledge , while 19.09 had low level of knowledge. Only 18.19 per cent of strawberry growers had high level of knowledge.

Thus, it could be stated that the knowledge level of majority of the respondents of satisfactory. This might be due to the fact that the most of the strawberry growers might have been exposed to the various sustainable cultivation practices. These might also be due to the better educational level and better socio economic status.

This finding were in line with the finding of Ghadage (2005), Raut (2006) and Howal (2008).

11.1.Practice wise knowledge of strawberry growers

The practice wise information pertaining to the knowledge level of strawberry growing the respondents about the sustainable cultivation practices were collected , tabulated and analyzed.

Table 12 Distribution of the respondent according to Practice wise knowledge about sustainable cultivation practices.

Sr.no.	Statement	Knowledge (N=110)					
		Full		Partial		No	
		F	%	F	%	F	%
1	**Land preparation**						
1.1	.Land preparation helps in,						
A	To Manage pest and weed incidence	95	86.36	15	13.63	-	-
B	To Increase infiltration rate	97	88.18	13	11.81	-	-
C	To Improve soil physical properties due to natural weathering	92	83.63	18	16.36	-	-
D	To Optimize nutrient availability	102	92.72	8	7.27	-	-
E	To Reduce erosion	91	82.72	19	17.27	-	-
F	To Increase the yield stability	104	94.54	6	5.45	-	-
G	To Balance nutrient flow	101	91.81	9	8.18	-	-
H	To It helps proper establishment of crop	108	98.18	2	1.81	-	-

i	To Enhance the uptake of nutrient from deeper layer	102	92.72	8	7.27	-	-
1.2	Ploughing the land						
A	By using bullock power	110	100	-	-	-	-
B	By using tractor / power tiller	110	100	-	-	-	-
1.3	Which is best method of planting?						
A	Flat bed	110	100	-	-	-	-
B	Raised bed	110	100	-	-	-	-
1.4	Do you have pollyhouse for planting of strawberry?	81	73.63	24	21.81	5	4.54
2	Nursery management	23	20.90	43	39.09	44	40.00
2	**Cropping Intensity**						
2.1	For better soil fertility strawberry should be rotated with						
A	Legumes	72	65.45	11	10	27	24.54
B	cereals	13	11.81	76	69.90	21	19.09
C	vegetables	64	58.18	26	23.63	20	18.18
D	d. all	5	4.54	8	7.27	97	88.18
2.2	Crop rotation helps to						
A	Increase the yield stability	88	80	12	10.90	10	9.09
B	Reduce weeds, pest and disease incidence	101	91.81	4	3.63	5	4.54
C	Recycling nutrient reserves from depth in the soil	102	92.72	5	4.54	3	2.72
D	Increases the Arthropod diversity	94	85.45	11	10	5	4.54
E	Transfer N from N-fixing species	85	77.27	13	11.81	12	10.90
3	**Planting**						
3.1	Do you know Spacing of raised beds ?						
A	4×3 m	76	69.09	14	12.74	20	18.18
B	4×4 m	83	75.45	12	10.90	15	13.63
3.2	Which is the proper timing of planting?						
A	March-April	83	75.45	11	10	16	14.54
B	September –October	62	56.36	32	29.09	16	14.54
C	November-December	106	96.36	4	03.63	-	-
3.3	What is a spacing between plant to plant and row to row ?						
A	45 × 60 cm	101	91.81	6	5.54	7	6.36

B	50 × 75 cm	95	86.36	8	7.27	3	2.72
3.4	Do you know about Propagation ?	110	100	-	-	-	-
	Season of propagation						
A	Blooming	102	92.72	5	4.54	3	2.72
3.5	.how much runners are produced						
A	12-18 runners	78	70.90	18	16.36	14	12.72
3.6	. Do you know how to take Care of young seedling ?						
	1.Soil should be well supplied with						
A	Moisture	95	86.36	11	10	4	3.63
B	Hoeing	98	89.09	7	6.36	5	4.54
C	Weed free	110	100	-	-	-	-
4	**Integrated nutrient management**						
4.1	Application of FYM to soil helps to :						
A	Increase the water holding capacity of the soil	110	100	-	-	-	-
B	Improve the physical properties of soil	110	100		-		-
C	Enhance microbial activity of soil	110	100	-	-	-	-
D	It maintains the balanced C:N ratio in the soil	52	47.27	28	25.45	30	27.27
E	Humic substances of FYM may act as a plant-growth stimulants	23	20.90	48	43.63	39	39.09
F	Any other	31	28.81	39	35.45	40	36.36
4.2	Amount of FYM/compost to be used per acre						
A	15-25 tonnes	62	56.36	26	23.63	22	20
4.3	Time of application of FYM						
A	Before sowing	110	100	-	-	-	-
B	After sowing	110	100	-	-	-	-
4.4	Do you know the vermicompost application?	98	89.09	12	10.90	00	00
A	5-10 t/ha vermicompost applied to field	82	74.54	18	16.36	10	9.09
4.5	Do you know green						

	manuring crops to be grown?						
A	Dhaincha	110	100	-	-	-	-
B	Sunhemp	32	29.09	12	10.90	66	60
C	Cowpea	99	90	11	10	-	-
4.6	Do you know the biofertilizer application?						
A	Azotobacter	78	70.90	12	10.90	20	18.18
B	Rhizobium	74	67.27	17	15.45	19	17.27
4.7	Which are the advantages of mulching?						
A	Reduces the evaporation rate and weeds	110	100	-	-	-	-
B	Reduces soil and water erosion	110	100	-	-	-	-
C	Encourages recycling of nutrients	110	100	-	-	-	-
D	Any other	-	-	-	-	110	100
4.8	Which type of mulching you practice?						
B	Trash mulch	110	100	-	-	-	-
C	Plastic mulch	110	100	-	-	-	-
4.9	Which chemical fertilizers are generally applied to strawberry?						
A	.Straight fertilizer	110	100	-	-	-	-
	Urea						
B	b.Mix fertilizer	110	110	-	-	-	-
	DAP						
C	c.Complex fertilizer	110	110	-	-	-	-
	19:19:19						
4.10	Do you know Fertilizer Dose?						
A	120kgN:100kgP:75kgK/ha	53	48.18	34	30.9	20	18.18
5	**Integrated Water Management**						
5.1	Do you know the different methods of irrigation?						
A	Drip	110	100	-	-	-	-
B	Furrow	110	100	-	-	-	-
C	Any other	-	-	-	-	-	-
5.2	What is a pH of soil required for strawberry crop?						

A	5-6	33	30	64	58.18	13	11.81
5.3	Do you know the time interval of irrigation?						
A	Per day	91	82.27	-	-	-	-
B	Weekly	19	17.27	-	-	-	-
C	Fortnightly	-	-	-	-	-	-
6	**Integrated pest management**						
6.1	Do you know the different method of weed management?						
A	Cultural methods	88	80	12	10.90	10	9.09
B	Hand weeding	110	100	-	-	-	-
C	Mulching	110	100	-	-	-	-
D	Use of improved implements	72	65.54	32	29.09	6	5.45
E	Use of herbicide	110	100	-	-	-	-
6.2	Which are the majour weeds in strawberry field?						
A	Ghol	91	82.72	19	17.27	-	-
B	Hariali	98	89.09	12	10.90	-	-
C	Reshim kata	108	98.18	2	1..81	-	-
6.3	Do you know the application of weedicide?	110	100				
A	Glyphosate	110	100	-	-	-	-
6.4	Do you know the different methods of IPM tools?						
A	Cultural methods	92	83.63	18	16.36	-	-
B	Mechanical method	86	78.18	24	21.81	-	-
C	Use of chemicals/pesticides	105	95.45	5	4.54	-	-
D	Biological method	16	14.54	21	19.09	73	66.36
E	Indigenous technical knowledge	32	29.09	14	12.72	64	58.18
6.5	Do you know the harmful pest of strawberry?						
A	Thrips	98	89.09	12	10.90	-	-
B	Red mites	110	100	00	-	-	-
C	Cutworms	62	56.36	16	14.54	32	29.09
D	Fruit borer	97	88.18	13	11.81	-	-
6.6	Do you know the application of pesticides ?						
A	Thrips – Emidachloprid/Rigent	103	93.63	7	6.36	-	-
B	Red mites – Majester	106	96.36	4	3.63	-	-
C	Cutworms – before planting dusting heptachlor in soil.	42	38.18	24	21.81	44	40

D	Fruit borer – corazen	92	83.63	14	12.72	6	5.45
6.7	Do you know the different tools of IDM ?						
A	Use of disease free seed material	110	100	-	-	-	-
B	Uproot and burn the disease affected plants	32	29.09	78	70.90	-	-
C	Biological methods	15	13.63	23	20.90	72	65.45
D	Use of chemicals	110	100	-	-	-	-
6.8	Do you know the diseases of strawberry ?						
A	Root rot	91	82.72	19	17.27	-	-
B	Powdery mildew	89	80.90	21	19.09	-	-
C	Anthracnose	98	89.09	12	10.90	-	-
D	Crown rot	86	78.18	24	21.81	-	-
E	Leaf blight	92	83.63	18	16.36	-	-
6.9	Do you know the chemicals used for controlling diseases?						
A	Root rot – curzate	92	83.63	12	10.90	6	5.45
B	Powdery mildew- Index	82	74.54	21	19.09	7	6.36
C	Anthracnose- Taqat	86	78.18	15	13.63	9	8.18
D	Leaf blight – curzate	71	64.54	24	21.81	15	13.63
6.10	Do you know the proper time of harvesting?						
A	For local market fruit should be harvested when fully ripe	110	100	-	-	-	-
B	For distant market fruit should be harvested still firm and colour not fully developed.	110	100	-	-	-	-
8	What management practices should be followed after harvesting to fetch good price in market?						
A	Sorting	110	100	-	-	-	-
B	Grading	72	65.45	26	23.63	12	10.90
C	Packing	85	77.27	25	22.72	-	-
D	Storing	54	49.09	22	20	34	30.90

4.2 Practice wise knowledge level of the respondents about sustainable cultivation practices.

The information pertaining the knowledge level of strawberry growers about the sustainable cultivation practices followed in strawberry cultivation given in table 12 is discussed as under.

1. Land preparation

The table 12 revealed that majority of farmers have complete knowledge about land preparation require for sustainable cultivation of strawberry.(i.e. It helps proper establishment of crop (98.18 %),to manage pest and diseases (95.86 %), to maintain the yield stability (94.54 %), to Enhance the uptake of nutrient from deeper layer (92.72 %), to Optimizing nutrient availability (92.72 %), to Balance nutrient flow (91.81 %), to Increase infiltration rate (88.18 %), to Improved soil physical properties (83.63 %), To Reduce erosion (82.72 %), while only few percent of the respondents had partial knowledge about land preparation require for sustainable cultivation of strawberry. (i.e. To Reduce erosion (17.27 %), to Improved soil physical properties (16.36 %),to manage pest and diseases (13.53 %), to Increase infiltration rate (11.81 %), Balance nutrient flow (8.18 %), to Optimizing nutrient availability (7.27 %), to maintain the yield stability (5.45 %) , to Enhance the uptake of nutrient from deeper layer (7.27 %). It helps proper establishment of crop (1.81 %).

It was observed that, cent per cent of the respondents had knowledge about methods of planting like flat bed and raised bed. 73.63 per cent of the respondents have complete knowledge about pollyhouse which used for strawberry cultivation while 21.81 per cent and 4.54 per cent of the respondents had partial and no knowledge about pollyhouse, respectively.

2. Nursery

It was revealed that, 20.90 per cent of the respondents had complete knowledge about nursery management and 39.09 per cent and 40.00 per cent of the respondents had partial knowledge and no knowledge about nursery management.

3. Cropping intensity

It was observed that ,the respondents had complete knowledge about strawberry rotated with legumes (65.45 %), vegetables (58.18 %), cereals (11.81 %), and all (4.54 %) for better soil fertility while the respondents had partial knowledge about strawberry rotated with cereals (69.90 %), vegetables (23.63 %), legumes (10.00 %), and all (7.27 %) and also some the respondents have no knowledge about strawberry rotated with legumes (65.45 %), vegetables (58.18 %), cereals (11.81 per cent all (4.54 %) for better soil fertility.

It was revealed that, majority of the respondents had complete knowledge about crop rotation helps to strawberry cultivation (i.e. Recycling nutrient reserves from depth in the soil (92.72 %), Reduce weeds ,pest and disease incidence (91.81 %), Increase the yield stability (80.00 %), Transfer N from N-fixing species (77.27 %), and few percent of the respondents had partial knowledge about crop rotation helps in strawberry cultivation (i.e. Recycling nutrient reserves from depth in the soil (92.72 %), Transfer N from N-fixing species (11.81 %), Increase the yield stability (10.90 %), Reduce weeds, pest and disease incidence (3.63 %) and It was observed that there is some of the respondents had no knowledge about crop rotation helps in strawberry cultivation (i.e. Transfer N from N-fixing species (10.90 %). Increase the

yield stability (9.09 %), Reduce weeds, pest and disease incidence (4.54 %) Recycling nutrient reserves from depth in the soil (2.72 %).

3. Panting

It was observed from table 12 that 69.09 per cent and 75.45 per cent of strawberry growers had complete knowledge about planting distance 4 × 3 m and 4 × 4 m respectively and 12.74 per cent and 10.90 per cent the respondents had partial knowledge about planting distance 4 × 3 m and 4 × 4 m respectively. Also 18.18 per cent and 14.54 per cent of strawberry growers had no knowledge about planting distance 4 × 3 m and 4 × 4 m respectively.

It was revealed from table 12 that 91.81 per cent and 86.36 per cent of strawberry growers had complete knowledge about spacing between pant to plant and row to row 45 × 60 cm and 50 × 75 cm respectively while 5.54 per cent and 7.27 per cent of the respondents had partial knowledge about spacing between pant to plant and row to row 45 × 60 cm and 50 × 75 cm respectively While 6.36 per cent and 2.72 per cent of strawberry growers had no knowledge about spacing between pant to plant and row to row 45 × 60 cm and 50 × 75 cm respectively.

4. Planting time

The data in table 12 Revealed that 75.45 per cent, 56.36 per cent and 96.36 per cent of the respondents had a complete knowledge about planting time of march-April, September-October and November-December respectively and 10 per cent, 29.09 per cent and 3.63 per cent of the respondents had a partial knowledge about planting time of March-April, September-October and November-December

respectively also 14.54 per cent of the respondent had a no knowledge about planting time of March-April and November-December respectively**.**

5. Season of propagation

It was observed that cent percent of the respondents had full knowledge about propagation but 92.72 per cent of the respondents had complete knowledge of season of propagation (blooming) while 4.54 per cent of had partial knowledge of season of propagation (blooming) and 2.72 per cent of the had no knowledge of season of propagation (blooming).

It was revealed that, 70.90 per cent of the respondents had complete knowledge about 12-18 runners are produced while 16.36 per cent of the respondents had partial knowledge about 12-18 runners are produced while 12.72 per cent of the respondents had complete knowledge about 12-18 runners are produced.

The result presented in table 12 shows that, majority of the respondents strawberry growers had complete knowledge about soil should be well supplied with moisture (86.36 %), hoeing (89.09 %) and cent per cent of the respondent had complete knowledge of weed free at seedling stage while 10 per cent and 6.36 per cent partial knowledge about moisture and hoeing respectively at seedling stage and 3.63 per cent and 4.54 per cent the respondents had no knowledge about soil should be well supplied with moisture and hoeing at seedling stage.

6. Integrated nutrient management

The data presented in table 12 shows that cent per cent of the respondents had knowledge about application of FYM helps in to Increase the water holding capacity of the soil and enhance microbial activity of soil. About 47.27 per cent and 20.90 per cent of the respondents had complete knowledge about maintains the balanced C:N ration in soil and Humic substance of FYM may act as plant growth stimulants respectively While 25.45 per cent and 43.63 per cent of the respondents had partial knowledge about, maintains the balanced C:N ration in soil and Humic substance of FYM may act as plant growth stimulants respectively while 39.09 per cent and 36.36 per cent of the respondents had no knowledge about maintains the balanced C:N ration in soil and Humic substance of FYM may act as plant growth stimulants respectively.

The data presented in table 12 shows that 56.36 per cent of the respondents had complete knowledge about amount of FYM compost used (15-25 tones/acre). While 23.63 per cent of the respondents had partial knowledge about amount of FYM compost used (15-25 tones/acre). While 20.00 per cent of the respondents had no knowledge about amount of FYM compost used (15-25 tones/acre).

It was revealed that, cent per cent of the respondents had complete knowledge about application of FYM before sowing.

It was observed that majority of the respondents had complete knowledge of application of vermicompost (89.09 per cent) while 10.90 per cent of the respondents had partial knowledge of application of vermicompost. About 74.54 per cent of the respondents had complete knowledge 5-10

tones/ha Vermicompost applied to field while 16.36 per cent of the respondents had partial knowledge 5-10 tones/ha vermicompost applied to field and 9.09 per cent of the respondents had no knowledge of 5-10 tones/ha vermicompost applied to field

It was revealed that, cent percent of the respondents had complete knowledge about green manuring crops like Dhaincha, sunhemp and cowpea.

The data presented in table 12 shows that 70.90 per cent and 67.27 per cent of the respondents had complete knowledge about biofertilizer application like azotobacter and rhizobium respectively while 10.90 per cent and 15.45 per cent of the respondents had partial knowledge about biofertilizer application like azotobacter and rhizobium respectively while 18.18 per cent and 17.27 per cent of the respondents had no knowledge about biofertilizer application like azotobacter and rhizobium respectively.

7. Mulching

It was revealed that, cent per cent of the respondents had complete knowledge about advantages of mulching (Reduces the evaporation rate and weeds, Reduces soil and water erosion, Encourages recycling of nutrient). cent percent of the respondents had complete knowledge about plastic and trash mulch

8. Chemical fertilizers

The present data reveals that, cent percent of strawberry growers had complete knowledge about straight fertilizers (urea), Mix fertilizers (DAP), complex fertilizers (19:19:19) but near about fifty per cent of the respondents (48.18 %) had complete knowledge about fertilizer dose of

strawberry while 30.90 per cent and 18.18 per cent the respondents had partial and no knowledge about fertilizer respectively.

9. Integrated water management

Cent per cent of the respondents had complete knowledge about method of irrigation like drip and furrow.

It was revealed that, only 30.00 per cent of the respondents have complete knowledge about pH of soil while 58.18 per cent and 11.81 per cent the respondents had partial and no knowledge about pH of soil (5-6) respectively.

It was revealed that, Majority of the respondents have complete knowledge about time interval of irrigation i.e. per day (82.27 %) ,and weekly (17.27 %).

10. Integrated pest management

10.1. Weed management

It was observed that, Majority of the respondents (80.00 %) had complete knowledge about cultural method of weed management while 10.90 per cent and 9.09 per cent of the respondents had partial and no knowledge about cultural method of weed management respectively.

Majority of the respondents had complete knowledge about major weeds on strawberry field i.e. ghol (82.72 %) , Hariali (89.09 %) and Reshim Kata (98.18 %) while some the respondents had partial knowledge about major weeds in strawberry field i.e. ghol (17.27 %), hariali (10.90 %) and Reshim kata (1.81 %).

Cent per cent of the respondents had complete knowledge about application of weedicide (glyphosate).

10.2 Integrated pest management

It was revealed that 83.63 per cent of the respondents had complete knowledge about cultural method of pest management followed by 78.18 per cent of the respondent had complete knowledge about mechanical method of pest management and majority of the respondent (95.36 %) had complete knowledge about chemicals used for pest control and some the respondents had partial knowledge about cultural method (16.36 %), mechanical method (21.81 %) and use of chemicals (4.54 %) for pest management.

It was observed that, majority of the respondents had complete knowledge about chemical used in controlling pests i.e. red mites-majester (96.36 %), thrips-emidachloprid/regent (93.63 %), and fruit borer-corazen (83.63 %), and cutworms-before planting dusting heptachlor in soil (38.18 %) While some the respondents had partial knowledge of chemicals used in controlling pests i.e cutworms-before planting dusting heptachlor in soil (21.81 %), fruit borer-corazen (12.72 %), thrips-emidachloprid/regent (6.36 %), and red mites-majester (3.36) and few the respondents had no knowledge about chemicals used in controlling pests i.e. cutworms-before planting dusting heptachlor in soil (40.00 %) and fruit borer-corazen (5.45 %).

It was revealed that, more than fifty per cent of the respondents (56.36 %) had complete knowledge about biological method of pest management while 29.09 per cent and 14.54 per cent the respondents had partial and no knowledge about biological method of pest management, respectively. About 29.09 per cent of the respondents had their complete indigenous knowledge while 12.72 per cent and

58.18 per cent the respondents had their partial and no indigenous knowledge about management of pest respectively.

Majority of the respondents had complete knowledge about majour pest in strawberry field i.e. thrips (89.09 %) ,red mites (cent percent) and fruit borer (88.18 %) while some the respondents had partial knowledge about major pest in strawberry field i.e. thrips (10.90 %), fruit borer (11.81 %). More than fifty per cent of the respondents had complete knowledge about cutworms (56.36 %) while 14.54 per cent and 29.09 per cent had partial and no knowledge about cutworms.

11. Integrated disease management

It was observed that, cent percent respondents had complete knowledge about different tools of integrated disease management (i.e. use disease free seed material and use of chemicals) while more than half of the respondents (56.60 %) had complete knowledge about biological method of disease management while 29.09 per cent and 14.54 per cent the respondents had partial and no knowledge about biological method of disease management, respectively.

It was revealed that, only 29.09 per cent of the respondents had complete knowledge about uproot the affected plants and burn it while 70.90 per cent of the respondents had partial knowledge about uproot the affected plants and burn it.

Majority of the respondents had complete knowledge about major diseases in strawberry field i.e. anthracnose (89.09 %), leaf blight (83.63 %) root rot (82.72 %), powdery mildew (80.90 %), while some the respondents had partial knowledge about major diseases in strawberry field i.e.

powdery mildew (19.09 %), root rot (17.27 %), leaf blight (16.36 %) and anthracnose (10.90 %).

It was observed that, majority of the respondents had complete knowledge about chemicals used in controlling diseases i.e. root rot – curzate (83.63 %), powdery mildew-index (74.54 %), Antracnose-Taqat (78.18 %) and leaf blight – curzate (64.54 %). While some the respondents had partial knowledge about chemicals used in controlling diseases i.e. root rot – curzate (83.63 %), Antracnose-Taqat (78.18 %) powdery mildew-index (74.54 %) and leaf blight – curzate (64.54 %) and few of the respondents had no knowledge about chemicals used in controlling diseases i.e. leaf blight – curzate (13.63 %) Antracnose-Taqat (8.18 %) ,powdery mildew-index (6.36 %) and root rot – curzate (5.45 %).

12. Proper time of harvesting

It was revealed that cent percent the respondents had complete knowledge about proper time of harvesting i.e. for local market fruit should be harvested when fully ripe and for distant market fruit should be harvested still firm and colour not fully developed.

13. Management after harvesting

13.1. Sorting

It was observed that, cent percent of the respondents had complete knowledge about sorting.

13.2. Grading

Present data reveals that ,near about two third of the respondents (65.45 %) had complete knowledge about grading while 23.63 per cent and 10.09 per cent of the respondents had partial and no knowledge about grading, respectively.

13.3. Packing

It was observed that, 77.27 per cent of the respondents had complete knowledge about packing while 22.72 per cent of the respondents had partial knowledge about packing.

14.4. Storing

Present data reveals that , 49.09 per cent of the respondents had complete knowledge about grading while 20.00 per cent and 30.90 per cent of the respondents had partial and no knowledge about storing, respectively.

4.3. Adoption of strawberry growers about sustainable cultivation practices.

The data in respect of the adoption level of strawberry growers about sustainable cultivation practices were collecteted and analyzed. From the analyzed data they were categorized on the basis of score obtained.

Table 13 Distribution of the respondents strawberry growers by their level of adoption about sustainable cultivation practices.

Sr. No.	Adoption level	No. of the respondents (N= 110)	Percentage
1.	Low(up to 104 score)	19	21.82
2.	Medium (104 to 110 score)	67	61.82
3.	High (111 and above score)	24	16.36
	Total	**110**	**100.00**
Mean=107.5 S.D.=3.19			

It is observed from table 13 and fig.13 that a 61.82 per cent of strawberry growers had medium level knowledge , while 21.82 had low level of adoption. Only 16.36 per cent of strawberry growers had high level of adoption.

This finding were in line with the finding of and Katkar (2001), Rathod (2008).

Table No 14 Distribution of Practice wise adoption level of sustainable cultivation practices followed in strawberry cultivation.

Sr. no.	Statement	Adoption N=110					
		Full		Partial		No	
		F	%	F	%	%	%
1	**Land preparation**						
1.1	Ploughing the land						
a	By using bullock power	18	16.36	-	-	92	83.63
b	By using tractor / power tiller	92	83.63	-	-	18	16.36
1.2	Which is best method adopt for planting?						
a	Flat bed	-	-	-	-	-	-
b	Raised bed	110	100	-	-	-	-
1.3	Do you have pollyhouse for planting of strawberry?	11	10	-	-	99	90
2	Nursery						
	You have nursery to grow seedlings?	14	12.72	7	6.36	89	80.90
2	**Cropping Intensity**						
2.1	For better soil fertility strawberry should be rotated with;						
a	Legumes	98	89.09	12	10.90	-	-
b	cereals	7	6.36	81	73.63	22	20.00
c	vegetables	58	52.72	21	19.09	31	28.18
d	All	1	0.90	3	2.72	106	96.36
3	**Planting**						
3.1	Do you know Spacing of						

	raised beds ?						
a	4×3 m	12	10.90	6	5.45	92	83.36
b	4×4 m	92	83.63	3	2.72	15	13.63
3.2	Which is the proper timing of planting?						
a	March-April	76	69.09	7	6.36	24	21.81
b	September –October	48	43.63	28	25.45	34	30.90
c	November-December	108	94.54	6	5.45	-	-
3.3	What is a spacing between plant to plant and row to row ?						
a	45 × 60 cm	81	73.36	6	5.45	23	20.90
b	50 × 75 cm	86	78.18	13	11.81	11	10
3.4	Do you know about Propagation ?	110	100	00	-	-	-
A	Season of propagation						
a	After Blooming season	91	82.72	9	8.18	10	9.09
3.5	. Do you know how to take Care of young seedling ?						
	1.Soil should be well supplied with						
a	Moisture	87	79.09	6	5.45	17	15.45
b	Hoeing	91	82.27	6	5.45	13	11.81
c	Weed free	110	100	-	-	-	-
4	**Integrated nutrient management**						
4.1	Amount of FYM/compost to be used per ha						
a	15-25 tonnes	56	50.90	23	20.90	31	28.81
4.2	Time of application of FYM						
a	Before sowing	110	110	-	-	-	-
b	After sowing	-	-	-	-	110	100
4.3	5-10 t/ha vermicompost applied to field	21	19.09	4	3.63	85	77.27
4.4	Do you adopt green manuring crops to be grown?						
a	Dhaincha	7	6.36	22	-	88	80
b	Sunhemp	32	29.09	7	6.36	71	64.54
c	Cowpea	3	2.72	7	6.36	103	93.63
4.5	Do you know the						

	biofertilizer application?						
a	Azotobacter	66	60	7	6.36	27	24.54
b	Rhizobium	42	38.18	9	8.18	59	53.63
4.6	Which type of mulching you practice?						
A	Trash mulch	-	-	-	-	110	100
B	Plastic mulch	110	100	-	-	-	-
4.7	Which chemical fertilizers are generally applied to strawberry?						
A	Straight fertilizer	110	100	-	-	-	-
	Urea						
B	Mix fertilizer	110	100	-	-	-	-
	DAP						
c	Complex fertilizer	110	100				
	19:19:19						
4.8	Do you adopt Fertilizer Dose?						
a	120kgN:100kgP:75kgK/ha	39	35.45	21	19.09	50	45.45
5	**Integrated Water Management**						
5.1	Do you adopt the different methods of irrigation?						
a	Drip	110	100	-	-	-	-
b	Furrow	-	-	-	-	110	100
c	Any other	-	-	-	-	-	-
5.2	Do you adopt the time interval for irrigation?						
a	Per day	91	82.27	-	-	-	-
b	Weekly	19	17.27	-	-	-	-
c	Fortnightly	-	-	-	-	-	-
6	**Integrated pest management**						
6.1	Do you adopt the different method of weed management?						
a	Cultural methods	79	71.81	8	7.27	23	20.90
b	Hand weeding	92	83.63	18	16.36	-	-
c	Mulching	110	100	-	-	-	-
d	Use of improved implements	66	60	25	22.72	19	17.27
e	Use of herbicide	7	6.36	2	1.81	101	91.81
6.2	Do you adopt the application of weedicide?						

a	Glyphosate	26	26.63	34	30.90	50	45.45
6.3	Do you adopt the different methods of IPM tools?						
a	Cultural methods	78	70.90	11	10	21	19.09
b	Mechanical method	79	71.81	11	10.00	20	18.18
c	Use of chemicals/pesticides	103	93.63	7	6.36	-	-
d	Biological method	13	11.81	24	21.81	74	67.27
e	Indigenous technical knowledge	21	19.09	11	10	78	70.90
f	Fruit borer	91	82.72	8	7.27	11	10
6.4	Do you adopt the application of pesticides ?						
a	Thrips – Emidachloprid/Rigent	73	66.36	5	4.54	32	29.09
b	Red mites – Majester	89	80.90	3	2.72	18	16.36
c	Cutworms – before planting dusting heptachlor in soil.	28	25.45	19	17.27	63	57.27
d	Fruit borer – corazen	86	78.18	9	8.18	15	13.63
6.5	Do you adopt the different tools of IDM ?						
a	Use of disease free seed material	110	100	-	-	-	-
b	Uproot and burn the disease affected plants	89	80.90	11	10	10	9.09
c	Biological methods	12	10.90	14	12.72	84	76.36
d	Use of chemicals	110	100	-	-	-	-
6.6	Do you know the chemicals used for controlling diseases?						
a	Root rot – curzate	85	77.27	7	6.36	18	16.36
b	Powdery mildew- Index	76	69.90	7	6.36	27	24.54
c	Anthracnose- Taqat	79	71.81	12	10.90	19	17.27
d	Leaf blight – curzate	66	60	21	19.09	23	20.90
6.7	Do you adopt the proper time of harvesting?						
a	For local market fruit should be harvested when fully ripe	110	100	-	-	-	-
b	For distant market fruit should be harvested still firm and colour not fully developed.	110	100	-	-	-	-
7	What management practices should be						

	followed after harvesting to fetch good price in market?						
a	Sorting	98	89.09	7	6.36	5	4.54
b	Grading	87	79.09	11	10	12	10.90
c	Packing	34	30.90	54	49.09	22	20
d	Storing	17	15.45	24	21.81	69	62.27

4.3.1 Practice wise adoption level of the respondents about sustainable cultivation practices.

The information pertaining the adoption level of strawberry growers about the sustainable cultivation practices followed in strawberry cultivation given in table14 is discussed as under.

1. Land preparation

The data reveals that, 16.36 per cent and 83.63 per cent of the respondents had completely adopted ploughing the land by bullock power and tractor power respectively while 83.63 per cent and 16.36 per cent of the respondents had no adoption of ploughing the land by bullock power and tractor power, respectively.

1.1. Method of planting

It was observed that, cent percent of the respondents had completely adopted of raised bed planting.

2. Cropping intensity

It was observed that ,majority of the respondents had had complete adoption about strawberry rotated with legumes (89.09 %),followed by vegetables (52.72 %), cereals (6.37 %) and all (0.90 %) for better soil fertility while the respondents had partial adoption about strawberry rotated with cereals (73.63 %), legumes (10.90 %), vegetables (19.09 %), and all (2.72 per cent). And the respondents had no

adoption about strawberry rotated with all (96.36 %), vegetables (28.18 %) and cereals (20.00 %) for better soil fertility.

3. Planting

It was observed from table 14 That 10.90 per cent and 92.00 per cent of strawberry growers had complete adoption about planting distance 4 × 3 m and 4 × 4 m respectively and 5.45 per cent and 2.72 per cent the respondents had partial adoption about planting distance 4 × 3 m and 4 × 4 m respectively also 83.36 per cent and 13.63 per cent of strawberry growers had no adoption about planting distance 4 × 3 m and 4 × 4 m respectively .

3.1 Planting time

The data in table 14 Revealed that 69.09 per cent, 43.63 per cent and 94.54 per cent of the respondents had a complete adoption about planting time of March-April, September-October and November-December respectively and 6.36 per cent, 25.45 per cent and 5.45 per cent of the respondents had a partial adoption about planting time of march-April, September-October and November-December respectively also 21.80 per cent and 30.90 per cent of the respondents had a no adoption about planting time of March-April and November-December respectively**.**

3.2. Panting distance

It was observed from table 14 that 73.36 per cent and 78.18 per cent of the respondents strawberry growers had complete adoption about spacing between pant to plant and row to row 45 × 60 cm and 50 × 75 cm respectively and 5.45 per cent and 11.81 per cent the respondents had partial adoption about spacing between pant to plant and row to row

45 × 60 cm and 50 × 75 cm respectively also 20.90 per cent and 10.00 per cent of the respondents strawberry growers had no adoption about spacing between pant to plant and row to row 45 × 60 cm and 50 × 75 cm respectively.

4. Season of propagation

The result presented in table 14 shows that, majority of the respondents strawberry growers had complete adoption about soil should be well supplied with hoeing (82.27 %), moisture (79.09 %) and cent percent of respondent had complete knowledge about weed free at seedling stage while 5.45 per cent of the respondents had partial adoption about moisture and hoeing while 15.45 per cent and 11.81 per cent the respondents had no adoption about soil should be well supplied with moisture and hoeing at seedling stage.

5. Integrated nutrient management

The data presented in table 14 shows that 50.90 per cent of the respondents had complete adoption about amount of FYM compost used (15-25 tones/acre) while 20.90 per cent of the respondents had partial adoption about amount of FYM compost used(15-25 tones/acre). and 28.31 per cent of the respondents had no adoption about amount of FYM used (15-25 tones/acre).

It was revealed that, cent percent of the respondents had complete adoption of application of FYM before sowing.

It was observed that, only 19.09 per cent of the respondents had complete complete adoption of vermicompost (5-10 tones/ha) applied to field while 3.63 per cent of the respondents had partial adoption vermicompost (5-10 tones/ha) applied to field while 77.27 per cent of the

respondents had no adoption of vermicompost (5-10 tones/ha) applied to field.

5.1. Green manuring crops

It was revealed that, 6.36 per cent of the respondents had complete adoption of green manuring crop (i.e. dhaincha). while 20 per cent and 80 per cent of the respondents had partial and no adoption green manuring crop (i.e. dhaincha).

It was observed that, 29.09 per cent of the respondents had complete adoption of green manuring crop (i.e. sunhemp). while 6.36 per cent and 64.54 per cent of the respondents had partial and no adoption green manuring crop (i.e. sunhemp).

It was revealed that, 2.72 per cent of the respondents had complete adoption of green manuring crop (i.e. cowpea). While 6.36 per cent and 93.36 per cent of the respondents had partial and no adoption green manuring crop (i.e. cowpea).

5.2. Biofertilizers

The data presented in table 14 shows that 60.00 per cent and 42.00 per cent of the respondents had complete adoption of biofertilizer application like azotobacter and rhizobium respectively while 6.36 per cent and 8.18 per cent of the respondents had partial adoption of biofertilizer application like azotobacter and rhizobium respectively and 24.54 per cent and 53.63 per cent of the respondents had no adoption of biofertilizer application like azotobacter and rhizobium respectively.

5.3. Mulching

It was observes that, cent percent of the respondents had complete adoption of plastic mulch and no adoption of trash mulch.

5.3. Chemical fertilizers

The present data reveals that, cent per cent of strawberry growers had complete adoption about straight fertilizers (urea), Mix fertilizers (DAP), complex fertilizers (19:19:19) but near about more than one third of the respondents (35.45 %) had complete adoption of fertilizer dose of strawberry while 19.09 per cent and 45.45 per cent the respondents had partial and no adoption of fertilizer respectively.

6. Integrated water management

6.1. Integrated pest management

6.1.1. Weed management

It was observed that, 71.80 per cent of the respondents had complete adoption of cultural method of weed management while 7.27 per cent and 20.90 per cent of the respondents had partial and no adoption of cultural method of weed management respectively.

Majority of the respondents had complete knowledge about hand weeding (83.63 %).

It was revealed that, 60.00 per cent of the respondents had complete adoption of weed management by improved implements while 22.72 per cent and 1.81 per cent of the respondents had partial and no adoption of weed management by improved implements, respectively.

It was revealed that, only 6.36 per cent of the respondents had complete adoption of use of herbicide for

control of weeds while 1.81 per cent and 91.81 per cent had partial and no adoption of use of herbicide for control of weeds respectively.

It was observed that, only 6.36 per cent of the respondents had complete adoption of use of glyphosate for control of weeds 1.81 per cent and 91.81 per cent of the respondents had partial and no adoption of glyphosate for control of weeds.

6.2. Integrated pest management

It was observed that, 70.90 per cent of the respondents had complete adoption of cultural method of pest management while 10.00 per cent and 19.09 per cent the respondents had partial and no adoption of cultural method of pest management respectively.

The data reveals that, 71.81 per cent and 93.63 per cent of the respondents had complete adoption of mechanical method and use of chemicals for controlling pest respectively and 6.36 per cent and 21.81 per cent of the respondents had partial adoption of mechanical method and use of chemicals for controlling pest respectively, also 18.18 of the respondents had no adoption of use of chemicals for controlling pest.

It was reveals that, 11.81 per cent of the respondents had complete adoption of biological method of pest management while 21.81 per cent and 67.27 per cent the respondents had partial and no adoption about biological method of pest management, respectively.

It was observed that, About 19.09 per cent of the respondents had their complete indigenous technical adoption while 10 per cent and 70.90 per cent the respondents had

their partial and no indigenous technical adoption for management of pest, respectively.

It was observed that, majority of the respondents had complete adoption chemical used in controlling pests i.e. red mites-majester (80.90 %), fruit borer-corazen (78.18 %) thrips-emidachloprid/rigent (66.36 %) and cutworms-before planting dusting heptachlor in soil (25.45 %), While some the respondents had partial adoption of chemicals used in controlling pests i.e. cutworms-before planting dusting heptachlor in soil (17.27 %), fruit borer-corazen (8.18 %), thrips-emidachloprid/regent (4.54 %) and red mites-majester (2.72 %), and few the respondents had no adoption about chemicals used in controlling pests i.e. thrips-emidachloprid/regent (29.09 %), red mites-majester (16.36 %), cutworms-before planting dusting heptachlor in soil (57.27 %) and fruit borer-corazen (13.63 %).

7. Integrated disease management

It was observed that, cent percent of the respondents had complete adoption of use of disease free seed materials different tools of integrated disease management followed by uproot and burn the disease affected plants and use of chemicals (80.90 %) while 10.90 per cent of the respondents had complete adoption of biological method of disease management and 12.72 per cent and 76.36 per cent of the respondents had partial and no adoption of biological method of disease management, respectively.

Majority of the respondents had complete knowledge about major diseases in strawberry field i.e. anthracnose (89.09 %), leaf blight (83.63 %), root rot (82.72 %) and powdery mildew (80.90 %), while some the respondents

had partial knowledge about major diseases in strawberry field i.e. powdery mildew (19.09 %), root rot (17.27 %), leaf blight (16.36 %), and anthracnose (10.90 %).

It was observed that, number of the respondents had complete adoption about chemicals used in controlling diseases i.e. root rot – curzate (77.25 %), Antracnose-Taqat (71.81 %), powdery mildew-index (69.90 %), and leaf blight – curzate (60.00 %). While some of the respondents had partial adoption of chemicals used in controlling diseases i.e. leaf blight – curzate (19.09 %), Antracnose-Taqat (10.90 %), root rot – curzate (6.36 %) and powdery mildew-index (6.36 %) few the respondents had no adoption about chemicals used in controlling diseases i.e. root rot – curzate (16.36 %), powdery leaf blight – curzate (20.90 %), mildew-index (24.54 %), and Antracnose-Taqat (17.27 %).

8. Proper time of harvesting

It was revealed that all the respondents had complete adoption of proper time of harvesting i.e. for local market fruit should be harvested when fully ripe and for distant market fruit should be harvested still firm and color not fully developed.

9. Management after harvesting

9.1 Sorting

Present data reveals that, 89.09 per cent of the respondents had complete adoption about sorting while 6.36 per cent and 4.54 per cent of the respondents had partial and no adoption about sorting, respectively.

9.2 Grading

Present data reveals that, 79.09 per cent of the respondents had complete adoption about grading while 10.00

per cent and 10.90 per cent of the respondents had partial and no adoption about grading, respectively.

9.3 Packing

It was observed that, 30.90 per cent of the respondents had complete adoption about packing while 49.09 per cent and 20 per cent of the respondents had partial adoption and no about packing.

9.4 Storing

The data reveals that, 15.45 per cent of the respondents had complete adoption about grading while 21.81 per cent and 62.72 per cent of the respondents had partial and no adoption about storing, respectively.

4.4 Relationship of selected independent variables with their knowledge level strawberry growers about sustainable cultivation practices.

To ascertain the relationship between strawberry growers knowledge level about various sustainable practices and their selected characteristics, the correlation test was applied. On the basis operational measures developed for the variables , hypothesis were stated for testing the relationship and their significance and correlation.

Table no. 15 The correlation coefficient between knowledge and various independent variables

Sr.No	Variables	'r' value's
1	Age	-0.279*
2	Education	0.266*
3	Land holding	0.032NS
4	Annual income	0.296*
5	Source of information	0.370*
6	Cropping pattern	0.204**
7	Cropping intensity	0.208**
8	Crop productivity	-0.015 NS
9	Marketing behavior	0.040 NS

*-significant at 0.01 per cent level

**-significant at 0.05 per cent level

NS- Non-significant

4.4.1.1.Age and Knowledge

The relationship between age and knowledge level of the respondents was found to be negative and significant at 0.01 per cent level.

Age and knowledge of strawberry growers had significant relationship, it indicated that both variables are related to each other.

Thus the hypothesis that age of respondents strawberry growers related with knowledge about sustainable cultivation practices is accepted.

4.4.1.2. Education and Knowledge

It was observed from the study that the education and knowledge level of the respondents had positively significant at 0.01 per cent level.

Thus the hypothesis that education of respondents strawberry growers related with knowledge about sustainable cultivation practices is accepted.

4.4.1.3.Size of land holding and knowledge

The relationship between size of land holding and knowledge level of strawberry growers was found non-significant.

Thus the hypothesis that size of land holding of respondents strawberry growers not related with knowledge about sustainable cultivation practices is rejected.

4.4.1.4.Annual income And knowledge

The relationship between annual income and knowledge level of strawberry growers about sustainable cultivation practices of the respondents was found to be positive and significant at 0.01 per cent level.

Thus the hypothesis that annual income of respondents strawberry growers related with knowledge about sustainable cultivation practices is accepted.

4.4.1.5.Source of information and knowledge

The relationship between source of information and knowledge level of strawberry growers about sustainable cultivation practices was found to be positive and significant at 0.01 per cent level.

Thus the hypothesis that source of information of respondents strawberry growers related with knowledge about sustainable cultivation practices is accepted.

4.4.1.5.Cropping pattern and knowledge

The relationship between cropping pattern and knowledge level of strawberry growers about sustainable

cultivation practices was found to be positive and significant at 0.05 per cent level.

Thus the hypothesis that cropping pattern of the respondents strawberry growers related with knowledge about sustainable cultivation practices is accepted.

4.4.1.6.Cropping intensity and knowledge

The relationship between cropping intensity and knowledge level of strawberry growers about sustainable cultivation practices was found to be positive and significant at 5 percent level.

Thus the hypothesis that cropping intensity of respondents strawberry growers related with knowledge about sustainable cultivation practices is accepted.

4.4.1.7.Crop productivity and knowledge

The relationship between crop productivity of strawberry and knowledge level of strawberry growers about sustainable cultivation practices was found to be negative and non-significant.

Thus the hypothesis that crop productivity of respondents strawberry growers not related with knowledge about sustainable cultivation practices is rejected.

4.4.1.8.Marketing behaviour and knowledge

The relationship between source of information and knowledge level of strawberry growers about sustainable cultivation practices was found to be non significant.

Thus the hypothesis that marketing behaviour of respondents strawberry growers not related with knowledge about sustainable cultivation practices is rejected.

4.4.2. Relationship of selected independent variables with their adoption level strawberry growers about sustainable cultivation practices.

To ascertain the relationship between adoption level of strawberry growers about various sustainable practices and their selected characteristics, the correlation test was applied. On the basis operational measures developed for the variables, hypothesis were stated for testing the relationship and their significance and correlation.

Table No . 16 The correlation coefficient between adoption and various independent variable

Sr.No	Variable	'r' value's
1	Age	-0.194**
2	Education	0.196**
3	Land holding	0.107NS
4	annual income	0.230**
5	Source of information	0.376*
6	Cropping pattern	-0.273*
7	Cropping intensity	0.201**
8	Crop productivity	0.042NS
9	Marketing behavior	0.045NS

*-significant at 1 per cent level

**-significant at 5 per cent level

NS- Non-significant

4.4.2.1.Age and adoption

The relationship between age and adoption level of the respondents was found to be negative and significant at 5 per cent.

Thus the hypothesis that age of respondents strawberry growers related with adoption of sustainable cultivation practices is accepted.

4.4.2.2.Education and adoption

It was observed from the study that the education and adoption level of the respondents had positively significant at 5 per cent.

Thus the hypothesis that education of respondents strawberry growers related with adoption of sustainable cultivation practices is accepted.

4.4.2.3.Size of land holding and adoption

The relationship between size of land holding and adoption level of strawberry growers was found non-significant.

Thus the hypothesis that size of land holding of respondents strawberry growers not related with adoption of sustainable cultivation practices is rejected.

4.4.2.4.Annual income And adoption

The relationship between annual income and adoption level of strawberry growers about sustainable cultivation practices of the respondents was found to be positive and significant at 0.05 per cent level.

Thus the hypothesis that annual income of respondents strawberry growers related with adoption of sustainable cultivation practices is accepted.

4.4.2.5.Source of information and adoption

The relationship between source of information and adoption level of strawberry growers about sustainable cultivation practices was found to be positive and significant at 0.01 per cent.

Thus the hypothesis that source of information of respondents strawberry growers related with adoption of sustainable cultivation practices is accepted.

4.4.2.6.Cropping pattern and adoption

The relationship between cropping pattern and adoption level of strawberry growers about sustainable cultivation practices was found to be negative and significant at 0.01 per cent level.

Thus the hypothesis that cropping pattern of respondents strawberry growers related with adoption of sustainable cultivation practices is accepted.

4.4.2.7.Cropping intensity and adoption

The relationship between cropping intensity and adoption level of strawberry growers about sustainable cultivation practices was found to be positive and significant at 0.05 per cent level.

Thus the hypothesis that cropping pattern of respondents strawberry growers related with adoption of sustainable cultivation practices is accepted.

4.4.2.8.Crop productivity and adoption

The relationship between crop productivity and adoption level of strawberry growers about sustainable cultivation practices was found to be non-significant.

Thus the hypothesis that crop productivity of respondents strawberry growers not related with adoption of sustainable cultivation practices is accepted.

4.4.2.9.Marketing behaviour and adoption

The relationship between marketing behaviour and adoption level of strawberry growers about sustainable cultivation practices was found to be non-sgnificant.

Thus the hypothesis that marketing behaviour of respondents strawberry growers not related with adoption of sustainable cultivation practices is rejected.

4.5 constraints faced by the strawberry growers

In adoption of sustainable cultivation practices by strawberry growers, every strawberry grower have many problem in respect of sustainable cultivation practices and marketing of produce. This constraints presented in Table. 18

Table 17 constraints faced by the respondents in the adoption of sustainable cultivation practices.

Sr. No.	Constraints	Frequ -ency	Per- cent (N=110)
1	Lack of knowledge about bilological control measures of insect pest and disease management	101	91.81
2	Shortage of irrigation water during summer season	96	87.27
3	High cost of manures and fertilizer	92	83.63
4	Lack of technical knowledge about doses of manure fertilizers , pesticides and insecticides	91	82.72
5	Shortage of labour	86	78.18
6	High cost of insecticide and pesticide	83	75.45
17	Lack of awareness about sustainable farming	79	71.80
	Unavailability of cold storage facilities near by the locality of the respondents.	74	67.27
8	Lack of knowledge about improved sustainable practices in strawberry	72	65.45

	cultivation.		
9	Market rates are not known in time	71	64.71
10	Lack of finance	35	31.81
11	Lack of technical knowledge about grading and packing	13	11.81

The above table 17 revealed that strawberry growers faced number of problems while adopting sustainable cultivation practices

It was observed that lack of knowledge about biologically control measures of insect pest and diseases and lack of technical knowledge about doses of manures and fertilizers were the major constraints made by 91.81 per cent and 82.72 per cent of strawberry growers, respectively. High cost of insecticides and pesticides was the constraints faced by 75.45 per cent strawberry growers. the respondents further expressed that they face the problem of none availability of cold storage facility (67.27 %) after harvesting of strawberry which causes major losses in strawberry production. The respondents also expressed about high cost of manures and fertilizers (83.63 %) and market rate not known in time (64.71 %).

Shortage of finance (31.81 %) , shortage of labour (78.18 %), lack of knowledge about improved sustainable practices of strawberry cultivation(65.45 %), shortage of irrigation water during summer season (64.71 %) and lack of technical knowledge about grading and packing(11.81 %) were the constraints faced by the respondents in adoption of sustainable cultivation practices in strawberry cultivation.

The majority of findings were consisting with the observation made by Prasad et al. (1996), Sawant (1996) , Yelpanekar et al. (2000) Dhakane (2005).

4.6. Suggestion made by the strawberry growers to overcome the constraints in adoption of sustainable cultivation practices followed in strawberry cultivation.

An attempt was made to ascertain the suggestions from strawberry growers to overcome constraints faced by them in adoption of sustainable cultivation practices. The respondents were requested to offer their valuable suggestion if any against the difficulties faced by them in adoption of sustainable cultivation practices. The information regarding the suggestions made by them collected and analyzed. The finding are presented in the table18.

Table 18 The distribution of the respondents by their suggestions made to overcome their problems faced in the adoption of sustainable cultivation practices in strawberry cultivation.

Sr.no.	Suggestions	Frequency	Percent (N=110)
1	Adequate provision for obtaining remunerative prices be made available	103	93.63
2	Information about market prices of different markets should be made available.	102	92.72
3	The subsidies on drip irrigation system may be increased.	96	87.27
4	Availability of bio-insecticide and bio- pesticides at cheaper rate.	92	83.63
5	The practical knowledge regarding plant protection and fertilizer application at proper time be imparted.	91	82.72
6	The various input like fertilizer insecticides and fungicides should be made available at	86	78.18

	proper time and at cheaper rate.		
7	Proper field demonstrations about biological control of disease pest and insect by research stations/scientist	82	74.54
8	Govt. should encourage to start the strawberry processing unit in rural area.	61	55.45
9	Govt. should encourage the farmers about the export of strawberry.	52	47.27
10	Cold storage facility made available at reasonable rates and at near by locality.	48	43.63

From the above table 18 it indicates that most of the strawberry growers made suggestions which were mostly related to marketing aspects. According to them there had been never had been a need of proper provisions of obtaining remunerative prices of strawberry (93.63 %). This suggestions cripped in because market prices of strawberry were reported were highly fluctuating and grape growers invested more amount in production of strawberry. So they suggested for assured remunerative prices , also strawberry growers suggested that information about market prices of different market should be available (92.72 %) to them.

A majority of strawberry growers suggested that availability of proper field demonstrations about biological control of disease, pest and insects by research stations/scientist (74.54 %) which increases the awareness of sustainable practices. Also strawberry growers suggested the availability of bio-insecticides and bio-pesticides at cheaper rate (83.63 %). Also strawberry growers suggested to increase the subsidy on drip irrigation system by government.

About 82.72 per cent of the respondents suggested that the practical knowledge regarding plant protection and fertilizer application at proper time be imparted because it directly influence the sustainable cultivation practices also suggested the various input like fertilizer insecticides and fungicides should be made available at proper time and at cheaper rate (78.18 %).

The Govt. should encourage to start the strawberry processing units in rural areas near by their locality was the suggestions made by 55.45 per cent of strawberry growers which is followed by suggestion that Govt. should encourage the farmers about the export of strawberry (47.27 %).

5.SUMMARY, CONCLUSIONS AND IMPLICATIONS

This chapter deals with the summary of the findings of the study and their implications for the further line of action and research.

In an agrarian country like India national income is born by agricultural industries. In the near future farmers will be required to harvest more fruit crops to fulfill the need of increasing population. On the other hand they will also be required to produce more fruit crops for supplying them as a raw material to the fruits based agro-industries and for export marketing under these circumstances, it is essential to plan a strategy for enhancing the fruit production, the success of which depends on the farmers share in such strategy of increasing fruit production.

The adoption of sustainable cultivation practices by the farmers therefore, become imperative, to increase agricultural production. However, it is well known that there persists a gap between pace of research and the readiness with which farmers accepts its findings.

Strawberry is important fruit crop of India and its commercial production is possible in temperate and subtropical climate in India. It is generally cultivated in the hills. Strawberry is also successfully cultivated in plains also in Maharashtra around Pune ,Nashik and Sangali districts of Maharashtra. It is cultivated commercially in Himachal Pradesh , Uttar Pradesh, Maharashtra, West Bengal, Nilgiri hills, Delhi, Haryana, Kashmir valley and Punjab. Main centres of strawberry cultivation are Nainital (Himachal Pradesh), Deharadun (Uttarakhnd), Mahabaleshwar

(Maharashtra), Kashmir valley, Benglore, Kalimpong (West Bengal). In Mahabaleshwar Tahsil area under strawberry cultivation was 850 ha. in which 1800 farmers were engaged which produces 20000 tonnes of strawberry which have an worth goes above 100 crore.

Though the hectares under this crop is increasing per hectare yield of strawberries is not yet reached to desired extent. It can be increased by efficient use of available resources and adoption of sustainable cultivation practices strawberry growers might be facing certain problems in cultivation of the crop. The present study was attempted at this direction.

The research study entitled the **"Analysis of sustainable practices followed in strawberry cultivation"** was undertaken with the following specific objectives. To study the profile of the respondents.

1. To study the profile of the respondents.
2. To study extent of knowledge about sustainable practices followed by the respondents.
3. To study extent of adoption about sustainable practices followed by respondents.
4. To study the relationship of profile of respondents with knowledge and adoption.
5. To elicit constraints and obtain suggestion experienced by respondents.

The methodological procedure consists of measurement of knowledge and adoption as dependent variable and selected characteristics of the strawberry growers as independent variables, research site, selection of villages, selection of respondents, measurement of variables, tools as well as

techniques of data collection and analysis of data. Statistical measures such as percentage, frequencies, mean, standard deviation, coefficient of correlation were also used.

On the basis of maximum area and production under strawberry in Mahabaleshwar tahsil of the Satara district was purposefully selected for the study. The interview schedule was developed in accordance with the objectives laid down in the study. The developed schedule was pre-tested before using it for collecting the data. The findings of this study are based on the data collected by interviewing 110 respondents from 6 villages of Mahabaleshwar tahsil from Satara district. The information collected were processed and statistically analysed. The findings are presented and discussed by using the frequencies and percentages. The coefficient of correlation (r) was computed for finding out the relationship between the selected characteristics of strawberry growers with their level of knowledge and adoption of sustainable cultivation practices as dependent variable. The summary of important finding is given in following pages.

5.1 Summary :

5.1.1 It was observed that 48.18 per cent of the respondents belonged with middle age group, while 40.00 per cent and 11.82 per cent of strawberry growers belonged to middle and old age group, respectively.

5.1.2 It was revealed that 40.00 per cent of the respondents strawberry growers were educated up to secondary school level, while 25.45 per cent of the respondents had received college education, remaining 21.82 per cent of the respondents were educated up to higher

secondary and 10.00 per cent of the respondents had received primary education and only 2.73 per cent of the respondents were illiterate.

5.2.3 It is observed that 44.55 per cent of the strawberry growers had medium size of land holding between 2.01 to 4.00 hectares, while 20.00 per cent of them had small size of land holding 1.01 to 2.00 ha followed by 18.18 per cent of them had marginal size of land holding up to 1.00 ha and only 17.27 per cent of respondent had large size of farm holding more than 4.01 ha.

5.2.4 It was observed that, 68.18 per cent of the strawberry growers had medium annual income in between Rs. 237453 to 599912/-, while 18.19 per cent of them had high annual income of Rs. 599913 and above and Only 15.00 per cent of them had low annual income up to Rs. 237452/-.

5.1.5 it was observed that 62.72 per cent of the respondents were using medium sources of information, whereas 23.63 per cent and 13.64 per cent of them had used low and high sources of information, respectively.

5.1.6 It was observed that, 41.82 per cent of the respondents strawberry growers had fair cropping pattern, while 31.82 per cent of them had good cropping pattern and 26.36 per cent of respondent had good cropping pattern

5.1.7 It was revealed that , more than half of the (53.64 %) the respondents strawberry growers had medium cropping intensity with remaining 24.55 per cent and 21.82 per cent of them having high and low cropping intensity respectively.

5.1.8 It was observed that, majority of the respondents had medium level of crop productivity with

remaining 11.81 per cent of the respondents had high level of crop productivity while there is no any the respondents had low level of crop productivity.

5.1.9 It was observed that near about half of the respondents strawberry growers (48.18 %) had medium level of marketing behaviour, followed by 28.18 per cent and 23.64 per cent of them had low and high level of marketing behaviour , respectively.

5.1.10 Overall knowledge level of strawberry growers :

It was observed from table 13 that a 62.72 per cent of strawberry growers had medium level knowledge , while 19.09 per cent had low level of knowledge. Only 18.19 per cent of strawberry growers had high level of knowledge

5.1.11 Overall adoption level of strawberry growers

It was observed that a 61.82 per cent of strawberry growers had medium level adoption, while 21.82 per cent had low level of adoption and Only 16.36 per cent of strawberry growers had high level of adoption.

5.1.12 Practice wise knowledge of the respondents about sustainable cultivation practices followed in strawberry cultivation.

It was revealed that, majority of respondents (80.00%) had complete knowledge about land preparation while cent percent of respondent had complete knowledge about ploughing the land by using bullock power, by using tractor/power tiller and method of planting (flat bed and raised bed). 73.63 per cent of respondents had complete knowledge about pollyhouse used for planting but about 40.00 per cent of respondents had no knowledge about nursery management.

65.45 per cent of respondents had complete knowledge about strawberry rotated with legumes. More than 80.00 per cent of respondents had complete knowledge about importance crop rotation.75.45 per cent of respondents had complete knowledge about spacing of raised beds (4 × 4 m). Majority of respondents had proper knowledge about planting time of strawberry (November-December). Majority of respondents had complete knowledge about plant to plant and row to row spacing (45 × 60 m and 50 × 75 m). Cent per cent of respondents had complete knowledge about propagation and 92.72 per cent of respondents had knowledge about season of propagation. Majority of respondents had complete knowledge about soil should be supplied with moisture, hoeing and weed free. Cent percent of respondets had complete knowledge importance of application of FYM to soil and time of application. Majority of respondents had complete knowledge about vermicompost application and their dose. Cent percent of respondents had knowledge about green manuring (Dhaincha). Near about 70.00 per cent of repsondents had complete knowledge about biofertilizer application (Azotobacter and Rhizobium). Cent percent of respondets had complete knowledge about advantages of mulching (trash mulch and plastic mulch). Cent percent of respondents had complete knowledge about fertilizers generally applied to field. Only 48.18 per cent of respondents had complete knowledge about dose of fertilizer used in strawberry field. .

Cent percent of respondents had complete knowledge about different methods of irrigation (Drip, Furrow). Only 30.00 per cent of respondents had knowledge about pH of soil required for strawberry crop. 82.27 per cent of respondents had complete knowledge about time interval of irrigation (per day). Majority of

respondents complete knowledge about integrated weed management and major weeds of strawberry field. Majority of respondents complete knowledge about integrated pest management and major pest of strawberry field. More than 80.00 per cent respondents had complete knowledge about application of pesticides. Majority of respondents complete knowledge about integrated disease management and major diseases of strawberry field. More than 80.00 per cent respondents had complete knowledge about application of chemicals used to controlling diseases. Cent percent of respondents complete knowledge about proper time of harvesting. Cent percent of respondents had complete knowledge about post harvesting practices like storing and about 30.90 per cent of respondents had no knowledge about storing.

5.1.12 Practice wise adoption of the respondents about sustainable cultivation practices followed in strawberry cultivation.

It was observed that, 83.63 per cent of respondents had complete adoption of ploughing the land by using tractors/ power tiller. Cent per cent of respondents had adoption of raised bed for planting. About 90.00 per cent of respondents had no adoption of pollyhouse for strawberry cultivation. Majority of respondents had no adoption of nursery grow seedlings. 89.09 per cent of respondents had complete knowledge about strawberry rotated with legumes.

It was observed that, 83.63 per cent of respondents had complete adoption of spacing of raised beds (4 × 4 m). About 94.54 per cent of respondents had complete adoption of proper timing of planting (November-December). About 82.27 per cent of respondents had complete adoption propagation after blooming

season. Majority of respondents had adoption of soil should be well supplied with moisture, hoeing and weed free. About 50.90 per cent of respondents had adoption of amount of FYM used per acre. About 77.27 per cent of respondents had no adoption of application of vermicompost application. Majority of respondents had no adoption of green manuring crop (Dhaincha, sunhemp and cow pea). 60.00 per cent of respondents had complete adoption of biofertilizer application. Cent per cent of respondents had complete adoption of plastic mulch and fertilizers generally used in strawberry cultivation while about 50.00 per cent of respondent had no adoption of fertilizer dose. Cent per cent of respondents had complete adoption method of irrigation (drip). Majority of respondents (82.27 %) had complete adoption of the time interval of irrigation (per day). Majority of respondents had complete adoption of integrated weed management. Majority of respondents had complete adoption of integrated pest management. 80.90 per cent of respondents had adoption of majester for controlling of red mites. Majority of respondents had complete adoption of integrated pest management.77.27 per cent of respondents had adoption of curzate for controlling root rot. Cent percent of respondents complete adoption of proper time of harvesting. About 89.09 per cent of respondents had complete adoption of sorting while 62.27 per cent of respondents had no adoption of storing.

5.4 Relationship between selected independent variables and extent of knowledge and adoption.

personal, socio-economic, communicational and psychological characteristics, age of respondents was negatively correlated with knowledge and adoption at 0.01 per cent and 0.05 percent level respectively.

While, education, annual income, and source of information exhibited positively and significant relationship with knowledge and Adoption of respondents. While, land holding , crop productivity and marketing behavior exhibited non-significant relationship with knowledge and adoption.

The cropping intensity was exhibited positive and significant relationship with knowledge and adoption.

5.1.14 Constraints faced by strawberry growers in adoption of sustainable cultivation practices

It was observed that lack of knowledge about biologically control measures of insect pest and diseases and lack of technical knowledge about doses of manures and fertilizers were the major constraints made by 91.81 per cent and 82.72 per cent of strawberry growers, respectively. High cost of insecticides and pesticides was the constraints faced by 75.45 per cent strawberry growers. The respondents further expressed that they face the problem of non availability of cold storage facility (67.27 %) after harvesting of strawberry which causes major losses in strawberry production. The respondents also expressed about high cost of manures and fertilizers (83.63 %) and market rate not known in time (64.71 %).

Shortage of finance (31.81 %), shortage of labour (78.18 %), lack of knowledge about improved sustainable practices of strawberry cultivation (65.45 %), shortage of irrigation water during summer season (64.71 %) and lack of technical knowledge about grading and packing (11.81 %)

were the constraints faced by the respondents in adoption of sustainable cultivation practices in strawberry cultivation.

5.1.15 Suggestions made by the respondents to overcome the constraints faced by them in adoption sustainable cultivation practices.

A majority of strawberry growers suggested that availability of proper field demonstrations about biological control of disease, pest and insects by research stations/scientist (74.54 %) which increases the awareness of sustainable practices. Also strawberry growers suggested the availability of bio-insecticides and bio-pesticides at cheaper rate (83.63 %). Also strawberry growers suggested the increase the subsidy on drip irrigation system by government.

About 82.72 per cent of the respondents suggested that the practical knowledge regarding plant protection and fertilizer application at proper time be imparted because it directly influence the sustainable cultivation practices also suggested the various input like fertilizer insecticides and fungicides should be made available at proper time and at cheaper rate (78.18 %).

The Govt. should encourage to start the strawberry processing units in rural areas near by their locality was the suggestions made by 55.45 per cent of strawberry growers which is followed by suggestion that Govt. should encourage the farmers about the export of strawberry (47.27 per cent).

5.2 Conclusions

5.2.1 Personal, socio-economic and psychological characteristics of the strawberry growers

Majority of strawberry growers from medium age group, educated up to secondary school level, medium land holding, medium level of annual income, medium sources of information, fair cropping pattern, medium cropping intensity and medium marketing behaviour.

5.2.2 Practice wise knowledge of sustainable cultivation practices followed in strawberry cultivation.

It was revealed that, majority of respondents had complete knowledge about land preparation while cent percent of respondent had complete knowledge about ploughing the land by using bullock power, by using tractor/power tiller and method of planting (flat bed and raised bed). More than two third of the respondents had complete knowledge about pollyhouse used for planting but about more than on third respondents had no knowledge about nursery management.

Near about two third of the respondents had complete knowledge about strawberry rotated with legumes. Majority of respondents had complete knowledge about importance crop rotation. Only one fourth of the respondents had no knowledge about spacing of raised beds (4 × 4 m). Majority of respondents had proper knowledge about planting time of strawberry (November-December). Majority of respondents had complete knowledge about plant to plant and row to row spacing (45 × 60 m and 50 × 75 m). Cent per cent of respondents had complete knowledge about propagation and 92.72 majority of the respondents had knowledge about season of propagation. Majority of respondents had complete

knowledge about soil should be supplied with moisture, hoeing and weed free. Cent percent of respondents had complete knowledge importance of application of FYM to soil and time of application. Majority of respondents had complete knowledge about vermicompost application and their dose. Cent percent of respondents had knowledge about green manuring (Dhaincha). Two third cent the respondents had complete knowledge about biofertilizer application (Azotobacter and Rhizobium). Cent percent of respondents had complete knowledge about advantages of mulching (trash mulch and plastic mulch). Cent percent of respondents had complete knowledge about fertilizers generally applied to field. Near about half of respondents had complete knowledge about dose of fertilizer used in strawberry field. .

Cent percent of respondents had complete knowledge about different methods of irrigation (Drip, Furrow). More than one fourth of respondents had knowledge about pH of soil required for strawberry crop. Majority of the respondents had complete knowledge about time interval of irrigation (per day). Majority of respondents complete knowledge about integrated weed management and major weeds of strawberry field. Majority of respondents complete knowledge about integrated pest management and major pest of strawberry field. More than 80.00 per cent respondents had complete knowledge about application of pesticides. Majority of respondents complete knowledge about integrated disease management and major diseases of strawberry field. Cent percent of respondents complete knowledge about proper time of harvesting. Cent percent of respondents had complete knowledge about post harvesting practices like storing and about one fourth of the respondents had no knowledge about storing.

5.2.3. Practice wise adoption of the respondents about sustainable cultivation practices followed in strawberry cultivation.

It was observed that, Majority of the respondents had complete adoption of ploughing the land by using tractors/ power tiller. Cent per cent of respondents had adoption of raised bed for planting. Only on tenth of the respondents had no adoption of pollyhouse for strawberry cultivation. Majority of respondents had no adoption of nursery grow seedlings. 89.09 per cent of respondents had complete knowledge about strawberry rotated with legumes.

It was observed that, 83.63 per cent of respondents had complete adoption of spacing of raised beds (4 × 4 m). About majority of respondents the had complete adoption of proper timing of planting (November-December) and complete adoption propagation after blooming season. Majority of respondents had adoption of soil should be well supplied with moisture, hoeing and weed free. About half of the respondents had adoption of amount of FYM used per acre. More than two third of the respondents had no adoption of application of vermicompost application. Majority of respondents had no adoption of green manuring crop. (Dhaincha, sunhemp and cow pea). More than half of the respondents had complete adoption of biofertilizer application. Cent per cent of respondents had complete adoption of plastic mulch and fertilizers generally used in strawberry cultivation while half of the respondent had no adoption of fertilizer dose. Cent per cent of respondents had complete adoption method of irrigation (drip). Majority of respondents had complete adoption of the time interval of irrigation (per day). Majority of respondents had complete

adoption of integrated weed and pest management. Majority of respondents had complete adoption of integrated pest management. Cent percent of respondents complete adoption of proper time of harvesting. Majority of the respondents had complete adoption of sorting while near about two third of the respondents had not adopted storing after harvesting of strawberry.

5.2.4. Relationship between selected Independent and dependent variables.

It is concluded that increase in education, annual income, source of information, cropping intensity and knowledge and adoption of sustainable practices was also increased. The variables age and crop productivity was negative relationship with knowledge and adoption. Land holding and crop productivity and marketing behavior had non-significant relationship with knowledge and adoption.

5.2. Constraint analysis and suggestions of the strawberry growers.

The major constraints reported by the strawberry growers in adoption of sustainable cultivation practices were Lack of knowledge about biological control measures of insect pest and disease management, Shortage of irrigation water during summer season, High cost of manures and fertilizer , Lack of technical knowledge about doses of manure fertilizers , High cost of insecticide and pesticide , Lack of awareness about sustainable farming , Unavailability of cold storage facilities near by the locality of the respondents.

Major suggestion made by the respondents strawberry growers was adequate provision for obtaining remunerative prices be made and information about market

prices of different markets should be made available to them.Other suggestions were practical knowledge regarding plant protection and fertilizer application at proper time be imparted and cold storage facility made available at reasonable rates and near by locality.

5.3. Implications

The auther hopes that this research study be highly useful in understanding the personal, socio-economic and psychological characteristics of strawberry growers, their knowledge level, adoption level and constraints faced by them in adoption of sustainable cultivation practices followed in strawberry cultivation. Moreover, the result of this study would provide guidelines to the village level workers, extension functionaries and other development agencies for bringing about desirable changes in implementation of different horticultural programmes at grass root levels by considering all these facts and findings of this study the following implications.

5.3.1 Action Implications

1. It was noticed that the cropping pattern of the respondents strawberry growers was poor to fair. This calls for education of the respondents in judicious use of improved technology and technological inputs.
2. It was depicted from the cropping pattern that there is a large variation in the area cultivated under different crops. Also the crop productivity of majority of crops was below average. i.e. low. This implies that department of agriculture should develop location specific technology

and dissemination amoung the strawberry cultivators to help them for sustainable agricultural development.

3. The association between personal and socio-economic characteristics of the respondents revealed that six characteristics namely age, education , annual income, cropping intensity , source of information and cropping pattern were positively and significantly related with sustainable practices of strawberry growing. This suggest that the characteristics having significant contribution should be suitably adjusted to improve the crop productivity of the respondents.
4. The study shows very less knowledge and adoption of respondents regarding nursery management, crop rotation, green manuring, integrated nutrient management, indigenous technical knowledge and storing. Thus it implies to create awareness an above practice jointly by the agricultural universities and state departments of agriculture by conducting field trials, training and by using appropriate extension methods.
5. It was observed that the respondents were experiencing different constraints to varying degree. Suitable measures need to be undertaken by the department of agriculture in line with the suggestions made by the respondents to help them in solving the problems and improving production of strawberry.
6. It was obseved that India's 80 percent of strawberry production in mahableshwar tahsil so there is need to develop research station on strawberry.

5.3.2 Research implications

In light with the findings of the study, following implications can be taken in to consideration for future research.

1. The present study being exploratory type, the finding of the study will have to be tested to a greater depth in other different parts of the region and at the state levels to judge its validity on a larger scale.
2. All aspects of the respondents in relation to their sustainable cultivation practices could not be studied. Therefore, characteristics other than included in this study, need to be studied to a greater extent.
3. The area of research may be extended further and size of sample of the respondents may also increased in such other study to support the finding of the present study.
4. The study will be useful bench mark for making further studies similar type and preparing a village development plan for the upliftment of rural India and the farmers living in that environment.

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Appendix I

SUSTAINET DIMENSIONS:

How do you know your agricultural practices are sustainable? Ecological Dimension

✓ Does it help conserve soil fertility?

✓ Does it conserve the quality and availability of water?

✓ Does it increase biodiversity?

✓ Does it spread hazardous substances?

✓ Does it affect the landscape (relief, vegetation cover, settlement structure)?

✓ How much energy would be required if this technology is scaled up?

✓ If it is scaled up, would there be a significant impact on the climate?

Economic Dimension

✓ Does the practice improve incomes?

✓ Does it lead towards food and income security?

✓ Does it enable farmers to accumulate their working capital?

✓ How would the nutritional situation and food availability change if the approach is applied on a large scale?

✓ Is it able to compete with other sectors?

✓ Is it possible to aggregate an economic gain to the national level?

Social and Cultural Dimensions

✓ Are the rural poor involved in the approach?

✓ How does the approach draw on or affect social customs, traditions, norms and taboos?

✓ Does the approach ensure a more equitable division of labour and distribution of income between men and women? Poor and rich? Young and old? Different ethnic groups and castes? Participating farmers and non-participants?

✓ Will broad adoption improve the health situation of the people?

✓ Does the approach assure equitable access to assets, agricultural inputs such as land (secure land-use rights), water, capital (credit), skills and knowledge? Is it accessible to the poor?

✓ The technology safe for humans and animals?

✓ Do the beneficiaries gain opportunities for empowerment, access to social services, control and decision-making? :

✓ Is the approach legally stable?

Appendix II

Interview Schedule

Analysis of sustainable practices followed in strawberry cultivation.

Research Guide

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Researcher

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Part – 1

Name of farmer	:	_____				**Age**	:	_____Years
Village	:	_____	Taluka	:	_____	District	:	Satara.

2. Education -

Sr. No.	Status	Mark
1	Illiterate	
2	Primary (up to 5 th std.)	
3	Middle (up to 10 th std.)	
4	Secondary (up to 12 th std)	
5	Collegiate (grduation)	

3. Land Holding

Sr. No.	Type of land	Owned	Leased in	Leased out	Total
1	Irrigated				
2	Rainfed				
3	Waste Land				
Total					

4.Annual income

Sr. No.	Occupation	Annual Income (Rs)	Sr. No.	Occupation	Annual Income (Rs.)
1.	Agriculture		7.	Daily wages	
2.	Dairy		8.	Business	
3.	Goat farming		9.	Fruit processing	
4.	Sheep farming		10.	Strawberry cultivation	
5.	Poultry		11.	Any Other	
6.	Service			**Total**	

5.Area under strawberry cultivation : _____ acres

6. .Source of information

	Source of information	Always	Sometimes	Never
A)	**Print media**			
1.	Newspaper			
2.	Magazines			
3.	Poster			
B)	**Electronic media**			
1.	Radio			
2.	Television			
3.	Film			
4.	Computer			
C)	**Personal contacts**			
1.	Gramsevak			
2.	Agril. Extn. Officer / Company Agent			
3.	College of Agriculture			

4.	State Agricultural University			
5.	Agricultural Scientists			
6.	Progressive Farmers			
7.	Local leaders			
8.	Friends, Relatives			
9.	Market Committee			
D)	**Extension Education Sources**			
1	Agricultural Exhibition			
2.	Field tours			
3.	Group Discussion			
4.	Other			

7.Cropping pattern

Sr.no.	season	Crop	Area (ha.)	Variety	Production (Q/ha.)	Productivity (Q/ha.)
1	**kharif**					
2	**Rabi**					
3	**Summer**					

4	**Annual**					
5	**Perennial**					

8. Marketing behaviour

Sr.no.	Particulars	Yes	No
1	Are you exporting strawberry?		
2	Do you gain market information from APMC?		
3	Are you sell strawberry in local market?		
4	Do you store strawberry to get good price in future?		
5	Do you sell your strawberry to marketing organization?		
6	Are you sell your strawberry to companies (MAPRO , MALA'S)?		
7	Do you sell your strawberry to trader /commission agent?		

Part-2

A. DEPENDENT VARIABLES

I. Knowledge and adoption level

Following are the statements included to measure the knowledge level of sustainable cultivation practices in strawberry. Kindly give your correct responses to each respective items.

Sr.no.	Statement	Knowledge			Adoption		
		full	Partial	No	Full	Partial	No
1	**Land preparation**						
1.1	.Land preparation helps in,						
	a) To Manage pest and weed incidence						
	b) To Increase infiltration rate						
	c) To Improve soil physical properties due to natural weathering						
	d) To Optimize nutrient availability						
	e) To Reduce erosion						
	f) To Increase the yield stability						
	g) To Balance nutrient flow						
	h) To it helps proper establishment of crop						
	i) To Enhance the uptake of nutrient from deeper layer						
1.2	Ploughing the land						
	By using bullock power						
	By using tractor / power tiller						
1.3	Which is best method of planting?						
	a. Flat bed						
	b. Raised bed						
1.4	Nursery						
	Are you know about						

	nursery manangement practices?						
	You have nursery to grow seedlings?						
1.5	Do you have pollyhouse for planting of strawberry?						
2	**Cropping Intensity**						
2.1	For better soil fertility strawberry should be rotated with;						
	a. Legumes						
	b. cereals						
	c. vegetables						
	d. all						
2.2	Crop rotation helps to						
	a. Increase the yield stability						
	b. Reduce weeds, pest and disease incidence						
	c. Recycling nutrient reserves from depth in the soil						
	d. Increases the Arthropod diversity						
	e. Transfer N from N-fixing species						
	f. Any other						
3	**Planting**						
3.1	Do you know Spacing of raised beds ?						
	a) 4×3 m						
	a) 4×4 m						
3.2	Which is the proper timing of planting?						
	a. March-April						
	b. September -Actober						
	c. November-December						
3.3	What is a spacing between plant to plant and row to row ?						
	a. 45 × 60 cm						
	b. 50 × 75 cm						
3.4	Do you know about Propagation ?						

	Season of propagation						
	a. After Blooming season						
3.5	.how much runners are produced						
	a. 12-18 runners						
3.6	. Do you know how to take Care of young seedling ?						
	1.Soil should be well supplied with						
	a. Moisture						
	b. Hoeing						
	c. Weed free						
	4. Integrated nutrient management						
4.1	Application of FYM to soil helps to :						
	a. Increase the water holding capacity of the soil						
	b. Improve the physical properties of soil						
	c. Enhance microbial activity of soil						
	d. It maintains the balanced C:N ratio in the soil						
	e. Humic substances of FYM may act as a plant-growth stimulants						
	f. Any other						
4.2	Amount of FYM/compost to be used per acre						
	a. 15-25 tonnes						
4.3	Time of application of FYM						
	a. Before sowing						
	b. After sowing						
4.4	Do you know the						

	vermicompost application?						
	5-10 t/ha vermicompost applied to field						
4.5	Do you know green manuring crops to be grown?						
	a) Dhaincha						
	b) Sunhemp						
	c) Cowpea						
4.6	Do you know the biofertilizer application?						
	a. Azotobacter						
	b. Rhizobium						
4.7	Which are the advantages of mulching?						
	a. Reduces the evaporation rate and weeds						
	b. Reduces the evaporation rate and weeds						
	c. Reduces soil and water erosion						
	d. Encourages recycling of nutrients						
	e. Enhances the bio-cultivation						
	f. Any other						
4.8	Which type of mulching you practice?						
	a. Trash mulch						
	b. Plastic mulch						
4.9	Which chemical fertilizers are generally applied to strawberry?						
	a.Straight fertilizer						
	Urea						
	b.Mix fertilizer						
	DAP						
	c.Complex fertilizer						
	19:19:19						
4.10	Do you know Fertilizer Dose?						

	120kgN:100kgP:75kgK/ha						
5	**Integrated Water Management**						
5.1	.Which is the proper time of irrigation ?						
	a) Per day						
	b) Weekly						
	c) Fortnightly						
5.3	What is a pH of soil required for strawberry crop?						
	a) 5-6						
6	**Integrated pest management**						
6.1	Do you know the different method of weed management?						
	a) Cultural methods						
	b) Hand weeding						
	c) Mulching						
	d) Use of improved implements						
	e) Use of herbicide						
6.2	Which are the major weeds in strawberry field?						
	a) Ghol						
	b) Hariali						
	c) Reshim kata						
6.3	Do you know the application of weedicide?						
	Glyphosate						
6.4	Do you know the different methods of IPM tools?						
	a. Cultural methods						
	b. Mechanical method						
	c. Use of chemicals/pesticides						
	d. Biological method						
	e. Indigenous technical knowledge						
6.5	Do you know the harmful pest of strawberry?						
	a) Thrips						
	b) Red mites						

	c) Cutworms						
	d) Fruit borer						
6.6	Do you know the application of pesticides ?						
	a) Thrips – Emidachloprid/Rigent						
	b) Red mites – Majester						
	c) Cutworms – before planting dusting heptachlor in soil.						
	d) Fruit borer – corazen						
	Do you know the different tools of IDM ?						
	a. Use of disease free seed material						
	a. Uproot and burn the disease affected plants						
	b. Biological methods						
	c. Use of chemicals						
6.8	Do you know the diseases of strawberry ?						
	a. Root rot						
	b. Powdery mildew						
	c. Anthracnose						
	d. Crown rot						
	e. Leaf blight						
6.9	Do you know the chemicals used for controlling diseases?						
	a. Root rot – curzate						
	b. Powdery mildew- Index						
	c. Anthracnose- taqat						
	d. Leaf blight – curzate						
6.10	Do you know the proper time of harvesting?						
	a. For local market fruit should be harvested when fully ripe						

	b. For distant market fruit should be harvested still firm and colour not fully developed.						
8	What management practices should be followed after harvesting to fetch good price in market?						
	a. Sorting						
	b. Grading						
	c. Packing						
	d. Storing						

3. Constraint faced by strawberry growers

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4. Suggestion by strawberry growers

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8. VITA

MUJAWAR REHAN HASAN
A candidate for the degree
of
MASTER OF SCIENCE (AGRICULTURE)
in
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2015

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* Educational	☛ Completed S.S.C. from Tarktirth Lakshmanshatri Joshi Vidyalay, Wai in 2008 with 64.46 % marks. ☛ Passed H.S.C. from Kisanveer Mahavidyalay, Wai in 2010 with 57.00 % marks. ☛ Received Bachelor of Science (Agriculture) degree in First class from college of Agriculture, Baramati, Mahatma Phule Krishi Vidhyapeeth, Rahuri in 2014 with 7.74/10.00 CGPA.
* N.S.S.	☛ Enrolled as N.S.S. volunteer and attended one special camp held at Jalgaon Supe, Tal. Baramati, Dist. Pune.
*Extra curriculum activities	☛ Won two silver medal in intercollegiate Weightlifting championship. ☛ Participated two times in All India Inter-university weightlifting championship held at Gurunanak Dev

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