

**An Economic Comparison of Farm  
Efficiency between KVK Adopted and Non-  
Adopted Farmers of Umaria District of  
Madhya Pradesh**

**THESIS**

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**Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur**

**In partial fulfillment of the requirement for the Degree of**

**MASTER OF SCIENCE**

*In*

**AGRICULTURE**

**(AGRICULTURAL ECONOMICS)**

**VINIT KUMAR JAISWAL  
(170109020)**

**Department of Agricultural Economics and Farm Management**

**College of Agriculture, Jabalpur 482004**

**Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, (M.P.)**

**2019**

## CERTIFICATE- I

This is to certify that the thesis entitled “**An Economic Comparison of Farm Efficiency between KVK Adopted and Non-Adopted Farmers of Umaria District of Madhya Pradesh**” submitted in partial fulfilment of the requirement for the degree of **Master of science (Agriculture) in Agricultural Economics** of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur is a record of the bonafide research work carried out by **Vinit Kumar Jaiswal** under my guidance and supervision. The subject of the thesis has been approved by the Student’s Advisory Committee and the Director of Instruction.

All the assistance and help received during the course of the investigation has been acknowledged by him.

**Place: Jabapur**

**(Dr. Deepak Rathi)**

**Date:.....**

Chairman of the Advisory Committee

### Thesis Approved by the Student’s Advisory Committee

Committee	Name	Signature
<b>Chairman</b>	<b>Dr. Deepak Rathi</b>	.....
<b>Member</b>	<b>Mr. G.K. Vani</b>	.....
<b>Member</b>	<b>Dr. Seema Naberiya</b>	.....
<b>Member</b>	<b>Dr. H.L. Sharma</b>	.....

This thesis is approved by

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Name seal and signature

## CERTIFICATE- II

This is to certify that the thesis entitled **“An Economic Comparison of Farm Efficiency between KVK Adopted and Non-adopted Farmers of Umaria District of Madhya Pradesh”** submitted by Mr. Vinit Kumar Jaiswal to Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur in partial fulfilment of the requirements for the degree of **Master of science in Agriculture** in the Department **Agricultural Economics and Farm Management** has been, after evaluation, approved by the External Examiner and by the Student’s Advisory Committee after an oral examination on the same.

**Place: Jabalpur**

**(Dr. Deepak Rathi)**

Date: .....

Chairman of the advisory committee

Members of the Advisory Committee

Committee	Name	Signature
<b>Chairman</b>	<b>Dr. Deepak Rathi</b>	.....
<b>Member</b>	<b>Mr. G.K. Vani</b>	.....
<b>Member</b>	<b>Dr. Seema Naberiya</b>	.....
<b>Member</b>	<b>Dr. H.L. Sharma</b>	.....

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Department	- Agricultural Economics and Farm Management
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Date:

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**Dr. Deepak Rathi**

**Major Advisor**

**(Vinit Kumar Jaiswal)**

**Student**

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I, Vinit Kumar Jaiswal S/o Shri Yagyasharan Jaiswal Certify the work embodied in thesis entitled **“An Economic Comparison of Farm Efficiency between KVK Adopted and Non-Adopted Farmers of Umaria District of Madhya Pradesh”** is my own hand bonafide work carried out by me under the guidance of **Dr. Deepak Rathi** at Department of Agricultural Economics and Farm Management, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during 2018-19

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Place: Jabalpur

Date: .....

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# **CHAPTER – 1**

## **INTRODUCTON**

## INTRODUCTION

Agriculture is the most important sector of Indian Economy. Indian agriculture sector accounts for 18 percent of India's gross domestic product (GDP) and provides employment to more than 50 percent of the countries workforce. India is the world's largest producer of pulses, spices and spice products.

There are various stack holders in this sector and they play an important role in development of this sector, one of them is Krishi Vigyan Kendra (KVK), the light house for rural peoples, is an innovative science based institution, which undertakes vocational training of farmers, farm women, and rural youths, conduct on-farm researches for technology refinement and organize frontline demonstration to promptly demonstrate the latest agriculture technologies to the farmers as well as the extension workers. The KVK function on the principle of collaborative participation of scientist, subject-matter experts, extension workers and farmers.

Krishi Vigyan Kendra (KVK) are agricultural extension centers created by ICAR (Indian Council for Agricultural Research) and its affiliated institutions at district level to provide various types of farm support to the agricultural sector. The first KVK on a pilot basis was established in 1974 at Puducherry (Pondicherry) on the recommendation of Mehta committee. KVKs provide several farm support activities like providing technology dissemination to farmers, training, awareness etc. Krishi Vigyan Kendra also known as Farm Science Center provides solution to problems related to agriculture and allied subjects, as and when faced by farmers of that particular locality. To achieve the set objectives, KVKs undertake following types of activities in the adopted villages: (1) Farm Advisory Service. (2) Training programme for different categories of people. (3) Training programme for the extension functionaries. (4) Front Line Demonstration (FLD). (5) On Farm Testing (OFT).

Training is one of the most important activities of Krishi Vigyan Kendra. Training is a planned and systematic effort to increase the

knowledge, improve the skill and change the attitude of the person towards a particular subject. Training need assessment is the first and foremost factor to be considered before conducting any training programme. Depending upon the need and categories of trainees, KVK imparts mainly following three types of training:

1. Training to the practicing farmers and farm women.
2. Training to the Rural Youth.
3. Training programme for the extension functionaries.

The KVK use to impart training on various aspects and co-ordinate various activities at ground level for capacity building as well as efficient utilization of the resources, thereby increasing the productivity and economic wellbeing of the farming community. The efficiency refers to “how well” or “how effectively” a decision making unit combines inputs to produce an output. Farm efficiency mainly includes; technical efficiency, economic efficiency, allocative efficiency and return to scale. Technical efficiency focuses on output produced from a given bundle of inputs and technology. Allocative efficiency focuses on the ability and willingness of an economic unit to minimize costs of production for a given set of input prices through substitution or reallocation of inputs. Economic efficiency implies an economic state in which every resource is optimally allocated to serve each individual or entity in the best way while minimizing waste and inefficiency.

The main purpose of this study is to measure and investigate factors affecting technical efficiency, economic efficiency, allocative efficiency and return to scale of KVK adopted and non-adopted farmers and comparison between them.

### **1.1 Hypothesis:**

H<sub>0</sub>: The efficiencies (technical, allocative, economic, scale) are same in case of adopters and non-adopters sample farms.

H<sub>1</sub>: The efficiencies of the adopted and non-adopted sample farms are not same.

### **1.2 Objectives:**

1. To assess the socio-economic characteristics of adopted and non-adopted farmers.
2. To determine the farm profitability of adopted and non-adopted farmers.
3. To examine the technical, allocative, economic and scale efficiency of the adopted and non- adopted farmers.
4. To analyse the factors affecting technical, allocative, scale and economic efficiency of adopted and non-adopted farmers.
5. To suggest policy measures for enhancing farm profitability and efficiency of farmers.

### **1.3 Limitations:**

1. The farmers do not keep any systematic record of their farming practises and have provided the information based on their recall memory.
2. The study is limited to the small area.
3. The conclusion drawn and suggestion will be specific for the study area.
4. The sample size is small therefore result cannot be generalized.
5. The conclusion is based on the data provided by the farmers.

# CHAPTER – 2

## REVIEW OF LITERATURE

Searching of relevant literature is helpful in formulating the framework of research problem undertaken. The researcher would be able to make an improvement over the existing studies and also expand the horizon of investigation on the subject matter. The review could also help in refracting the concept and statement, which were made in the earlier studies as well as for supporting of the present study. The attempt of new research worker is to study the literature related to the problem undertaken. Therefore, it forms an integral part of any systematic research work.

The review of literature based on objective are divided into following subheads:

- 2.1. Socio-economic characters of KVK adopted and non- adopted respondents.
- 2.2. Farm profitability of KVK adopted and non-adopted respondents.
- 2.3. The technical, allocative, scale and economic efficiency of the KVK adopted and non-adopted respondents.
- 2.4. Factors affecting the technical, allocative, scale and economic efficiency.

### **2.1 Socio-Economic Characters of KVK Adopted and Non-Adopted Respondents**

Sharma *et al.* (2000) revealed that majority of the trained farmers had completely adopted improved varieties, seed treatment, and culture methods. Majority of the farmers had partially adopted fertilizer application practices, while majority did not adopt plant protection measures. The study also confirmed that there is no association between the extent of adoption and farmers' age and size of land holding. On the other hand, farmers' annual income, level of education, and social participation were found to be positively and significantly related to the extent of adoption of soybean and maize practices.

Kale and Bhople (2003) found that there was a negative and significant correlation between education of small and big cotton growers and adoption gap in case of seed rate. In case of plant protection measures and use of measures, education of small and big farmers was found to be non-significantly related.

Bandgar *et al.* (2004) indicated that the independent variables namely education, social participation, socio-economic status and scientific orientation were found to be positively and significantly related at 0.01 level of probability, whereas land holding, area under cotton crop and extension contact were found to be positively and significantly related at 0.05 level of probability with adoption of university recommended cotton technology by the respondents.

Yadaw (2007) worked on impact of Krishi Vigyan Kendra on adoption of rice production technology by the farmers in Durg district of Chhattisgarh & concluded that KVK trained farmers had excelled over untrained farmers in respect of level of education, social participation, participation of male in farm activity, land holding, level of irrigation, annual income, credit acquisition, sources of information, contact with extension agents, Cosmo politeness and knowledge about KVK. It shows the indirect impact of KVK training programmes on various aspects of the trained farmers.

Adesope *et al.* (2012) explained the effect of socio-economic characteristics of farmers on their adoption of organic farming practices. The study concludes that adoption of organic farming practices was low as farmers adopted only 5 of the 14 practices identified. These include crop rotation, mixed cropping, hoeing and hand weeding, slash and burn and intercropping. It was found that respondents perceived that organic farming practices increased soil organic matter content, reduce input cost of farming, involved low risk in crop failure. Also, it was found that organic farming practices have high social value of general acceptability, are compatible with their own cultural systems, are inexpensive, are natural form of farming, and are environmentally friendly.

## **2.2 Farm Profitability of KVK Adopted and Non-Adopte Respondents**

Singh *et al.* (2010) evaluated the agricultural vocational training programmes conducted by KVK in India state of Punjab. The knowledge tests were administered to 35 bee keeping and 25 mushroom cultivation trainee, before and after the training programmes organized in 2004. The trainees significantly gained in knowledge. A separate sample of 640 trainees, trained prior to 2005, was selected for finding the adoption status. Out of 640, a sample of 200 was selected by proportionate sampling technique out of three categories, namely: non-adopters, discontinued-adopters and continued-adopters for evaluation of long term impact of these training programmes. Ex-post-facto one-shot study case study design was applied for this impact analysis the vocational training programmes have resulted in continued-adoption of the beekeeping and mushroom cultivation enterprises by 20% and 51% trained farmers, respectively. Age and trainee occupation had significant influence on the adoption decision of beekeeping vocation, whereas education and family income significantly affected the adoption decision of mushroom cultivation. The continued-adopters of beekeeping and mushroom growing had increased their family income by 49% and 24% respectively.

Asiwal *et al.* (2015) worked on role of KVK in enhancing productivity and profitability of moong bean through FLDs in Sikar district of Rajasthan and conclude that before KVK most of the farmers from adopted villages were using uncertified seeds without treatment and not adopting improvement practices resulting in low production of moong bean. But after contact with KVK and conducting FLDs and training in adopted village the change in extent of new technologies were increased up to 29.13 percent in case of HYVs, 29.13 percent balanced dose of NPK, 25 percent in zinc sulphate, 21.87 percent in seed treatment and 18.75 percent increase in proper seed rate and use of insecticides. The percent increase in production of FLDs ranged from 19.36 to 39.69 with

additional net profit ranged from Rs. 15700/- to Rs. 35350/- over local plots.

### **2.3 The Technical, Allocative, Scale and Economic Efficiency of the KVK Adopted and Non-Adopted Respondents.**

Singh (1993) studied adoption, non-adoption and reversion behaviour of farmers in relation to adoption of paddy technology and found a positive and significant relationship between caste and their adoption behaviour of small farmers.

Hedau (2000) found that the majority of the respondents belonged to other backward class and found that the caste was non-significant in relation with the adoption of paddy production technology.

Coeli *et al.* (2005) applied programming techniques to detailed data for 406 rice farms in 21 villages, for 1997, produces inefficiency measures, which differ substantially from the results of simple yield and unit cost measures. For the Boro (dry) season, mean technical efficiency was 69.4 per cent, allocative efficiency was 81.3 per cent, cost efficiency was 56.2 per cent and scale efficiency 94.9 per cent. The Aman (wet) season results are similar, but a few points lower. Allocative inefficiency is due to overuse of labour, suggesting population pressure, and of fertilizer. Second-stage regressions show that large families are more inefficient, whereas farmers with better access to input markets, and those who do less off-farm work, tend to be more efficient. The information on the sources of inter-farm performance differentials could be used by the extension agents to help inefficient farmers. There is little excuse for such sub-optimal use of survey data, which are often collected at substantial costs.

Abate *et al.* (2006) applied a stochastic frontier model in Ethiopia and found that tenure status significantly influences technical efficiency. The authors reported that more than half of the farmers cultivating wheat on their own plots operated above the average efficiency level compared to less than one-quarter for those cultivating on borrowed plots. Beside land tenure systems, several other social economic and resource factors

were identified to have an influence on technical efficiency. Technical efficiency was higher for older farmers due to experience gained over time. Male headed households were found to be more efficient than female headed households and households with more educated heads were found to be more efficient. This study however had its emphasis on wheat production and the results would not be generalized to other enterprises.

Amos (2007) performed a research on economic efficiency of small scale food crop production in Nigeria: A stochastic frontier approach and founded that age, level of education and family size were significant variables greatly influencing technical efficiency of cocoa farmers. Therefore, education policy that would encourage farmers to be literate would increase the efficiency level of farmers and should be embarked upon by the government.

Kolawole & Ojo (2007) worked on economic efficiency of small scale food crop production in Nigeria: a stochastic frontier approach and resulted that it is evident from this study that economic efficiency of the farmers could be improved substantially and that technical inefficiency constitutes a more serious problem than allocative inefficiency judged by the average technical and allocative efficiency recorded in the area. The study further shows that allocative efficiency appears to be more significant than technical efficiency as source of gain in economic efficiency meaning that allocative inefficiency is not a serious problem to the food crops farmers. That is, the food crop farmers are capable of producing a given level of output at a minimum cost input ratio. The result however pointed to the importance of examining not only technical efficiency, but also allocative efficiency and economic efficiency when measuring productive efficiency with the aim of examine critically the role higher efficiency level can have on output in agriculture.

Ogundari and Ojo (2007) estimated technical and allocative efficiency of smallholder crop farmers in Nigeria using Cobb Douglas production and cost functions. The finding of the study was that farmers operated under increasing returns to scale and therefore had the

potential of improving their efficiency. The educational level of the head of farmer (schooling years), farm size, quantity of fertilizer, age of farmer, credit availability, and farming experience of the farmer were found to influence technical efficiency significantly.

Mulwa *et al.* (2009) used a two-step estimation technique (DEA meta-frontier and Tobit Regression) to highlight the inefficiencies in maize cultivation and their causes in Western Kenya. The study found that farmers could reduce their input use by about 20–30% and still achieve their current production level. The costs could be reduced by over 50% without affecting production thereby indirectly increasing the farmers' incomes.

Obare *et al.* (2010) applied a dual stochastic efficiency technique and a two-limit Tobit model to analyze resource allocative efficiency in Irish potato production in Kenya. The authors established that Irish potato production in Nyandarua North District is characterized by decreasing returns to scale with a mean allocative efficiency of 0.57. The paper further established that farming experience, access to extension and credit, and membership in a farmers' association positively and significantly influenced allocative efficiency.

Ahmad *et al.* (2018) found that technical efficiency at national level in sugarcane production was found to be 66% which indicated that the production of crop may further be raised by 34% with the available technology. Allocative mean efficiencies indicated that costs may be reduced by 40% through using optimum combination of inputs keeping in mind their prices while selecting their quantities. The cost efficiency (CE) asserted that farmers may potentially reduce their overall cost of sugarcane production, up to 60% to harvest the existing level of output at least cost. Undoubtedly, the export of sugar from India has increased during the period of investigation.

## **2.4 Factors Affecting Technical, Allocative, Scale and Economic Efficiency of Kvk Adopted and Non-Adopted Respondents**

Armagan (2008) studied on determining the factors affecting efficiency scores in agriculture and indicated that conventional dummy variable such as age, education and experience are not significant, but type of enterprise for all efficiency levels and scale of enterprise for only total efficiency level was found to be significant factors in explaining efficiency level un this case study.

Poungchomou and chantanop (2015) studied on factors affecting technical efficiency of smallholder rubber farming in northeast Thailand and found that the variance of gamma and sigma square of the frontier production function was significant at a level of 0.01. All inputs (except chemical fertilizer) are major factors that have influenced the change in the output of para rubber production. The mean technical efficiency index for the farmers was found to be 0.573 and the efficiency factor, which were comprised of age of farmers, education, gender and age of the rubber tree, were found to be significant factors that affect the variation in technical efficiency among the farmer. The policy implication of the study is that technical efficiency of the para rubber could be increased by 42.7% by improving the use of available resources. Thus the government should give more education about rubber production, including tapping trees and managing farms because this education will impact the knowledge that can be applied to farming techniques in order to enhance efficiency.

Dessale (2019) worked on analysis of technical efficiency of small holder wheat growing farmers of Jamma District, Ethiopia and concluded that the maximum likelihood parameter estimate showed that wheat output was positively and significantly influenced by area, fertilizer, labour and number of oxen. The estimated mean level of technical efficiency of the sample farmers were about 82%. The estimated stochastic production frontier model together with the inefficiency parameter showed the age, education, improved seed, training and credit were found to have negative and significant effect on technical

efficiency, while farm size was found to have positive and significant effect on technical in efficiency of wheat production.

# **CHAPTER – 3**

## **MATERIAL AND METHODS**

## **MATERIAL AND METHODS**

This chapter deals with the materials and methods employed for the collection and analysis of the data as per the requirement of the study. The material and methods has been described as under with following sub-heads:

1. Profile of the study area
2. Selection of the sample respondents
3. Size of sample
4. Period of study
5. Data collection and research methodology

### **3.1 Profile of the Study Area**

A research programme requires the knowledge of the area in which an investigation is to be carried out. General characteristics of the study area will facilitate the discussion with regard to similarities and variation of various components and this will help in providing the background and importance of the study area.

#### **3.1.1 Location of the district**

Umaria district lies in eastern part of the Madhya Pradesh. It is bounded by Satna district in North, Dindori district in South, Shahdol district in East and Katni district in West. The district lies between north latitudes 23° 05' and 24° 20' and east longitudes 80° 40' and 81° 17'. Umaria district is falling under Survey of India toposheets No. 63D/16, 63H/4, 64A 10,11,13,14,15, 15,16 64E 1,2,3,4,6,7 and 8.

#### **3.1.2 Area and population**

It extends for about 100 Kms from North to South and 66 Kms. from East to West. The area of district is 4503 Sq.kms. Portion of the area is 1.32% of the total area of the state and it ranked at 41 among the district in terms of area. The district is divided into 2 tehsil (Bandhogarh and Pali) and three blocks (Manpur, Karkeli, and Pali).

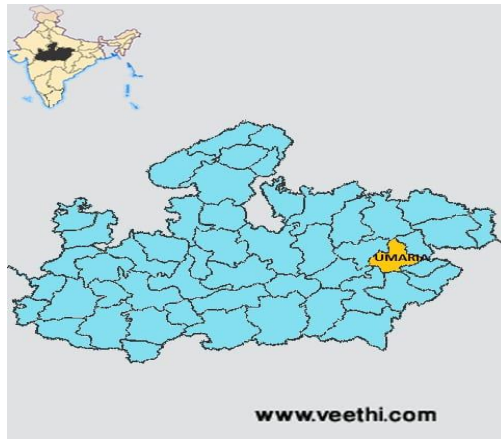


Fig.1 Map of India and Madhya Pradesh

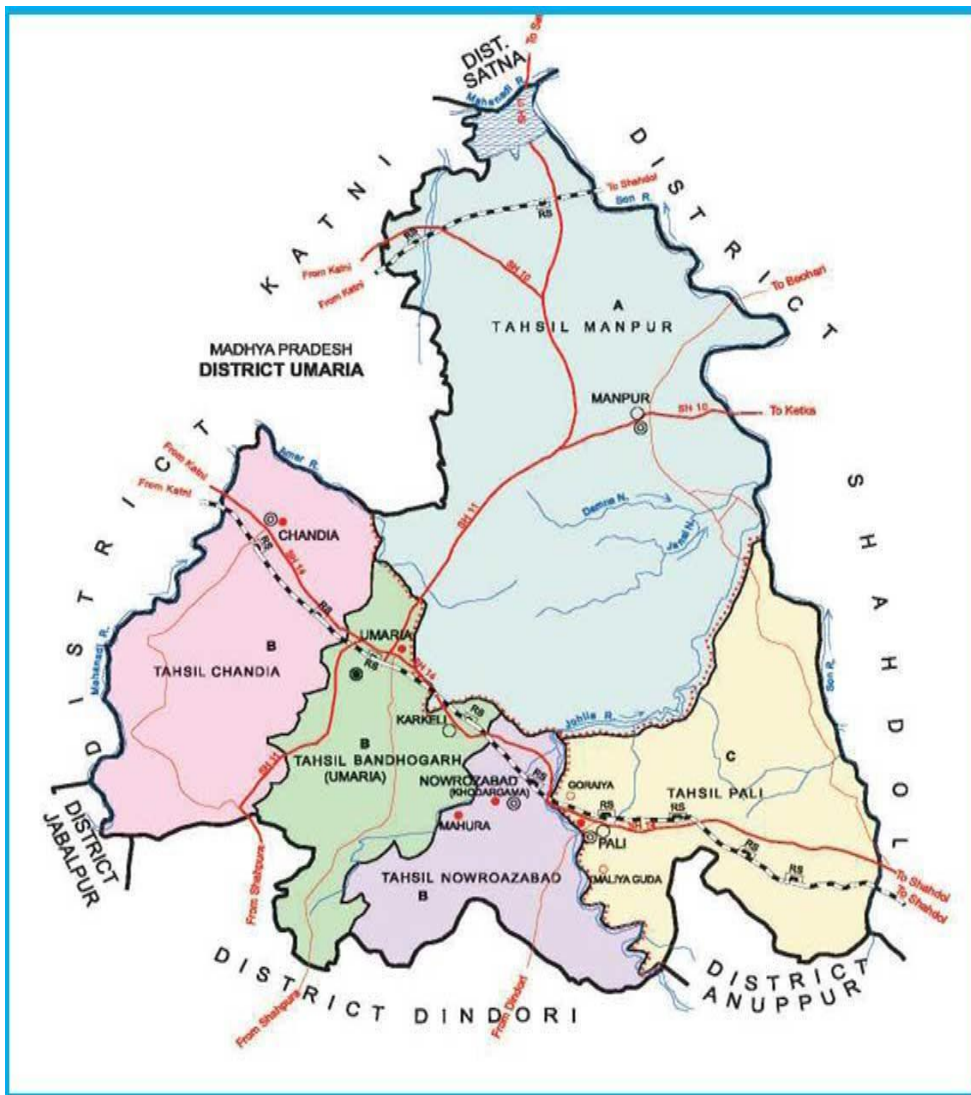


Fig.2 Map of Umariya District

### **3.1.4 Climate and rainfall**

The Climate of district is characterized by a hot summer and general dryness, except during southwest monsoon season. The year may be divided into four seasons. The cold season (average temperature 16.6 °C), December to February is followed by the hot season (average temperature 33.8°C) from March to about the middle of June. The period from the middle June to September is the southwest monsoon season. October and November from the post monsoon or transition period. There is only one IMD meteorological observatory located at district headquarters Umaria. Meteorological data of this observatory has been used for analysis.

The average annual rainfall of Umaria district is about 1248.8 mm. The maximum rainfall takes place during the south-west monsoon period i.e. from June to September. The August month is the wettest month of the year and about 30% of the annual rainfall takes place only during this month. During winter & summer season about 10% & 3% of respectively rainfall takes place. From October to May, only 13% of the annual rainfall takes place.

### **3.1.5 Geomorphology and soil types**

Physio-graphically, structural land forms represented by plateau, hills and valleys have developed in central, southern and north eastern part of the district.

The southern part of this district is represented by hilly terrain, which is northern part of Amarkantak hills extending in East-west direction. The highest elevation of the district is located on southern boundary of the district near village Singhpur having an elevation of 980 m above mean sea level, comprising of basaltic rocks. Other prominent hills are also located on southern and south western part near villages Mangthar, Manri and Surajpura having elevation 856 m, 678 m and 760 m above mean sea level respectively. The elevation of the district 355 m above mean sea level is located near village Darbai (10°59'-240 04') near the junction of river son and with Chhoti Mahanadi.

The physiographic features developed in the area bounded between Johilla river in the east and Chhoti Mahanadi in the west are hilly and undulating plains which attains the maximum elevation of 842 m (approximately) above mean level (Donadi hill) near village Aganhuri (23°28'15" : 80°50'30", 46/A15) and minimum elevation of above 362 m above mean sea level near Jogia (23°42'50": 80°41'45,64A/15).

The Umaria district is covered by various rock types viz Basaltic, Sedimentary and Grainitic terrains. Soil is also depending upon lithology of the area. As per classification of National Bureau of soil survey and land use planning, Nagpur, soils of the area have been described in following groups, while same are given in table and Soil map of the district is presented in table.

**Table 3.1 Soil Map of the District**

<b>Soil Type</b>	<b>Description</b>	<b>Soil Taxonomy</b>
(A)Soils of laterite Terrain	(a)Soils of Undulating Land	Slightly deep-to-deep, well drained loamy skeleton to loamy soils with moderate erosion
(B)Soils of Basaltic Rocks	(a)Soils of Hills and Hills Ranges	Very thin stony with severe erosion
	(b)Soils of Undulating Plateau	Deep, moderately well drained clayey soils on gently sloping plateau with moderate erosion
(C)Soils of Sedimentary Rocks (Gondwanas)	(a)Soils of Hills and Ridges	Very shallow, excessively drained, loamy skeleton soils on moderately to steep sloping hills with severe erosion
	(b)Soils of Dissected Plateau	Deep well drained loamy soils with moderate erosion
	(c)Soils of undulating plateau and plains	Deep, moderately well drained clayey to loamy soils on gently sloping plateau with moderate erosion
	(d)Soils of undulating plateau	Deep, moderately well drained clayey soils on foothills slopes with moderate erosion

(Source: Directorate of census, district census hand book, 2013)

### 3.1.6 Land utilization pattern of the district

The data of land utilization pattern of the district are presented in table 3.2

**Table 3.2 Land Utilization Pattern of the District**

Land holding	Area ('000ha)
Net sown area	112.05
Area sown more than once	29.78
Gross cropped area	141.83
Cropping Intensity	126.58%

(Source- KVK Umariya, district profile)

The net sown area was found to be 112.05 hectare and the gross cropped area was 141.78 hectare. The area which was sown more than once was found to be 29.78 hectare. The cropping intensity of the district was found to be 126.58%.

### 3.1.7 Cropping pattern of the district

The data of cropping pattern of the district are presented in the table 3.3 which revealed that total kharif area was 86.6 hectare and the total rabi area was 26.8 hectare. The gross cropped area was found to be 141.83 hectare. In kharif season mainly rice (44 ha) followed by kodo kutki (18.8 ha), maize (10.6 ha), pigeon pea (5.1 ha), black gram (3.5 ha) and sesame (2.4 ha) were cultivated. In rabi season mainly wheat (26.2 ha), mustard (7.5 ha), chickpea (5.9 ha), lentil (5.3 ha), linseed (3.7 ha) was cultivated.

**Table 3.3 Cropping pattern of the district**

<b>Crops</b>	<b>Area ('000ha)</b>
<b>Kharif</b>	
Paddy	44.0 (31.02)
Kodo-kutki	18.8 (13.26)
Maize	10.6 (7.47)
Pigeon pea	5.1 (3.59)
Black gram	3.0 (2.12)
Sesame	2.4 (1.6)
Ramtil	2.0 (1.41)
Other	4.9 (3.4)
Total Kharif Area	86.6 (61.06)
<b>Rabi</b>	
Wheat	26.2 (18.47)
Mustard	7.5 (5.2)
Chickpea	5.9 (4.15)
Lentil	5.3 (3.74)
Linseed	3.7 (2.61)
Pea	1.4 (0.99)
Total rabi area	50.4 ( )
Gross Cropped Area	141.83 (100)

(Source: KVK Umariya, district profile)

### **3.2 Selection of The Sample Respondents**

The study is purely based on primary data, which was collected from the adopted and non-adopted farmers of the KVK present in the district. The adopted farmer samples are selected with the help of KVK representative. From the KVK a list of adopted farmers was provided, from that list farmers were selected randomly for collection of data.

For the selection of non- adopted farmers, a village selected which was never adopted by the KVK. From that village the samples were selected randomly and primary data were collected through a well-designed interview schedule.

### **3.3 Size of Sample**

The total number of the sample was 90. In which there are the 45 sample farmers were selected from the adopted village and the 45 farmers were selected from the non-adopted village.

**3.4 Period of the Study:** The study pertains to the year 2017-2018.

### **3.5 Data Collection and Research Methodology**

This study area selected for the study is Umaria district. The study is based on collection of primary data from at most 45 farmers' adopted by the KVK present in the district and 45 non-adopted farmers'(total 90 farmers) present in the vicinity of the selected adopted farmers'. The farmers would be contacted through KVK and data would be collected through a pre-tested well designed questionnaire through personal face to face interview from sample farmer. The primary data would be collected on all physical inputs applied by respondents in the production process for various enterprises on the farm. The data on prices of inputs purchased from markets and prices of output realized by farmer from the market. Only those crop enterprises would be considered for data collection which are part of commercial agriculture since output price data on crops grown for subsistence farming would not be available.

To assess the farm profitability following cost and returns would be calculated as used in the study conducted by Meena *et al.* (2016).

**3.5.1 Cost of cultivation:** The cost of cultivation of crops would be worked out by using various cost concepts defined below:

Cost A1: It includes –

1. Value of hired human labour
2. Value of hired and owned bullock labour
3. Value of hired and owned machine labour

4. Value of seed (both farm seed and purchased)
5. Value of manures (owned and purchased) and fertilizers
6. Depreciation
7. Irrigation charges
8. Land revenue
9. Interest on working capital
10. Miscellaneous expenses

Cost A2: Cost A1 + rent paid for leased-in land

Cost B1: Cost A1 + interest on fixed capital (excluding land)

Cost B2: Cost B1 + rental value of owned land + rent for leased-in land

Cost C1: Cost B1 + imputed value of family labour

Cost C2: Cost B2 + imputed value of family labour

Cost C3: Cost C2 + 10 per cent of cost C2 as management cost.

$$\text{Cost of production (per q)} = \frac{\text{Cost of cultivation} - \text{By product value}}{\text{Quantity of Main product}}$$

**3.5.2 Income measures:** Following income measures would be calculated: -

Gross income: It is the total value of main product.  $GI = (Q_m \times P_m)$

Where, GI = Gross income  $Q_m$  = Quantity of main product  $P_m$  = Price of main product

Returns over variable cost (RVC):  $RVC = \text{Gross income} - \text{Cost A1}$

Farm business income (FBI):  $FBI = \text{Gross income} - \text{Cost A2}$

Family labour income (FLI) or returns to family labour:  $FLI = \text{Gross income} - \text{Cost B2}$

Net income (NI):  $NI = \text{Gross income} - \text{Cost C2}$

Returns to management RM =  $\text{Gross income} - \text{Cost C3}$

Returns per rupee (RPR)  $RPR = \text{Gross income per hectare} / \text{Cost C2 per hectare}$ .

Income over cost A2 + FL =  $\text{Gross income} - (\text{cost A2} + \text{FL})$

To examine the technical efficiency Data Envelopment Analysis (DEA) would be performed using R software. The DEA method is a non-parametric approach to measurement of efficiency. It does not assume a production function like Stochastic Frontier Analysis does. However, neither of the two can be said as better to the other (Watkins, 2013). DEA consists in preparing an efficient frontier with which to compare the inputs and outputs of the DMUs. In the terminology of DEA, a farm is a decision making unit (DMU). Farrell (1957) introduced the notion of relative efficiency in which the efficiency of a particular decision making unit (DMU) may be compared with another DMU within a given group. Farrell identified three types of efficiency, technical efficiency, allocative efficiency (referred to by Farrell as “price efficiency”), and economic efficiency (referred to by Farrell as “overall efficiency”). Technical efficiency (TE) refers to the ability of a DMU to produce the maximum feasible output from a given bundle of inputs, or the minimum feasible amounts of inputs to produce a given level of output. The former definition is referred to as output-oriented TE, while the latter definition is referred to as input-oriented TE. Allocative efficiency (AE) refers to the ability of a technically efficient DMU to use inputs in proportions that minimize production costs given input prices. Allocative efficiency is calculated as the ratio of the minimum costs required by the DMU to produce a given level of outputs and the actual costs of the DMU adjusted for TE. Economic efficiency (EE) is the product of both TE and AE (Farrell, 1957). Thus, a DMU is economically efficient if it is both technically and allocatively efficient. Economic efficiency is calculated as the ratio of the minimum feasible costs and the actual observed costs for a DMU.

The inputs used for the study are mentioned below:

- Seed
- Fertilizer
- Manure
- Pesticide
- Irrigation

The outputs are taken for the study are:

- Main product yield (kharif)
- By product yield (kharif)
- Main product yield (rabi)
- By product yield (rabi)

The technical efficiency score of the  $n^{\text{th}}$  farm can be find out using following DEA linear programming formulation:

$$TE_n = \min_{\lambda, \theta_n} \theta_n$$

$$\sum_i^I \lambda_i X_{ij} - \theta_n X_{nj} \leq 0$$

$$\sum_i^I \lambda_i Y_{ik} - Y_{nk} \geq 0$$

s.t.

$$\sum_i^I \lambda_i = 1$$

$$\lambda_i \geq 0$$

where subscript i, j and k are used for  $i^{\text{th}}$  farm,  $j^{\text{th}}$  input and  $k^{\text{th}}$  output. The symbol X-denotes input while Y-denotes output.  $\lambda_i$  is the non-negative weight associated with  $i^{\text{th}}$  farm. When  $\sum_i \lambda_i = 1$  set equal to one then variable returns to scale (VRS) prevails and when this constraint is omitted then constant returns to scale (CRS) prevails. To find out scale efficiency, a ratio of technical efficiency under VRS to CRS is computed.

To find economic efficiency, following cost minimizing linear programming formulation would be used:

$$MC_n = \min_{\lambda_i} \sum_{j=1}^J P_{nj} X_{nj}$$

$$\sum_i^I \lambda_i X_{ij} - \theta_n X_{nj} \leq 0$$

$$\sum_i^I \lambda_i Y_{ik} - Y_{nk} \geq 0$$

s.t.

$$\sum_i^I \lambda_i = 1$$

$$\lambda_j \geq 0$$

where  $Mc_n$  is the minimum cost for the  $n^{\text{th}}$  farm and  $P_{nj}$  is the price of  $j^{\text{th}}$  input for  $n^{\text{th}}$  farm. Then economic efficiency would be calculated as following:

$$EE_n = \frac{\sum_{j=1}^J P_{nj} X_{*nj}}{\sum_{j=1}^J P_{nj} X_{nj}}$$

Allocative efficiency would be obtained by dividing the economic efficiency of the sample farm by the corresponding technical efficiency.

**test: two sample assuming unequal variance**

To test the technical efficiency, allocative efficiency, economic efficiency, scale efficiencies of adopted and non-adopted farms unit is statistically different or not we applied t-test, two sample assuming unequal variance.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where  $\bar{x}_1$  and  $\bar{x}_2$  are samples mean,  $s_1^2$  and  $s_2^2$  are sample variances and  $n_1$  and  $n_2$  are numbers of samples size of adopted and non-adopted farmers' samples respectively.

**OLS** would be used to find out factors affecting technical and economic efficiency of adopted and non-adopted farmers' in the district.

To find out best model fit, step wise regression analysis was performed with the help of R software and best model OLS regression was used to find out factors affecting technical and economic efficiency of adopted and non-adopted farmers in the district. List of independent variables to be considered for running regression analysis is given below:

1. Area Under Crop
2. Area Irrigated
3. Caste

4. Family Size
5. Fertilizer Quantity
6. Age
7. Adoption Status
8. Non-farm Income
9. Machine to Inventory
10. Labour to Machine

# **CHAPTER - 4**

## **RESULTS AND DISCISSION**

## **RESULTS AND DISCUSSION**

This chapter is concerned with the results and cover the analysis and interpretation of the primary data collected for the study with the stated objectives. The result has been discussed under the following sub-heads:

- 4.1. Socio-economic characters of KVK adopted and non- adopted respondents.
- 4.2. Farm profitability of KVK adopted and non-adopted respondents.
- 4.3. The technical, allocative, scale and economic efficiency of the KVK adopted and non-adopted respondents.
- 4.4. Factors affecting the technical, allocative, scale and economic efficiency.

### **4.1 Socio-Economic Characteristics of KVK Adopted and Non-Adopted Respondent**

The socio-economic characteristics consisting of the age and family size, caste, education level, extent of non-farm income, land utilization pattern and cropping intensity of the KVK adopted and non-adopted respondents. The detailed socio-economic characteristics of sample respondents has been analysed using field survey data and presented as under.

#### **4.1.1 Age and family size of the respondents**

The age of head of family plays a vital role in the adoption of new innovation. The average age of the respondent and the average family size is presented in Table 4.1.

#### 4.1 Average family size and average age of the respondent

(Unit: Number)

Average Family Size	Adopted	Non adopted
Male	2	2
Female	2	4
Children	2	2
Dependent	5	7
family size	6	8
Age (in years)	47	48

(Source: Field Survey)

The presented data revealed that the average age of respondent was 47 and 48 in case of adopted and non-adopted respondent, and average family size 6 and 8 in case of adopted and non-adopted respectively. The male members and children are equal in both the category i.e., 2 but the female members are more in non-adopted respondent as compared to adopted respondent i.e., 2 and 4 respectively. The number of dependent member of family on the respondent was higher in non-adopted respondent (5) as compared to the adopted respondent (7). Hence the total family size is also higher in non-adopted respondent (8) and lower in adopted respondent (6).

##### 4.1.2 Caste structure of the respondents

The caste structure of the respondents had been classified into four sub groups; General (GEN), Other Backward Class (OBC), Schedule Caste (SC), Schedule Tribe (ST) are presented in Table 4.2

**Table 4.2 Caste wise distribution of the adopted and non-adopted respondents**

(Unit: Number)

Caste	Adopted	Non adopted
GEN	4 (8.89)	5 (11.11)
OBC	22 (48.89)	25 (55.56)
SC	19 (42.22)	11 (24.44)
ST	0 (0)	4 (8.89)
<b>Total</b>	<b>45</b> <b>(100)</b>	<b>45</b> <b>(100)</b>

(Figures in parenthesis show the per cent to the total)

(Source: Field Survey)

The data presented in table 4.2 shows that majority of the respondents belongs to OBC (48.89 %) and (55.56 %) followed by SC (42 %) and (24.4 %) and general within (8.89 %) and (11.11 %) in case of adopted and non-adopted respectively. None of the respondent belongs to ST category in case of adopted but (8.89 %) found to be ST in case of non-adopted respondent.

#### 4.1.3 Educational status

Education level of the respondent has been classified into illiterate, primary, secondary, middle, higher secondary and graduate which is presented in table 4.3

**Table 4.3 Education level of the selected respondents**

(Unit: Number)

<b>Educational level</b>	<b>Adopted</b>	<b>Non adopted</b>
Illiterate	15 (33)	26 (58)
Primary	16 (36)	9 (20)
Secondary	06 (13)	5 (11)
Middle	6 (13)	3 (7)
Higher Secondary	1 (2)	0 (0)
Graduation	1 (2)	2 (4)
<b>Total</b>	<b>45</b> <b>(100)</b>	<b>45</b> <b>(100)</b>

(Figures in parenthesis show the per cent to the total)

(Source: Filed Survey)

The education status of the adopted and non-adopted respondents depicts that illiteracy found to be higher in non-adopted (58%) as compared to adopted (33%). The maximum number of the respondents were found to be educated up to primary level.

#### 4.1.4 Extent of non-farm income

The level of non-farm income across adopted and non-adopted respondents is presented in table 4.4

**Table no: 4.4 Extent of non-farm income (per annum)**

(Unit: Number)

Value	Adopted	Non-adopted
<1000	22 (48.89)	28 (62.22)
1001-10000	12 (26.67)	6 (13.33)
10001-50000	8 (17.78)	7 (15.56)
50001-100000	2 (4.44)	0 (0.0)
100001-500000	0 (0.0)	3 (6.67)
>500001	1 (2.22)	1 (2.22)
Total	45 (100)	45 (100)

(Figures in Parenthesis show the per cent to the total)

The maximum percentage of respondent were found to earn less than 1000 rupees in case of adopted (48.89%) and non-adopted (62.22%) respondents respectively, while 26.67 and 13.33 per cent adopted and non-adopted respondent were found to earn income between Rs.1001-10000 and 17.78 and 15.56 earned income between Rs.10001-50000 while only 2.22 per cent in both the category used to earn more than 500000.

#### 4.1.5 Land utilization pattern

The information related to the different parameters of land utilization pattern of adopted and non-adopted respondent is presented in table 4.5

**Table 4.5 Land utilization pattern of selected respondent**

(Unit: ha)

Particulars	Adopted	Non Adopted	% Difference Over Non-Adopted
Size of Holding	2.84	2.71	4.7
Uncultivated Area	0.47	0.79	-40.51
Cultivated Area	2.37	1.92	23.44
Irrigated Area	2.24	1.67	34.13
Area Sown more than once	2.29	1.85	23.78
gross cropped area	4.66	3.77	23.61

(Source: Field Survey)

The characteristics of operational holding of sample respondents (adopted and non-adopted) describes about the total size of holding,

uncultivated area, cultivated area, irrigated area, area sown more than once and gross cropped area. On an average size of holding in adopted was found to be 2.84 hectare and in non-adopted 2.71 hectare, which is higher by 4.7 per cent in case of adopted respondents. Uncultivated area is higher in non-adopted (0.79 ha) respondent as compared to the adopted (0.47 ha) respondent. Net cultivated area of adopted respondents was 2.37 hectare and non-adopted respondents was 1.92 hectare. Irrigated area, area sown more than once, gross cropped area was also high in adopted respondents by 34.13, 23.78, 23.61 per cent over non adopted respondents respectively.

#### 4.1.6 Cropping pattern and cropping intensity of selected respondents

Cropping pattern across various season and cropping intensity of the adopted and non-adopted respondent are presented in the table 4.6

**Table 4.6 Cropping pattern and cropping intensity of the selected respondents**  
(Unit: ha)

Particulars	Adopted	Non-adopted	% Difference
Paddy	1.93 (41.42)	1.64 (43.50)	17.68
Maize	0.17 (3.65)	0.09 (2.39)	88.89
Urd Bean	0.15 (3.22)	0.09 (2.39)	66.67
Kodon	0.07 (1.50)	0.04 (1.06)	75
Jowar	0.05 (1.07)	0.06 (1.59)	-16.67
<b>Area Kharif</b>	<b>2.37</b> <b>(50.86)</b>	<b>1.92</b> <b>(50.92)</b>	<b>23.44</b>
Wheat	1.60 (34.33)	1.48 (39.25)	8.11
Gram	0.34 (7.30)	0.19 (5.04)	78.95
Pea	0.23 (4.93)	0.13 (3.45)	76.92
Mustard	0.11 (2.36)	0.06 (1.59)	83.33
<b>Area Rabi</b>	<b>2.29</b> <b>(49.14)</b>	<b>1.85</b> <b>(49.07)</b>	<b>23.78</b>
<b>gross cropped area</b>	<b>4.66</b> <b>(100)</b>	<b>3.77</b> <b>(100)</b>	<b>23.06</b>
Net cultivated Area	2.37	1.92	23.44
Cropping Intensity	196.71	159.24	23.53

(Figures in Parenthesis shows per cent to the gross cropped area)

About 50 per cent area was found to be allocated under different crops during kharif and rabi season. In both the category adopted and non-adopted the major crops grown during kharif were found to be paddy which covers 41.42 and 43.50 per cent of gross cropped area in case of adopted and non-adopted category respectively. In rabi season wheat (34.33% & 39.25%) followed by gram (7.30% & 5.04%) were found to be major crop grown by adopted and non-adopted respondents in area under study. The area under kharif and rabi gross cropped area was found to be 23.44 per cent more in case of adopted as compared to non-adopted respondents.

Adopted respondents were found to allocate 88.89 and 75 per cent more area in case of maize and kodo as compared to non-adopted respondent, while during rabi season adopted respondents used to allocate 83.33, 78.95 and 76.92 per cent more area in mustered, gram, and pea as compared to non-adopted respondents respectively.

#### **4.2. Farm Profitability of KVK Adopted and Non-Adopted Respondents**

Farm profitability refers to the profit and losses incurred through the operation of the farm. A farm income statement is a summary of income and cost that occurred during a specified period.

##### **4.2.1 Variable, fixed and total cost in paddy cultivation**

The variable fixed and total cost incurred in kharif season of adopted and non-adopted respondents are presented in the table 4.7. In case of adopted and non-adopted respondents, on an average total cost was found to be Rs.40598.67 and Rs.41383.22 per hectare respectively, which was found to be 1.9 per cent less in case of adopted respondent.

Out of total cost incurred, the proportion of variable and fixed cost was found to be 52.89 and 47.11 per cent respectively in case of adopted respondents and 57.46 and 42.54 respectively in case of non-adopted respondent. Variable cost was found to be 9.70 per cent less and fixed cost was 8.65 per cent more in case of adopted over non-adopted respondents.

**Table 4.7 Total, variable and fixed cost in paddy cultivation**

(Unit: Rs/ha)

S.No	Particulars	Adopted	Non-Adopted	% Difference
1	Labour (Hired)	4065.39 (10.01)	4160.88 (10.05)	-2.29
2	Labour (Family)	952.16 (2.35)	1033.3 (2.50)	-7.85
	Total (Human labour)	5017.55 (12.36)	5194.18 (12.55)	-3.40
3	Machine (Hired)	4092.59 (10.08)	3066.55 (7.41)	33.46
4	Machine (Owned)	622.89 (1.53)	374.77 (0.91)	66.21
	Total (Machine)	4715.48 (11.61)	3441.32 (8.32)	37.03
<b>A</b>	<b>Total Operational cost</b>	9733.03 (23.97)	8635.5 (20.87)	12.71
1	Seed	2624.77 (6.47)	5747.69 (13.89)	-54.33
2	Pesticide	401.20 (0.99)	400.00 (0.97)	0.30
3	Manure	2500.00 (6.16)	2447.92 (5.92)	2.13
4	Fertilizer	4912.02 (12.10)	5154.40 (12.46)	-4.70
5	Irrigation	278.61 (0.69)	261.57 (0.63)	6.51
<b>B</b>	<b>Total Material cost</b>	10716.60 (26.40)	14011.58 (33.86)	-23.52
C	Interest on working capital @10%	1022.48 (2.52)	1132.35 (2.74)	-9.70
	Variable cost (A+B+C)	21472.11 (52.89)	23779.43 (57.46)	-9.70
D	Land revenue	12.00 (0.03)	12.00 (0.03)	0.00
E	Depreciation	314.84 (0.78)	259.93 (0.63)	21.12
F	Interest on fixed capital @12%	1082.64 (2.67)	996.44 (2.41)	8.65
G	Rental value for owned land	17717.08 (43.64)	16335.42 (39.47)	8.46
	Fixed cost (D+E+F+G)	19126.56 (47.11)	17603.79 (42.54)	8.65
	Total cost (VC+FC)	40598.67 (100)	41383.22 (100)	-1.90

(Figures in parenthesis show the per cent to total cost)

The average total operational cost in case of adopted and non-adopted respondent was found to be Rs.9733.03 and Rs.8635.50 respectively which is higher by 12.7 per cent in case of adopted over non- adopted respondents. Total material coat was found to be lower by 23.52 per cent in case of adopted respondent (Rs.10716.60) as compared to non-adopted respondent (Rs.14011.58). The adopted and non-adopted respondents used to invest more on fertilizer (12.10% and 12.46%) followed by seed (6.47% and 13.89%), manure (6.16% and 5.92%), pesticide (0.99% and 0.97%) and irrigation (0.69% and 0.63%).

#### 4.2.2 Cost concepts in paddy of adopted and non-adopted respondents

Almost every day in farm organization and operation cost consideration enters. It is an important tool for measuring farm business activities. The farm management specialist has specified cost concepts into Cost A1, A2, B1, B2, C1, C2, and C3. In this section efforts have been made to discuss according to various costs concepts for cultivation of paddy crop in case of KVK adopted and non-adopted respondents. Different cost concept of adopted and non-adopted respondent in paddy cultivation is presented in table 4.8

**Table 4.8 Cost concept of paddy crop**

(Unit: Rs./ha)

Particulars	Adopted	Non-Adopted	% Difference
COST A1 and A2	20846.79 (46.68)	23018.06 (50.57)	-9.43
COST B1	21929.43 (49.10)	24014.50 (52.75)	-8.68
COST B2	39646.51 (88.78)	40349.92 (88.64)	-1.74
COST C1	22881.59 (51.24)	25047.80 (55.02)	-8.65
COST C2	40598.67 (90.91)	41383.22 (90.91)	-1.90
COST C3	44658.54 (100)	45521.54 (100)	-1.90
Cost of Production (Rs/q)	261.80	364.40	-28.16

(Figures in parenthesis show the per cent to the Cost C3)

The data presented in table 4.8 indicates that total cost of cultivation of paddy was found to be Rs.44658.67 and Rs.45521.54 in case of adopted and non-adopted respondents respectively, which was

found to be 1.90 per cent less in case of adopted respondent as compared to non-adopted respondents. The proportion of cost A1 and cost A2 was found to be similar but was less for adopted respondents by 9.43 per cent over non-adopted respondents. The proportion of cost B1 and B2 was found to be 49.10 per cent and 88.78 per cent in case of adopted respondents and 52.75 per cent and 88.64 per cent in case of non-adopted respondents. All costs A1 and A2, B1, B2, C1, C2 and C3 were found to be less by 9.43 per cent, 8.68 per cent, 1.74 per cent, 8.65 per cent, 1.90 per cent and 1.90 per cent as compare to non-adopted respondents. The cost of production was found to be Rs.261.80 and Rs.364.40 per quintal in case of adopted and non-adopted respondents, which is 28.16 per cent less in case of adopted respondents over non-adopted respondents.

#### **4.2.3 Profitability and income measures of paddy production (Adopted and Non-Adopted)**

The profitability and income measures of paddy crop between adopted and non-adopted respondents is presented in table 4.9

**Table 4.9 Income measures of paddy production:** (Unit-Rs./ha)

<b>Particulars</b>	<b>Adopted</b>	<b>Non-adopted</b>	<b>% Difference</b>
Yield of Main product (q/ha)	44.15	40.87	8.03
Value of Main Product (Rs./q)	77262.50	71522.50	8.03
Value of By product	29040	26490	9.63
Gross Income	106302.50	98012.50	8.46
Return over Variable Cost	85455.71	74994.44	13.95
Farm Business income	85455.71	74994.44	13.95
Family Labour Income	66655.99	57662.58	15.60
Net income	65703.83	56629.28	16.02
Income over A2+FL	21798.95	24051.36	-9.36
Return to Management	61643.96	52490.96	17.44
Returns Per Rupee	2.62	2.37	10.55

(Source: Field survey)

It is clear from the table that on an average yield of main product in case of adopted and non-adopted respondent was found to be 44.15 and 40.87 q/ha respectively and the price was 1750 Rs/q. Yield is found to be 8.03 per cent more in case of adopted respondent as compared to non-adopted respondent.

Gross income was found to be 8.46 per cent more in case of adopted respondents over non-adopted respondents which was Rs.106302.50 and Rs.98012.50 respectively.

Family labour income was found to be Rs.66655.99 in case of adopted respondents and Rs.57662.57 in case of non-adopted respondents, which is higher by 15.60 per cent in case of adopted over non-adopted respondents. The net income of adopted respondents was found to be Rs.65703.83 and non-adopted respondents was Rs.56629.28. Adopted respondents has high net income by 16.02 per cent as compare to non-adopted respondents.

The return per rupee investment was found to be Rs.2.62 and Rs.2.37 in case of adopted and non-adopted respondents respectively. It is clear from the above findings that yield, return over variable cost, family labour income, net income, return to management and return per rupee were found to be more in case of adopted over non-adopted respondents by 8.03 per cent, 13.95 per cent, 15.60 per cent, 16.02 per cent, 17.44 per cent and 10.55 per cent respectively. This indicates that profitability measures favouring to the adopted respondents over non-adopted respondents which clearly shows that KVK adopted respondents are found to be superior in terms of profitability as compared to the non-adopted respondents.

#### 4.2.4 Variable, fixed and total cost in wheat cultivation

Various cost incurred in cultivation of wheat of adopted and non-adopted respondents are presented in table 4.10

**Table 4.10 Total, variable and fixed cost in wheat cultivation**

(Unit: Rs./ha)

S.No	Particulars	Adopted	Non-Adopted	% Difference
1	Human Labour (Hired)	2167.25 (6.09)	2567.59 (6.83)	-15.59
2	Human Labour (family)	1213.41 (3.41)	918.39 (2.44)	32.12
	Total (Human Labour)	3380.66 (9.50)	3485.98 (9.27)	-3.02
3	Machine (Hired)	5622.68 (15.79)	4280.67 (11.39)	31.35
4	Machine (owned)	293.62 (0.82)	1213.41 (3.23)	-75.80
	Total (Machine)	5916.3 (16.62)	5494.08 (14.61)	7.68
<b>A</b>	<b>Total Operational cost</b>	9296.96 (26.11)	8980.06 (23.89)	3.53
1	Seed	4523.81 (12.71)	7712.32 (20.52)	-41.34
2	Pesticide	496.23 (1.39)	531.92 (1.41)	-6.71
3	Manure	0 (0.00)	0 (0.00)	0.00
4	Fertilizer	5690.78 (15.98)	5628.10 (14.97)	1.11
5	Irrigation	982.14 (2.76)	1631.46 (4.34)	-39.80
<b>B</b>	<b>Total Material cost</b>	11692.96 (32.84)	15503.80 (41.24)	-24.58
C	Interest on working capital @10%	753.681 (2.12)	949.48 (2.53)	-20.62
	Variable cost (A+B+C)	21772.71 (61.16)	25186.12 (67.00)	-13.55
D	Land revenue	12 (0.03)	12 (0.03)	0.00
E	Depreciation	259.05 (0.73)	267.49 (0.71)	-3.16
F	Interest on fixed capital @12%	782.793 (2.20)	702.26 (1.87)	11.47
G	Rental value for owned land	12775.5 (35.88)	11424.89 (30.39)	11.82
	Fixed cost (D+E+F+G)	13829.34 (38.84)	12406.64 (33.00)	11.47
	Total cost (VC+FC)	35602.06 (100)	37592.76 (100)	-5.30

(Figures in parenthesis show the per cent to the total cost)

The data presented in table 4.10 indicates that the total cost was found to be Rs.35602.06 and Rs.37592.76 in case of adopted and non-adopted respondents respectively. The total cost was found to be less in case of adopted respondent by 5.30 per cent over non-adopted respondents.

Out of the total cost incurred, the proportion of variable and fixed cost was found to be 61.16 per cent and 38.84 per cent respectively in case of adopted respondents and 67 per cent and 33 per cent respectively in case of non-adopted respondents. The variable cost was found to be 13.55 per cent less and fixed cost was 11.47 per cent more in case of adopted respondents over non-adopted respondents.

The total operational cost was found to be observed 26.11 per cent and 23.89 per cent in case of adopted and non-adopted respondents respectively. The material cost was found to be 32.84 per cent in case of adopted and 41.24 per cent in case of non-adopted respondents. Material cost was 24.58 per cent less in case of adopted over non-adopted respondents. The adopted and non-adopted respondents used to invest more in fertilizer (15.98% and 14.97%) followed by seed (12.71% and 20.52%), irrigation (2.76% and 4.34%) and pesticide (1.39% and 1.41%).

#### 4.2.5 Cost concepts in wheat of adopted and non-adopted respondents

The cost concepts in wheat crop of adopted and non-adopted respondent is presented in table 4.11

**Table 4.11 Cost concept of wheat crop**

(Unit: Rs./ha)

Particulars	Adopted	Non-Adopted	% Difference
COST A1 and A2	20801.24 (53.16)	24794.45 (59.60)	-16.11
COST B1	21584.03 (55.16)	25496.711 (61.29)	-15.35
COST B2	34359.53 (87.80)	36921.60 (88.76)	-6.94
COST C1	22797.44 (58.26)	26415.10 (63.50)	-13.70
COST C2	35572.94 (90.90)	37839.99 (90.96)	-5.99
COST C3	39133.15 (100)	41599.27 (100)	-5.93
Cost of Production (Rs/q)	587.04	765.45	-23.31

(Figures in parenthesis show the per cent to the cost C3)

The table shows that on an average total cost was found to be Rs.39133.94 and Rs.4599.27 for adopted and non-adopted respondent respectively, which is less by 5.93 per cent in case of adopted over non-adopted respondents. The cost A1 and A2 was found to be similar in case of adopted (Rs.20801.24) and non-adopted (Rs.24794.45). The cost of production was found to be Rs.587.04 and Rs.765.45 per quintal in case of adopted and non-adopted respondents respectively. The cost of production was found to be 23.31 per cent less in case of adopted respondents as compared to non-adopted respondents.

#### 4.2.6 Income measures and profitability of wheat crop

The income measures and farm profitability of adopted and non-adopted respondents in production of wheat crop are presented below in table 4.12

**Table 4.12 Income measures and profitability of wheat crop**

(Unit: Rs./ha)

Particulars	Adopted	Non-adopted	% Difference
Yield of Main product (q/ha)	35.76	31.93	11.99
Value of Main Product	62043.60	55398.55	11.99
Value of By-Product	14609.40	13150.80	11.09
Gross Income	76653.00	68549.35	11.82
Return over Variable Cost	55851.76	43754.90	27.65
Farm Business Income	55851.76	43754.90	27.65
Family Labour Income	42293.47	31627.75	33.72
Net income	41080.06	30709.36	33.77
Income over A2+FL	22014.65	25712.84	-14.38
Return to Management	37519.85	26950.08	39.22
Returns Per Rupee	2.15	1.81	18.95

(Source: Field Survey)

The data in table 4.12 depicts that yield of main product was found to be 35.76 q/ha and 31.93 q/ha in case of adopted and non-adopted respondents respectively, which is 11.99 per cent higher in case of adopted respondent as compared to non-adopted respondent. The price of the main product was Rs.1735/- per quintal.

Gross income was found to be Rs.76653 and Rs.68549.35 per hectare in case of adopted and non-adopted respondents. Net income was found to be in case of adopted and non-adopted respondent was Rs.41080.06 and Rs.30709.36 per hectare respectively. Income over A2 + family labour was found to be Rs.22014.65 and Rs.25712.84 per hectare in case of adopted and non-adopted respondents respectively, which is less by 14.38 per cent in case of adopted over non-adopted respondents. Return to management was found to be Rs.37519.85 and Rs.26950.08 per hectare in case of adopted and non-adopted respondents respectively. Return per rupee investment was found to be Rs.2.15 in case of adopted respondents and Rs.1.81 in case of non-adopted respondents.

It is clear from above findings that as for as yield, gross income, net income, family labour income, return to management and return per rupee investment were found to be more in case of adopted respondents over non-adopted respondents by 11.99 per cent, 11.82 per cent, 33.77 per cent, 39.22 per cent and 18.95 per cent respectively. This indicates that profitability measures favouring adopted respondents which clearly

shows that KVK adopted respondents were found to be superior in terms of profitability over non-adopted respondents.

### 4.3 The Technical, Allocative, Scale and Economic Efficiency of KVK Adopted and Non-Adopted Respondents

The season wise farm efficiency viz. technical, economic, scale and allocate efficiency of KVK adopted and non-adopted respondents are presented in table 4.13

**Table 4.13 Efficiencies of adopted and non-adopted respondents**

Particulars	Kharif Season			Rabi Season		
	Adopted	Non-Adopted	Difference	Adopted	Non-Adopted	Difference
Technical Efficiency crs	0.84	0.54	Significant	0.74	0.51	Significant
Technical Efficiency vrs	0.86	0.60	Significant	0.79	0.58	Significant
Scale Efficiency	1.02	1.11	Non-Significant	1.06	1.13	Non-Significant
Economic Efficiency	0.93	0.80	Significant	0.88	0.77	Significant
Allocative Efficiency	1.08	1.36	Non-Significant	1.13	1.35	Non-Significant

**Table:4.13(b) t test results (Kharif Season)**

Particulars	Technical Efficiency CRS		Technical Efficiency VRS		Scale Efficiency		Economic Efficiency		Allocative Efficiency	
	A	NA	A	NA	A	NA	A	NA	A	NA
Mean	0.84	0.51	0.86	0.60	1.02	1.11	0.93	0.80	1.08	1.36
Variance	0.01	0.00	0.01	0.01	0.00	0.05	0.00	0.01	0.01	0.04
Hypothesis	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
DF	52.00		75.00		44.00		71.00		61.00	
T Stat	24.55		12.69		-2.60		8.37		-8.63	
P(T<=t) one-tail	0.00		0.00		0.01		0.00		0.00	
t Critical one-tail	1.67		1.67		1.68		1.67		1.67	
P(T<=t) two-tail	0.00		0.00		10%		0.00		30%	
T critical two tail	2.01		1.99		2.02		1.99		2.00	

(A denotes number of adopted respondents, NA denotes number of non-adopted respondents)

**Table 4.13(a) t test results (Rabi Season)**

Particulars	Technical Efficiency CRS		Technical Efficiency VRS		Scale Efficiency		Economic Efficiency		Allocative Efficiency	
	A	NA	A	NA	A	NA	A	NA	A	NA
Mean	0.74	0.52	0.79	0.58	1.06	1.13	0.88	0.76	1.13	1.34
Variance	0.00	0.01	0.01	0.02	0.01	0.04	0.02	0.02	0.05	0.06
Hypothesis	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
DF	80.00		78.00		57.00		86.00		84.00	
T Stat	13.88		8.24		-2.19		3.69		-4.18	
P(T<=t) one-tail	0.00		0.00		0.02		0.00		0.00	
t Critical one-tail	1.66		1.66		1.67		1.66		1.66	
P(T<=t) two-tail	0%		0%		30%		0%		20%	
T critical two tail	1.99		1.99		2.00		1.99		1.99	

(A denotes number of adopted respondents, NA denotes number of non-adopted respondents)

**Table:4.13(c) Distribution of efficiencies of sample respondents (Kharif season)**

Efficiency range	Technical Efficiency CRS		Technical Efficiency VRS		Scale Efficiency		Economic Efficiency		Allocative Efficiency	
	A	NA	A	NA	A	NA	A	NA	A	NA
E<0.1	0	0	0	0	0	0	0	0	0	0
0.1≤E<0.2	0	0	0	0	0	0	0	0	0	0
0.2≤E<0.3	0	0	0	0	0	0	0	0	0	0
0.3≤E<0.4	0	0	0	0	0	0	0	0	0	0
0.4≤E<0.5	0	4	0	2	0	0	0	0	0	0
0.5≤E<0.6	0	41	0	32	0	0	0	2	0	0
0.6≤E<0.7	3	0	1	5	0	0	0	1	0	0
0.7≤E<0.8	11	0	9	4	0	0	2	18	4	0
0.8≤E<0.9	24	0	21	1	3	3	35	21	3	3
E=1	7	0	14	1	1	4	8	2	2	8
E>1	0	0	0	0	41	38	0	1	36	34
Total	45	45	45	45	45	45	45	45	45	45

(A denotes number of adopted respondents, NA denotes number of non-adopted respondents)

**Table:4.13(d) Distribution of efficiencies of sample respondents (Rabi season)**

Efficiency range	TE CRS		TE VRS		Scale Efficiency		Economic Efficiency		Allocative Efficiency	
	A	NA	A	NA	A	NA	A	NA	A	NA
E<0.1	0	0	0	0	0	0	1	0	1	0
0.1≤E<0.2	0	0	0	0	0	0	0	0	0	0
0.2≤E<0.3	0	0	0	0	0	0	0	1	0	0
0.3≤E<0.4	0	0	0	0	0	0	0	0	0	0
0.4≤E<0.5	0	22	0	9	0	0	0	1	0	1
0.5≤E<0.6	2	21	2	21	0	0	0	2	0	0
0.6≤E<0.7	9	0	5	12	0	0	0	9	0	1
0.7≤E<0.8	33	1	28	0	0	0	8	13	0	0
0.8≤E<0.9	0	0	8	2	8	3	20	10	3	3
E=1	1	1	3	1	6	3	16	9	4	1
E>1	0	0	0	0	31	39	0	0	37	39
Total	45	45	45	45	45	45	45	45	45	45

(A denotes number of adopted respondents, NA denotes number of non-adopted respondents)

The table depicts that in kharif season the technical efficiency (crs) of adopted and non-adopted farm units was found to be 0.84 and 0.54 and under technical efficiency (vrs) it was 0.86 and 0.60 for adopted and non-adopted farm units respectively. Thus, KVK adopted farm unit achieve high technical efficiency for every unit of input applied in kharif season. For rabi season the mean technical efficiency score under CRS was found to be 0.74 and 0.5 and under VRS it was found to be 0.79 and 0.58 for adopted and non-adopted farm units respectively. Thus, KVK adopted farm achieve more technical efficiency for every input applied in kharif as well as rabi season.

In kharif and rabi seasons significant difference was found between adopted and non-adopted farm unit under technical efficiency CRS and VRS as  $p \text{ value} < \alpha$  i.e.,  $0.0\% < 5\%$  and  $0.0\% < 5\%$  respectively.

The mean scale efficiency score for the adopted and non-adopted farm unit was found to be 1.02 and 1.11 for kharif and 1.06 and 1.13 for rabi season which indicates that both farm unit operates at increasing return to scale.

There was non-significant difference between adopted and non-adopted farm unit in scale efficiency as the  $p \text{ value} > \alpha$  i.e.,  $30\% > 5\%$  for kharif season and  $p \text{ value} < \alpha$  i.e.,  $20\% > 5\%$  in rabi season.

The mean economic efficiency score across adopted and non-adopted farm units was calculated as 0.93 and 0.80 for kharif season which reveals that total cost of production could be reduced on an average by approx.7% and 20% respectively to achieve same level of output. For rabi season, the mean economic efficiency score across adopted and non-adopted farm units was found to be 0.88 and 0.77 which revealed that total cost of production could be reduced on an average by approx 22% and 33% respectively to achieve same level of output.

There was a significant difference between adopted and non-adopted farm unit under economic efficiency as the  $p \text{ value} < \alpha$  i.e.,  $0\% < 5\%$  in kharif season and  $0\% > 5\%$  in rabi season.

The mean allocative efficiency score across adopted and non-adopted farm units was calculated 1.08 and 1.36 for kharif season which indicates that on an average non-adopted farm unit are using input in cost minimizing levels given the input prices efficiently than adopted farm units in kharif season. For rabi season, the mean allocative efficiency score was calculated 1.13 and 1.35 for adopted and non-adopted farm units respectively which reveals that adopted farm units using inputs more efficiently than the non-adopted farm units.

There was non-significant difference between adopted and no-adopted farm units under allocative efficiency as the  $p\text{value} < \alpha$  i.e.,  $30\% > 5\%$  in kharif season and  $20\% > 5\%$  in rabi season.

#### 4.4 Factors Affecting the Technical, Allocative, Scale and Economic Efficiency

##### 4.4.1 Factors affecting the technical, allocative, scale and economic efficiency of kharif season

Factors affecting the farm efficiencies i.e., technical, allocative, scale and economic of kharif season are presented in the table 4.14

**Table 4.14 Factors affecting farm efficiency of kharif season**

Dependent variable	Economic Efficiency	Allocative Efficiency	Scale Efficiency	Technical Efficiency Crs	Technical Efficiency Vrs
Independent Variable	Regression coefficient				
Intercept	0.451*** (7.378)	0.610*** (6.012)	1.574*** (12.101)	0.631*** (13.385)	0.943*** (9.996)
Adoption Status Yes (Dummy)	0.00021*** (18.283)	0.0745 (0.325)	0.3141*** (5.484)	0.00014*** (8.962)	0.00112** (9.996)
Land holding (Medium) (ha) (Dummy)	0.009 (0.703)	0.1548*** (4.071)	-0.1083* (2.310)	-	-0.0549 (1.773)
Land holding (Small) (ha) (Dummy)	0.03402* (2.245)	0.1216 (0.0201)	-0.04104 (0.649)	-	-0.00923 (0.223)
Fertilizer Quantity (kg/Acre)	-0.0012*** (6.495)	-	-0.0010* (2.245)	-	-0.0009** (2.651)
Labour to machine	0.0916* (2.469)	-	-	-	-
Area under Crop (ha)	-	0.0775*** (8.521)	-0.057*** (4.988)	-0.0068 (1.922)	-0.035*** (4.556)
Area Irrigated (ha)	-	-0.066*** (7.032)	0.0483*** (5.028)	0.0104* (2.369)	0.0375*** (5.977)
Family Size	-	-0.0087 (1.861)	-	0.0064* (2.477)	0.0056 (1.418)
Caste OBC (dummy)	-	0.0968* (2.295)	-	-0.0621** (2.679)	-0.0753* (2.294)
Caste SC (Dummy)	-	0.0727 (0.0999)	-	-0.0667** (2.896)	-0.0613 (1.868)
Caste ST (Dummy)	-	0.1499 (0.0297)	-	-0.0658 (1.788)	-0.095 (1.827)
Machine to Inventory	-	-	-	0.0251 (1.597)	-
R <sup>2</sup> Adjusted	0.99	0.76	0.43	0.89	0.78
F Statistic (F critical)	37.23 (2.277)	28.96 (2.054)	12.33 (2.123)	81.84 (1.997)	33.47 (1.997)
No. of Observation	90	90	90	90	90
AIC	-256.86	-136.62	-100.23	-250.48	-183.09

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Table 4.14 reveals that for every 1 percent increase in adoption status yes the economic, scale and technical efficiency (CRS and VRS) increases by 0.00021, 0.0314, 0.00014 and 0.00112 per cent respectively at highly significant level. Land holding (small) was found to be positive and significant as for as allocative and economic efficiency was concerned, which means 1 per cent increase in land holding (small) increases the efficiency by 0.03402 and 0.1216 per cent respectively. Land holding (medium) was found to be positive and significant as for as allocative efficiency is concerned when there is increase in land holding by 1 hectare, but found to be negative and significant to scale and technical efficiency vrs which means a unit increase decrease the efficiency. For every 1 per cent decrease in land holding (medium) efficiency was decreases by 0.1083 per cent.

Fertilizer quantity was found to be negative and significant as for as economic, scale and technical efficiency VRS is concerned which implies that a unit increase in variable decreases the efficiency. Caste OBC, SC and ST positively affect the economic efficiency but negatively affect the technical efficiency CRS and VRS. A single unit increase in area irrigated decreases the allocative efficiency by 0.066 per cent and increases the scale, technical efficiency CRS and VRS by 0.048, 0.0104 and 0.0375 per cent respectively.

For every 1 percent increase in caste OBC and SC increases the allocative efficiency by 0.098 and 0.149 unit and decreases the technical efficiency VRS by 0.075 unit.

#### 4.4.2 Factors affecting the technical, allocative, scale and economic efficiency of rabi season

Factors affecting the farm efficiencies i.e., technical, allocative, scale and economic of rabi season are presented in the table 4.15

**Table 4.15 Factors affecting farm efficiency of rabi season**

Dependent variable	Economic Efficiency	Allocative Efficiency	Scale Efficiency	Technical Efficiency Crs	Technical Efficiency Vrs
Independent Variable	Regression coefficient				
Intercept	0.994*** (12.471)	1.412*** (8.733)	1.064*** (8.031)	0.514*** (45.84)	0.383*** (7.104)
Area under crop (ha)	-0.020** (2.850)	0.0346* (2.194)	-0.0249* (2.263)	-	-
Area irrigated (ha)	0.0219* (2.217)	-	0.039*** (3.715)	-	0.0126* (2.139)
Adoption Status Yes (Dummy)	-0.0073 (0.127)	-0.1364 (1.615)	-0.365*** (2.891)	0.226*** (14.23)	0.0564 (1.285)
Age	0.001690 (1.546)	-	-	-	-
Fertilizer quantity (kg /acre)	-0.001*** (5.882)	-0.0021*** (5.094)	-	-	0.00032 (1.583)
Land holding Medium (ha) (Dummy)	-	0.1637* (2.324)	-0.03483 (0.738)	-	-
Land holding Small (ha) (Dummy)	-	0.1150 (1.298)	0.0266 (0.446)	-	-
Labour to Machine	-	-	0.0470*** (3.603)	-	0.376*** (4.136)
R <sup>2</sup> Adjusted	0.3877	0.5181	0.4425	0.6935	0.5448
F Statistic (F critical)	12.27 (2.477)	16.95 (2.122)	11.09 (2.053)	202.4 (3.948)	27.63 (2.321)
No. of Observation	90	90	90	90	90
AIC	-96.99	-34.70	-99.11	-181.51	-125.76

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Table 4.15 reveals that for every 1 per cent increase in area under crop the allocative efficiency was increases by 0.0346 per cent and scale efficiency was decreases by 0.0249 per cent. Every 1 per cent increase in area irrigated increases the economic efficiency and technical efficiency VRS by 0.022 unit and 0.0126 per cent.

Labour to machine ratio are positive and highly significant as for as scale efficiency and technical efficiency VRS. Which implies that a unit increase in these variables results in increase in the efficiency with

the same proportion. Whereas adoption status yes and fertilizer quantity was found to be negative and significant as for as economic, allocative and scale efficiency is concerned which implies that these variables are responsible for decrease in efficiency.

For every 1 per cent increase in land holding (medium) the allocative efficiency increases by 0.1637 per cent, whereas area under crop decrease the scale efficiency by 0.0249 per cent. Adoption status yes was negative and highly significant to scale efficiency.

AIC: Akaike Information Creation is an estimator of relative quantity of statistical model for a given set of data. AIC quality of each statistical model related to each of other model. Lower values of AIC suggest better model, but it is relative measure of model fit.

# **CHAPTER - 5**

## **Summary, Conclusion and Suggestions**

## **Summary, Conclusion and Suggestions**

### **5.1 Summary**

The concept of farm efficiency is primarily concerned with the performance of the processes used in transforming given inputs into outputs. Farm efficiency measures that are usually distinguished at the farm level technical efficiency which is measured as the farm success in producing maximum output from a given set of input. Allocative or price efficiency is a measure of farm success in choosing an optimal set of input with a given set of input price. The product of technical and allocation efficiency turns out to be economic efficiency.

The present study focuses on Umaria district measuring the efficiency of KVK adopted and non-adopted farmers in Karkeli block of Umaria district of Madhya Pradesh. The results help of the study may help the policymakers in identifying appropriate policies and strategies to improve efficiency of farms.

The present study entitled "An economic comparison of farm efficiency between KVK adopted and non-adopted farmers of Umaria district of Madhya Pradesh" was undertaken in the year 2018-19 the objective of the study were-

1. To assess the socio-economic characteristics of adopted and non- adopted farmers.
2. To determine the farm profitability of adopted and non-adopted farmers.
3. To examine the technical, allocative, economic and scale efficiency of the adopted and non- adopted farmers.
4. To analyse the factors affecting technical, allocative, scale and economic efficiency of adopted and non-adopted farmers.
5. To suggest policy measures for enhancing farm profitability and efficiency of farmers.

The study was conducted in Umaria district. Karkeli block was selected purposively among 3 blocks as the KVK provides their services and awareness programmes to the farmers. Sample of 2 villages of the

block was selected on the basis of KVK adoption status of villages, so one KVK adopted and one non-adopted village was selected randomly. A sample of 90 farmers in the ratio of 45:45 was selected randomly. The farmers were classified into two groups viz., KVK adopted and non-adopted farmers. Pre-tested interview schedule was used for collection of data in the year 2018-19.

Average age of farmers' of KVK adopted and non-adopted farm unit was observed 47 and 48 years respectively. Average family size of adopted and non-adopted farmers was 6 and 8 with 33 and 58 per cent illiteracy in case of adopted and non-adopted farmer respectively. Among adopted farmers 36 per cent had education up to primary level, 13 per cent to secondary and middle, 2 per cent to higher secondary and 2 per cent to graduation level whereas among non-adopted farmers 20 per cent had education up to primary level, 11 per cent to secondary, 7 per cent to middle and 4 percent to graduation level.

Majority of farmers were found to belong OBC category in case of adopted and non-adopted (48.89% & 55.56%) followed by SC (42.22% & 24.44), General (8.89% & 11.11) and ST (0% & 8.89%), while 26.67 and 13.33 per cent adopted and non-adopted farmers were found to earn income between Rs.1001-10000 and 17.78 and 15.56 earned income between Rs.10001-50000 while only 2.22 per cent in both the category used to earn more than 500000.

The average size of land holding of sample farmers was 2.84 hectare and 2.71 hectare for adopted and non-adopted farmer respectively. Overall cropping pattern in study area show that paddy crop was found to be dominating in kharif season followed by maize and urd bean by both the category and in rabi season wheat followed by gram and pea were found to be prefer by both the category. The cropping intensity was higher in adopted (196.71%) as compared to non-adopted (159.24%).

On an average the per hectare total cost incurred in paddy cultivation was found to be 1.90 per cent less in case of adopted farm (Rs.40598.67) as compared to non-adopted farm (Rs.41383.22). Out of

total cost incurred, adopted paddy grower was found to invest 9.70 per cent less variable cost and 8.65 per cent more on fixed cost in case of adopted over non-adopted farmers. On an average yield of main product (44.15 q/ha), net income (Rs.65703.83) and return per rupee (Rs.2.62) was 8.03 per cent, 16.02 per cent and 10.55 per cent more in case of adopted over non-adopted farmers. On an average the per hectare total cost of wheat in case of adopted farm (Rs.35602.06) was found to be 5.30 per cent less as compared to non-adopted. Out of total cost incurred, adopted wheat grower was found to invest 13.55 per cent less variable cost (Rs.21772.71) and 11.47 per cent more on fixed cost (Rs.13829.34) in case of adopted over non-adopted farmers. On an average yield of main product (36.76 q/ha), net income (Rs.41080.06) and return per rupee (Rs.2.15) was found to be 11.99 per cent, 33.77 per cent and 18.95 per cent more in case of adopted over non-adopted farmers.

From the study it is analysed that the KVK adopted farm units were found to be more technical, economical, scale and allocative efficient as compared to non-adopted farm units in kharif as well as in rabi season. In kharif season adoption status yes, land holding (medium) and labour to machine ratio was found to be positive and significant to economic efficiency but fertiliser quantity was found to be negative and significant. Land holding (medium), area under crop and caste OBC was found to be positive and significant to allocative efficiency but negative to area irrigated. Adoption status yes and area irrigated was positively significant to scale efficiency but negative and significant to land holding medium, fertiliser quantity and area under crop. Adoption status yes, area irrigated was found to be positive and significant to technical efficiency CRS and VRS. Negative and significant variables was caste OBC and SC, fertiliser quantity and caste OBC in technical efficiency CRS and VRS respectively.

In rabi season variable which was found to be positive and significant were area under crop to allocative efficiency, area irrigated to economic, scale and technical efficiency VRS, adoption status to scale efficiency,

land holding (medium) to allocative and labour to machine scale and technical efficiency VRS. Variables which was found to be negative and significant were area under crop to economic and scale efficiency, adoption status (yes) to scale efficiency and fertiliser quantity to economic and allocative efficiency.

## **5.2 Conclusion**

The foregoing discussion on various aspects of the study led to draw the following conclusions:

The list of results obtained in this research study concludes that illiteracy rate was higher in case of non-adopted respondents. Size of land holding, net cultivated area and cropping intensity was found to be higher in case of adopted respondents as compared to non-adopted respondents.

Total cost incurred in paddy and wheat cultivation was found to be less in case of adopted as compared to non-adopted respondents. Profitability measures of paddy were found to favour adopted respondents over non-adopted respondents which clearly shows that there is positive impact of KVK as adopted respondents performed well as compared to non-adopted respondents.

The results pertaining to farm efficiencies that estimated mean of technical, economic, scale and allocative efficiency of KVK adopted respondents was more as compared to non-adopted respondents in kharif as well as in rabi season. Again it was found that there is a positive impact of KVK on adopted respondents over non-adopted respondents. The mean difference between adopted and non-adopted respondents for technical efficiency (CRS & VRS) and economic efficiency was found to be significant but scale and allocative efficiency was found to be non-significant in kharif as well as rabi season.

In kharif season the coefficient of variable such as adoption status (yes), land holding (small) and labour to machine ratio was found to be positive and significant to economic efficiency but negative and significant to fertilizer quantity. Allocative efficiency was found to be

positive and significant to land holding (medium), area under crop and caste OBC but negative and significant to area irrigated. Adoption status (yes) and area irrigated is positive and significant to scale efficiency but negative and significant to land holding (medium), fertilizer quantity and area under crop. Technical efficiency (CRS) was found to be positive and significant to adoption status (yes), area irrigated and family size but negative and significant to caste OBC and caste SC. Technical efficiency (VRS) was found to be positive and highly significant to adoption status (yes) and area irrigated but negative and significant to fertilizer quantity, area under crop and caste (OBC).

In rabi season economic efficiency was found to be negative and significant to area under crop, and fertiliser quantity but positive and significant to area irrigated. Allocative efficiency was found to be positive and significantly affected by the variables to area under crop and land holding (medium) but negative and significant to fertilizer quantity. Area irrigated and labour to machine ratio was found to be positive and significant to scale efficiency but negative and significant to area under crop and adoption status (yes). Technical efficiency (CRS) was found to be positive and significant to adoption status (yes) and technical efficiency (VRS) is positive and significant to area irrigated and labour to machine ratio.

### **5.3 Suggestion:**

The suggestion is written on the basis of the result which is collected from the field survey and analysed further on the different aspects. These suggestions are only restricted up to the study area.

Illiteracy is higher in case of adopted as well as non-adopted respondents. Therefore, farmers are not aware properly about schemes and other benefit provided by government, banks or other agriculture organisation. So there is a need to literate the farmers.

Both adopted and non-adopted farmers were found to be inefficient in case of scale and allocative efficiency. This indicates that

farmers can decrease the quantity of inputs to get same level of output or farmers can increase the area with the same quantity of inputs.

Government should have a look on the minimum support price of different crops and make some changes in increasing order.

Water is an important factor for cultivation so it should be insured government should have to develop some irrigation source like rain water reservoir, to use that water in non-rainy season.

The farmers are abusive about the new schemes or changes in the old schemes. So there is a need of timely intervention organisation of symposium to provide the new and update information.

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# APPENDICES

**Department of Agricultural Economics**

**Jawaharlal Nehru Krishi Vishwa Vidyala, Jabalpur**

**“Economic Analysis of Farm Profitability and Efficiency of KVK adopted and non-adopted farmers in Umaria District of Madhya Pradesh”**

**Name of the student: VINIT KUMAR JAISWAL**

**Name of the major advisor: Dr. Deepak Rathi**

**Name of the village:**

**Block: Karkeli**

**District: Umaria**

**1. Details of Sample Farmer**

Name of farmer	Age (year)	Education level	Caste	Mobile no.	Extent of non-farm income (Rs.) Insert code *
			GEN/SC/ST/OBC		

\*<1000: 0, 1001-10,000: 1, 10001-50,000:2, 50,001-1,00,000:3, 1,00,001-5,00,000:4, >5,00,000: 5

**2. Details of family members (numbers)**

Male Members	Female Members	Children (<15 years)	Members dependents on farmer

**3. Information about land holding (acres)**

Land	Area	Cultivated land	Land Revenue (Rs.)	Fallow land		Leased In		Leased Out	
				Current	Old	Area	Rent paid (Rs.)	Area	Rent received (Rs.)*
Irrigated									
Rain fed									

\*If land rented out is NIL then specify the rental value of owned land



## 7. Details of subsidy/loan availed

Source of subsidy/loan	Item(s)	Amount (Rs.)	Interest rate charged (%)	Installment paid yearly (Rs.)

## 8. A. Details of cost of cultivation

Crop name			
Inputs	Quantity/No.	Rate or Price (Rs.)	Purchased from /sold to
Seed			
Fertilizers and bio-fertilizers			
Manures			
Plant protection chemicals and seed treatment			
Growth promoters			
Irrigation			
Crop Insurance premium (Rs.)			
Other charges (Rs.)			
Yield of main product (quintal)			
Yield of by-product (quintal)			



**C. Animal and Machine use details\***

Farm operation	Animal Use				Machinery Used				
	Duration	No.	Rate	Owned/Hired	Name of Machinery	Duration	No.	Rate	Owned/Hired

\*Annual maintenance and non- farm usage of owned animals and machines be sought from farmers to arrive at imputed value.

**9. Fruit Choice survey (Rank fruits from 1 to 6 with 1 being most favored and 6 being least favored) Mention locally available fruits**


**10. Knowledge and Skill updation activities**

Name of activity	Provided by	Extent of adoption *

\*0- Not adopted, 1-Partially adopted, 2-Moderately adopted, 3-Fully adopted

**Remarks of the investigator:**

# **CURRICULUM VITAE**

## CURRICULUM VITAE

**Name of the Author : Vinit Kumar Jaiswal**

**Place of Birth : Rewa (M.P.)**

**Date of Birth : 22-07-1994**



### **Institutions Attended:**

1. Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh
2. AKS University, Satna , Madhya Pradesh
3. Kendriya Vidhyalaya, Baikunthpur, Chhattisgarh
4. Saraswati Shishu Vidhya Mandir, Churcha Colliery, Chhattisgarh

### **Educational Qualification:**

<b>Name of the Degree</b>	<b>Name of the Institution</b>	<b>University/Board</b>	<b>OGPA/Percent</b>	<b>Year of passing</b>
M.Sc. (Ag)	College of Agriculture, Jabalpur	JNKVV Jabalpur	6.74	2019
B.Sc. (Agri.)	AKS University	AKS University, Satna	6.95	2017
12 <sup>th</sup>	Kendriya Vidhyalaya, Baikunthpur	CBSE	53.2	2013
10 <sup>th</sup>	Kendriya Vidhyalaya, Baikunthpur	CBSE	6.8	2010

For the partial fulfilment of the master's degree programme, he was allotted a research problem on **“An Economic Comparison of Farm Efficiency between KVK Adopted & Non-adopted Farmers of Umaria District of Madhya Pradesh”** which was successfully conducted by him and being submitted in the form of thesis.