

**ROLE OF WOMEN IN TODAY'S AGRICULTURE:
AN IMPACT STUDY IN SAMASTIPUR DISTRICT OF
BIHAR**

BY

POOJA KUMARI



A THESIS SUBMITTED TO
THE RAJENDRA AGRICULTURAL UNIVERSITY, PUSA, BIHAR
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

**MASTER OF SCIENCE (HOME SCIENCE) IN
(EXTENSION AND COMMUNICATION
MANAGEMENT)**

**RAJENDRA AGRICULTURAL UNIVERSITY, BIHAR
PUSA, (SAMASTIPUR)-848125**

2015

Regd. No. M/HECM/181/2013-2014 of RAU

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**DEPARTMENT OF HOME SCIENCE EXTENSION AND
COMMUNICATION MANAGEMENT**

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(SAMASTIPUR)-848125**

DEDICATED

TO

**MY DEAR PARENTS
AND FAMILY**

***"WHOSE PERPETUAL AFFECTION
AND EVERLASTING BLESSING AND SUPPORT INSPIRED ME
TO HAVE
HIGHER AMBITION IN LIFE"***

P00JA

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Certificate

This is to certify that the thesis entitled "ROLE OF WOMEN IN TODAY'S AGRICULTURE: AN IMPACT STUDY IN SAMASTIPUR DISTRICT OF BIHAR" submitted in the partial fulfilment of the requirements for the award of the degree of MASTER OF SCIENCE IN HOME SCIENCE (EXTENSION AND COMMUNICATION MANAGEMENT) of the Faculty of Post-graduate Studies, Rajendra Agricultural University, Bihar, Pusa (Samastipur) is a faithful record of bona fide research work carried out by MISS. POOJA KUMARI under my supervision and guidance. The results of the investigation reported in the thesis work have not so far been submitted for any other degree or diploma.

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

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Acknowledgment

It gives me immense pleasure when work comes to an end successfully, My acknowledgements are many times more than what I am expressing.

*No leaf flatters without the will of **Almighty**. First of all I would like to bow my head in the dignity of **Almighty God** that bestowed me with immense patience and favourable circumstances to achieve this feat.*

*I wish to express my profound sense of gratitude and heartfelt reverence towards my guide and chairman of my Advisory Committee, **Dr.(Mrs.) Arunima Kumari**, Associate Professor-cum-senior scientist, College of Home Science, who has been a great source of inspiration and full of strength for being coherent and concise during my research work. She critically examined the work and provided valuable suggestions each and every steps.*

*My thanks endowed with a feeling of honour flows spontaneously from my heart to the members of my advisory committee **Dr.Punam Kumari** (University Professor, Department of H.Sc. Extension and Communication Management, College of Home Science, Pusa), **Dr.Madan Singh** (University Professor, Department of Extension Education,Pusa), **Dr. Mahesh Kumar** (Assistant Professor, Department of Statistics, SMCA;FBS&H, Pusa) and Dean's Nominee **Dr. Dibyanshu Shekhar** (Assistant Professor, Department of Extension Education, Pusa) for their kind help and valuable suggestions rendered during the course of investigation and without whose co-operations, compilation of this manuscript was not possible.*

*I have no words to express profound sense of regard, deepest appreciations, gratitude and respect to **Dr, Meera Singh** (Chairman, Department of H.Sc. Extension and Communication Management and Dean, College of Home Science,R.A.U., Pusa) for her enthusiastic motivation, constructive criticism and valuable guidance during the course of investigation.*

*With an overwhelming sense of gratitude I am indebted to **Mrs. Singhla Prabha** for her every possible help and guidance at different stages of the research work. With the same spirit I would like to thanks to **Dr. Renu Kumari , Dr. Shipra Kumari**.*

I am very obliges to all the faculty members of college of Home Science for their good wishes and co-operations.

*Moral support, sacrifice, affection, blessings and constant encouragement from my father, **Mr. Surendra Kumar Singh**, who is an idle of my life. takes lion's share in bringing about this work to perfection. I take this opportunity to record my profound sense of gratitude to him for his everlasting inspirations and useful suggestions from time to time and providing every possible facilities to achieve this goal.*

I am spell bound in expressing my deep sense of gratitude from the core of my heart to my loving mother, **Mrs. Bimla Devi**, whose affectionate inspirations, heavenly blessings and good wishes have been supreme force behind every success in my life.

I feel short of words to express my feeling, love and affection towards my brother, **Mr. Priyesh Kumar** and Sister **Miss. Priya Kumari**, for their patience, co-operations and sacrifice.

During the journey of my thesis writing, though I met many kind of people but there were some people who not only showed me path, told me right and wrong steps but also walk with me towards success. My earnest and impassioned thanks to my friend **Miss. Swiny Sandhvi** and her family for the affection and encouragement, continuous support and esteemed inspiration provided by them at each and every steps of my investigation period.

I fail if I do not acknowledged my respected seniors, **Miss Ankita Kumari** and **Miss. Sara neelofar**, lovely juniors and batchmates, **Kumari Minu**, **Rambha Kumari**, **Runi Kumari**, **Ruchiya patel** and **Kavita Kumari** whose timely help has made me over courageous and self confident to perform the task entrusted with me.

I would certainly be mistaken, If I fail to acknowledge to all the staff members of Deparment of H.Sc. Extension and Communication management and College of Home Science especially **Sri Omprakash ji**, **Sri Rambalak ji** and **Sri Rai ji** for their necessary help and co-operations.

I will be failing in my duty if I do not express thanks to the Mukhiya and women of all four village namely Harpur, Mahmadda, Gorai and Madhopur and also **Mr. Amit Kumar**, **Mr. Abhinav Kumar** and **Mrs. Renu Kumari**, for providing necessary facilities and useful informations during the course of investigation.

Mr R. C. Sahay and **Mr. Aditya Sharma** deserves my special thanks for taking meticulous and hand pain in analyzing the data and typing and printing the manuscript.

Last but not least, I am highly obliged to honourable **Vice-Chancellor, RAU, Pusa, Bihar** for granting financial support in the form of fellowship and other vacilities during my M.Sc. degree.

I will plend guilty for forgetting and not acknowledging the contribution of those whose memory fails to recollect. I hope they will forgive me.

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Major Subject	: Home Science Extension & Communication Management
Minor Subject	: Extension Education
Year	: 2015
Total pages of dissertation	: 84+ viii (Bibliography)
Title of the research	: Role of women in today's agriculture: An impact study in Samastipur district of Bihar
Name of the University	: Rajendra Agricultural University, Pusa (Samastipur), Bihar-848125

Abstract

Women are vital human resources and constitutes half of the world population. According to Food and Agriculture Organization (2011), women farmers account for more than quarter of the world's population. Women comprise on an average 43 percent of the agricultural work force in developing countries. In India women constitutes 48.49% of population (World Bank, 2012). As farmers, agricultural workers and entrepreneurs, women constitute the backbone of India's agricultural and rural economy. As per census 2011, the percentage of female main workers to the total population of female stood at 25.5 percent. At All-India level the percentage share of females as cultivators, agricultural labourers are 24.92 percent and 18.56 percent respectively. The participation of woman farmers varies from carrying out actual farm operations in the field to supervision, management and decision making in different agricultural operations. Despite their productive contribution in agriculture, woman as farmers face constraints such as lack of accessibility to skills, trainings, information, technology, access to inputs, credits, financial incentives, market and control over farm income. Women farmers are less likely then men to use modern inputs such as improved seeds, fertilizers, mechanical tools etc., Hence, to bring about immediate desirable changes in the behaviour of farm women, they must be provided with the opportunities and resources.

100 rural women were randomly selected from four villages i.e., Harpur, Mahamdda, Gorai and Madhopur of Pusa and Kalyanpur blocks in Samastipur district and categorized into landless, marginal, small and medium farmers on the basis of size of land holding. Some of the most revealing independent variables i.e., age, caste, education, size and type of family, family income, occupation, size of land holding, social participation and knowledge level were selected. The dependent variables of the study were nature of involvement of woman farmers in agriculture, decision-making pattern of woman farmers in agriculture, and extent of adoption of improved agricultural technology of wheat production.

The findings of the study revealed that the participation of woman varies from pre-harvest to post-harvest agricultural activities. The maximum involvement of woman farmers was in post harvest activities than pre harvest activities. Marginal woman farmers were participating physically more while small and medium woman farmers were supervising the activities. The study further found that the woman having more involvement in production process were also participating more in decision-making process. The maximum participation of woman farmer in decision-making was that of marginal farmers. The extent of adoption of various improved technology of wheat was varying and the maximum adoption was of post harvest technology like harvesting of crops and storage management of grains. The study further found that maximum woman farmers were taking money as loan from their personal savings, friends or co-operatives. The various constraints that hinder the progress of women as farmers were their dual role played at farm and home, male dominance, lack of knowledge and skill, lack of credit, etc.,

The most important factors influencing the involvement of woman farmers in agriculture were caste, income, and size of land holding as these factors were positively and significantly affecting the involvement of woman farmers in agriculture. The study further indicated that the knowledge level of women farmers and marital status were positively and significantly affecting the decision-making pattern of woman farmers and in terms of extent of adoption of improved agricultural technology, the factors, occupation of respondents, family income, size of land holding and knowledge level of woman farmers were contribution as important factors. So these factors should be kept in due consideration while studying the role of woman as farmers.



INTRODUCTION

Indian women are the backbone of farming community. Women in agriculture are often '**physically visible**' but conceptually are '**invisible**' and remain marginalized. Rural women, besides their normal household responsibilities play a very significant role in agriculture and allied activities.

Agriculture is the dominant sector of Indian economy, which determines the country's growth and sustainability. It is the broadest economic sector and plays a prominent role in overall socio-economic fabric of country's economy. About 65 percent of the population still relies on agriculture for employment and their livelihood. India is first in the production of milk, pulses, jute and jute like fibre; second in rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton production and is a leading producer of spices and plantation crops as well as livestock, fisheries and poultry. The 11th Five Year Plan (2007-12) witnessed an average annual growth of 3.6 percent in the GDP from agriculture and allied sectors and the growth target for agriculture in the 12th Five Year Plan is estimated to be 4 percent.

The prosperity and growth of a nation depends on the position and development of its females, as they not only constitute nearly half of its population but also positively influence the growth of remaining half of population. It is only women around whom the whole families growth rotates. Women are vital human resources and constitutes half of the world population. According to Food and Agriculture Organization (2011), woman farmers account for more than quarter of the world's population. Women comprise on an average 43 percent of the agricultural work force in developing countries, ranging from 20 percent in Latin America to 50 percent in Eastern Asia and Sub-Saharan Africa and account for an estimated two-thirds of the world's 600 million poor livestock keepers. In India women constitutes 48.49% of population (World Bank, 2012). As farmers, agricultural workers and entrepreneurs, women constitute the backbone of India's agricultural and rural economy.

Ironically, we often define the men as farmers, in fact the women also equally involved in agriculture in all phases. Bhatt and Jarial (2012) clearly stated that while women played an important role in farming, yet the face of farming in India is

stereotypically male. If we think beyond the conventional definition of 'Farmer' most of the rural women should be considered as farmer. Women's attachment to farming dates even an era back when the very foundation stone of the human civilization as a consequences of the knowledge that food can be grown was laid. According to Dr. M. S. Swaminathan (1988), the famous agricultural scientist, it was women who first domesticated crop plants and thereby initiated the art and science of farming. While men went out hunting in search of food, women started gathering seeds from the native flora and began cultivating them. Women work in agriculture as, farmers on their own account, as unpaid workers on family farms and as paid or unpaid labourers on others farms and agricultural enterprise.

The work participation of women has increased from 19.7 percent in 1981 to 25.7 percent in 2001. They are now important partners in agriculture workforce since 89.3 percent of female work force are concentrated in agricultural sector. In India, women constitute approximately 50 percent of agricultural and livestock workers. Women shoulder the entire burden of looking after livestock, bringing up children and doing other household chores. In rural India, the percentage of women who depend on agriculture for their livelihood is as high as 84 percent. Independent participation of women was found to very marginal in major crops production (1%), postharvest activity (2%), livestock management (6%), and entrepreneurial activity (0%) (Anon 2009).

As per census 2011, workers constituted 39.79 percent of total population whereas the ratio of female workers was 25.51 percent. At All-India level the percentage share of females as cultivators, agricultural labourers, workers in households industry and the other workers stood at 24.92, 18.56, 2.95, and 47.20 percent respectively. The percentage of female main workers to the total population of female stood at 25.5 percent. Work participation rate of female workers in rural areas were higher which stood at 30.0 percent as compared to the work participation rate of 15.4 percent in urban areas.

Women make up about 33 percent of cultivators and about 47 percent of agricultural labourers. In 2009, 94 percent of the female agricultural labour force in crop cultivation was in cereal production, while 1.4 percent worked in vegetable production, and 3.72 percent were engaged in fruits, nuts, beverages and spice crops. Women's participation rate in agricultural sector is about 47 percent in tea plantation,

46.84 percent in cotton cultivation, 45.43 percent in growing oilseeds and 39.13 percent in vegetable production. Khan *et.al.*, (2012) found that among the various crops, women were mostly engaged in wheat cultivation and a women spent 38.72 hours on wheat production per acre in one season. Similarly in average acre under sugarcane and maize crop counted for 22.25 and 14.4 hours respectively. While these crops require labour intensive work, the work is considered quite unskilled. They contribute as cultivators and are engaged in a number of farm operations with men, independently or jointly. Fabiyi *et. al.*, (2007) showed that the percentage distributions of farm operations in which women were involved were in land clearing 58 percent, in planting 72 percent, in weeding 80 percent, transporting of products 82 percent, in harvesting 93 percent, in processing 93 percent, in marketing 88 percent. The same result has been shown by Kumari S *et. al.*, (2009). The participation of women varies from carrying out actual farm operations in the field to supervision, management and decision making in different agricultural operations. In many places, the contribution of women towards agriculture is more than that of men. Several research studies over the years have confirmed that women work for 14-18 hours of manual work daily on farming operations, livestock raising, fetching fodder, fuel and water from distant places and expending more energy a day.

Women as agricultural labourers participate in several activities such as weeding, sowing, transplanting, harvesting, storage etc. The utilization of time in agriculture by the farm women varied from 3.5h to 7.3h during lean to active season with an average of 5.3 h/day in agricultural activities. Maximum involvement of farm women was in drying and storage 77.3 percent followed by intercultural practices 73.9 percent and harvesting 72 percent. (Anon 2005).

Indian society is male dominated and common Indian hardly feels any prick or pinch because in male dominated society, women are considered as an asset possessed by males initially and transferred to another man through settlement or marriage. Even in day to day work they are exposed extremely by the male folk in the society. However, there are evidences in our society that large number of ladies had successfully managed everything. If one looks at ancient history, it would be absolutely clear that in the Vedic India, women occupied an exalted position in the households and never failed to make her presence felt. "In fact she was the very axis on which the wheel of household life in ancient India turned." (Gandhi 1962).

Research findings further showed that the women not only contribute to physical production process but also in decision making regarding to agricultural activities, household activities, marketing, livestock management, religious activities, purchasing of goods, etc. The women's participation in decision enhances the decision making power of males and also give them moral support. In cases where male migrates to seek employment, women tend to become the sole decision maker. Hence women must given full chance to participate in decision making as they are actively engaged in home and farm activities. Women's active involvement in decision making is considered essential for rapid economic development of the country.

Despite the important role played by women in agricultural production, they face several handicaps. They are in fact the largest group of landless labourers. Woman as farmers face constraints such as lack of accessibility to skills, trainings, information, technology, access to inputs, credits, financial incentives, market and control over farm income. Woman farmers are less likely than men to use modern inputs such as improved seeds, fertilizers, mechanical tools etc., They use conventional tools with little efficiency and face drudgery while working in the field and home. Also as men are migrating to urban areas for work more and more women are taking to farming, but they are not getting access to credit as they do not have pattas. Only 11 percent women have access to land holdings, that too, mostly as small and marginal farmers (Yojana 2012). Finally women have less education and less access to extension services. The machine and tools of women performed operations like paddy transplanters, harvesters, threshers, sprayers, weeders, seeders are not being tested to be made appropriate to women users. Extension personnel (mostly men) do not popularize them among women. Hence only 5 percent of women farmers are benefited from extension services. Also majority of the rural women are uneducated, unskilled, and tradition-bounded, therefore their productive capacities are also low, and counted as unskilled labour. Women's wage work is also considered a threat to the male ego women's engagement in multiple home-based economic activities leads to under remuneration for their work. Women tend to produce 20-30 percent less than their male counterparts. Modernization in agriculture has displaced farm women from their traditional roles. Due to this farm women constitute a disproportionate number of rural poor. Accesses to productive resources such as

appropriate technologies, training and credit facilities have always been insufficient to achieve their full potential.

To bring about immediate desirable changes in the behaviour of farm women, is really a formidable task. To achieve this end, it is necessary to clear the doubts from their mind and convince them about the superior performance of new agricultural technologies of the crops and the need to adopt the recommended packages of practices for the same. If woman farmers across the developing world had the same access to labour, fertilizers, extension services and seeds as male farmers, yields would increase as much as 20-30 percent per households, and the total agricultural output will be raised by 2.5 to 4 percent. This gain in production can reduce the number of hungry people in the world by about 12 percent to 17 percent, besides increasing women's income.

Statement of the Problem

Bihar is the 13th largest state, with an area of 94,163km² and the 3rd largest by population. The density of population is also very high i.e., 1106 people per km². In Bihar women constitute 49.82 million of its total population of 103 million with a sex ratio of 918 female per 1000 males(census 2011).The literacy rate in Bihar is 63.4 percent while the female literacy rate is 53.3 percent(census 2011).

The Gross State Domestic Product of Bihar for the year 2013-14 has been around 3683.37 billion INR. By sectors, its composition in agriculture is 22 percent, in industry is 5 percent and in service sector is 73 percent.

The economy of Bihar is largely service oriented, but it has a significant agriculture base. Bihar lies in the riverine plain of the Ganga basin area and is endowed with fertile Gangetic alluvial soil with abundant water resources. This makes Bihar's agriculture rich and diverse, although it has never reached its full potential. Rice, wheat, maize are the major cereal crops of Bihar. The net sown area in Bihar is 60 percent of its geographical area.

The total workers in Bihar are 34 million of which 9.50 million workers are the female workers. Of these female workers, 15.27 percent are cultivators, 60.77 percent are agricultural labourers, 6.83 percent are household industry workers and 17.13 percent are other workers. In Bihar the Female work participation rate was 18.8 percent in 2001 which rose to 19.1 percent in 2011 (statistical profile 2012-13). The

majority of rural woman workers participate in agriculture and related activities either as casual workers or self-employed. The lower castes are found to be work predominantly as paid agricultural labourer due to their poverty and inaccessibility to land resources. The self-employed in agriculture are from the landowning, sharecropping or traditional artesian households. They work as unpaid family workers or as supervisor. There is lack of knowledge and skill in rural women. The adoption of the improved technology by woman farmers are believed to be affected directly or indirectly by different socio-economic factors.

Women can be more successful and effectively adopt and use the technology than their male counterparts if they are provided with the opportunities and resources.

Keeping these views in mind, present study entitled role of women in today's agriculture has been taken up with the following specific objectives:

- I. To study the socio-economic profile of farm women.
- II. To see the role of women in decision making in the field of agriculture.
- III. To see the rate of adoption of modern techniques of agriculture.
- IV. To study the financial help the woman farmers get by the government/private organizations or any other NGOs and the constraints faced by them.
- V. To ascertain the relationship between selected socio-economic variables with extent of adoption of modern agricultural practices by farm women.

Scope and importance of the study

The finding of the study will give an idea about the extent of involvement of women in agriculture, their participation in decision making and the extent of adoption of improved agriculture practices. This study will also give us an idea about the financial support woman farmers get from government or any NGOs. This study aims to explore the relationship between various socio-economic variables and extent of adoption of improved agriculture practices. This study will help government as well as institutions to make woman farmers more aware about improved agricultural practices and to increase its extent of adoption. Also this will further help the government and institutions to develop women's friendly tools and implements in agriculture to reduce their drudgery and to save their time and increase their income.

Limitation of the study

The study was carried out in two blocks, Pusa and Kalyanpur (Samastipur district) only. Hence the findings of the study may not be fully generalised unless the existing socio-personal, ecological, and economic conditions are by and large similar. Also the researcher is a girl student and does not belong to that particular region, hence she has to first of all make a rapport with the respondent.

Being a student researcher, this study also suffered from the limitations of time, money, convenience etc. This prevented the researcher for either enlarging the scope of the study or the area under investigation. However, within the available resources sincere efforts have been made to make the study more systematic, comprehensive, realistic and scientific as possible.

Organization of the thesis

The thesis has been organized in five chapters. The first chapter deals with an introduction of the topic, specific objectives of the study and scope, importance and limitation of the study. The second chapter deals with a review of relevant studies and observation done in India and abroad. The third chapter deals with the Research methodology used in the study. The fourth chapter deals with findings and discussions of the present investigation. The fifth and the last chapter deals with a brief summary and conclusion of the present investigation.

The literature consulted and cited in this thesis has been enlisted in a section after the summary and conclusion. This is followed by relevant appendix.



REVIEW OF LITERATURE

A comprehensive review of literature is an essential part of any scientific investigation, therefore it was necessary for the researcher to acquaint with the work done in the past in order to delineate the important problem areas. The present review of literature has been categorized under following sub-headings:

- 2.1. The socio-economic profile of farm women.
- 2.2. Extent of participation of women in agricultural activities.
- 2.3. The role of women in decision making related to agricultural activities.
- 2.4. Knowledge and extent of adoption of improved technology by farm women.
- 2.5. Constraints faced by farm women in agriculture.

2.1. The socio-economic profile of farm women.

Nayar (1987) in his study found that in Indian context, both economic consideration and socio-cultural norms are likely to determine female employment. Given the level of per capita income, particularly of the landless agricultural labourers and marginal and small farmers in rural India, women belonging to these classes are forced to seek employment as a response to their family needs. Literacy, educational levels and demographic compulsions have a negligible impact on female participation rates in rural India, they are likely to become important determinants of FPR at higher levels of development in a society. Regarding technology, Nayar revealed that there is a bias against women in earning. This can prevent them in participating in productive work on the farm with change in technology.

Blevins and Jensen (1991) focused on female employment and its contribution to the economic viability of farm operations, by considering the importance of women's as well as men's employment in maintaining the economic viability of farm-related operations during a farm crisis and a wage boom. Although an equal percentage of females and males work off farm, the data show gender-defined pattern. While size of farm operation was a major predictor of the likelihood of engaging in off-farm employment for men, age and education level proved important predictors of women's employment off the farm. Both men and women recognized that the need for off-farm income conflicted with the perceived negative consequences for the farming

operation as a result of off-farm work, but comments on the questionnaire suggest that husbands were more comfortable having their wives get a job than taking one themselves.

Singh *et al.*, (1994) found that the relationship between socio-personal characteristics and extent of participation of women in agriculture found that caste, size of land holding, educational level and income were negatively and highly significantly correlated.

Singh *et al.*, (1996) concluded that participation of women in post-harvest operations was higher as compared to pre-harvest operations.

Singh and Verma (1997) found that the extent of participation of women in respect of post-harvest operations was high in case of about 60 percent of the respondents. While nature of participation varied from actual doing, supervision and the both. In majority of the cases they were either doing actually and supervising the activation.

Patki and Nikhade (1999) reported that with the advancement of age and increase in land holding, the involvement of rural women in agricultural activities tends to increase.

Crawford M (2011) reflected that it has 144,685 farmers utilizing 259, 358 hectares of land. It also indicates that, 43, 808 (30%) are women between the age of 35 – 54. The average land space utilized by women is 1.4 hectares in comparison to an average of 2.6 hectares of land cultivated by male farmers.

Doss (2011) showed that women comprise about 43% of the agricultural labour force globally and in developing countries. But the figure makes considerable variation across regions and within countries, according to age and social class. This showed that female time use in agriculture varies by crop, production cycle, age, and ethnic group. The overall burden of rural women exceeds that of men and they are mainly unpaid, seasonal and part-time worker, often paid less than men for the same work.

Bhatt and Jarial (2012) examined the gender inequality with Indian agricultural sector. While women play an important role in farming, yet the face of farming in India is stereotypically male. This is substantiated with unequal access to resources and opportunities.

Behera and Behera (2013) examined the ways in which greater integration through agriculture impact women and men differently and ensures implications for growth. This paper finds that agriculture creates many jobs for women in agriculture sector. Jobs that bring many household resources under women control leads to greater earnings in the family. Although, women are more than ever finally employed, differences in wages earned by women and men persist in all countries. Women also have less access to productive resources specially in developing countries. Due to these reasons and women's lower education level compel the women have a greater tendency to remain in subsistence agriculture. Professional women continue to discrimination in hiring and promotion. The impact of liberalization and globalization on women is important not only because they represent almost half of the total population, but also because they face constraints, which make them less beneficial from the liberalization. Once different impacts are ascertained well designed policy responses may aid women in taking advantage of greater openness to agriculture. Now the women are more working than men & most of the Farming activities(80%) is done by females, so this era is called as Feminization of Agriculture & Female face of Farming.

Mendal (2013) showed how the number of rural agricultural labour changed from 1971-2011. From the contribution of women to agricultural and food production is significant, but it is impossible to verify empirically the share produced by women.

2.2 Extent of participation of women in agricultural activities.

Perumal (1988) reported that majority of the farm women were engaged in farm operations viz. seed treatment, sowing, manuring, interculturing, harvesting and post-harvest activities.

Mijindadi (1993) estimated that women are responsible for 70 percent of actual farm work and constitute up to 60 percent of the farming population in Nigeria.

Singh *et.al.*, (1996) concluded that participation of women in post-harvest operations was higher as compared to pre-harvest operations.

Singh and Verma (1997) found that the extent of participation of women in respect of post harvest operations was high in case of about 60 percent of the respondents. While nature of participation varied from actual doing, supervision and the both. In majority of the cases they were either doing actually and supervising the activities.

Yahaya (2002) recorded that 76% of women from Oyo and Bauchi State are actively involved in farming activities or are engaged in their husband's farms.

Kumari M (2003) found that the independent work participation of men in all farm and allied activities was 31.28 percent while women independent work participation was 50.05 percent and joint participation was 18.67 percent. Men took independent decisions in a sizeable proportion (54.97percent) and women say independent decisions was (18.71 percent) of all farm and money related decisions. Joint decisions were taken by 26.86 percent of all farm and related decisions. This point out men dominated women in all farm and money related decisions.

Fabiya *et.al.*, (2007) showed that the percentage distributions of farm operations in which women were involved in the study area were in land clearing 58%, in planting 72%, in weeding 80%, transporting of products 82%, in harvesting 93%, in processing 93%, in marketing 88%. Women who had their personal farms, plant mainly groundnut (62%) soyabean (57%), rice (40%), cowpea (28%) maize (25%) and vegetables (10%). They also keep livestock such as pigs (48%), goats (23%), sheep (17%) and poultry 3 percent.

Kumari S *et.al.*, (2009) showed that majority of the respondents were of young age, illiterate, belonged to middle caste, had medium level of family education status and had nuclear family system. Sixty per cent of the respondents had occupation as agriculture and 39 per cent of them were landless. Average number of days 40.82 spent annually by farm women in paddy cultivation were highest in transplanting activity and time spent hrs/day in harvesting activity was 9.39. Participation of women was found highest (84%) in transplanting activity.

Kumari *et.al.*, (2009) revealed that majority of the farm women were involved in field preparation (80.0%) as well as seed treatment (79.5%) in the month of May, transplanting (78.0%) in July, weeding (73.5%) in August, harvesting and bundle making (80.00%) in October. While storing activity was performed by all the respondents (100.00%) in November. The study also found that the fact that maximum involvement of women labourers was in transplanting (2.84) followed by harvesting (2.82), bundle making (2.79), seed treatment (2.78) and weeding operations (2.41).

Chayal and Dhaka (2010) showed that farm women's participation was maximum in Cutting, Picking, cleaning of grains, drying of grains, storage, processing operations and major part of cleaning of field, raising nursery for seedling, weeding, shifting production to threshing floor, winnowing, & grading operations are also done by farm women. In case of leveling of field, fertilizer application they do least amount of work, whereas there is no participation of farm women in ploughing of field, plant protection measures and marketing activities. The study also depicts that age, family income, land holding influence the women participation in agriculture and the women participation in agriculture. Type of family, education level, cast were not effected by the women participation in agriculture.

Chayal *et al.*, (2010) showed that cutting, picking, cleaning of grains, drying of grains, storage, processing, weeding, winnowing are the major farm operations mainly performed by farm women. Participation of farm women in agriculture was significantly affected by socio-economic variables.

Nain and Kumar (2010) found that the extent of involvement was maximum in two operations that included weeding and harvesting (96.66%). This was followed by transplanting (93.33%), storage (71.66%), threshing (45%) and arranging seeds (43.33%). There was least involvement of farm women in operations like field preparation (38.33%), marketing (23.33%), sowing and irrigation (20%). The minimum involvement was found in fertilizer application where only a few (11.66%) farm women were involved.

Chauhan (2011) found that most of the farm women were engaged with sowing followed by stubble collection, clode crushing, manuring and seedbed preparation. In case of interculturing operations the participation of the farmwomen were observed highest in weeding followed by gap filling, application of fertilizer, bird scaring, irrigation, bunding and hoeing with hand. In harvesting and post harvesting operations, the highest participation was obtained in nipping / picking and threshing followed by harvesting, winnowing, storage, making threshing yard, bagging, packing and marketing of agriculture products.

Kalyani *et.al.*, (2011) examined that the average no. of working hours per day for a tribal woman is 16.8 where as it is 12.1 for tribal man. The work participation rate is equal (33.3%) for both the men and women. The participation of women was

found to be high in agriculture and allied activities except in horticulture. On comparison to men, the rate of work participation of tribal women was more in agricultural labour (27.7%), cattle/sheep rearing (41.6%), collection of minor forest produce (25.0%) and allied activities (25.0%) where as in men the participation rate in these activities was low i.e. (16.6%), (33.3%), and (8.3%) respectively. Only in horticulture, the participation rate of men was high (12.5%) when compared to women (8.3%).

Khan *et.al.*, (2012) found that among the various crops, women were mostly engaged in wheat cultivation and a woman spent 38.72 hours on wheat production per acre in one season. Similarly in average acre under sugarcane and maize crop counted for 22.25 and 14.4 hours respectively.

Moktan and Mukhopadhey (2012) found that farm women had participated to all the identified agricultural activities to a great extent irrespective of their different farming categories. It was found that farm women participated most in activities like transplanting and intercultural operation. The other major activities performed by marginal farm women were uprooting of seedlings, bringing seedlings to the main field, harvesting, seed sowing, land preparation and processing of farm produce. For small- medium category of farm women the other major agricultural activities were bringings seedlings to main fields, uprooting of seedlings, harvesting, land preparation, manure and fertilizers application, processing of farm produce and seed sowing. It was found that the total mean annual participation hour of respondent farm women was 1366 hours per year. It was found that more than 50% of the marginal farm women and small medium farm women have made economic contribution to the tune of rs.10001-Rs.15000. The study also revealed that education of the respondents, family education status, land holdings, material possession, social participation, level of awareness, level of knowledge, and level of skill had a positive and significant relationship with the extent of participation of farm women.

Unnati *et.al.*, (2012) showed that that majority (64.00%) of the respondents were from medium category of extent of participation, while 22.66 and 13.34 per cent respondents were from low and high category of extent of participation. The extent of participation of farm women in farm decision making in various activities was found to be low in case crop selection (40.00%), crop cultivation management (52.00%), inputs (48.67 %).The level of participation of women in farm decision making was

found medium in respect of intercultural operations (48.00%); harvesting of crops (45.33%); storage of farm produce (42.67 %); sale of farm produce (42.00 %); and financial management (48.67 %). The extent of participation of women was found to be high in farm decisions about agriculture and subsidiary occupation (38.67%), like animal husbandry and dairy business (38.67%) and financial management (36.00%).

Tegegne (2012) showed that women's contributes 46% of labor to agricultural activities. Men, boys and girls also participate in agricultural activities. However, women's work in the agricultural activities documented as marginal and they have been considered more as consumers than as producers. The study showed that the average day for a rural women in Halaba involves food processing, water and fuel wood collection, assisting family farm, marketing and labour exchange for community services. Also the level of participation as women's labour is more participating in agricultural activities, community services and contributing more in securing their household members food demand than other household members do. But women receive no remuneration for their labour, no monetary or maternal gains and no benefits in leisure time and improved living conditions. In general the contributing factors that influences women's role in agriculture depends upon the women's dependence on their husband. The other one is illiteracy, ignorance, low socio-economic status and traditional religious and cultural dominance and low political participation in the community.

Mondal (2013) investigated the women access to economic resources and examined the influence of selected socio-economic characteristics of women and access to economic resources on their participation in agricultural production. In this study area maximum no of women laborers are illiterate with no formal educational status which directly informed their participation in agricultural production. Women participation in rural labor markets varies considerably across regions, but invariably women are over represented in unpaid, seasonal and part-time work, and the available evidence suggests that women are often paid less than men for the same work. This paper re-affirms that women make essential contributions to agriculture and rural enterprises across the study area as well as developing world.

2.3. The role of women in decision making related to agricultural activities.

Ratan (1991) revealed that men dominated women in making independent decisions in agricultural labour allocation and livestock related decisions. However women took independent decisions in a sizeable proportion in labour allocation and livestock related decisions but their share in agricultural decisions was very low.

Kumari A (2001) observed that men dominated women in making independent decision related to all the three sub areas of farm related decision namely crop production decisions (81%), labour allocation decision (73.2%) and livestock related decisions (76.2%).

Brar, Gill And Walia (2007) observed that 42.9 per cent of the total surveyed farmers consulted women in decision making regarding number of hired labourers and kind of wages, while in 11.3 per cent cases their opinions were considered in this areas of decision making in agriculture. only 9.3 per cent of the total surveyed farmers considered the opinion of women, while 68.7 per cent not even consulted the women of family during marketing of their farm produce. However, in case of storage of farm produce 34.9 and 20.4 per cent of the surveyed farmers either consulted or considered the opinion of family women, respectively. Farm credit was more in the hand of adult male member of the family as 62.4 per cent of the total surveyed farmers not even consulted the women of family during farm credit decision making policies and only 5.8 per cent farmers considered the opinion of female members. However, family women were either consulted or their opinion considered during purchase or sale of land, animal and machinery as only in 16.9, 6.0 and 24.5 per cent cases women were not consulted in these areas of decision making in agriculture.

Damisa and Yohanna (2007) studied the participation of the women in decision making was quite minimal. The study revealed that in each of the farm operations, less than 20% of the women were consulted, except in the sourcing of farm credit where about 28% were consulted; about 13% or less of the women had their opinion considered in each of the farm operations except in storage and marketing where about 46% had their opinion considered. However, only between 1 and 2.5% took the final decision in all of the farm operations.

Mishra *et.al.*, (2009) found out that husbands consulted always their wives in respect of the practices namely application of manure in the field, type of vegetable, harvesting time and grading.

Nain and Kumar (2010) found that 63.33 per cent women perceived their decisions as relevant followed by acceptable (41.67%), active (38.33 %), always (38.33 %) and productive (36.67%). Less than one third of the women perceived that their decisions were credible and correct. Women's perception of their decision making in general was bent towards lower side, this may be due to the reason that in patriarchal families the agriculture is considered as the men's domain.

Khanduri *et.al.*, (2011) mentioned that this is a unique situation of the rural Garhwal of Uttarakhand, where women perform more than 80 per cent home and farm activities but their participation in decision-making has been less than 20.91 per cent.

Khanduri and Dev (2011) revealed that the overall pattern of decision-making process related to home and farm affairs, the maximum decisions were taken by all family members (33.64 %) followed by 27.27 %, 20.91 % and 18.18 % decisions taken by women and male, women alone and male alone, respectively. The study also revealed that the participation of women in decision-making process related to home affairs was comparatively lower (13.64 %) than farm affairs (28.18 %), while in case of males, the situation was just reverse as the participation of male in decisions related to home affairs (27.27 %) was higher than the farm affairs (7.27 %). Thus, males were dominating the scene regarding decisions related to home affairs as compared to their female counterparts, whereas in decisions relating to farm affairs it was the women who dominate the scene. This is a unique situation of the rural Garhwal of Uttarakhand, where women perform more than 80 % home and farm activities but their participation in decision-making has been less than 20.91 %. It shows that there was a clear-cut gender bias in the society, which explains traditionally subjugated status of women, as well as their role in decision-making process.

Gondaliya and Patel (2012) studied that the decision making pattern refers to take decision regarding agriculture activities either solely or with husband or with family members or no decision at all. In case of all of major agriculture activities such as sowing practices, nutrient management, crop protection and harvesting and post harvest activities majority of the farm women had taken joint decision with family members or with husband. While, independent female decisions were negligible. Certain area such as crop protections and policy decision, where farm women had denied to take any independent decision in all aspects of these activities.

Dawit *et.al.*, (2012), studied the roles of rural women in final decision making on purchase/sell of farm implements was quite minimum which reported by 6 per cent of the respondents. For selecting the drudgery reducing implements 45 per cent women were taking their own decision and purchased them according to their own choice.

Ram *et.al.*, (2012) studied the decision-making pattern and extent of participation of the farm women on fourteen different practices of agriculture . The results obtained showed that in both the respect majority of the farm women had medium level of participation with 76.66 per cent in decision-making pattern and 80.66 per cent in the extent of participation. It was followed by 12.68 per cent and 16.66 per cent of farm women in the high category of decision-making pattern and extent of participation.

Unnati, Ankush and Mande (2012) found that that majority (64.00%) of the respondents were from medium category of extent of participation, while 22.66 and 13.34 per cent respondents were from low and high category of extent of participation. The extent of participation of farm women in farm decision making in various activities was found to be low in case crop selection (40.00%), crop cultivation management (52.00%), transplanting or sowing (58.00 %) and use of farm inputs (48.67 %). The level of participation of women in farm decision making was found medium in respect of intercultural operations (48.00%); harvesting of crops (45.33%); storage of farm produce (42.67 %); sale of farm produce (42.00 %); and financial management (48.67 %). The extent of participation of women was found to be high in farm decisions about agriculture and subsidiary occupation (38.67%), like animal husbandry and dairy business (38.67%) and financial management (36.00%).

Lad, Wattamwar and Bothikar (2012) found that majority of farm women (50.83 per cent) were found in medium decision making category followed by 32.50 per cent in low decision making category, whereas only 16.67 per cent in high decision making category. It means that majority of respondents involved in medium to low category of decision making in different activities.

Walia *et.al.*, (2013) that women played negligible role in decision making for preparation of land, method of sowing etc. However, they had a good involvement in deciding the number of labourers to be hired and kind of wages to be given to them.

Women were involved in decision making regarding storage and marketing of farm produce, purchase and sale of farm machinery, land and animals. The control over farm credit remained confined to male members of the family only.

Sharma *et.al.*, (2014) indicated that the higher number of farm women (58.33%) were observed in low category of decision making followed by medium decision making of (22.50%) and high decision making with (19.17%) respectively.

The activities in which farm women achieved the highest score at low level of decision making process were weeding (mean score 1.14), selection of seed variety (mean score 1.56), harvesting (mean score 1.50), soil testing (mean score 1.70), winnowing process (mean score 1.42), seed treatment (mean score 1.45), plant protection (mean score 1.38), sowing (mean score 1.46), manure and fertilizer application (mean score 1.35), grain storage (mean score 1.48), collection of harvested crops (mean score 1.48), marketing (mean score 1.63) and soil treatment (mean score 1.53). The activities in which farm women achieved the highest score at medium level of decision making process were threshing process (mean score 1.97), seed processing (mean score 1.99), irrigation management (mean score 1.98) and preparatory of land (mean score 2.07).

Fartyal and Rathore (2014) found that that the activity, land preparation (including cutting bushes, soil preparation, breaking clods on field) and selection of seeds as to which variety is most suitable for sowing were mostly dominated by the decisions of men (75.51% and 80.61%) and both men and women (18.36% and 6.12%) only. As regards to decision making on land preparation and seed selection, women account only for 12.24 per cent and 13.26 per cent, respectively. In the activity cleaning of field such as to clean the field and remove weeds from the field majority of decisions were taken by women (41.83%) followed by men (32.65%) and only 25.51 per cent men and women jointly took decisions in this respect. Data regarding response on decision making on leveling of field were also male dominated (78.95%) followed by men and women jointly (14.28%). Only seven farm women were responsible for taking decisions on leveling of field. Raising nursery for seedling means before transplanting a sapling is prepared for transplanting and seed treatment. Before sowing majority (84.69% and 94.89%) of women took decisions followed by men (8.16% and 5.10%). Only 7.14% men and women jointly reported to have been taking decisions in raising nursery for seedling. The decisions about the activity

sowing seeds, when to sow and how to sow were also male dominated (88.77%) followed by men and women jointly (8.16%). In the pooled data it was observed that the decisions about transplanting, hoeing and weeding were mostly dominated by the decisions of men which were 56.12 per cent, 65.30 per cent and 44.89 per cent respectively followed by women (39.79%, 21.42% and 37.75%). Whereas, joint decisions were taken by both men and women regarding transplanting (4.08%), hoeing (13.26%) and weeding (17.36%). In the activities irrigation and plant protection measures majority of decisions were taken by men (89.79% and 84.69%) followed by women (6.12% and 10.2%). Very small percentage of respondents (4.08 and 5.10, respectively) reported to have been making joint decisions for irrigating the field and plant protection measures. The decisions about harvesting were also male dominated (77.55%). The decisions about the activity marketing of vegetable produce were also male dominated (94.89%) followed by only 5.10 per cent women who had an opportunity to take decision regarding marketing of the produce. Post harvest activities include storage and processing were also male dominated (79.5%) followed by 13.26 per cent men and women jointly. Very few women (7.14%) reported to have been taking decisions regarding post harvest technologies.

Sharma *et.al.*, (2014) The study revealed that more number of farm women found to have high level of participation in agricultural operation i.e. (47.50%) followed by the medium participation (33.33%) and low participation (19.17%) in agricultural operations respectively. The study also revealed that the higher number of farm women (58.33%) were observed in low category of decision making which was followed by 22.50 per cent and 19.17 per cent respectively in case of medium and high decision making process. The study also revealed that the socio economic factors found to influence the agriculture operations and decision making pattern of farm women positively and significantly.

2.3. Knowledge and adoption of improved technology by farm women

Chand *et.al.*, (1985) examined the impact of new agricultural technology on the employment and wages of different categories of women workers and the effect of various individual factors on the employment pattern of men and women workers in Punjab. The study showed that modernization of agriculture in Punjab has resulted in increased employment per hectare of cultivated area for all kind of female labour.

Shakya and Flim (1986) found that adoption of modern technology was not related with family size.

Reddy *et.al.*, (1989) observed that knowledge of improved practices was found to be higher in middle aged farmers.

Quisumbing (1995) examined the econometric evidence on gender differences in agricultural productivity. This study found that in general, male and female farmers are equally efficient as farm managers. Women farmers' lower yields are attributed to lower levels of inputs and human capital than men. Returns to schooling for both men and women are significant in dynamics agricultural settings where modern technologies have been introduced. Farmers with more education, more land and farm tools are more likely to adopt new technologies.

Subashini and Thyagarajan (2000) found that there was positive and significant relationship between farm mechanization and knowledge level of respondents.

Singh and Singh (2002) found that the education of the respondents were significantly affected with knowledge level of the respondents.

Ani *et.al.*, (2004) found that out of the seven farm technologies studied, it was only the use of fertilizer that could be adjudged as the one most significantly adopted by the respondents, where majority (96.3%) of the respondents had fully adopted the practice. The use of improved seeds was known to majority (84.0%) of the respondents while only few (22.0%) eventually adopted the technology. This study also showed that the use of insecticides, herbicides, seed dressing chemical and storage chemical were only adopted by 23.0, 23.5, 7.0 and 1.2%, respectively. This indicates low adoption rates for these technologies. All the practices as a complete package were adopted by only 26.2% of the respondents.

Saka *et.al.*, (2005) found that farm size, frequency of extension contact and the yield rating of the improved rice varieties are the significant factors influencing both the decision of farmers to adopt the improved rice varieties and intensity of use.

Manjula *et.al.*, (2006) found that most to the variation in the knowledge of trained farm women were land holding, organizational participation, decision making and scientific orientation. While in case of untrained farm women, five factors viz., age, marital status, land holding, decision making and scientific orientation contributed the most. These findings indicated that three factors viz., land holding, decision making ability and scientific orientation operated commonly both in case of trained and untrained farm women.

Okunade (2006) found that there was hundred percent adoption of application of fertilizer, improved processing techniques for cassava, soyabean and palm oil respectively. About 93.75 percent each adopted intensive feed garden and use of crop residue to feed livestock and 83.75 percent adopted improved processing technique for cowpea. About 56.25 percent adopted improved planting spacing of crops while 37.5 percent adopted processing techniques of maize. Only 25 percent adopted spraying of herbicides and 18.75 percent were found to have adopted improved management practices.

Bala *et al.*, (2006) examined that the timely harvesting, proper seed selection (i.e. the selection of bold, disease-free and pure seed), seed treatment and timely sowing were the practices with highest mean per cent score (MPS) followed by the beneficiary group. Among the non-beneficiary group, proper seed selection ranked first with MPS 75.33, followed by timely harvesting (MPS 48), and proper time and method of fertilizer application (MPS 44).

Chemical weed control, irrigation and proper spacing were the least adopted practices among both the groups. A considerable difference in the magnitude of adoption, among two groups, was observed for practices like seed treatment, pre-sowing soil treatment, use of HYVs and balanced use of fertilizers.

Deshmukh (2007) found that majority of the respondents (97.92 per cent) belonged to the low level of knowledge, while only 2.08 per cent respondents had high level of knowledge and medium level of knowledge was nil. He found that most of the respondents i.e. 81.94 per cent were falling under low adoption level, while remaining respondents i.e. 9.38 and 8.68 per cent were high and medium adoption level respectively.

Mande *et.al.*, (2007) found that almost all farm women possessed either high (42.67 per cent) or medium knowledge (56.00 per cent) of identifying maturity signs of grains or fruit crops. Similarly 50 per cent of them had medium to high knowledge of grading, packing, transporting of fruit and vegetable. However in case of rest of the practices of PHT, majority of farm women were found to have low knowledge. Eighty six per cent farm women possessed low knowledge about safe storage methods followed by practices viz. control measures for storage pests (80.67 per cent) storage pests and their nature of damage (80.00), drying period for safe storage (67.33 per cent), low cost storage structures (66.66 per cent), making of processed products of

fruits and vegetable (59.33 per cent) and modern machinery for harvesting (54.00 per cent). Majority of farm women possessed low knowledge in these areas.

Prasad (2007) observed that age of respondents had negative but significant relationship with extent of adoption.

Singh *et.al.*, (2007) found that lack of infrastructures and poor availability of credit facility were major economical constraints faced by untrained farmers in relation to training i.e. 93.33% followed by higher prices of inputs i.e. 90.67%. Major Cultural constraints faced by untrained farmers were orthodox thin king (68.67%) and not considered role of women in the training i.e. (66.67%) followed by non-adoption of modern technology and preferred to followed traditional practices i.e. 42% faced by the untrained farmers in relation to training.

Singh (2007) examined that the sowing operation was totally traditional and majority of the farmers in Kangra (85%) and Una (78%) were using broadcasting method of sowing. For weeding and harvesting operation, majority of women farmers in both the districts were involved using manual operated khutti/ kudali and plain sickle. Wheat threshing operation was totally mechanized and accomplished by power operated wheat threshers by 100% farmers of both districts.

Okwn & Umorn (2009) in his paper showed that highest information needs were in the areas of pesticides, fertilization application and improved farm implements. Husband, fellow women and mass media were the main source of agricultural information to women farmers and accessibility of information from these sources were relatively high. Age, educational level and income of women farmers showed significant relationship with their accessibility to agricultural information.

Singh and Chahal (2009) The majority of sample farmers (>80 per cent) had sown the crop with conventional method using normal tillage It was found that majority of sample farmers were using recommended quantity of seed (40 kg/acre) for sowing of wheat crop It was also observed that 16.04 per cent, 13.75 per cent and 16.14 per cent of the sample farmers used more than recommended seed rate, whereas 7.22 per cent, 10.88 per cent and 3.29 per cent used less than the recommended seed rate for sowing of wheat crop. It was observed during the study that nearly 28 per cent of the sample farmers treated the seed before sowing wheat in 2006-07; their number increased to 37 per cent in 2007-08 and further to 39 per cent in 2008-09. a majority

of the sample farmers followed single directional method of sowing; it was followed by the broadcasting method by about 30 per cent farmers in all the three years under study. It was found that only a small percentage of the sample farmers used recommended dose of nitrogen (50 kg/acre) in wheat crop, it was 16.71 in 2006-07, 12.38 per cent in 2007-08 and 15.43 per cent in 2008-09. About 3 per cent of the sample farmers used lower than the recommended dose more than 80 per cent of the sample farmers used higher than the recommended dose of nitrogen in their wheat crop. Most of the sample farmers applied recommended dose of phosphorus (25 kg/acre) to their crops, It was noticed that 15-20 per cent of the sample farmers applied more than recommended and about 2 per cent of the farmers applied less than recommended dose of phosphorus to wheat crop, The present study has found that about 50 per cent of the sample farmers applied recommended number of irrigations (4-5) to wheat crop. About 30-40 per cent farmers applied less and 8-14 per cent applied more than the recommended number of irrigations.

Kumbhare and Singh (2011) found that 53.75 per cent respondents had adopted the wheat production technology at higher level followed by 31.25 per cent and 15.00 per cent respondents had adopted the wheat production technology at medium and low level respectively.

Sethi and Sharma (2011) found that in agriculture sector, the farm women are assigned secondary roles with insignificant powers. Their significant contribution as labour input has generally remained unaccounted. They are far behind and need to be adequately empowered to take up future challenges. The nature and extent of women involvement in agriculture varies greatly from region to region, ecological sub-zones, caste, class and stages in the family cycle. Empowering farm women for better quality of life is an important and burning issue today. Knowledge coupled with efficient resource management is considered one of the most important factors for development. Extension approaches and strategies followed for transfer of technology to farm women are required to satisfy their specific needs and problems. Thrust needs to be given on cultivation technologies, improved agricultural tools and implements, institutional approach for empowerment and inculcating entrepreneurship skill in them. Coordination is to be made among technology generation, technology dissemination and technology receiving system. The empowering strategies would need to be further sharpened to make them effective and result oriented.

Simtowe *et al.*, (2012).found that the land owned, education and the number of extension visits are positively associated with adoption.

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(2012–13). The Directorate of Research on Women in Agriculture (DRWA) has been engaged in research under different technology-based theme areas in farm women perspective in a network mode with research and development institutions and agricultural universities. For drudgery reduction of women in agriculture, improved agricultural tools/technologies, namely, fertilizer trolley, manual seed drill, mat nursery, vegetable plucker, vegetable bag, water bag, face protector, dung collector, fodder chopper, fodder collector, groundnut stripper, groundnut decorticator, groundnut stripping frame, long handle fork, manual maize sheller, mango harvester, potato picker and revolving stool, were field validated. Trainings/ demonstrations were organized for capacity development of women in agriculture.

Komolafe *et.al.*, (2014) found that all (100%) of respondents were aware of improved crop varieties but only 42.6% utilized the practice. Appropriate spacing of crop practices were known among majority (76.5%) but few (17.4%) adopted the practices. Most (79.1%) were also aware of appropriate planting date but only 9.6% utilized the practices. All (100%) were aware of fertilizer application but few (12.1%) adopted the practices. Other practices such as weeding interval, agrochemical application, tillage practices, soil conservation practices, and improved processing techniques of crops were known by majority but only few (6.9%) adopted weeding interval, (4.4%) adopted tillage practices, no respondents adopted soil conservation practices. Improved practices adopted by majority were; agrochemical application (71.3%) and improved processing techniques of crops (82.6%).

Onamadu and Osahon (2014) found that the coefficient for age (1.800), Gender (2.650) were negative and significant at 1.0 percent level of probability. This implies that any increase in the variables (age and Gender) would lead to a corresponding decrease in the adoption of improved rice farming techniques. This is because elderly people are more risk averters. Education is significant at 1.0percent, but positively related to adoption of improved rice farming technology. This implies that the more educated rice farmers are, the higher the adoption of improved rice technologies.

Tiwari and Tripathi (2014) showed that independent variables viz. age, educational level, marital status, exposure to media and contacts with experts were positively correlated with the adoption of advanced technologies of agriculture. Findings revealed the significant correlation in the age, past experience of training, attendance in different activities of the center and perceived needs of farm- women with the adoption of advanced technologies of agriculture at 5% and 1% level of significance.

2.4. Constraints faced by farm women in agriculture.

Doss (1999) in his study showed that women farmers are often constrained by their lack of access to labour, land, and inputs. The dynamics of household decision-making affects technology adoption; roles and responsibilities within the household are often renegotiated when new technologies are adopted, and women may be reluctant to provide labour if they do not receive some of the benefits.

Desmukh *et.al.*, (2007) found that the constraints of no information about variety released and agricultural technologies recommended by MAU were expressed by 62.5 per cent, while 56.94 per cent respondents gave other constraints like costly seed, lack of information regarding seed cost, place of sale and proper guidance. As much as 52.77 per cent respondents expressed that non availability of seed, travelling over long distance for seed purchase, shortage of seed, and seed is not available in due time are also serve as constraints for them.

Fabiya *et. al.*, (2007) The result revealed that 88% of the respondents age were within 20-49 years, 12% were 50-70 years of age; 80% were married including widows and divorces, 20% single; 75% had formal education, 25% had no formal education; 35% had 1-10 years farming experience, while 65% had 11-40 years. Majority (72%) of the respondents were small-scale farmers having 0.1-3.0 hectares of farmland for cultivation of food crops. Majority of the women acquired land for farming from their husbands and relations (freehold), while others hired land for farming. The respondents sources of income for farming were through cooperative society (33%) and previous farm out put (23%) only few (13%) were able to secure Bank loan, while others borrowed money from friends. The result also showed that women were involved in all farm activities from land clearing to harvesting, processing and marketing of produce. They plant different crops, rear animals and

keep poultry. The women farmers' constraints include mainly lack of land for farming, credit facilities, costly and late input delivery. Women farmers have contributed immensely, to food production, processing and preservation of foods.

Tiwari (2010) found that the main economic constraints that faced women farmers were scattered holdings, limited resources of purchase inputs, unavailability of labour to carry out work, small size of holdings, insufficient irrigation, non-availability of loans at proper time. The social problems which the farm women faced in the adoption of agricultural technologies were caste, customs, tradition and religious beliefs. Other problems were non-availability of technical knowledge, lack of skill in technical knowledge and non-availability of information on various topics resulting in negative attitudes.

Nain and Kumar (2010) found that the major constraints identified by the farm women were non-availability of input in time (88.33%), low price of produce (86.66%), less involvement in decision making (76.66%), lack of knowledge regarding new technology (63.33%), irregular and untimely rainfall (61.66%) lack of marketing facilities (56.66%), lack of plant protection measures and lack of credit facilities (45%) respectively. Lack of irrigation facilities was perceived as least important constraint (23.33%). Lack of knowledge regarding modern practices was perceived as a constraint by (63.33%) of respondents.

Owolabi, Abubakar and Amodu (2011) found that most of the farm women complained about difficulties in securing loan from financial Institutions, about 42 percent of them sourced funds from personal saving (adashi) while 28 percent made their financial help through cooperatives. 20 percent got financial assistance through institutions mostly from Nigeria Agricultural Credit Bank (NACB).



RESEARCH METHODOLOGY

The research methodology is the backbone of any research work. This chapter deals with the research methods, procedures and techniques used in the present study for collecting and analysing data with respect to the objective of the study. This methodological framework used for the present investigation has been divided into the following subheadings:

- 3.1 Locale of the study
- 3.2 Sample and sampling procedure
 - a) Selection of the districts.
 - b) Selection of the blocks.
 - c) Selection of the village.
 - d) Selection of respondents.
- 3.3 Selection of variables, their operationalization and measurement.
- 3.4 Data Collection.
- 3.5 Statistical analysis of data.

3.1 The locale of the study

The present study has been carried out in the Samastipur district of Bihar. Out of 38 districts in Bihar, Samastipur district was selected purposely. Altogether there are 20 blocks in Samastipur districts, out of which two blocks namely Pusa and Kalyanpur were purposively selected. Rajendra agricultural University, well known centre for transfer of latest agricultural technology, is situated in the heart of Pusa and also the Kalaynpur block is nearby this, hence these two blocks were selected.

Samastipur is a district of Bihar which is spread over an area of 2904 sq. kms. Samastipur is bounded on the north by the Bagmati River which separates it from Darbhanga district. On the west it is bordered by Vaishali and some part of Muzaffarpur district, on the south by the Ganges, while on its east it has Begusarai and some part of Khagaria district. The district headquarters is located at Samastipur. According to the 2011 census, Population Density in the District is 1465 per sq.km. and the total population is 4.25 million of which male and female were 2,228,432 and 2,026,350 respectively. Average literacy rate of Samastipur in 2011 were 63.81 compared to 45.13 of 2001. The male and female literacy were 73.09 and 53.52

respectively. The district comprises of 4 sub-divisions, and 20 Community Development Blocks. It has 5 towns and 1248 villages.

Table 1: The demographic features of the Samastipur district are as follows:

District Samastipur	
Geographical area	290455.6 ha
Cultivable land	193781.76ha
Not cultivable land	17573.76ha
Numbers of blocks	20
Number of panchyats	381
Number of villages	1250
Total population	4.5 million
Male population	2228432
Female population	2026350
Literacy rate	63.81
Male literacy rate	73.09
Female literacy rate	53.52

3.2.1. Sampling Plan

A Random sampling technique was applied to draw the sample for the study.

a) Selection of the District- The study was conducted in purposively selected Samastipur district with the consideration that:

- Rajendra Agricultural University is situated in samastipur district and is a hub for agricultural training and implementation of various improved practices.
- The main occupation of people of this district is mainly agriculture and more than half of the population depend on this for their livelihood.
- Women are actively participate in various agricultural operations in this district.

b) Selection of Blocks- Out of 20 blocks in Samastipur district, 2 blocks were randomly selected for the study

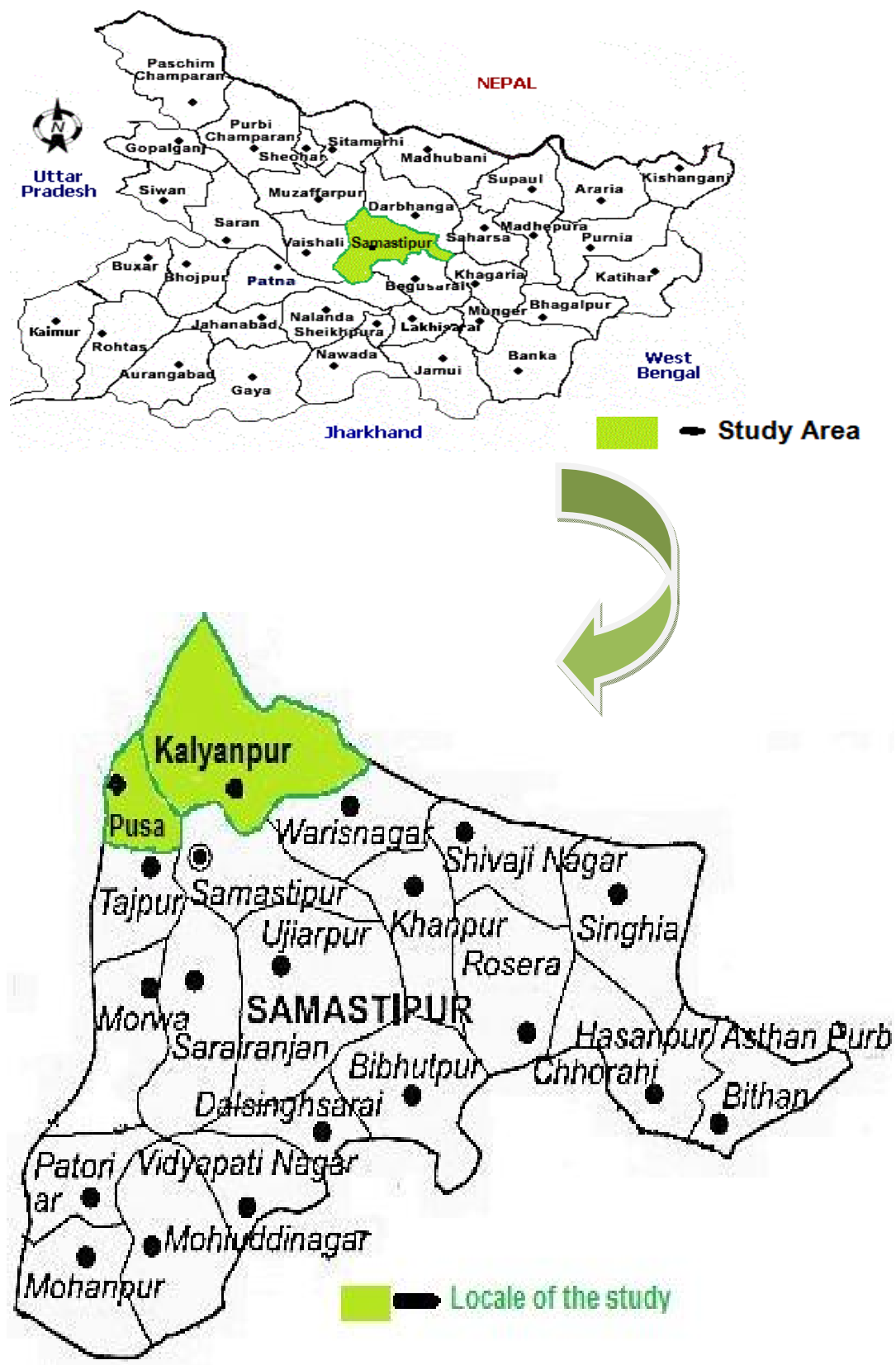


Fig 1: Map of Bihar and Samastipur showing the selected area.

Table 2: The demographic profile of both the blocks are:

Blocks	Pusa	Kalyanpur
Geographical area	478624.8ha	23534.32ha
Cultivable land	10106.00ha	14208.32ha
Non-Cultivable land	468518.8ha	9326.0ha
No. of Panchyats	13	31
No. of villages	37	153
Total population	260309	259459
Male population	132020	134344
Female population	128289	125115

Pusa Block

Pusa is a Block of Samastipur District of Bihar. It belongs to Darbhanga Division and located 19 KM in north from district head quarter, Samastipur and 80 KM from State capital Patna.

Pusa Block is bounded by Bandra Block in North, Kalyanpur Block in East, Tajpur Block in South, Patepur Block in west . It consist of 40 Villages and 14 Panchayats. Pusa Mahamadpur Deopar is the smallest Village and Harpur Pusa is the biggest Village in Pusa block. This Place is situated at the border of the Samastipur District and Muzaffarpur District. Maithili is the Local Language of Pusa but people also speaks Hindi and Urdu.

The total population of Pusa Block is 110,429, living in 19,357 houses and spread across over 40 villages and 14 panchayats .Total males population are 57, 166 and females are 53, 263. The weather of Pusa is hot in summer. Pusa summer highest day temperature is in between 25 ° C to 42° C.

Kalyanpur Block

Kalyanpur is a Block in Samastipur District of Bihar. It belongs to Darbhanga Division. It is located 12 KM in North from district head quarter Samastipur and 88 KM from State capital Patna in west. Kalyanpur block consist of 123 villages and 31 panchayats. Gobindpur is the smallest village and Kharsand is the biggest village in Kalyanpur block. Maithili is the Local Language of Kalyanpur block but people also speaks hindi and urdu. Total population of Kalyanpur Block is 259, 459 living in 45, 865 houses and spread across 123 villages and 31 panchayats. The total males population is 134, 344 and females population is 125,115.

Selection of village

From the two selected blocks, two villages from each block were selected for the present investigation. Thus four villages were selected for the study purpose. From Pusa Block, Harpur and Mahmadda were selected and from Kalyanpur block, Gorai and Madhurapur were selected. The selection of these villages was based on the assumption that these were having maximum amount of involvement of rural women in agricultural activities.

c) Selection of respondents

From each villages, 25 respondents were selected by stratified random sampling technique. From each strata of land holding namely landless (who work on other farms), marginal (land holding upto 2.5 acre), Small(land holding from 2.51-5 acre), medium(land holding from 5.1-10 acre) and large (land holding more than 10 acre) respondents were taken.

3.2.2. Procedure of data collection

For the data collection, structured schedule was developed. Before the data collection the researcher student visit the selected village with the help of Mukhiya and local leaders. This helped much in establishing the required rapport for conducting the field investigation. Each of the respondents were personally contacted and interviewed with the help of structured interview schedule. The interview schedule was administered in hindi language and sometimes in local language and their responses were recorded in hindi language on the schedule. It was made sure that the respondents understand the questions completely and the responses given by them were correct.

3.3 OPERATIONALISATION AND MEASUREMENT OF THE VARIABLE

The independent variables selected for the present study were selected on the basis of extension review of literature, discussion with scientists, extension experts and members of advisory committee.

Selected variables and their measurements:

The following charts depicts the list of selected variables and scales/instruments for their measurements (Table 2).

Table 3: List of selected variables and their measurement.

Variables	Measurements
A. Independent variables	
Age	Chronological age of respondents in number of years.
Caste	SES scale developed by Trivedi (1963) with necessary modification.
Education(self)	SES scale of Trivedi (1963) with necessary modification.
Education(husband)	SES scale of Trivedi (1963) with necessary modification.
Size of family	SES scale of Trivedi (1963).
Type of family	SES scale of Trivedi (1963).
Family income	SES scale of Trivedi (1963).
Occupation	SES scale of Trivedi (1963).
Land holding	Number of acres of land holding owned by the respondents
Type of house	SES scale of Trivedi (1963) with minor modification
Drought animals	SES scale of Trivedi (1963) with minor modification.
Agricultural implements	Sechuled was develop for the study.
Social participation	SES scale of Trivedi (1963).
Knowledge about production technology(wheat)	Sechuled was develop for the study.
B. Dependent variables	
Nature of participation of women in agriculture.	Scheduled was developed.
Decision-making pattern of women.	Scheduled was developed.
Extent of adoption of improved agricultural technology (wheat) by women.	Scheduled was developed.

SES-Socio-economic scale

Details of measurement of independent and dependent variables adopted under the study were as follows:

1. Age

It refers to the chronological age of the respondent rounded to the nearest whole number, at the time of investigation. For the purpose of measurement, the respondents were classified into three groups namely, young, middle, and old respondents. The respondents' age were ranged between 20 to 70 years.

Class	Age
Young women	upto 30 years
Middle-aged women	31-50 years
old aged women	above 50 years

2. Caste

Caste is a closed class system of a society which clearly distinguish the status and role for its members, the membership of which is determined by birth and is endogenous in nature. The respondents of the study were divided into 3 caste groups. The given groups along with their assigned scores were:

Caste	Score
Forward caste	3
Backward caste	2
Scheduled caste/Scheduled tribes	1

3. Education

Education is the individual's ability to read and write, and the amount of formal education he/she possesses will affect the manner in which the individual gathers data and relates himself/herself to his/her environment (Beal and Sibley, 1967). Seven educational levels were scored as suggested by Trivedi, 1963 which appear below:

Level of Education	Score
Illiterate	0
Read only	1
Read and write	2
Primary	3
Middle	4
High school	5
Graduate and above	6

4. Land Holding

It refers to the Cultivated land owned by the farm families. The area of the land was recorded in acres. On the basis of acreage, the respondents were classified as:

Size of holding	Score
Landless	0
upto 2.5 acres	1
2.51-5.00 acres	2
5.01-10.00 acres	3
Above 10 acres	4

5. Family Type

It refers to the type of the family respondent refers to i.e., Nuclear and Joint. In our Indian society, generally two type of family are characterised: Nuclear in which husband, wife and children are included and Joint where husband, wife, children and other family members are included. The type of family was measured with the help of SEs scale of TRivedi (1963). According to the structure of the family in which respondents were residing, the following scores were assigned.

Family Type	Score
Nuclear family	1
Joint family	2

6. Family size

It refers to total number of individuals of all ages and both sexes living in the same house and sharing the same kitchen. Family size was measured with the SES scale of Trivedi (1963). According to the number of individuals the respondents were categorized into 2 categories:

Family Size	Score
Small family(1-5)	1
Large family(>5)	2

7. Occupation

It refers to the main source of livelihood of the respondents. A person's usual or principal work or business, especially as a means of earning a living may also be defined as occupation. It was measured by Trivedi scale (1963). Scoring pattern was as follows:

Occupation	Score
Unemployed	0
Labourers	1
Agriculture	2
Own business	3
Service	4

8. Income

It refers to the respondents earning as farmer or as agricultural labourers. Income is the sum of all the wages, salaries, profits, interests payments, rents, and other forms of earnings received in a given period of time. It was measured with the help of SEs scale of Trivedi (1963). Scoring pattern was as follows:

Income level	Score
Below Rs.25000	0
Rs.25000-Rs.50000	1
Rs.50000-Rs.75000	2
Above Rs.75000	3

9. Family Income

It refers to the total earning of the family from all the sources in a year. It was measured with the help of SEs scale of Trivedi (1963). Scoring pattern was as follows:

Income level	Score
Below Rs.25,000	0
Rs.25000-Rs.50000	1
Rs.50000-Rs.75000	2
Above Rs. 75000	3

10. Type of House

It refers to the type of dwelling one lives in. In the present study, houses were classified into the categories of kaccha , mixed and pucca and were scored as in Trivedi Scale(1963).

Type of house	Score
Kaccha	1
Mixed	2
Pucca	3

11. Drought animals

It refers to the total number of milch animals and non milch animals along with small animals like goatery and poultry. It was measured with the scoring pattern developed for the study.

Drought animals	Score
No animals	0
One animal	1
1-2 animals	2
3-4 animals	3
4-5 animals	4
more than 5 animals	5

12. Agricultural implements

Agricultural implements refers to the implements used for agricultural purpose and their scoring was done as follows:

Agricultural implements	Score
Hasuli/khurpi	1
Kodali	1
Improved plough	2
Bullock cart	2
Duster	2
Pumpset/motor	3
Tractor	3
Thresher	3
Sprayer	3

13. Social participation

It refers to the degree of involvement of respondents in formal organization as members or office bearers. The social participation of the respondents was quantified with the help of scoring system developed by Trivedi (1963) as follows:

Social participation	Score
No participation	0
Member of one organization	1
Members of more than one organization	2
Office bearer	3

14. Knowledge about improved production technology of wheat.

Knowledge refers to the totality of understood information possessed by a person. In the present study Knowledge was operationalized as the adequate specific information possessed by the respondents about the production technology of wheat. Knowledge test developed by Ratan (1991) with modification was used to measure the knowledge of respondents about improved technology of wheat. Altogether 20 items were selected for the

knowledge test. A score of 1 was given for correct answer and 0 for the incorrect answer. The total knowledge score for individual respondent was calculated by summing up the no. of items correctly answered. As a result the maximum score that one could get was 20 and the minimum was 0. After computing the knowledge score, the percentage of knowledge score was obtained using the formula given below:

$$\text{Level of knowledge score of the respondent} = \frac{\text{obtained score}}{\text{Maximum possible score}} \times 100$$

The range scored from 0 to 100. The score thus obtained were put into this form.

Knowledge level	Percentage Score
Low (mean-sd)	0
Medium (mean±sd)	1
High (mean+sd)	2

Dependent variables

Nature of work participation

It refers to the type of involvement of women in farm activities. It was measured by seeing their involvement in agriculture as physical participation, supervision or both. It was measured with the help of pre-tested structured interview schedule develop for the study.

Extent of involvement/participation- With a view to know the extent of participation, pre-harvest and post- harvest agricultural activities were explored. A total of 15 specific operation, 8 for pre harvest, and 7 for post-harvest were identified. The extent of both men and women was measured with the help of a structured interview schedule develop for the purpose in terms of percentage.

Decision making

Decision-making can be regarded as the cognitive process resulting in the selection of a belief or a course of action among several alternative possibilities. Every decision-making process produces a final choice that may or may not prompt action. Decision-making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. According to Reick (1960), decision making is a mental process based on conscious reasoning.

In the present study decision making refers to the extent of participation of women farmers in decision making process. To measure the extent of decision making power of women, percentage participation of women was calculated in different areas of agriculture.

Adoption

Adoption is a decision to make full use of an innovation as the best course of action available. Wilkenning (1953) described the adoption of an innovation as a process composed of learning, deciding, and acting over a period of time.

According to Rogers and Shoemaker (1971) adoption may be defined as a decision to make full use of an innovation. The term adoption here refers to the actual application of the improved practices/technology in the farm. It was measured with the help of a pre-tested schedule developed for the study. Rate of adoption was presented in the form of percentage of women farmers who have adopted the improved practices/technology in their farm.

Extent of adoption- Based on the review of literature and with the consultation of scientists, 11 improved agricultural practices were identified and selected for the study. A score of 1 was given for full adoption of the technology and 0 for the non-adoption of the technology. The maximum score that respondents could obtain was 11 and the minimum was 0. The total score that each respondent was computed by using the formula as given below.

$$\text{Extent of adoption of improved agricultural technology} = \frac{\text{Obtained score}}{\text{Maximum possible score}} \times 100$$

Statistical analysis of the data

The data, thus collected from the respondents through interview schedule were put under scoring. Appropriate score were assigned to each of the responses of the respondents. Then these scores were put forth for the statistical analysis to enable to easy and meaningful interpretation of the data.

The statistical techniques used for the analysis of the study were frequencies, mean, percentages, χ^2 - test, standard deviation, coefficient of correlation, multiple regression, and ranking.

Frequency

The number of individuals (or objects) having the same measurement or enumeration count or lies in the same measurement group is defined as frequency.

Percentage

Percentage was used in descriptive analysis for making simple comparison. For calculating percentage, the frequency of a particular cell was multiplied by 100 and divided by total number of respondents in their particular category to which cell they belonged.

Arithmetic mean

Arithmetic mean was found out by computing the sum of the column and dividing it by total number of respondents. The formula is given below:

$$\frac{\sum x_i}{n}$$

Where X_i is the observation and n is the number of observation.

Correlation coefficient

In order to study the association of variables under study, or to know the behaviour of two variables, correlation analysis was done. The formula to compute coefficient of correlation was as follows

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\left(\sum X^2 - \frac{(\sum X)^2}{n} \right) \left(\sum Y^2 - \frac{(\sum Y)^2}{n} \right)}$$

where,

n = Number of respondents

X = Independent variables

Y = Dependent variables

r = Coefficient of correlation between X and Y

For testing the significance of r , t -value was worked out by employing the following formula: $t = \frac{r}{\sqrt{1-r^2}} \sqrt{(n-2)}$

Multiple regression equation

The multiple regression equation gives the predicted value of the dependent variable for any given set of values of independent variables. The prediction equation comprises of multiple regression coefficient. The formula used was as follows:

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n + e$$

where,

Y = Predicted value of dependent variable

a = constant

e = Error term

X_1, \dots, X_n = Values of independent variables.

b_1, \dots, b_n = Regression coefficient

Which appear in equation and represent the amount of change in Y for unit change in X respectively.

n = number of independent variables.



RESULTS AND DISCUSSION

The analysis of the data and the results of the investigation are presented and discussed in this chapter to draw meaningful interpretations. These have been elaborated in seven sections as under:

- 4.1 In first section socio-personal and economic characteristics of the woman farmers were studied.
- 4.2 In second section the nature of involvement of all respondents categories were studied.
- 4.3 The third section deals with the decision-making pattern of rural women in agriculture.
- 4.4 The fourth section deals with the extent of adoption of improved practices by woman farmers in terms of wheat production technology.
- 4.5 The fifth section deals with the financial help rural women get from governmental or non-governmental organisations.
- 4.6 In sixth section the constraints faced by rural women in practising agricultural activities were studied.
- 4.7 In seventh section the correlation coefficient between socio-economic characteristics of woman respondents and their nature of participation in agricultural activities, their decision-making pattern and extent of adoption of improved technology by them were discussed. The regression coefficient and ANOVAs were also done to draw meaningful interpretation.

The findings and discussion are now being presented as follows:

Section 4.1 The socio-personal and economic characteristics of the woman farmers

The socio-personal and economic characteristics of woman respondents is depicted under following sections. For the purpose of analysis the woman respondents were categorised into five groups viz., landless labourers, marginal farmers, small farmers, medium farmers and large farmers based on the size of land holding. This has been presented in Fig.3. The woman respondents from large farmer category were very small hence it was included with medium farmers for ease of convenience of use of statistical analyse. A brief profile of the respondents is given below:

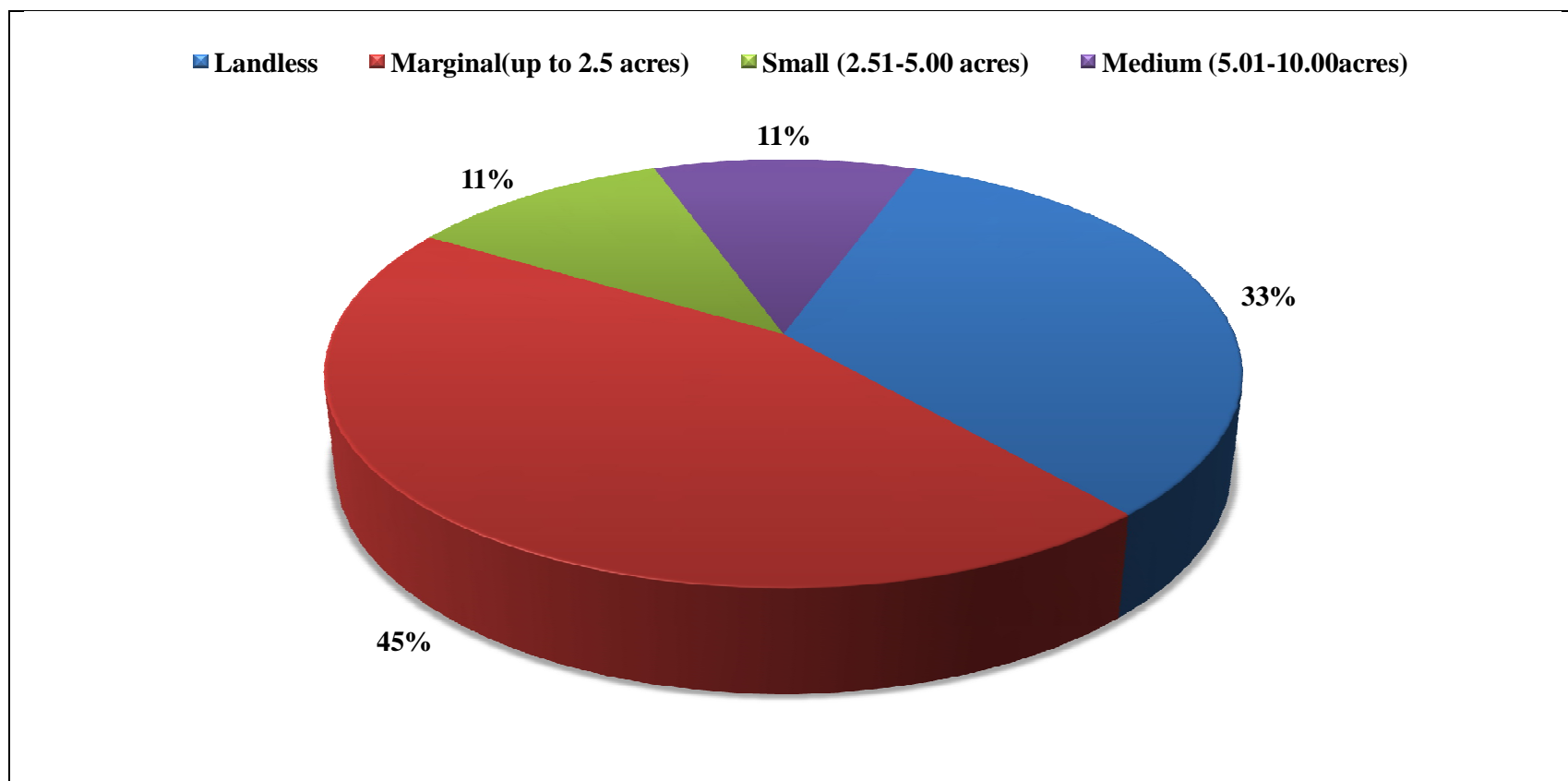


Fig. 2: Categorization of rural women farmers on the basis of size of land holdings

4.1 Age-wise classification of respondents of various land holdings categories

Age is defined as the chronological years completed by the respondents. For the purpose of measurements, the respondents were classified into three groups according to their age, namely, young, middle and old respondents.

Table 4: Age-wise classification of the respondents (N=100)

Age	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Young(20-30)	14	42.43	3	6.67	1	9.09	1	9.09	19	19.00
Middle(30-50)	16	48.49	36	80.0	7	63.64	9	81.82	68	68.00
Old(>50)	3	9.09	6	13.34	3	27.28	1	9.09	13	13.00

As it appears from Table 4, majority of the respondents i.e., 68 percent belonged to middle-aged category followed by 19 percent of young age of respondents and 13 percent of old age.

4.2 Marital status-wise classification of the respondents of various landholding categories

Table 5: Marital status-wise classification of the respondents (N=100)

Marital status	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Married	27	81.82	38	84.45	11	100	10	90.91	86	86.00
Widow	6	18.19	7	15.56	0	0.00	1	9.09	14	14.00

The respondents were classified into two categories on the basis of their marital status viz., married and widow. Table 5 inferred that majority of the respondents i.e., 86 percent were married followed by 14 percent of widow respondents. No respondents were unmarried or divorced.

4.3 Caste-wise classification of the respondents of various landholding categories

Caste of an individual is defined as a hierarchy of endogamous divisions in which membership is hereditary and permanent (Berreman 1979). In this study, caste has been categorised as forward, backward and scheduled caste categories.

Table 6: Caste-wise classification of the respondents (N=100)

	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	F	%
Forward	0	0.00	1	2.23	3	27.28	5	45.46	9	9.00
Backward	10	30.31	39	86.67	8	72.73	6	54.55	63	63.00
Scheduled Caste	23	69.70	5	11.12	0	0.00	0	0.00	28	28.00

As it appears from Table-6, 63 percent of the respondents belonged to backward class followed by 28 percent of scheduled caste. Only 9 percent of the respondents belonged to forward class and majority of them were from small and medium land holding category of farmers.

4.4 Education-wise classification of the respondents of various landholding categories

Education is the individual's ability to read and write, and the amount of formal education possessed by them. In the present study, it refers to the extent of formal schooling undergone by the respondents.

Table 7: Education-wise classification of the respondents (N=100)

Education(self)	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	F	%
Illiterate	29	87.88	20	44.45	3	27.28	0	18.19	52	52.00
Read and Write	3	9.09	6	13.34	1	9.09	4	36.37	14	14.00
Primary	1	3.03	14	31.12	6	54.55	2	18.19	23	23.00
Middle	0	0.00	5	11.12	1	9.09	1	9.09	7	7.00
High	0	0.00	0	0.00	0	0.00	2	18.19	2	2.00
Graduate and above	0	0.00	0	0.00	0	0.00	2	0.00	2	2.00

As it appeared from Table-7, as high as 52 percent of the respondents were illiterate, 23 percent were having primary education, 14 percent can only read and write, 7 percent have middle education and only 2 percent were high school passed and graduate.

4.5 Education-wise classification of male-heads of families of respondents of various land holding categories

It refers to the academic qualifications of respondent's husband acquired through formal schooling and training.

Table 8: Education-wise classification of the Male-heads (N=100)

	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Illiterate	15	45.46	8	17.78	0	18.19	0	9.09	23	23.00
Read and Write	4	12.13	1	2.23	0	0.00	0	0.00	5	5.00
Primary	8	24.25	4	8.89	1	9.09	1	9.09	14	14.00
Middle	6	18.19	14	31.12	3	27.28	2	18.19	25	25.00
High	0	0.00	17	37.78	4	13.23	5	45.46	26	26.00
Graduate and above	0	0.00	1	2.23	3	9.09	3	18.19	7	7.00

As it appear from Table-8, as high as 26 percent of the male-heads of the families of respondent were having high school education, 25 percent have middle school education, 14 percent have primary, 5 percent can only read and write, and 7 percent were graduate. The illiterates constitute 23 percent.

4.6 Classification of respondents of various land holding categories according to their family size

Table 9: Family size-wise classification of the respondent

Total family members	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
0-5members	15	45.46	14	31.12	3	27.28	4	36.37	36	36.00
>5members	18	54.54	31	68.89	8	72.73	7	63.64	64	64.00

Family size refers to the number of individuals of all ages and sexes living in the same house and sharing the common kitchen. Table-9 showed that 64 percent of the family have more than 10 family members and only 36 percent have family members less than five.

4.7 Classification of respondents of various land holding categories according to their family type

A family may be nuclear or joint. Operationally, for the purpose of the present study nuclear family is taken as the unit consisting of husband, wife and their children while joint family having at least two married couples, living in the same residence and earnings from all sources were pooled together and managed by one family-head.

Table 10: Family type-wise classification of the respondents

Type of family	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Nuclear	18	54.54	14	31.12	1	9.09	4	36.37	37	37.00
Joint	15	45.46	31	68.89	10	90.91	7	63.64	63	63.00

Table-10 showed that 63 percent families were joint type while 37 percent families were of nuclear type.

4.8 Occupation-wise classification of respondents of various land holding categories

Occupation refers as the main source of earning or livelihood. For the present study, for women respondents, occupation is categorised as Agricultural labourers and Agriculturer.

Table 11: Occupation-wise classification of the respondents (N=100)

Occupation (self)	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Ag.Labourer	31	93.94	0	0.00	0	0.00	0	0.00	31	31.00
Agriculturer	2	6.06	45	100	11	100	11	100	69	69.00

The data on occupation of the respondents in Table-11 showed that 69 percent of the respondents have agriculture as the main occupation while 31 percent were agricultural labourers.

4.9 Occupation-wise classification of male-heads of families of respondents of various land holding categories

Table 12: Occupation-wise classification of the male-heads

	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Ag.Labourer	22	66.66	0	0.00	0	0.00	0	0.00	22	22.00
Agriculture	0	0.00	5	11.11	5	45.45	6	54.54	14	14.00
Ag.+Own business	0	0.00	8	17.77	4	36.36	2	18.18	16	16.00
Ag.+Service	0	0.00	27	60	2	18.18	3	27.27	32	32.00

(Here the male-head refers to the respondent's husband.*14 percent respondents were widow, hence their husband occupation is not mentioned. And 2 respondent husband were physically handicapped hence they were not engaged in economic activities.)

The data on occupation of the respondent's husband in Table-12 showed that 14 percent of the respondents have agriculture as the main occupation, 22 percent were labourers, 16 percent have their own business along with agriculture, and 32 percent were in service along with agriculture.

4.10 Classification of respondents of various land holding categories according to their family income

It refers to the income from different sources such as agriculture, business, husband's job, and from any other sources in terms of rupees. It is categorised as low, middle, middle-high and high income group.

Table 13: Family income-wise classification of the respondents (N=100)

Family Income in Rs.	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Low(<25000)	33	100.00	5	11.11	0	0.00	0	0.00	38	38.00
Middle(25001- 50000)	0	0.00	28	62.22	1	9.09	1	9.09	30	30.00
Middle high(50001-75000)	0	0.00	10	22.22	3	27.27	5	45.45	18	18.00
High (>75000)	0	0.00	2	4.44	7	63.63	5	45.45	14	14.00

Table 14 showed that majority of the respondents family i.e., 38 percent were in low family income category, 30 percent families were in middle-high income category, 18 percent families were in middle income group and 14 percent families were in high income group. This has been presented in fig.13.

4.11 Classification of respondents of various land holding categories according to their type of house

Table 14: Type of the house of the respondents (N=100)

Type of house	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Kaccha	33	100.0	2	4.44	0	0.00	0	0.00	35	35.0
Mixed	0	0.00	29	64.44	5	45.46	3	27.27	37	37.0
Pacca	0	0.00	14	31.11	6	54.54	8	72.72	28	28.0

Table 14 showed that 35 percent respondents have kaccha house, 28 percent have pacca house, and 37 percent have mixed type of house respectively.

4.12 Classification of respondents of various land holding categories according to possession of domestic animal-

Table 15: Domestic animals possessed by the respondents (N=100)

Domestic animals	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
No animal	19	57.5	5	11.1	0	0.00	0	0.00	24	24
1-2 animals	14	42.4	36	80.0	9	81.8	8	72.7	67	67
3-4 animals	0	0.00	4	8.8	2	18.1	3	27.2	9	9

Table 15 , showed that 24 percent of the respondents have no animals, 67 percent have 1-2 animals and 9 percent have more than 2 animals respectively.

4.13 Classification of respondents of various land holding categories according to possession of agricultural implements

Table 16: Agricultural implements possessed by the respondents (N=100)

Agricultural implements	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Low (0-2)	33	100	9	20	0	0.00	0	0.00	42	42
Medium (3-5)	0	0.00	28	62.2	7	63.6	5	45.4	40	40
High (6 and above)	0	0.00	8	17.7	4	36.3	6	54.5	18	18

(Description: Note, in case of low category only sickle, hand-hoe and khurpi are taken.)

Table 16 showed that 40 percent have medium agricultural implements, 42 percent have low and 18 percent were in high agricultural implements possessing group.

4.14 Social participation of respondents of various land holding categories

Table 17: Social participation of the respondents (N=100)

Social participation	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
No participation	33	100.0	40	88.8	4	36.36	11	100.0	88	88.0
Member of 1 organization	0	0.00	5	11.11	7	63.63	0	0.00	12	12.0

Table 17 showed that 88 percent of the respondents have no social participation and 12 percent were member of one organization.

4.15 Knowledge level-wise classification of respondents of various land holding categories

Knowledge is the totality of understood information possessed by a person. In the present study knowledge was operationalised as quantum of specific information possessed by the respondents about the production technology of high-yielding varieties of wheat.

Table 18: Knowledge level of the respondents (N=100)

Knowledge level	Landless (N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
	f	%	f	%	f	%	f	%	f	%
Low (Mean-SD)	33	100.00	1	2.23	0	0.00	0	0.00	34	34
Medium (Mean±SD)	0	0.00	42	93.3	9	81.8	6	54.55	57	57
High (Mean+SD)	0	0.00	2	4.45	2	18.1	5	45.46	9	9

Table 18 showed that 57 percent of the respondents have medium level of knowledge, 34 percent have low level of knowledge and 9 percent have high level of knowledge.

Discussion

Table 4-18 showed that majority of the respondents i.e., 45 percent were having marginal type of land holding. Most of the respondents i.e., 68 percent were of middle aged, 63 percent were of backward category, 52 percent were illiterate, 64 percent having more than 5 family members and somewhat the same percentage were of joint family, 69 percent of the respondents were having agriculture as the main occupation and 38 percent having low family income, 40 percent of the respondents have medium i.e., 3-5 agricultural implements and 57 percent have medium level of

knowledge and 88 percent of the respondents have no social participation. The findings were in line with the findings of Puneetha (1989), Pallavi (2001), Kumari M (2003), Mande et.al.,(2007) Desmukh et al.,(2007) Sujatha P.,(2008), Paswan A.(2010) Nuhu et.al.,(2014).

Section 4.2 Nature of Involvement of rural women in agricultural activities

4.2.1 Involvement of women in pre-harvest agricultural activities

An attempt was made to study the nature of involvement of landless, marginal, small and medium land holding category of woman farmers with respect to pre-harvest agricultural activities. The distribution of woman farmer, on the basis of their involvement has been presented in Table 19 and illustrated in Fig 3.

The findings revealed that the maximum physical participation was of landless labourers in pre harvest activities (42.42%), while medium land holding category of women had no physical participation followed by 32.77 percent physical participation of marginal farmers and 1.13 percent physical participation of small farmers. The data further indicated that 17.04 percent medium land holding category of farmers supervised the pre-harvest agricultural activities while landless labourers do not supervised the activities. The data showed that 11.38 percent marginal farmers and 26.13 percent small farmers supervised the pre-harvest agricultural activities. It is obvious that the medium and small farmers involved maximum in supervising the activities while the landless and marginal in physical participation. However, by 15.90 percent of small farmers, 14.43 percent of marginal farmers, 6.06 percent of landless and 4.54 percent of medium woman farmers participated jointly in agricultural activities.

4.2.2 Involvement of rural women in post-harvest activities

The distribution of women on the basis of involvement has been presented in Table 20 and illustrated in Fig 4. Table 20 indicated that 32.46 percent of landless labourers had physical participation followed by 59.67 percent of marginal woman farmers, 10.38 percent of small woman farmers in post-harvest agricultural activities while medium land holding category of woman farmers had no physical participation in post-harvest agricultural activities. The table 21 further revealed that 42.85 percent of medium farmers had supervision in post harvest agricultural activities followed by 12.98 percent small farmers, 3.17 percent marginal farmers. Landless woman

Table 19: Percentage participation score of involvement of different categories of woman farmers in pre-harvest agricultural activities

A.	Pre-harvest operations	Landless (N=33)			Marginal (N=45)			Small (N=11)			Medium (N=11)		
		Pp	Su	Both	Pp	Su	Both	Pp	Su	Both	Pp	Su	Both
1.	Cleaning of field	48.48	0.0	15.15	40.0	6.66	17.77	0.00	36.36	0.0	0.0	18.18	0.0
2.	Preparation of field	48.48	0.0	15.15	40.0	6.66	17.77	0.0	45.45	0.0	0.0	18.18	0.0
3.	Ploughing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.	Sowing	48.48	0.0	0.0	42.22	8.88	35.55	9.09	63.63	27.27	0.0	45.45	36.36
5.	Irrigation	54.54	0.0	6.06	40.0	17.77	17.77	0.0	36.36	18.18	0.0	0.0	0.0
6.	Weeding	100	0.0	0.0	86.66	4.44	8.88	0.0	27.27	45.45	0.0	54.54	0.0
7.	Fertilizer application	39.39	0.0	12.12	13.33	46.66	17.77	0.0	0.0	36.36	0.0	0.0	0.0
8.	Pesticide application	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean Score	42.42	0.0	6.06	32.77	11.38	14.43	1.13	26.13	15.90	0.0	17.04	4.54

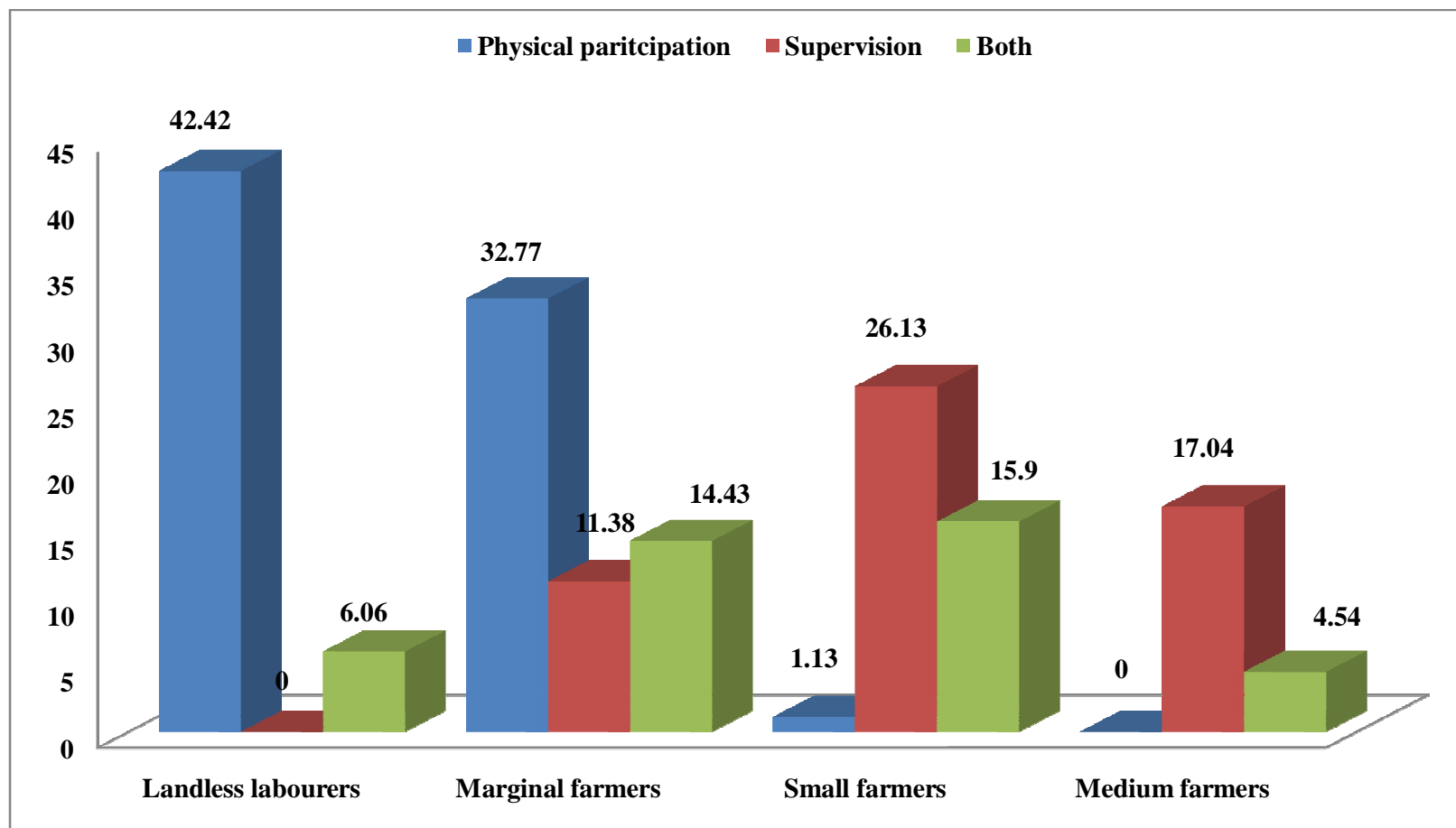


Fig.3: Nature of involvement of four categories of woman farmers in pre-harvest agricultural activities

Table 20: Percentage participation score of involvement of different categories of woman farmers in post-harvest agricultural activities

B.	Post-harvest activities	Landless(N=33)			Marginal(N=45)			Small(N=11)			Medium(N=11)		
		Pp	Su	Both	Pp	Su	Both	Pp	Su	Both	Pp	Su	Both
1.	Harvesting of crops	100.0	0.0	0.0	64.44	0.0	17.77	0.0	18.18	36.36	0.0	54.54	0.0
2.	Bringing crops to home	48.48	0.0	0.0	66.66	11.11	24.44	0.0	45.45	27.27	0.0	54.54	0.0
3.	Threshing	0.0	0.0	0.0	0.0	4.44	15.55	0.0	0.0	0.0	0.0	0.0	0.0
4.	Winnowing	78.78	0.0	0.0	86.66	0.0	13.33	0.0	27.27	54.54	0.0	54.54	0.0
5.	Preservation of grains	0.0	0.0	0.0	80.0	0.0	20.0	36.36	0.0	36.36	0.0	45.45	36.36
6.	Preservation of seeds	0.0	0.0	0.0	62.22	0.0	8.88	36.36	0.0	36.36	0.0	45.45	27.27
7.	Marketing	0.0	0.0	0.0	57.77	6.66	13.33	0.0	0.0	0.0	0.0	0.0	0.0
	Mean score	32.46	0.0	0.0	59.67	3.17	16.18	10.38	12.98	27.27	0.0	42.85	9.09

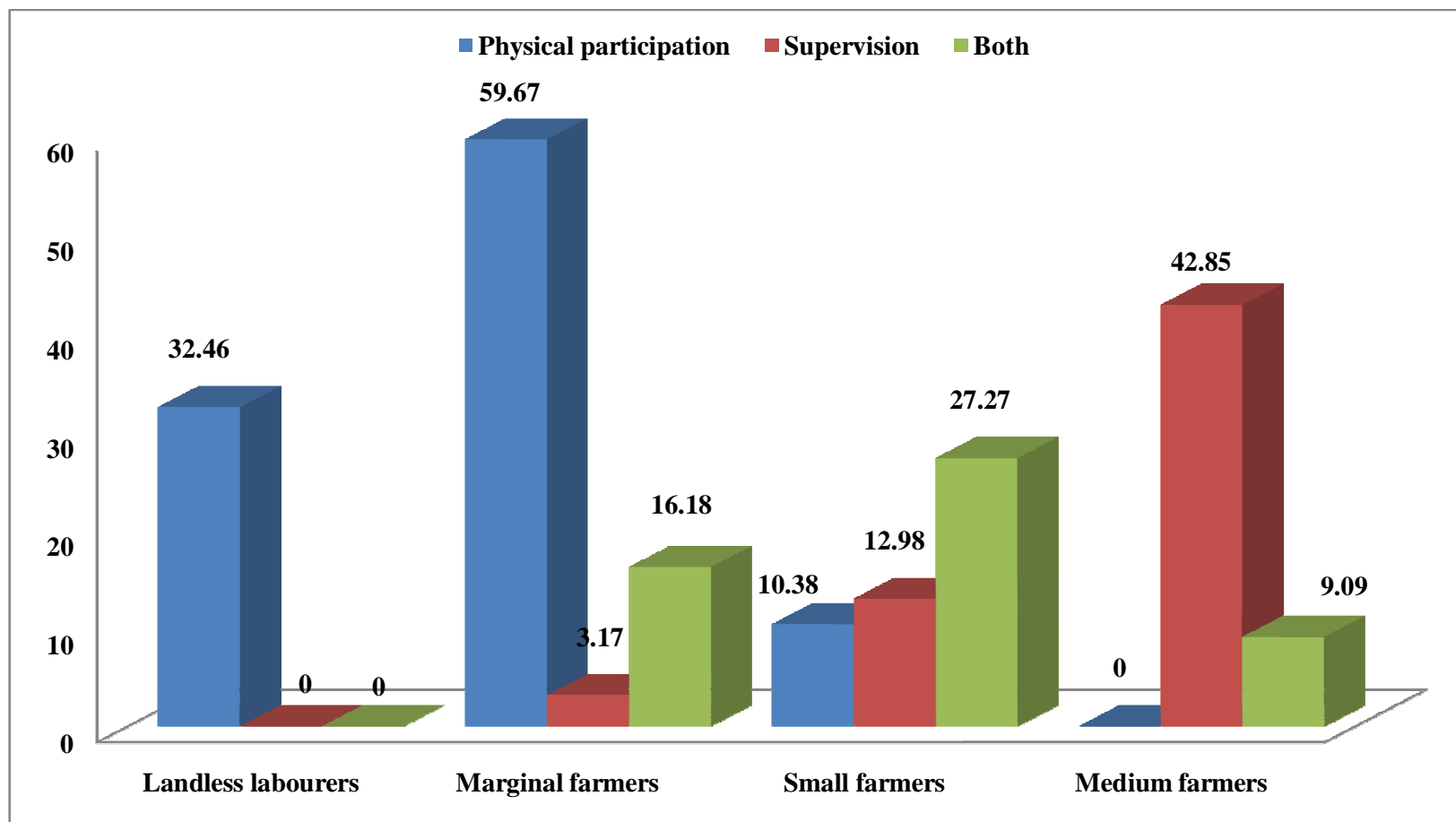


Fig.4: Nature of involvement of four categories of woman farmers in post-harvest agricultural activities

Table 21: Percentage participation score of involvement of different categories of woman farmers in overall agricultural activities

	Overall agricultural activities	Landless(N=33)			Marginal(N=45)			Small(N=11)			Medium(N=11)		
		Pp	Su	Both	Pp	Su	Both	Pp	Su	Both	Pp	Su	Both
A.	Pre-harvest operations	42.42	0.0	6.06	32.77	11.38	14.43	1.13	26.13	15.90	0.0	17.04	4.54
B.	Post-harvest activities	32.46	0.0	0.0	59.67	3.17	16.18	10.38	12.98	27.27	0.0	42.85	9.09
	All agricultural activities	37.44	0.0	3.03	46.22	7.27	15.30	5.75	19.55	21.58	0.0	29.94	6.81

labourers had no supervision. The data presented in the table further indicated that 27.27 percent of small farmers, 9.09 percent of medium land holding category of farmers, 3.17 percent of marginal farmers participated jointly in post-harvest agricultural activities.

4.2.3 Discussion

Size of land holding is related with economic condition of rural women and played an important role in their involvement in different agricultural activities. For economic return and maintenance of their family members they work in the field in various agricultural operations. This might be the reasons for the maximum physical involvement of marginal woman farmers and landless woman folk in agricultural activities in comparison to small and medium category of woman farmers. In supervision the case is just reverse. The landless labourers and marginal farm women poorly supervised the agricultural operations whereas medium category of woman farmers had maximum supervision in different farm operations followed by small rural woman farmers. The findings were in line with Singh *et al.*, (1996), Singh and Verma (1997).

The participation of women varies in pre-harvest and post-harvest agricultural activities. The maximum involvement of woman farmers both in terms of physical participation and supervision was of the marginal woman farmers in post harvest activities. The pre-harvest activities are mainly seen as men's activity and hence less number of women as compared to men were involved in pre-harvest agricultural activities except the operation of weeding where more number of women are involved. The findings were supported by Deepali and Malathi (1987), Shilaja et al. (1993), Singh and Sharma (1997), Kumai, P. (2001) and Chayal and Dhaka (2010).

Section 4.3: The decision-making pattern of rural women in different agricultural practices.

The decision-making pattern of man and woman varies from society to society. An attempt was made to study the nature and extent of decision making by woman farmers in different agricultural activities. The woman farmers were categorised into landless, marginal, small and medium farmers on the basis of land holding category. The areas of decision-making in agricultural activities have been further subdivided into five areas, namely, agriculture, labour allocation, livestock, selling of grains and loan related decisions.

Table-22 indicated the percentage of four categories of woman farmers in different areas of agricultural decision-making and illustrated in Fig 6. The table revealed that marginal woman farmers participated maximum i.e., 29.35 percent in all the areas for decision making followed by 20.08 percent landless labourers, 20.47 percent small farmers and medium category land holding farmers, 19.27 percent. This may be attributed due to the reason that marginal farmers participate in the production process more than the other category farmers, hence their decisions are also given importance. The data revealed a gradual decrease in decision-making role of women with increase in land holding size.

4.3.1 Agricultural decision

As it appears from the Table-23, 20.22 percent marginal woman farmers took decision related to agriculture followed by 14.45 percent by medium farmers and 13.64 percent by small farmers respectively. Landless labourers do not participate in agricultural decision-making.

4.3.2 Labour allocation decision

As regards the labour allocation decisions, Table-23 indicated that 28.89, 22.72, and 18.19 percent of marginal, small and medium woman farmers participated respectively in decision making. The table showed an increasing trend of labour allocation decisions from small woman farmers to medium size of land holding farmers participated less.

4.3.3 Livestock-related decisions

As it appears from Table-23, 40 percent of marginal woman farmers participated in livestock related decisions followed by 27.27 percent by medium and small farmers, 21.21 percent by landless labourers, and 18.19 percent by medium woman farmers.

4.3.4 Selling of grains related decisions

Table-23 showed that 37.78, 31.89 and 18.38 percent of marginal woman farmers, small woman farmers and medium woman farmers participated in selling of grains related decisions.

Table 22: Percentage participation score of decision-making pattern of women and men in different agricultural activities

	Decision-making area	Landless(N=33)			Marginal(N=45)			Small(N=11)			Medium(N=11)		
A.		M	F	B	M	F	B	M	F	B	M	F	B
1.	What crops to be planted?	0.0	0.0	0.0	37.78	28.89	33.33	36.36	9.09	54.55	63.64	0.00	36.36
2.	When and how ploughing should be done?	0.0	0.0	0.0	42.22	28.89	28.89	36.36	9.09	54.55	63.64	0.00	36.36
3.	Which seeds to be used, local or HYV seeds?	0.0	0.0	0.0	60.0	13.33	26.67	63.64	0.00	36.36	72.73	0.00	27.27
4.	When sowing is done?	0.0	0.0	0.0	60.0	17.78	22.22	63.64	0.00	36.36	72.73	0.00	27.27
5.	When widding is done?	0.0	0.0	0.0	26.67	40	33.33	36.36	18.18	45.46	27.28	45.44	27.28
6.	From which method the field is irrigated?	0.0	0.0	0.0	64.45	13.33	22.22	54.55	18.18	27.27	45.44	27.28	27.28
7.	How many times the field is irrigated?	0.0	0.0	0.0	64.45	13.33	22.22	54.55	18.18	27.27	54.54	18.18	27.28
8.	Which fertilizer or pesticides is to be used?	0.0	0.0	0.0	68.89	8.89	22.22	36.36	18.18	45.46	63.63	9.09	27.28
9.	How much fertilizer is to be used?	0.0	0.0	0.0	68.89	13.33	17.78	36.36	18.18	45.46	72.72	9.09	18.19
10.	When harvesting is done?	0.0	0.0	0.0	33.34	24.45	42.21	45.46	27.27	27.27	36.36	36.36	27.28

Cound.

B.	Labour-allocation decision												
1.	How many labour is hired?	0.0	0.0	0.0	40.0	28.89	31.11	45.46	27.27	27.27	45.46	9.09	45.45
2.	How much wages is given?	0.0	0.0	0.0	40.0	28.89	31.11	45.46	18.18	36.36	45.44	27.28	27.28
C.	Livestock related decision	42.43	21.21	36.36	24.44	40.0	35.56	27.27	27.27	45.46	45.46	27.28	27.28
D.	Selling of crops related decision												
1.	When crops should be sold?	0.0	0.0	0.0	22.22	40.0	37.78	27.27	18.18	54.55	45.44	27.28	27.28
2.	Where crops should be sold?	0.0	0.0	0.0	26.67	37.78	35.55	27.27	36.37	36.36	54.54	18.18	27.28
3.	Whom the crops should be sold? retailer or wholesaler?	0.0	0.0	0.0	33.33	35.56	31.11	27.28	36.36	36.36	54.54	9.09	36.37
4.	How much price should be fixed?	0.0	0.0	0.0	26.67	37.78	35.55	18.18	36.36	45.46	54.54	18.18	27.28
E.	Loan-related decisions												
1.	If loan is taken or not?	60.60	30.31	9.09	66.67	22.22	11.11	72.73	9.09	18.18	63.63	27.28	9.09
2.	From where loan is taken?	78.79	15.15	6.06	71.11	11.11	17.78	72.73	0.00	27.27	72.72	9.09	18.19
3.	How much loan is taken?	60.60	15.15	24.25	62.22	26.67	11.11	63.64	9.09	27.27	54.54	27.28	18.18
4.	When the loan is repaid?	63.64	21.21	15.15	66.67	19.45	13.88	72.73	9.09	18.18	72.72	0.00	27.28

Table 23: Percentage participation score of women in overall decision-making pattern in agriculture activities

	Decision-making area	Landless(N=33)	Marginal(N=45)	Small(N=11)	Medium(N=11)
A.	Agricultural decisions	0.0	20.22	13.64	14.54
B.	Labour allocation decisions	0.0	28.89	22.72	18.18
C.	Livestock related decisions	21.21	40.00	27.27	27.27
D.	Selling of crops related decisions	0.0	37.78	31.89	20.45
E.	Loans related decisions	20.45	19.86	6.81	15.91
	All farm related decisions (mean)	20.08	29.35	20.47	19.27

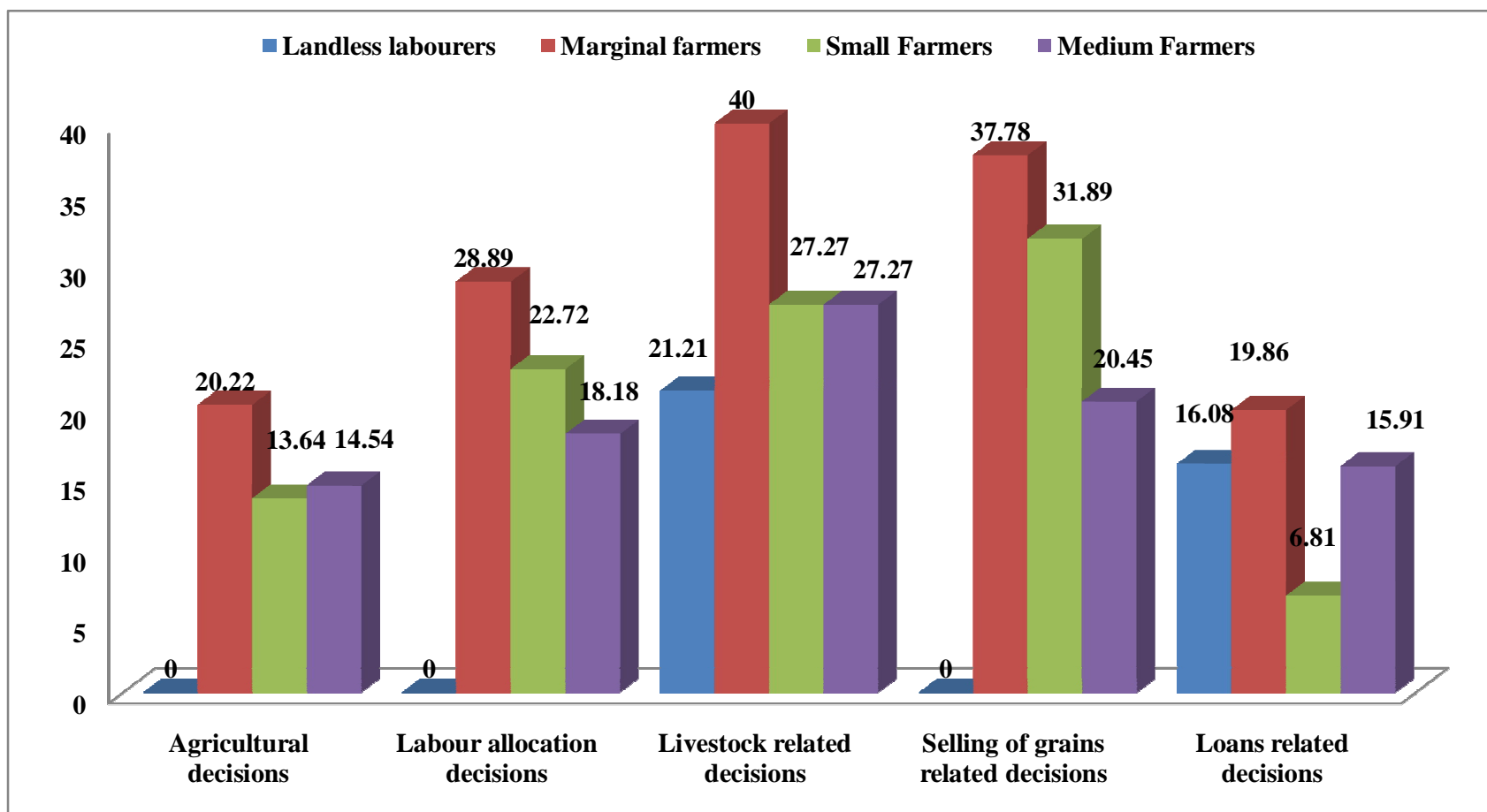


Fig.5: Decision-making pattern of four categories of woman farmers in agriculture

4.3.5 Loan related decisions

Table-23 showed that 20.45, 19.86, 6.81 and 15.92 percent landless labourers, marginal woman farmers, small woman farmers and medium woman farmers participated in loan related decisions respectively. The medium category of woman farmers were participating more in loan related decisions due to their high educational status.

4.3.6 Discussion

The decision-making pattern of woman can be affected by their educational status, participation in economic contribution age and knowledge level. The study found that the women having more involvement in agricultural activities also participated more in decision-making process. In rural families, type and size of the family, caste, education level of rural women, their employment status and rational position affect their involvement in decision making. The findings of the study was found in line with Ratan (1991), Kumari,M.(2003), Dawit et al.(2012), Gondaliya and Patel (2012), Fartyal and Rathore (2014).

Section 4.4: The fourth section deals with the extent of adoption of improved practices by women farmers in terms of wheat production technology.

4.4.1 Knowledge of Improved Technology among the Women

Knowledge about any technology is a pre-requisite for adoption. An attempt has been made to study the knowledge of woman respondents about production technology of high yielding varieties of wheat.

Table 24: Frequency distribution of woman respondents by knowledge scores of production technology of HYV wheat.

Percentage Knowledge score	Number of respondents	Percentage of respondents
Low (Mean-SD)	34	34
Medium (Mean±SD)	57	57
High (Mean+SD)	9	9

Table 24 showed the frequency distributions in four categories. The Table showed that 34.00 percent respondents were found in low knowledge category. 57 percent of respondents were from medium knowledge category and only 9 percent were in high knowledge category respectively.

4.4.2 Extent of adoption of improved technology

Adoption of improved technologies is pre-requisite for bringing change into the family and is indicator of change in any society. An attempt has been made in this section to analyse the adoption of selected improved agricultural technology by the respondents. The percentage distribution of women by adoption of improved technologies in the given areas has been presented in Table 25 and Fig 7.

Table 25 revealed that substantial percentage of respondents were adopting the agricultural technologies in the area of study. The respondents adopting various technologies were, land preparation(30%) ,Variety of seed used (47%), Line sowing(35%), Seed rate (41%), Seed treatment(24%), Irrigation management(54%), Time period of irrigation(51%), Chemical fertilizers(47%), Plant protection measures(46%), Harvesting of crops(63%), and storage management(56%). Adoption of agricultural technologies followed an increasing trend with increase in land holding status of the respondents. Hence, it can be concluded that land holding status of the respondents has direct bearing on the adoption of improved practices.

4.4.3 Discussion

Rate of adoption of improved technologies may be attributed as the extent of adoption presented in percentage of adoption of technologies. Adoption of various improved technology of HYV wheat were affected by the respondents knowledge level, land holding size, education and social participation. Also, the adoptions of various technologies were different in terms of percentage adoption. Post-harvest technologies were adopted by more number of respondents than the pre-harvest technologies. The findings were supported by Krishnamurthy et al. (1998), Bala et al.(2006), Kumbhare and Singh(2011), Arun kumar Paswan(2010) and Vinod Kumar Singh(2014),

Section 4.5: The fifth section deals with the financial help rural women get from governmental or non-governmental organisations.

4.5.1 Source of credit

It deals with the women access to get credit from various sources. It has been presented in Table 26 and depicted in Fig 8. Credit can help woman farmers to change their desires. Credit can also affect expenditure on the use of mechanical equipment, working capital as well as improved seed. Most of the respondents interviewed,

Table 25: Extent of adoption of improved technology of different categories of women farmers

SI. No.	Technology	Landless(N=33)		Marginal (N=45)		Small (N=11)		Medium (N=11)		Pooled (N=100)	
		f	P	f	P	f	P	f	P	f	P
1.	Land preparation	0	0.00	19	42.22	5	45.46	6	54.55	30	30.00
2.	Variety of seeds used	0	0.00	28	62.22	9	81.82	10	90.91	47	47.00
3.	Line sowing	0	0.00	18	40.00	6	85.71	11	100	35	35.00
4.	Seed rate	0	0.00	20	44.45	10	90.91	11	100	41	41.00
5.	Seed treatment	0	0.00	11	24.45	4	36.36	9	81.82	24	24.00
6.	Irrigation management	0	0.00	33	73.33	10	90.90	11	100	54	54.00
7.	Time period of irrigation	0	0.00	31	68.88	9	81.81	11	100	51	51.00
8.	Chemical fertilizers	0	0.00	27	60.00	9	81.81	11	100	47	47.00
9.	Plant protection measures	0	0.00	28	62.22	8	72.752	10	90.91	46	46.00
10.	Harvesting of crops	0	0.00	42	93.33	10	90.91	11	100	63	63.00
11.	Storage management	0	0.00	35	77.78	10	90.91	11	100	56	56.00

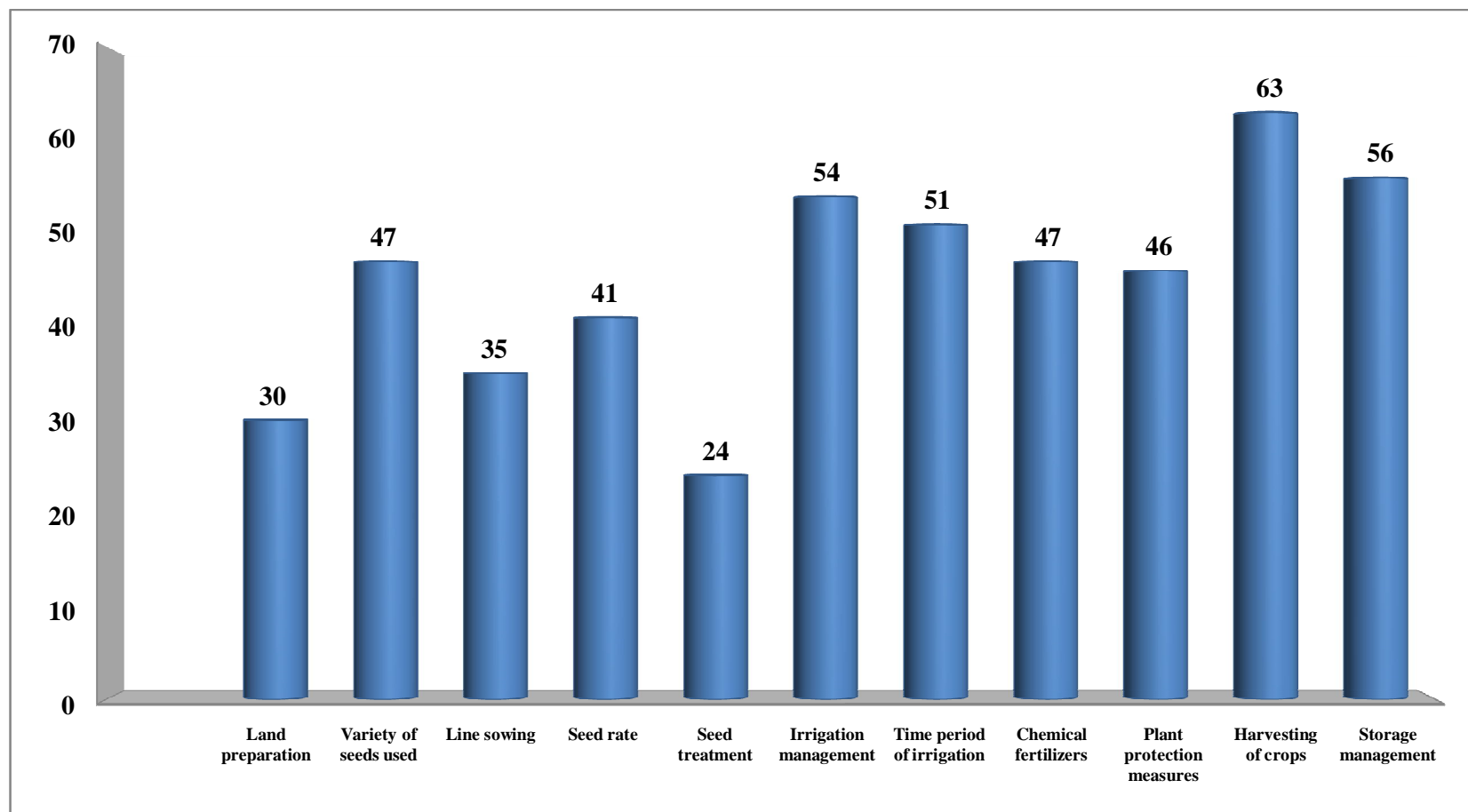


Fig.6: Extent of adoption of improved technology (wheat) by woman farmers

complained of difficulties in securing loan from financial institutions. As it appeared from the Table 26, majority of the woman farmers and labourers i.e., 35 percent use their personal saving, 20 percent took money from money lender in their villages, 16 percent from cooperatives, 14 percent from self help groups, 11 percent from their friends and relatives. Only 4 percent took loan from financial institutions. The findings were in line with Fabiyi et al.(2007) and Owolabi et al. (2011).

Table 26: Source of Credit for woman farmers.

Credit Source	Frequency	Percentage	Ranking
Cooperatives	16	16.00	III
Personal Saving	35	35.00	I
Friends/Relatives	11	11.00	V
Financial Institutions (Regional Rural Banks, Commercial Banks etc)	4	4.00	VI
Money lender	20	20.00	II
SHGs	14	14.00	IV

Section 4.8: In sixth section the constraints faced by rural women in practising agricultural activities were studied.

Woman farmers faces several types of constraints that are categorized as socio-personal, financial and technological constraints. Dual role of women at farm and home and male dominance was perceived by 90 and 82 percent of the respondents as one of the major constraint that hindered their growth as farmers. Lack of credit was the main financial constraint for 76 percent of woman farmers and lack of knowledge and skill was major technological constraints for 78 percent of woman farmers. The findings were supported by Doss (1999), Deshmukh et al. (2007), nain and Kumar (2010) and Tiwari (2010).

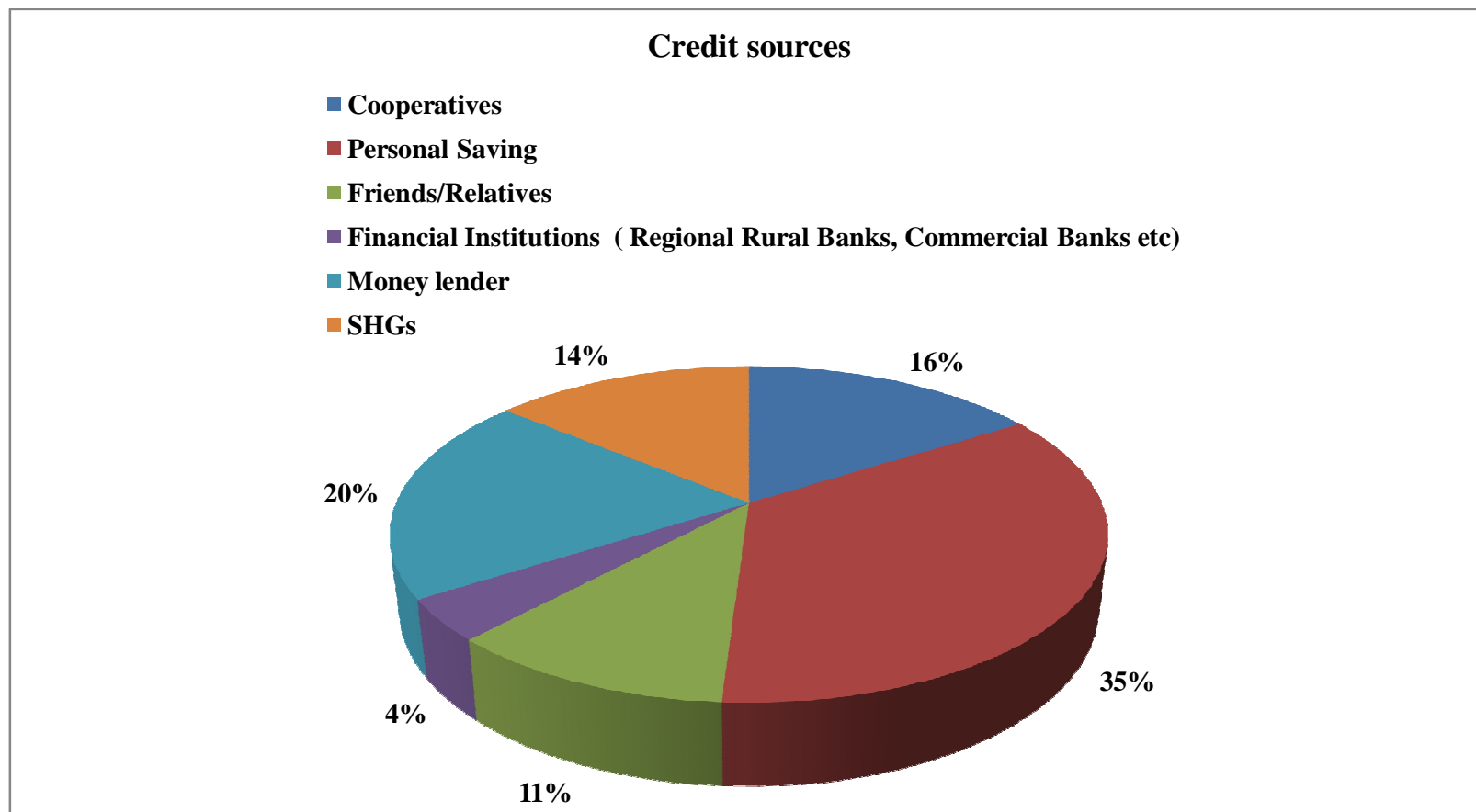


Fig.7: Credit sources for woman farmers

Table 27 Constraints faced by women farmers in agriculture

Sl. No.	Constraints	Frequency	Percentage	Ranking
A.	Socio-personal			
1.	Education	55	55.00	VIII
2.	Lack of land-holding power	45	45.00	XI
3.	Male-dominance	82	82.00	II
4.	Lack of decision-making power	67	67.00	IV
5.	Dual role at farm and home	90	90.00	I
B.	Financial			
1.	Lack of Money/credit	76	76.00	III
2.	Difficulty in taking loans	30	30.00	XII
C.	Technological constraints			
1.	Lack of Knowledge and skill	49	49.00	X
2.	High cost	66	66.00	V
3.	Un-availability	54	54.00	IX
4.	Poor contact with extension agent	63	63.00	VI
5.	Lack of improved tools specific for women	60	60.00	VII

Section 4.9: Relationship of socio-personal and economic characteristics of rural woman farmers with their nature of involvement in agriculture, decision-making pattern and extent of adoption of improved technology by them.

4.9.1 Relationship of nature of involvement of rural woman farmers in agricultural activities with selected socio-economic characteristics

In this section role of woman farmers with respect to nature of involvement in pre and post harvest activities, decision-making and extent of adoption were taken as dependent variables Y_{1A} , Y_{1B} , Y_2 , Y_3 and fifteen variables were taken as independent variables. The co-efficient of correlation of nature of involvement of woman farmers with selected independent variables were worked out and presented in the Table 28.

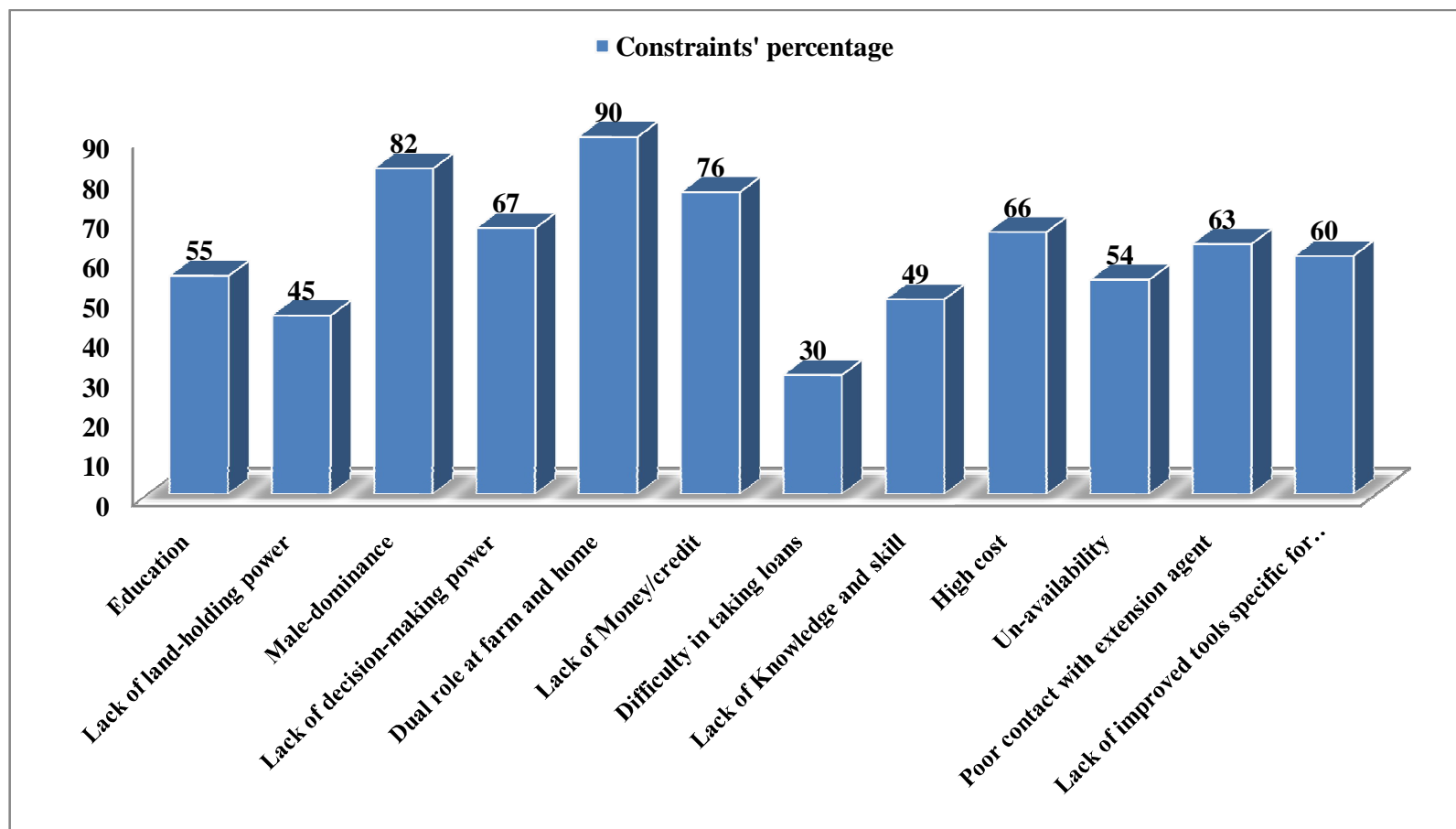


Fig 8: Constraints of woman farmers in agriculture

Table 28 indicates that coefficient of correlation between socio-personal and economic characteristics with the dependent variables i.e., involvement of woman farmers in agricultural activities in pre harvest activities. Among different independent variables caste ($r = 0.484$), respondent education ($r = 0.427$), Education (male-heads) ($r = 0.394$), Occupation of respondent ($r = 0.563$), occupation(male-head) ($r = 0.555$), land holding($r = 0.419$), Family income ($r = 0.554$), agricultural implements ($r = 0.556$), and knowledge level ($r = 0.411$) were found to be positive and highly significant at 1 per cent level of probability. The variables marital status and size of family were non-significant and negative while all other variables were non-significant but positive.

Table 28: Coefficient of correlation between nature of involvement of woman farmers in agricultural activities and selected independent variables

Variables	Value of 'r'	
	Pre harvest activities (Y_{1A})	Post harvest activities (Y_{1B})
Age (X_1)	0.057	0.034
Caste (X_2)	0.484 ^{**}	0.572 ^{**}
Marital status (X_3)	-0.080	-0.067
Education (respondent) (X_4)	0.427 ^{**}	0.571 ^{**}
Education (Respondent Husband) (X_5)	0.394 ^{**}	0.467 ^{**}
Total family members (X_6)	-0.01	-0.068
Type of family (X_7)	0.083	0.112
Occupation(respondent) (X_8)	0.563 ^{**}	0.530 ^{**}
Occupation (respondent husband) (X_9)	0.555 ^{**}	0.392 ^{**}
Size of land holding (X_{10})	0.419 ^{**}	0.801 ^{**}
Family Income (X_{11})	0.554 ^{**}	0.743 ^{**}
Domestic animals (X_{12})	0.195	0.366 ^{**}
Social participation (X_{13})	0.100	0.005
Knowledge level (X_{14})	0.411 ^{**}	0.532 ^{**}
Agricultural implements (X_{15})	0.556 ^{**}	0.678 ^{**}

* = Significant at 5% level of significance

** = Significant at 1% level of significance

Table 28 indicates the correlation coefficient between socio-personal and economic characteristics with the dependent variables i.e., involvement of woman farmers in agricultural practices in post harvest activities. Among different independent variables caste ($r = 0.572$), respondent education ($r = 0.571$), education (male-head) ($r = 0.467$), Occupation of respondent ($r = 0.530$), occupation (male-head) ($r = 0.392$), land holding ($r = 0.801$), Family income ($r = 0.743$), agricultural implements ($r = 0.678$), domestic animal ($r = 0.366$) and knowledge level ($r = 0.532$) were found to be positive and highly significant at 1 per cent level of probability. The variables marital status and size of family were found to be negative and non-significant while all other variables were positive but non-significant.

This indicated that with the increasement in educational level, size of land holding, income, social participation, knowledge-level, caste and occupation category, there was corresponding increase in the involvement of woman farmers in pre-harvest and post-harvest activities. The findings of the present investigation are in line with the findings of Rao (1976), Nayyar (1987), Knot and Nagore (1989), Yadav (1990), Singh *et al.*, (1994), Patki and Nikhade (1999), and Prasad (2007).

4.9.2 Relationship of decision-making pattern of rural woman farmers in agricultural activities with selected socio-economic characteristics

An individual's contribution in decision-making has been found to be influenced by number of socio-economic characteristics. In order to analyze the decision making role of women under study, correlation coefficient was computed between socio-economic characteristics and their contribution in decision-making role.

Table 29 indicates that only marital status ($r = 0.347$) knowledge-level ($r = 0.050$) were found significant and positive at 5 percent level of significance with decision-making pattern of rural women. All other independent variables were found non significant. The variables age, size of family, type of family and family income were negative while caste, Education(self), Education(male-head), occupation(self), occupation(male-head), possession of domestic animals, social participation, knowledge-level and possession of agricultural implements were found positive. This indicates that the woman without male-head in the family take decision independently. Also with the enhancement in knowledge-level of respondents, their

decision-making role also enhanced. The findings were find in line with the findings of Kumari P (1994), Ratan (1991), Jha (1992), Chandani *et al.*, (1998), Anita(2001) and Kumari, P (2001).

Table 29: Coefficient of correlation between decision-making pattern of woman farmers in agricultural activities and selected independent variables

Variables	Value of 'r'(decision making)
Age (X ₁)	-0.055
Caste (X ₂)	0.110
Marital status (X ₃)	0.347**
Education (respondent) (X ₄)	0.045
Education (Respondent Husband) (X ₅)	0.161
Total family members (X ₆)	-0.163
Type of family (X ₇)	-0.119
Occupation(respondent) (X ₈)	0.114
Occupation (respondent husband) (X ₉)	0.010
Size of land holding (X ₁₀)	-0.006
Family Income (X ₁₁)	-0.006
Domestic animals (X ₁₂)	0.046
Social participation (X ₁₃)	0.050
Knowledge level (X ₁₄)	0.050
Agricultural implements (X ₁₅)	0.036*

* = Significant at 5% level of probability

** = Significant at 1% level of significant

4.9.3 Relationship of extent of adoption of improved technology (wheat) by woman farmers with selected socio-economic characteristics

Adoption of improved technology is pre-requisites for bringing change into the family and is indicator of change in any society. Table 30 revealed that the extent of adoption of improved technology was correlated with the socio-economic characteristics. The independent variables caste (r =0.677), education (self)(r =0.738), education(male-head) (r =0.614), occupation(self) (r =0.727), occupation(male-head) (r =0.462), size of land holding (r =0.726), family income (r =0.781), agricultural implements (r =0.738) and knowledge-level (r =0.651) were positively and significantly correlated. The variable, marital status was negatively and significantly

influenced the extent of adoption of improved technology. This means that the respondents with male heads of family were more adopting the improved technology. Other variables were not significant but positively correlated except age and size of family. This means that with the increasement in independent variables of caste, education, land holding and knowledge-level, the extent of adoption of improved technology by woman farmers increases. The findings were supported by Kaur (1981), Reddy *et al.*, (1989), Singh and Sharma (1990), Singh and Singh (2002), Subodh (2003), and Snehlata (2006).

Table 30: Coefficient of correlation between extent of adoption of improved technology (wheat) by woman farmers and selected independent variables

Variables	Value of 'r'(adoption)
Age (X ₁)	-0.140
Caste (X ₂)	0.677**
Marital status (X ₃)	-0.229*
Education (respondent) (X ₄)	0.738**
Education (Respondent Husband) (X ₅)	0.614**
Total family members (X ₆)	-0.105
Type of family (X ₇)	0.018
Occupation(respondent) (X ₈)	0.727**
Occupation (respondent husband) (X ₉)	0.462**
Size of land holding (X ₁₀)	0.726**
Family Income (X ₁₁)	0.781**
Domestic animals (X ₁₂)	0.404**
Social participation (X ₁₃)	0.131
Knowledge level (X ₁₄)	0.651**
Agricultural implements (X ₁₅)	0.738**

* = Significant at 5% level of probability

** = Significant at 1% level of significant

4.9.4 Relationship of nature of involvement of different categories of rural woman farmers in pre-harvest agricultural activities with selected socio-economic characteristics

Table 31 revealed that respondent's education, husband education, self occupation, and husband occupation, were significantly and positively correlated in case of landless woman labourers. Social participation and knowledge were not significantly but positively correlated. Age, Caste, size of family and type of family were not significantly but negatively correlated. This revealed that with increase in age, caste, size of family and type of family the participation of landless labourers decreases while with increase in education, income, social participation and knowledge their participation in pre-harvest activities increases.

Table 31 also revealed that in case of marginal woman farmers, age ($r = .366$) is highly significant but negative. This means that with increase in age the participation in pre harvest activities decreases. The variables self education ($r = .391$), caste ($r = .645$), income ($r = .600$), family income ($r = .524$) and agricultural implements ($r = .402$) were positive and highly significant indicating that increase in their value results in increase in their participation in activities. The variable husband education ($r = .340$), occupation ($r = .350$), knowledge ($r = .313$) were positive and significant at 5 percent level of significance.

Table 31 further revealed that in case of small woman farmers, no variables were significant but education ($r = .112$), husband education ($r = .411$), size of family ($r = .304$), type of family ($r = .157$), family income ($r = .164$), and agricultural implements ($r = .269$) were negatively correlated and age ($r = .193$), caste ($r = .373$), husband occupation ($r = .265$), income ($r = .484$), social participation ($r = .088$), and knowledge ($r = .475$) were positively correlated.

Table 31 showed that in case of medium woman farmers, caste ($r = .777$), agricultural implements ($r = .826$) and knowledge ($r = .777$) were positive and highly significant. Land holding ($r = .616$), family income ($r = .618$) were positive and significant. The variables size of family ($r = .339$), type of family ($r = .063$) were not significant and negative.

Table 31: Coefficient of correlation between nature of involvement of different categories of woman farmers in agricultural activities and selected independent variables

Variables	Value of 'r' (Pre harvest activities (Y _{1A}))			
	Landless (N=33)	Marginal (N=45)	Small (N=11)	Medium (N=11)
Age (X ₁)	-.125	-.366*	.193	.046
Caste (X ₂)	-.002	.645**	.373	.777**
Marital status (X ₃)	.351*	.391**	-.112	.213
Education (respondent) (X ₄)	.552**	.340*	-.411	.060
Education (Respondent Husband) (X ₅)	-.195	.022	-.157	-.063
Total family members (X ₆)	-.061	.249	-.304	-.339
Type of family (X ₇)	.543**	-	-	-
Occupation(respondent) (X ₈)	.470	.350*	.265	.470
Occupation (respondent husband) (X ₉)	-	.600**	.484	.459
Size of land holding (X ₁₀)	-	.524**	-.164	.618*
Family Income (X ₁₁)	-	-	-	.616*
Domestic animals (X ₁₂)	.290	.117	.088	.220
Social participation (X ₁₃)	-	.402**	-.269	.826**
Knowledge level (X ₁₄)	.098	-.273	.475	.298
Agricultural implements (X ₁₅)	-.108	.313*	-	.777**

* = Significant at 5% level of probability

** = Significant at 1% level of significant

4.9.5 Relationship of nature of involvement of different categories of rural woman farmers in post-harvest agricultural activities with selected socio-economic characteristics

The relationship between different categories of woman farmers with their participation in post-harvest agricultural activities is shown in Table 32.

Table 32: Relationship of nature of involvement of different categories of rural women farmers in post-harvest agricultural activities with selected socio-economic characteristics

Variables	Value of 'r' (Post harvest activities (Y _{1B}))			
	Landless (N=33)	Marginal (N=45)	Small (N=11)	Medium (N=11)
Age (X ₁)	-.213	-.182	.445	-.225
Caste (X ₂)	-.023	.210	.274	.557
Marital status (X ₃)	.300	.319*	-.117	.131
Education (respondent) (X ₄)	.509**	.130	-.204	.096
Education (Respondent Husband) (X ₅)	-.119	-.041	.170	.462
Total family members (X ₆)	-.005	-.181	.178	-.007
Type of family (X ₇)	.574**	-	-	-
Occupation(respondent) (X ₈)	.504**	.145	-.170	.712*
Occupation (respondent husband) (X ₉)	-	.499**	.346	-.367
Size of land holding (X ₁₀)	-	.398**	-.123	.011
Family Income (X ₁₁)	-	-	-	.242
Domestic animals (X ₁₂)	.440	-.025	-.269	-.248
Social participation (X ₁₃)	-	.273	-.266	.350
Knowledge level (X ₁₄)	.230	.012	-.079	.444
Agricultural implements (X ₁₅)	-.154	.158	-	.557

* = Significant at 5% level of probability

** = Significant at 1% level of significant

Table 32 showed that in case of landless labourers husband education ($r = .509$), self occupation ($r = .574$) and husband occupation ($r = .504$) were positive and highly significant. Education ($r = .300$) and social participation were not significant but positive. The variables age ($r = .213$), caste ($r = .023$), size of family ($r = .005$), type of family ($r = .119$) and knowledge ($r = .154$) were not significant and negatively correlated.

Table 32 showed that income ($r = .499$) and family income ($r = .398$) were positive and highly significant for marginal woman farmers. Age ($r = .182$), size of family ($r = .181$), type of family ($r = .041$), and social participation ($r = .025$) were not significant but negatively correlated.

Table 32 showed that for small woman farmers, no variables were significantly correlated but self education ($r = .117$), husband education ($r = .204$), husband occupation ($r = .170$), family income ($r = .123$), agricultural implements ($r = .266$) and social participation ($r = .269$) were negative and age ($r = .445$), caste ($r = .274$), size of family ($r = .178$), type of family ($r = .170$), and income ($r = .346$) were positive.

Table 32 further showed that for medium woman farmers, husband occupation ($r = .712$) was positive and significant at 1 percent level of significance. The variables age ($r = .225$), size of family ($r = .007$), income ($r = .367$) and social participation ($r = .248$) were not significant and negative. The variables caste ($r = .557$), education ($r = .131$), type of family ($r = .096$), family income ($r = .011$), knowledge ($r = .557$) were not significant but positive.

4.9.6 Relationship of different categories of rural woman farmers in decision making role with selected socio-economic characteristics

The relationship of different categories of rural woman farmers in decision making role with selected socio-economic characteristics has been depicted in Table 33. The Table showed that no variables were found significant for different category of farmers in their decision making role except husband education ($r = .610$) for small woman farmer.

Table 33 showed that for landless labourers caste ($r = .057$), husband education ($r = .252$), type of family ($r = .110$), occupation ($r = .260$), social participation ($r = .119$) and knowledge ($r = .151$) were positive while age ($r = .056$), education ($r = .008$), size of family ($r = .189$) were negatively correlated.

Table 33 further showed that education ($r = .013$), size of family ($r = .105$), type of family ($r = .263$), husband occupation ($r = .177$), agricultural implements ($r = .064$) and knowledge ($r = .005$) were negatively correlated and age ($r = .052$), husband education ($r = .068$), family income ($r = .050$) and social participation ($r = .051$) were positively correlated for marginal woman farmers.

Table 33 showed that husband education ($r = .610$) was found to be positive and significant at 1 percent level of significance for small woman farmers. The variables caste ($r = .249$), education ($r = .464$), husband education ($r = .320$), family income ($r = .510$), agricultural implements ($r = .356$) and social participation ($r = .525$) were positively correlated and size of family ($r = .439$), type of family ($r = .022$) and income ($r = .056$) were negatively correlated for small farmers.

Table also showed that for medium women farmers age (.130), caste (.139), education (.091), size of family (.198), type of family (.198), husband occupation (.067), land holding (.216) and knowledge (.139) were not significant and negative while husband occupation (.526), income (.420), family income (.307) agricultural implements (.017) and social participation (.582) were positively significant.

Table 33: Coefficient of correlation between decision making power of different categories of women farmers in agricultural activities and selected independent variables

Variables	Value of 'r' (Decision making (Y ₂))			
	Landless (N=33)	Marginal (N=45)	Small (N=11)	Medium (N=11)
Age (X ₁)	-.056	.052	-.545	-.130
Caste (X ₂)	.057	.215	.249	-.139
Marital status (X ₃)	-.008	-.013	.464	-.091
Education (respondent) (X ₄)	.252	.068	.320	.526
Education (Respondent Husband) (X ₅)	.110	-.263	-.022	-.198
Total family members (X ₆)	-.189	-.105	-.439	-.198
Type of family (X ₇)	.260	-	-	-
Occupation(respondent) (X ₈)	-.027	-.177	.610*	-.067
Occupation (respondent husband) (X ₉)	-	.038	-.056	.420
Size of land holding (X ₁₀)	-	.050	.510	.307
Family Income (X ₁₁)	-	-	-	-.216
Domestic animals (X ₁₂)	.119	.051	.525	.582
Social participation (X ₁₃)	-	-.064	.356	.017
Knowledge level (X ₁₄)	.024	-.128	.312	.067
Agricultural implements (X ₁₅)	.151	-.005	-	.139

* = Significant at 5% level of probability

** = Significant at 1% level of significant

4.9.7 Relationship of different categories of rural woman farmers with extent of adoption of improved technology with selected socio-economic characteristics

Table 34 showed the relationship of different categories of rural woman farmers with extent of adoption of improved technology with selected socio-economic characteristics. There was no correlation between landless woman labourers. Table 33 showed that for marginal woman farmers caste ($r = .440$), education ($r = .621$), husband education ($r = .403$), husband occupation ($r = .446$), social participation were positively correlate and highly significant at 5 percent level of significance while age ($r = .597$), size of family ($r = .401$), type of family ($r = .307$), were highly significant but negatively correlated.

Table 34: Coefficient of correlation between extent of adoption of improved technology (wheat) by different categories of woman farmers and selected independent variables

Variables	Value of 'r' (Extent of adoption (Y ₃))			
	Landless (N=33)	Marginal (N=45)	Small (N=11)	Medium (N=11)
Age (X ₁)	-	-.597**	-.648**	-.255
Caste (X ₂)	-	.440**	.261	.473
Marital status (X ₃)	-	.621**	.706*	.232
Education (respondent) (X ₄)	-	.403**	.702*	.108
Education (Respondent Husband) (X ₅)	-	-.307*	-.273	-.043
Total family members (X ₆)	-	-.401**	-.529	-.202
Type of family (X ₇)	-	-	-	-
Occupation(respondent) (X ₈)	-	.446**	.273	.620*
Occupation (respondent husband) (X ₉)	-	.181	.198	.007
Size of land holding (X ₁₀)	-	.213	.608*	.239
Family Income (X ₁₁)	-	-	-	.202
Domestic animals (X ₁₂)	-	.398**	.674*	-.126
Social participation (X ₁₃)	-	.275	.467	.599
Knowledge level (X ₁₄)	-	-.110	.098	.323
Agricultural implements (X ₁₅)	-	.209	-	.473

* = Significant at 5% level of probability

** = Significant at 1% level of significant

Table further showed that for small woman farmers' education ($r = .706$), husband education ($r = .702$), family income ($r = .608$) and social participation ($r = .674$) were positive and significant at 1 percent level of significance while age ($r = .648$) was significantly but negatively correlated.

Table 34 also showed that for medium woman farmers' husband education ($r = .620$) was positive and significant while age ($r = .255$), size of family ($r = .202$), type of family ($r = .043$), and social participation ($r = .126$) were not significant and negative.

4.9.8 Relative contribution of selected socio-economic characteristics towards nature of involvement of woman farmers in pre harvest activities

The result presented in Table 35 revealed that the independent variables, occupation (male-head), size of land holding, family income, and possession of agricultural implements were found positively and significantly affecting the involvement of woman farmers in pre harvest activities either in case of physical participation or in the case of supervision. However, the factor knowledge-level of women were found significant but negatively affecting the participation of women in pre harvest agricultural activities. The coefficient of determination was 0.557 indicating that all the variables explained 55.70 percent variability towards the dependent variables i.e., nature of involvement of woman farmers in pre-harvest agricultural activities.

Table 35: Relationship between regression coefficient of nature of participation of woman farmers in pre harvest activities with independent variables.

Variables	Value of 'r' (Pre harvest activities Y _{1A})						R ²
	Const.	Regression coefficient	S.E.	Standarized regression coefficient	t-value	Sig.	
Age (X ₁)		-	0.014	0.095	0.993	0.323	
Caste (X ₂)		0.373	0.272	0.165	1.374	0.173	
Marital status (X ₃)		0.488	0.412	0.121	1.184	0.240	
Education (respondent) (X ₄)		-	0.103	0.060	0.451	0.653	
Education (Respondent Husband) (X ₅)		-	0.075	-0.002	-0.018	0.986	
Total family members (X ₆)		-	0.277	0.027	0.267	0.790	
Type of family (X ₇)	-2.505	-0.209	0.272	-0.078	-0.770	0.443	0.557
Occupation(respondent) (X ₈)		0.206	0.424	0.073	0.486	0.628	
Occupation (respondent husband) (X ₉)		0.530	0.170	0.343	3.129	0.002	
Size of land holding (X ₁₀)		-0.688	0.237	-0.547	-2.906	0.005	
Family Income (X ₁₁)		0.669	0.271	0.538	2.468	0.016	
Domestic animals (X ₁₂)		-0.279	0.224	-0.121	-1.245	0.217	
Social participation (X ₁₃)		0.104	0.307	0.028	0.339	0.735	
Knowledge level (X ₁₄)		-0.437	0.252	-0.228	-1.738	0.086	
Agricultural implements (X ₁₅)		0.536	0.254	0.302	2.110	0.038	

Table 36: ANOVA

Source of variables	df	Sum of squares	Mean square	F-value	Sig
Regression	17	95.057	5.592	6.070	0.000
Residual	82	75.533	0.921		
Total	99	170.590			

Table 36 showed that F-value was significant, therefore it can be concluded that the independent variables were influencing the work participation pattern of woman farmers in pre harvest activities in agriculture.

4.9.9 Relative contribution of selected socio-economic characteristics towards nature of involvement of woman farmers in post-harvest activities

The result presented in Table 37 revealed that the independent variables, size of land holding and possession of agricultural implements affect the involvement of women in post-harvest activities positively and significantly while, size of family, occupation (male-head) and knowledge-level of respondents were negatively significant. However, age, caste, marital status, type of family, family income, and social participation were found non-significant. The coefficient of determination was .725 indicating that all the variables explained 72.50 percent variability towards the dependent variables i.e., nature of involvement of woman farmers in post-harvest agricultural activities.

Table 37: Relationship between regression coefficient of nature of participation of women farmers in post harvest activities with independent variables

Variables	Value of 'r' (Post harvest activities Y _{1B})						R ²
	Constant	Regression coefficient	S.E.	Standardized regression coefficient	t-value	Sig.	
Age (X ₁)		-	.010	.020	.270	.788	
Caste (X ₂)		-	.191	.035	.372	.711	
Marital status (X ₃)		.166	.289	.046	.575	.567	
Education (respondent) (X ₄)		-	.073	.064	.610	.544	
Education (Respondent Husband) (X ₅)		-	.053	-.036	-.389	.698	
Total family members (X ₆)		-.336	.194	-.038	-1.73	.087	
Type of family (X ₇)		.251	.191	.105	1.31	.192	
Occupation(respondent) (X ₈)		-.653	.298	-.260	-2.19	.031	
Occupation (respondent husband) (X ₉)	0.115	.167	.119	.121	1.40	.164	.725
Size of land holding (X ₁₀)		.612	.166	.546	3.68	.000	
Family Income (X ₁₁)		-	.190	-.040	-.233	.817	
Domestic animals (X ₁₂)		-	.157	.017	.228	.820	
Social participation (X ₁₃)		-.128	.216	-.039	-.596	.553	
Knowledge level (X ₁₄)		-.319	.177	-.187	-1.806	.075	
Agricultural implements (X ₁₅)		.390	.178	.247	2.18	.032	

Table 38: ANOVA

Source of variables	df	Sum of square	Mean square	F	Sig.
Regression	17	98.123	5.77	12.71	.000
Residual	82	37.237	.454		
Total	99	135.360			

Table 38 showed that F-value was significant, therefore it can be concluded that the independent variables were influencing the work participation pattern of woman farmers in post- harvest activities in agriculture.

4.9.10 Relative contribution of selected socio-economic characteristics towards decision-making pattern of woman farmers.

The result presented in Table 39 revealed that the independent variables knowledge and marital status were positive and significant with the decision making pattern of women in farm activities. This may be due to the reason that knowledge brought confidence and ability into women to take right and wrong decisions and also the male counterparts will show confidence in them. The size of land holding were significant but negatively affecting the participation of women in decision-making. This indicates that with the increase in land holding size of woman farmers their decision-making power decreases. All the other variables were found non-significant with the decision making pattern of women farmers in different agricultural activities. The independent variables age, education(self), type of family, size of family, occupation(self), family income, social participation and possession of agricultural implements were negatively correlated and caste, and education(male-head) were positively correlated but non-significant. The coefficient of determinant was 0.295 indicating that all the variables explained 29.50 percent variability towards the dependent variables i.e., decision-making pattern of woman farmers.

Table 39: Relationship between regression coefficients of decision making power of woman farmers with independent variables

Variables	Value of 'r' (Decision making Y ₂)						R ²
	Const.	Regression coefficient	S.E.	Standardized regression coefficient	t-value	Sig.	
Age (X ₁)		-.110	.083	-.159	-1.32	.191	
Caste (X ₂)		2.03	1.66	.185	1.22	.225	
Marital status (X ₃)		11.22	2.51	.577	4.45	.000	
Education (respondent) (X ₄)		-.161	.632	-.043	-.254	.800	
Education (Respondent Husband) (X ₅)		.108	.461	.034	.233	.816	
Total family members (X ₆)		-.843	1.69	-.064	-.499	.619	
Type of family (X ₇)	-3.314	-2.613	1.66	-.201	-1.57	.120	0.295
Occupation(respondent) (X ₈)		-	2.59	-.007	-.036	.971	
Occupation (respondent husband) (X ₉)		1.348	1.037	.180	1.301	.197	
Size of land holding (X ₁₀)		-2.58	1.44	-.424	-1.78	.078	
Family Income (X ₁₁)		-.326	1.65	-.054	-.197	.844	
Domestic animals (X ₁₂)		1.17	1.37	.105	.858	.396	
Social participation (X ₁₃)		-.969	1.87	-.055	-.516	.607	
Knowledge level (X ₁₄)		.129	1.53	.014	.084	.933	
Agricultural implements (X ₁₅)		-1.355	1.55	-.0158	-.871	.386	

Table 40: ANOVA

Source of variables	df	Sum of square	Mean square	F	Sig.
Regression	17	1179.19	69.36	2.01	.019
Residual	82	2824.55	34.44		
Total	99	4003.75			

Table 40 showed that F-value was significant, therefore it can be concluded that the woman farmer's decision-making was influenced significantly by the independent variables under study.

4.9.11 Relative contribution of selected socio-economic characteristics of woman farmers towards extent of adoption of improved technology.

Table 41: Relationship between regression coefficient of extent of adoption of improved technology of wheat production by woman farmers with independent variables

Variables	Value of 'r' (Extent of adoption Y_3)						R^2
	Constant	Regression coefficient	S.E.	Standardized regression coefficient	t-value	Sig.	
Age (X_1)		-	.030	-.075	-1.21	.228	
Caste (X_2)		.823	.603	.106	1.36	.176	
Marital status (X_3)		-1.543	.915	-.112	-1.68	.096	
Education (respondent) (X_4)		.592	.230	.221	2.57	.012	
Education (Respondent Husband) (X_5)		-	.167	.044	.591	.556	
Total family members (X_6)		-.409	.614	-.043	-.665	.508	
Type of family (X_7)		-.429	.604	-.047	-.710	.480	
Occupation(respondent) (X_8)	-2.018	4.882	.943	.503	5.17	.000	0.815
Occupation (respondent husband) (X_9)		-.749	.377	-.141	-1.98	.050	
Size of land holding (X_{10})		-	.526	.010	.080	.936	
Family Income (X_{11})		1.332	.602	.311	2.21	.030	
Domestic animals (X_{12})		-.905	.498	-.114	-1.81	.073	
Social participation (X_{13})		-.766	.682	-.061	-1.12	.265	
Knowledge level (X_{14})		-	.552	.009	.103	.918	
Agricultural implements (X_{15})		.864	.565	.142	1.53	.130	

The result presented in Table 41 revealed that the independent variables, education(self) and occupation(self) were positively and significantly influenced the extent of adoption of improved agricultural technology by the woman farmers while possession of domestic animals, marital status, occupation(male-head) were negative but significant. The other independent variables were found non-significant. The coefficient of determinant was 0.815 indicating that all the variables explained 81.50 percent variability towards the dependent variables i.e., extent of adoption of improved technology of woman farmers.

Table 42: ANOVA

Source of variables	df	Sum of square	Mean square	F	Sig.
Regression	17	1642.34	96.60	21.24	0.00
Residual	82	372.96	4.54		
Total	99	2015.31			

Table 42 showed that F-value was significant, therefore it can be concluded that the woman farmers' extent of adoption of improved technology was influenced significantly by the independent variables under study.



SUMMARY AND CONCLUSION

Globally women constitute almost half of the human resources and are the pivot around which the family, the society, and the whole humanity move. The prosperity and growth of a nation is measured by the status and development of its women as they not only constitute half of the population but also influence the growth of the remaining half of the population. Since time immemorial women are found to be involved in farm production in addition to their sole responsibility of managing the homes. With rapid expansion of India's economy, we closely observe a phenomenon of 'feminization of agriculture' where women play an increasingly important role in agriculture and work, spanning from cultivating field crops to livestock rearing, gardening, gathering, and fishing. These women are important drivers of economic and ecological sustainability. In India, the word farmer or *kissan* is perceived as addressing a man and seldom a Woman, this 'mindset' is reflected in the policies and national agenda and women continue to remain 'invisible' farmers. Thus the face of an Indian farmer remains a man's face. Agriculture is an engine of economic growth and provides the basis for most livelihoods in developing countries. Women are a significant portion of the agricultural labour force, constituting an average of 43 percent in developing countries, with ranges from about 20 percent in Latin America to 50 percent in Eastern Asia and sub-Saharan Africa. . In India, women constitute approximately 50 percent of agricultural and livestock workers.

As per census 2011, workers constituted 39.79 percent of total population whereas the ratio of female workers was 25.51 percent. At All-India level the percentage share of females as cultivators, agricultural labourers, workers in households industry and the other workers stood at 24.92, 18.56, 2.95, and 47.20 percent respectively. The percentage of female main workers to the total population of female stood at 25.5 percent. Work participation rate of female workers in rural areas was higher which stood at 30.0 percent as compared to the work participation rate of 15.4 percent in urban areas.

Women make up about 33 percent of cultivators and about 47 percent of agricultural labourers. In 2009, 94 percent of the female agricultural labour force in crop cultivation was in cereal production, while 1.4 percent worked in vegetable production, and 3.72 percent were engaged in fruits, nuts, beverages and spice crops.

Rural Indian women are extensively involved in agricultural activities. However, the nature and extent of their involvement differs with the variations in agro-production systems. The mode of female participation in agricultural production varies with the land-owning status of farm households. Their roles range from managers to landless labourers. In overall farm production, women's average contribution is estimated at 55 percent to 66 percent of the total labour with percentages much higher in certain regions (Venkateswaran, 1992).

Women make essential contributions to the agricultural and rural economies in all developing countries. Their role varies considerably between and within regions and are changing rapidly in many parts of the world, where economic and social forces are transforming the agricultural sector. Rural women often manage complex households and pursue multiple livelihood strategies. Their activities typically include producing agricultural crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water, engaging in trade and marketing, caring for family members and maintaining their homes. Many of these activities are not defined as "economically active employment" in national accounts but they are essential to the well-being of rural households.

Despite the important role played by women in agricultural production, they face several handicaps. They are in fact the largest group of landless labourers. Women as farmers face constraints such as lack of accessibility to skills, trainings, information and technology, access to inputs, credits, financial incentives, market and control over farm income. Women farmers are less likely than men to use modern inputs such as improved seeds, fertilizers, mechanical tools etc., They use conventional tools with little efficiency and face drudgery while working in the field and home. Also as men are migrating to urban areas for work more and more women are taking to farming, but they are not getting access to credit as they do not have pattas. Only 11 percent women have access to land holdings, that too, mostly as small and marginal farmers (Yojana 2012). Finally women have less education and less access to extension services.

Bihar is the 13th largest state, with an area of 94,163km² and the 3rd largest by population. The total workers in Bihar is 34 million of which 9.50 million workers are the female workers. Of these female workers, 15.27 percent are cultivators, 60.77 percent are agricultural labourers, 6.83 percent are household industry workers and

17.13 percent are other workers. In Bihar the Female work participation rate was 18.8 percent in 2001 which rose to 19.1 percent in 2011 (statistical profile 2012-13). The majority of rural women workers participating in agriculture and related activities are either as casual workers or self-employed. The lower castes are found to be work predominantly as paid agricultural labour due to their poverty and inaccessibility to land resources. Hence there is a need to awaken the rural women for boosting production.

Keeping these views in mind, present study entitled role of women in today's agriculture was undertaken with the broader objective to make an assessment of involvement of women in agriculture. The specific objectives of this study were:

- I. To study the socio-economic profile of farm women.
- II. To see the role of women in decision making in the field of agriculture.
- III. To see the rate of adoption of modern techniques of agriculture.
- IV. To study the financial help the women farmers get by the government/private organizations or any other NGOs and the constraints faced by them.
- V. To ascertain the relationship between selected socio-economic variables with extent of adoption of modern agricultural practices by farm women.

The present study was conducted in Pusa and Kalyanpur Block of Samastipur district. Four villages namely Harpur, Mahmadda, Gorai, and Madhurapur were selected purposively for the study. Rural women from four villages were selected and categorized in landless, marginal, small and medium farmers. Thus the total samples for the study were 100. Based on the review of available relevant literature and discussions with experts and members of advisory committee a manageable set of variables were selected. The independent variables selected for the study were age, caste, education, type of family, size of family, income, size of land holding, family income, type of house social participation, agricultural implements and knowledge level.

The dependent variables were nature and extent of participation of woman farmers in pre and post-harvest agricultural activities, decision making pattern and extent of adoption of improved agricultural technologies.

For measurement of independent variables, some test were developed and some of the scale developed by earlier research works were used.

Salient findings of the study

The major findings of the present study are summarised under seven major heads given below:

1. Nature of involvement of rural women farmers in pre and post-harvest agricultural activities

The findings revealed that women participated in almost all the agricultural activities either in the form of physical participation, supervision or jointly. The landless rural women have maximum physical participation in both pre-harvest and post harvest agricultural activities followed by the marginal women farmers. In pre harvest 42.42 percent of landless labourers were physically doing the work while in post- harvest 59.67 percent of marginal woman farmers were engaged. The medium category of size of land holding women farmers had no physical participation in pre and post-harvest activities but in case of supervision (pre-17.04 percent and post-42.85 percent), they participated maximum. The marginal women farmers overall participation in agricultural activities physically was 46.22 percent and as supervision was 7.27 percent while of small woman farmers were 5.75 percent and 19.55 percent. However, by 26.13 percent of small farmers, 14.43 percent of marginal farmers, 6.06 percent of landless and 4.54 percent of medium woman farmers participated jointly in pre-harvest agricultural activities and 27.27 percent of small farmers, 9.09 percent of medium land holding category of farmers, and 16.18 percent of marginal farmers participated jointly in post-harvest agricultural activities.

2. The decision-making pattern of rural women in different agricultural practices.

The findings indicated that men dominated women in dependent decisions in all the areas of agriculture. However the marginal woman farmers participated maximum i.e., 29.35 percent in all the areas of agriculture for decision making. Then came the small farmers i.e., 20.47 percent and medium category land holding farmers, 17.05 percent. This may be attributed due to the reason that marginal farmers participate in the production process more than the other category farmers, hence their decisions are also given importance.

3. Extent of adoption of improved practices by women farmers in terms of wheat production technology.

The respondents adopting various technologies were, land preparation (30%), Variety of seed used (47%), Line sowing (35%), Seed rate (41%), Seed treatment (24%), Irrigation management (54%), Time period of irrigation (51%), Chemical fertilizers (47%), Plant protection measures (46%), Harvesting of crops (63%), and storage management (56%). Adoption of agricultural technologies followed an increasing trend with increase in land holding status of the respondents.

4. The financial help rural women get from governmental or non-governmental organisations.

It deals with the women access to get credit from various sources. Credit can help women farmers to change their desires. Majority of the women farmers and labourers, 35 percent use their personal saving, 20 percent took money from money lender in their villages, 16 percent from cooperatives, 14 percent from self help groups, 11 percent from their friends and relatives. Only 4 percent took loans from financial institutions.

5. The constraints faced by rural women in practising agricultural activities were studied.

Women farmers faces several types of constraints that are categorized as socio-personal, financial and technological constraints. Dual role of women at farm and home and male dominance was perceived by 90 and 82 percent of the respondents as one of the major constraint that hindered their growth as farmers. Lack of credit was the main financial constraint for 76 percent of women farmers and lack of knowledge and skill was major technological constraints for 54 percent of women farmers.

6. Relationship of role of women farmers with selected socio-economic characteristics

In this section role of woman farmers with respect to nature of involvement in pre and post harvest activities, decision-making and extent of adoption were taken as dependent variables Y_{1A} , Y_{1B} , Y_2 , Y_3 and fifteen variables were taken as independent variables. The coefficient of correlation between different dependent variables with the socio-economic characteristics was worked out.

7. Relationship of nature of involvement of rural women farmers in agricultural activities with selected socio-economic characteristics

The coefficient of correlation between socio-personal and economic characteristics with the dependent variables i.e., involvement of woman farmers in agricultural activities in pre harvest activities were worked out. Among different independent variables caste ($r = 0.484$), respondent education ($r = 0.427$), Education (male-heads) ($r = 0.394$), Occupation of respondent ($r = 0.563$), occupation(male-head) ($r = 0.555$), land holding($r = 0.419$), Family income ($r = 0.554$), agricultural implements ($r = 0.556$), and knowledge level ($r = 0.411$) were found to be positive and highly significant at 1 per cent level of probability.

The correlation coefficient between socio-personal and economic characteristics with the dependent variables i.e., involvement of woman farmers in agricultural practices in post harvest activities. Among different independent variables caste ($r = 0.572$), respondent education ($r = 0.571$), education (male-head) ($r = 0.467$), Occupation of respondent ($r = 0.530$), occupation (male-head) ($r = 0.392$), land holding ($r = 0.801$), Family income ($r = 0.743$), agricultural implements ($r = 0.678$), domestic animal ($r = 0.366$) and knowledge level ($r = 0.532$) were found to be positive and highly significant at 1 per cent level of probability.

This indicated that with the increasement in educational level, size of land holding, income, social participation, knowledge-level, caste and occupation category, there was corresponding increase in the involvement of woman farmers in pre-harvest and post-harvest activities.

8. Relationship of decision-making pattern of rural woman farmers in agricultural activities with selected socio-economic characteristics

The variables marital status($r = 0.347$) knowledge-level ($r = 0.050$) were found significant and positive at 5 percent level of significance with decision-making pattern of rural women. All other independent variables were found non significant. This indicates that the woman without male-head in the family take decision independently. Also with the enhancement in knowledge-level of respondents, their decision-making role also enhanced.

9. Relationship of extent of adoption of improved technology (wheat) by woman farmers with selected socio-economic characteristic

The extent of adoption of improved technology was correlated with the socio-economic characteristics of woman farmers. The independent variables caste ($r = 0.677$), education (self) ($r = 0.738$), education(male-head) ($r = 0.614$), occupation(self) ($r = 0.727$), occupation(male-head) ($r = 0.462$), size of land holding ($r = 0.726$), family income ($r = 0.781$), agricultural implements ($r = 0.738$) and knowledge-level ($r = 0.651$) were positively and significantly correlated. The variable, marital status was negatively and significantly influenced the extent of adoption of improved technology. This means that the respondents with male heads of family were more adopting the improved technology.

10. Relative contribution of selected socio-economic characteristics towards nature of involvement of woman farmers in pre harvest activities and post harvest agricultural activities

The independent variables, occupation (male-head), size of land holding, family income, and possession of agricultural implements were found positively and significantly affecting the involvement of woman farmers in pre harvest activities either in case of physical participation or in the case of supervision. However, the factor knowledge-level of women were found significant but negatively affecting the participation of women in pre harvest agricultural activities. The coefficient of determination was 0.557 indicating that all the variables explained 55.70 percent variability towards the dependent variables i.e., nature of involvement of woman farmers in pre-harvest agricultural activities.

The independent variables, size of land holding and possession of agricultural implements affect the involvement of women in post-harvest activities positively and significantly while, size of family, occupation (male-head) and knowledge-level of respondents were negatively significant. However, age, caste, marital status, type of family, family income, and social participation were found non-significant. The coefficient of determination was .725 indicating that all the variables explained 72.50 percent variability towards the dependent variables i.e., nature of involvement of woman farmers in post-harvest agricultural activities.

11. Relative contribution of selected socio-economic characteristics towards decision-making role of woman farmers.

The independent variables knowledge and marital status were positive and significant with the decision making pattern of women in farm activities. This may be due to the reason that knowledge brought confidence and ability into women to take right and wrong decisions and also the male counterparts will show confidence in them. The size of land holding were significant but negatively affecting the participation of women in decision-making. This indicates that with the increase in land holding size of woman farmers their decision-making power decreases. All the other variables were found non-significant with the decision making pattern of women farmers in different agricultural activities. The coefficient of determinant was 0.295 indicating that all the variables explained 29.50 percent variability towards the dependent variables i.e., decision-making pattern of woman farmers.

12. Relative contribution of selected socio-economic characteristics towards extent of adoption of improved technology.

The independent variables, education(self) and occupation(self) were positively and significantly influenced the extent of adoption of improved agricultural technology by the woman farmers while possession of domestic animals, marital status, occupation(male-head) were negative but significant. The other independent variables were found non-significant. The coefficient of determinant was 0.815 indicating that all the variables explained 81.50 percent variability towards the dependent variables i.e., extent of adoption of improved technology of woman farmers.

Implications of the findings

Based on the findings of the present study some of the implications for improving rural women involvement in farm operations are as follows:

1. The woman farmers should be given due place in the developmental programmes and research strategies to improve their status as a farmers.
2. Substantial amount of women are working as landless labour or agricultural farmers on their own land on the other. But the decision taken by women folk are not given due importance to enhance the participation of women folk in decision making they should be soundly educated and economically empowered.

3. Effective training of rural women should be organised at frequent intervals at village level to ensure more participation of all categories of rural women, particularly the landless, marginal rural women in agricultural practices.
4. It has been observed that the woman farmers have little access to input supplies, credit and marketing facilities. For increasing the access of rural women to input and service organizational efforts should be made through various policy makers and co-operatives societies etc., to provide integrated package of supply and services.
5. Unless women's existing work burden is reduced through increasing efficiency and productivity, women will have little or no time to participate in extension training and non-farm income generating activities. Therefore high priorities should be given to generation and adoption of improved agricultural technologies. Efficient agricultural tools should be evolved and popularized. Appropriate agricultural technologies should be evolved for female dominated tasks as transplanting, weeding, harvesting, carrying loads, winnowing, cleaning and drying of grains.

Conclusion

The finding of the study provide relevant information related with socio-economic and psychological characteristics of selected rural women related to their involvement in pre and post harvest agricultural activities, decision-making pattern, extent of adoption of improved agricultural technology and credit facilities available for the rural woman farmers. The best way to make use of natural and potential capabilities of rural women is to provide them with opportunities for self development and self employment. The findings of the study would help to develop new strategies and policies for the woman farmers that are regarded as invisible farmers. This will result in improving their economic condition and hence the socio-economic conditions will improve. The study also confirms the universal fact that women play a very crucial role and contribute a lot in income generation. This compels utilization of women's potential for accelerated agricultural entrepreneurship development for rapid over all development of the state.

Suggestion for future research

Based on the findings of the present investigations, the following future research problems may be projected.

1. For greater generalisation of the findings of the present study, similar study should be conducted with large sample and in different areas varying in agro-physical and socio-cultural conditions.
2. Studies should be conducted to evolve package of appropriate extension methods to communicate improved farm technologies to rural women.
3. Investigations may be carried out to find out the impact of adoption of improved farm technologies on their socio-economic status.
4. Studies on comprehensive training needs of farm-women and appropriate training methods for them should be conducted.
5. Standardized scale with greater precision and accuracy may also be developed for measuring the role of rural women in farm activities.



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QUESTIONNAIRE

ON

Role of women in today's agriculture : An impact study in Samastipur District of Bihar.

(Appendix-I)

GENERAL INFORMATION

1½ mRrjnk=h dk uke %

2½ ifr@fir k dk uke %

3½ oBkfgd fLFkr %

d½ vfookfgr

[k½ fookfgr

x½ fo/kok

?k½ rykd"knk

4½ irk %

d½ Cykld

[k½ xte

x½ ftyk

5½ mez %

d½ 20&30 o'kz

[k½ 30&40 o'kz

x½ 40&50 o'kz

?k½ 50 o'kz I s vf/kd

6½ tkfr %

d½mPp tkfr

[k½ fi N³h tkfr

x½vud fpr tkfr tutkfr

7½ f"kk %

1½ mRrjnk=h dh f"kk

d½/f"kkfkr

[k½ dby i < I duk

x½ i < vkj fy[k I duk

?k½ i kFked

¾ fefMy

Pk½ mPp fo/kky;

N½ukrd ; k ml I sT; knk

2½ ifr dh f"kk

d½/f"kkfkr

[k½ dby i < I duk

x½ i < vkj fy[k I duk

?k½ i kFked

¾ fefMy

Pk½ mPp fo/kky;

N¼Lukrd ; k ml I sT; knk

8½ ifjokj eady I nL; %

d½ efgyk

x½ cPpa

9½ ifjokj dk iɔkj %

d½ , dy

10½ mRrjnk=h dk 0; ol k; %

d½ cjkstxkj

x½ [ksh

¾ ukɔjh

11½ ifr dk 0; ol k; %

d½ etnjh

x½ Loa dk dkjkckj@0; ol k;

12½ [ksh ; lxx; dgy Hkfe %

d½ 0riegj

x½ 1&5 , d³

¾ 10 , d³ I sT; knk

13½ mRrjnk=h dk vk; %

d½ 25000 rd

x½ 50000& 75000

14½ ifjokj dk vk; %

d½ 25000 rd

x½ 50000&75000

15½ ?kj dk iɔkj %

d½ dPPkk ?kj

x½ fefJr

16½ I k/ku I Ei Uurk %

[k½ i q 'k

[k½ I a 0r

[k½ etnjh

?k½ Loa dk dkjkckj

[k½ [ksh

?k½ ukɔjh

[k½ , d , d³ I sde

?k½ 5&10 , d³

[k½ 25000&50000

?k½ 75000 I sT; knk

[k½ 25000&50000

?k½ 75000 I sT; knk

[k½ i Ddk ?kj

		gkW	ugha
1½	Lipkj I k/ku		
d½	jSM; k		

[kʲ]	Vhoh		
x½	v[kʲkʲj		
2%	lkfjogu l k/ku		
d½	Lkkbfdy		
[kʲ]	cʲy xk³h		
x½	ekʲj Lkkbfdy		
3%	dfʲk l ʲkʲkʲr l k/ku		
d½	mʲur gy		
[kʲ]	cʲy xkʲMh		
x½	i fʲe i ʲx l ʲ		
/kʲ/	BʲʲVj		
M½	MLVj		
p%	Fkʲ j		
N½	fʲNMelko eʲʲkhu		
t½	dʲpky		
>½	[kʲ i h@gl ʲyh		

17½ i ʲʲkʲkyu %

d½ xk;

x½ kʲdjh

³½ eNyh ikyu

[kʲ Hkʲ

?k ʲeʲqʲh ikyu

p½ vl;

18½ l kʲfʲtʲd ʲkʲhʲkʲj

d½ fʲkʲdy ugh gʲ

x½ ,d l sT; knk l ʲʲBu l s tʲʲh gʲ

³½ vl;

[kʲ fʲd l h ,d l ʲʲBu l s tʲʲh gʲ

?k ½ Loʲ l ʲʲBu pykrh gʲ

(Appendix-II)

19½ df'k dk; kē esefgykvka dh Hkxhnhkj h%

df'k dk; .	Hkxhnhkj h		
	"kjh fjd Hkxhnhkj ¼o ½	fujh{k.k	nksuka
d½ dVuh ds i gy½ pre-harvest operation½			
1½ [kr dh l Qkb.			
2½ [kr r\$ kj djuk			
3½ t qkb.			
4½ c pkb.			
5½ fl pkb.			
6½ fudksh			
7½ mojd dk fN³dko			
8½ dhVuk"kd dk fN³dko			
[k½ dVuh ds ckn½ post-harvest operation½			
9½ Ql y dh dVkb.			
10½ Ql y dks ?kj yuk			
11½ Ql y dh dhVuh@i hVuh½ threshing½			
12½ Ql y dks QVduk@vkd kuk½ winnowing½			
13½ Ql y Hk.Mkj.k			
14½ chT dk Hk.Mkj.k			
15½ Ql y dh [kjh fckdh			

(Appendix-III)

20½ df'k dk; kē esefgykvka }kjk fu.kz yus dh {kerk %

	fu.kž yus dk {ks-	fu.kž		
		efgyk	i q 'k	nksjka
d½	[krh l st@sfu.kž			
1½	[kr esdku l h Ql y yxkbž tk, xh			
2½	[kr esQl y dc yxkbž tk, xh			
3½	[kr dh t@kbž dc gksch			
4½	[kr dh t@kbž dš s gksch			
5½	[kr dh l Qkbžfudkuh dc gksch			
6½	[kr esfl pkbž dc gksch			
7½	[kr esfl pkbžfdruh ckj gksch			
8½	[kr esdku l k mojd&dhVuk"kd dk iz kx fd; k tk, xk			
9½	[kr esmojd&dhVuk"kd dk iz kx fdruh ckj fd; k tk, xk			
10½	Ql y dh dVkbž dc gksch			
[k½	Ektnij l sl @/kr fu.kž			
1½	fdrusEktnij dks dke es yxk; k tk; xk			
2½	Ektnijka dksfdruh etnijh nh tk, xh			
x½	i "kiky l sl @/kr fu.kž			
2½	Ql y dh [kjh&fcdh l sl @/kr fu.kž			
1½	Ql y dks dc cpk tk, xk			
2½	Ql y dksfdruses cpk tk, xk			
3½	Ql y dksdgkllcpk tk, xk			
3½	__.k l sl @/kr fu.kž			
1½	__.k fy; k tk; xk ; k ugh			
2½	fdruk __.k fy; k tk; xk			
3½	__.k dc fy; k tk; xk			
4½	dgkll s __.k fy; k tk; xk			

21½ d'k l @kh ubž tkudkj; kllvki dksfdl l sirk pyh %

	Lkkepkj ¼ v[kckj] j sM; ks ; k Vhoi½	i 3kd h	lk kj vf/kdkjh	jk d' fo vf/kdkjh	n@kunkj l :
cht dh ubž fdLeka ds					
ckjse					
mojd					
vkst kj					
fl pkb					
dVkb					
Hk. Mkj . k					
fcdh					

(Appendix-IV)

22½efgykvlaeaf'k mlur rduhd dh tkudkjh

		gkW	ugha
1½	Vhyst dsckjs ea tkurh g\$ D; k gkrk g\$		
2½	thjks Vhyst dk gkfudkj .k i Hkko dsckjs ea tkurh g\$		
3½	mlur cht D; k g		
4½	xgwdh cht nj D; k g\$		
5½	xgwdk Qht nj D; k g\$		
6½	enk mipkj D; k g\$		
7½	cht mipkj l sD; k l e>rs\$yki ?		
8½	cht dksfdruh xbjkbZ rd jki uk pkfg, ?		
9½	nkscht dsjki u eanijh fdruh gkukh pkfg,		
10½	xgwdh jkiuh dc gkrh g\$		
11½	xgweafdruh ckj fl pkbZ gkrh g\$		
12½	xgwdksfdl fof/k l sjki u djuk pkfg,		
13½	xgwdso l y dh igyh fl pkbZ dc gkukh pkfg,		
14½	xgwes dka dka l k [kkn Mkyrs g\$		
15½	xgwdso l y eakbVktu fdruk Mkyrs g\$		
16½	xgwdso l y eaQkl Qkl fdruk gkyrs g\$		
17½	xgwdso l y eai k/kl fdruk Mkyrs g\$		
18½	xgwdsi k\$ka cpko dsfy, d; k djuk pkfg, ?		
19½	xgwdso l y dh dVkbZ dc gkrh g\$		
20½	xgwdsvukt dk Hk.Mkj.k d\$ sf d; k tkrk g\$		

23½efgykvla}kk mlur df'k rduhd viukuk %&

	mlur rduhd viukusdh nj %	l ylg ds vuq kj	de ; k T; l nk
1½	Hkfe dksr\$ kj djuk@enk tlp djokuk		
2½	i \$Drc} jki u		
3½	chtksdh fdLe		
4½	cht dksjki usdh nj		
5½	cht mipkj		
6½	fl pkbZ i caku		
7½	fl pkbZ dc vlg fdrus l e; ij		
8½	[kkn dks l j {k.k rduhd		
9½	i k\$kk l j {k.k rduhd		
10½	l e; c} dVkb		
11½	vukt dk Hk.Mkj.k		

(Appendix-V.a)

24½ efgyk fdl kula dsfy, l jdkjh l gk; rk dk i ko/kku %

		gk	ugh
d½	D; k l jdkj vki dkscht dh [kjh ij fjk; r nrh gS		
[k½	cS VDVj dh [kjh ij l jdkj l svki dksfjk; rh jde inku dh tkrh gA		
x½	mojd ; k dhVuk"kd dh [kjh ij l jdkjh l gk; rk inku dh tkrh gA		
?k½	Ql ykadh fcdh dsfy, l jdkj dh py jgh ; kstukvka dk vki ykhk mBkrh gA		
¾	futh l lFku ; k xS l jdkjh l lFku l svki dks [krh dsfy, fdl h idkj dh l gk; rk feyrh gA		
p½	Ljdkj dh ; kstukvka dk vki mBkrh gA		

25½ efgyk fdl kula dks feyus okyh l jdkjh l gk; rk rFk ml s i kus ea vkus okyh fnDdr%

d½	[krh dsfy, l jdkj l svki dks l gk; rk feyrh gS\ ; fn gkWrks fdu fdu {k=k e% cøkbZ fl økbZ dVuh Hk.Mkj.k vU;	gk	ugh
[k½	Ljdkj dh py jgh ; kstukvka dk vki ykhk mBkrh gS\ ; fn ugha rks D; ka %		
x½	[krh dsfy, D; k vki dks cSka l syku vkl kuh l sfey tkrk gS\ ; fn ugh rks dks&dks l h fnDdra vkrh g% 1½ 2½ 3½		
?k½	__k yus ds l e; vki dks i ¾ kfu; kWHkh >yuh i ¾rh gS\ ; fn gkWrks dks&dks l h i ¾ kfu; kW% 1½ 2½ 3½		
¾	Ql y ds Hk.Mkj.k es l jdkj l s l gk; rk feyrh gS\		
p½	Ql yk dks cktkj rd ys tkus ds fy, D; k vki dks dkbZ l jdkjh l gk; rk feyrh gS\		
N½	Ql yk dh fcdh dsfy, D; k vki dks dkbZ l jdkjh l gk; rk feyrh gS\		

(Appendix-V.b)

26½ efgykvla }kjk df'k ea vkus okyh fnDdrka dk dkj .k%&

	fnDdr	gkW	ugha
1½	f"kk{kk dk vkòko		
2½	Òfie vf/kdkj dk vkòko		
3½	Tkkudkjh dk vkòko@dk; Zdqkyrk dk vHkko		
4½	fu.kZ yusdh {kerk dk vkòko		
5½	i\$ s dk vkòko		
6½	Ekgfykvla dsfy, mllur vktkja dk vkòko		
7½	vl;		

