A STUDY ON KNOWLEDGE AND ADOPTION LEVEL OF IMPROVED CULTIVATION PRACTICES AMONG THE POTATO GROWERS IN MEERUT DISTRICT OF UTTAR PRADESH

THESIS

SUBMITTED TO THE

SARDAR VALLABHBHAI PATEL UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, MEERUT-250110 (U.P.), INDIA

By

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DEDICATEED

TO

MY

BELOVED

PARENTS

AND

FAMILY

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CERTIFICATE

This is to certify that the thesis entitled **"A study on Knowledge and Adoption Level of Improved Cultivation Practices Among the Potato Growers in Meerut District of Uttar Pradesh"** submitted in partial fulfilment of the requirements for the degree of **Master of Science (Agriculture)** major in **Agricultural Extension and Communication** and minor in **Agronomy** of the College of Post-Graduate Studies, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, is a record of the *bona fide* research carried out by **Mr. Sumit Kumar Mishra,** Id. No. **PG/A-2751/19,** under my supervision and no part of the thesis has been submitted for any other degree or diploma.

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

Place: SVPUA&T, Meerut
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CERTIFICATE

We, the undersigned, members of the Advisory Committee of **Mr. Sumit Kumar Mishra,** Id. No.**PG/A-2751/19**, a candidate for the degree of **Master of Science (Agriculture)** major in **Agricultural Extension and Communication** and minor in **Agronomy** agree that the thesis entitled **"A study on Knowledge and Adoption Level of Improved Cultivation Practices Among the Potato Growers in Meerut District of Uttar Pradesh"** may be submitted by **Mr. Sumit Kumar Mishra** in partial fulfilment of the requirements for the degree.

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Chairman
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Member	Member	Member

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INTRODUCTION

Potato (Solenum tuberosum L.) is an herbaceous annual plant of the Solanaceae family. It is commonly referred to as "The King of Vegetables." This crop originated in South America and was carried to India by the Portuguese in the 16th century, occupying the world's largest area under any single vegetable crop. It's known as "poor man friend." It is one of the most commonly grown crops in the country for vegetable uses. The potato is a high-energy food. It provides more food per unit area then all major food crops combined. The underground stem of the potato has been changed to make it edible.

Potato is the world's fourth most significant food crop, following rice, wheat, and maize, and their production potential is widely acknowledged. In India, potato is mainly used as a vegetable, but this is a staple food crop in the most of developed countries. **(Mane *et al.* 2017)**

The world's total potato production in 2019 was 462 million tonnes, including China, India, Russia, Ukraine, and the United States leading the way. **(FAO STAT, 2019)**.

Potato is produced on 2.15 million hectares in India, with a production of 51.30 million tonnes and a per hectare yield of 245.42 q/ha. Uttar Pradesh is the leading producer of potatoes in India, accounting for 27.43%, followed by West Bengal (25.78%), Bihar (15.97%), Gujarat (7.1%), Madhya Pradesh (6.74%), Punjab (5.59%), Assam (2.22%), and Haryana (1.22%). Uttar Pradesh is India's greatest potato-growing state, with total production of 14.00 million tonnes from 0.61 million hectares and a productivity of 251.0 q/ha, representing for 27.43% of overall production. **(DAC & FW 2018)**.

Kannauj, Agra, Firozabad, and Farrukhabad are the top potato-producing districts in Uttar Pradesh, while Meerut has 5323 hectares of potato cultivation and produces 189251 metric tonnes, with a per hectare output of 344.28 q/ha. **(Anonymous 2018).**

Although potato is a temperate zone crop, it can grow in a wide range of climatic conditions. This is only grown in such conditions where the temperature is moderately cool during the growing season. Temperature of 24 °C are ideal for plant vegetative growth, whereas 20 °C is ideal for tuber development. As a result, potatoes are grown as a summer crop in the hillsides and as a winter crop in tropical and subtropical areas.

Due to its edible energy edible protein, it is a nutritionally preferred vegetable. In comparison to cereals like rice and wheat, it produces more dry matter, edible energy, and edible protein in a shorter period of time because it is such a short-duration crop. The potato is then viewed as an important crop for sustaining the country's nutritional security. **(Perka *et al.* 2016)**

Potato is a cost-effective source of energy in the human diet. It's high in water, carbohydrates, vitamins (particularly C and B1), and minerals.

Table no. 1: Nutritional value of potato (per 100 g, raw potato with skin)

Sr. No.	Name	Amount
1	Water	79.25gm
2	Energy	77 kcal
3	Carbohydrate	17.49 gm
4	starch	15.29 gm
5	Fiber	2.10 gm
6	protein	2.05 gm
7	Sugar	0.82 gm
8	Fat	0.09 gm
9	Potassium	425 mg
10	Phosphorus	57 mg
11	Magnesium	23 mg
12	Vitamin C	19.70 mg
13	Calcium	12 mg
14	Sodium	6 mg
15	Iron	0.81 mg
16	Manganese	0.153 mg

Data source: USDA, 2020

Potato is utilized in several of industries, including the manufacturing of starch, alcohol, laundries, and yarn sizing in textile mills. It is also used to make dextrin and glucose, among other things. Potatoes are dried into items such as potato chips, sliced, or shredded potato as a food product. It's a bushy herb with many branches that grows to 0.5 to 1.0 m in height and underground stems that produce the delicious tubers. The leaves have an unusual pinnate arrangement with a big terminal leaflet. It blooms in panicles of cymose flowers.

Potato plays a significant role in Indian agriculture, accounting for nearly 21% of the total vegetable area. **(DAC&FW, 2018)** It is predicted that by 2050, India will demand 125 million tonnes of potato from an area of 3.62 million ha due to population growth and changes in lifestyle and economy. **(CPRI, 2015).**

Potato has a huge potential for doubling farmers' income because they may be utilised for vegetables, seeds, and processing. Potatoes produce more food in less time and with less land than any other important crop. Potato is mostly farmed (about 85 percent) in India's Indo-Gangetic plains for a short period of time (about 90 days). As a reason, it may be easily changed in a diversity of cropping systems. With a predicted population rise of 19% by 2050 and the goal of being the world's most populous country by 2024. **(United Nations, 2017),** the demand for potatoes and their products will increase at a rate faster, and by 2050, several possibilities for raising potato producer earnings may be available. Increasing potato productivity, reducing potato production costs, providing a fair price for the crop, and reducing harvest and post-harvest losses are only a few of them.

Potato is an essential crop in India's struggle against food insecurity, malnutrition, and poverty. Potatoes are a staple food in Europe and other industrialized countries. In effort to fight food and nutritional security, China has recently made potato one of the staple food crops. Potatoes produce more food and calories in a smaller amount of time and

space than any other important crop. In view of the increased population, shrinking cultivable land, rising numbers of farmers who wish to leave farming, poverty, hunger, and malnutrition issues, potato is a better option for dealing with these issues. Potato intake per capita in India is really low, at around 25 kg.per year, due to misconceptions about the potato. The nutritious value of potatoes should be advertised through the media and other public awareness campaigns. Potatoes have the ability to double a farmer's revenue. To ensure sustainable and increased production and potentially profitable prices for farmers, the government and policymakers should create and implement appropriate production and marketing strategies. **(Kharumnuid *et al.* 2021)**

Importance of the study

Due to its proximity to the National Capital Territory of Delhi, which provides an international market for vegetables and the Central Potato Research Institute (CPRI), Modipuram, which provides improved varieties, the Meerut district of Western Uttar Pradesh has a lot of potential for commercial potato cultivation. Due to growing urbanisation, rapid industrialization, and the change of united families to nuclear families, land holdings in India are declining. As a response, potato farmers must be aware of its most recent updated technological procedures in order to increase their productivity as well as their socio-economic standing. Adoption of the most recent recommended package of practises requires the development of new high-yielding varieties, as well as seed selection, seed treatment, balanced chemical fertilizer, and, most important, plant production to maintain quality and nutritive value even as increasing market demand. Instead, there is a major difference between the advanced technologies that has been advocated and its actual implementation by potato growers. This study will serve as a guide for researchers and extension workers to work from of the perspective of farmers to ensure productivity and reduce the gap in the adoption of potato growing technologies and restrictions.

This study can also help planners, administrators, and anyone who are directly or indirectly involved in potato crop cultivation. As a response, a specific study will be planned to evaluate the amount of adoption of recommended cultivation practices of potato in the Meerut District of Uttar Pradesh.

Statement of the problem:

Whereas Uttar Pradesh is India's greatest potato-growing state, massive losses in potato production have occurred due to potato growers' misunderstanding of suggested crop cultivation techniques. The socio-economic position of the potato grower's family is found to be a significant factor in the adoption of new and improved potato growing technologies. It has an effect on potato growers' expertise. The potato growers were expected to obtain awareness, and this had an impact on their adoption process.

Keeping all the aspects in view, the present study entitled **"A study on knowledge and adoption level of improved cultivation practices among the potato growers in Meerut District of Uttar Pradesh"** with following objectives.

1. To study the socio-economic status of potato growers.
2. To assess the knowledge level of potato growers with respect to package of practices.
3. To study the adoption level of potato growers with respect to package of practices.
4. To find out the constraints in adoption of improved cultivation practices faced by the potato growers.

Justification of the problem:

In all scenarios, agriculture technology is never completely adopted by farmers because there is a gap between the technologies proposed by scientists and their actual adoption by farmers. This research could also help with crop rotation in a specific area.

This research study will help for planners and extension workers in developing technologies for investing in new technologies to the potato grower's sectors, which are in desperate need of social and economic security. Various information sources were studied and presented in this study with regard to the socio-economic profile of farmers and their association with the amount of knowledge and adoption. The study is justified because of its proper method to identifying barriers to the adoption of better farming practises by potato grower administrators and extension workers in order to make a sincere effort in promoting potato grower knowledge and adoption.

REVIEW OF LITERATURE

CHAPTER-2 REVIEW OF LITERATURE

Review of literature is a scholarly paper that presents the current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic. Literature review are secondary sources and do not report new or original experimental work. It helps to acquire a broad general background for the research study and provides basis for theoretical framework and insight into the methods and procedures of research the main aim is to find out the knowledge and available information on the earlier studies undertaken by the researchers in a given field of study and to compare the present results with that of the results of previous research. It is very essential on the part of the researcher to review the efforts made in the past by earlier researchers.

This chapter consists of research findings drawn from reviews of relevant study. Since, studies related that to on potato farmers. An attempt is made to put together some of the closely related and available literature on research study. The review of literature of present study entitled **"A study on knowledge and adoption level of improved cultivation practices among the potato growers in Meerut District of Uttar Pradesh"** with following objectives.

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I. The socio-economic status of potato growers.

Peer *et al.* (2013) revealed that 29.33 per cent of the respondents were educated up to middle school. As face as family system is concerned that joint family system is not losing its importance in rural setting and might have helped the potato growers to utilize their own family members in cultivation of potato crop that 60.00 per cent majority of the respondent belonged to joint families and 68.00 per cent of the respondent had medium family members. About 36.89% of respondent had annual net income of Rs. 50,000/- in rabi season through potato crop.

Chavai *et al.* (2015) concluded that, a majority 56.36 per cent of the potato growers belonged to age between 36 to 50 years, 48.18 per cent completed secondary level education, 64.55 per cent had 6 to 8 members in their family, 57.29 per cent had medium level of social participation, 50.91 per cent had small land holding upto 2.00 ha, 75.46 per cent respondent having annual income between Rs. 180001 to 4, 20,000.

Mishra and Ghadei (2015) concluded that, 35.61 per cent of the vegetable farmers had high school education. Among the sample about 57.56 per cent of farmers were marginal. With respect to farming, about 61.50 per cent had medium level of farming experience. As far as social participation is concerned about 25.37 per cent of vegetable farmers were member of two organizations. The annual income of vegetable farmers revealed that About 56.59 per cent were found in the medium income category ranging from Rs. 55,001 to 1, 90,000. 57.07 per cent of had medium level of socio-economic status.

Perkha *et al.* (2016) reported that average family size of potato growers was five in the study area. The educational status of the respondent showed that 70.80 per cent were

literate. The social status of the respondent 29.20 per cent was schedule cast and tribe the remaining 70.80 per cent were backward and other caste. The average size of the holding was 4.82 ha. In which dry land constituted (4.22 ha) 87.56 per cent and irrigated dry land was (0.6 ha)12.44 per cent. It is further observed that (1.2ha) 24.89 per cent of the total holding of the respondent was under potato cultivation, the potato farmers realized a gross income of Rs. 112800 and net income of Rs. 63441.57 per hectare.

Sani *et al*. (2017) reported that the majority of 51.25 per cent respondent were belong to middle age group and majority 27.50 per cent respondent passes high school education whereas, the majority of the respondent 67.50 per cent belonging to the OBC caste category and 46.25 per cent respondent were having medium size land holding 2-4ha.

Katyani *et al.* (2017) concluded that the majority of head of family were farmer and earning less than Rs.10, 000 per month. Prevalence of nuclear family was seen in rural areas as majority of respondent were belonging to nuclear family, having up to five members, living in mixed type of houses, belonging to small farmer category and holding up to two animals. Rural areas were also witnessing technological advancement as most of respondent were having improve Chula and mobile phone while considerable were having connection, television, and other home assets.

Shivam *et al.* (2017) concluded that a maximum number of the respondent 67.50 per cent were found in the middle age group 33-53 years, maximum 96.50 per cent of found literate, 96.50 per cent married most of 31.50 per cent were belonging the small farmer land holding category and 53.50 per cent of the respondent annual family income were between Rs 50001/- to 250000/-

Yadav *et al.* (2017) found that the majority of the potato farmers. The average age of household family 55.51 per cent and in most of cases they are male members. The average family size comprises of 8 person having literacy rate 77.76 per cent. On an

average 78.56 per cent females are occupied in agriculture and only 57.51 per cent males engaged in agriculture. The average net income in potato farmingRs.76, 282/- per hectare.

Katyani *et al.*(2017) found that 19.00 per cent respondent were having tractor followed by 14.37 per cent electric tube well, 66.25 per cent transport their produce to the market by bullock-cart, less than 40.00 per cent depended on river water for irrigation, 48.75 per cent of respondent were getting cash wage on daily basis, about 29.38 per engaged in potato cultivation from 10-20 years while maximum 40.63 per cent respondent were followed maize- potato-tomato crop rotation.

Mane *et al.* (2017) revealed that majority 56.67 per cent of the potato growers were found in the middle age group, 35.83 per cent educated up to high secondary level,54.17 per cent belonged to medium size of family, 60.83 per had membership in one organization,42.50 per cent semi-medium farmers having 2.01 to 4.0 ha of land, 67.50 per cent medium annual income 71.67 per cent of the potato growers fell in medium category of the extension participation.

Yadav *et al.* (2018) reported that maximum55.30 per cent of farm women belonged to age group 20-30 years, 32.00 per cent illiterate, 41.00 per cent married, 58.00 per cent found landless and 34.00 per cent had marginal land holding. The majority 41.70 per cent of the farm women families those annual income was between Rs.30001/- 40,000/-

Singh *et al.* (2018) revealed that the maximum numbers of respondent were literate, almost farmers attain the age 30 years. On the basis of data, it can be said that agriculture is the main occupation of the farmers. Other than caste-based occupation of the respondent was having subsidiary occupation that maximum numbers of farmers did have more interest in one participate in social organization and this area is most of the respondent had pucca type of housing pattern.

Sharma *et al.* (2019) revealed that the average family size composed of five members and 27.00 per cent family members were in the age group of 16-30 years. Agriculture along with livestock was the main occupation. The size of farm holding was 0.82 ha, 66.00 per cent under irrigation, 50.00 per cent of the total farm income generated by agriculture with allied activities and out of total income generated through agriculture, about 10.00 per cent was contributed by potato crop.

Verma *et al.* (2019) reported that majority of the respondent 61.88 per cent belong to above 45 years age group, 41.88 per cent12th passed, 53.75 per cent belonged to OBC category. 63.75 per belonged to joint family, 55.00 per cent having more than 04 member of the family, 80.00 per cent having pucca house, 57.00 per cent having 1.0 ha land , 76.25 per cent were depending upon agriculture, 98.75 per cent having mobile, 98.11 per cent respondent were having bike, 70.62 per cent were not participate any organization and 68.75 per cent farmers having annual income Rs.300000/ – 500000/- respectively.

Singh and Prakash (2019) reported that 63.63 per cen trespondents were of medium age 31 to 50 years age group and 45.45 per cent belonging to other backward caste, 23.63 per cent educational status up to intermediate level, mostly married and lived joint family. 49.09 per cent had formal institutional membership. 38.18 percent belonged to medium land holding size 1- 2 ha., 80.00 percent pucca houses and having small dairy size (1 to 3 milch animal or 10 small animals), 47.27 per cent had medium dairy size (4 to 6 milch animals or 20 small animals) and having a pucca animals shed. The majority of 60.00 per cent respondents were having progressive farmers / neighbors as communication sources, followed by 21.81 percent news paper/ magazine. Most of the 89.00 per cent respondents were having cycle and scooter/ motor cycle 40.90 percent respectively.

Pattnaik *et al.* (2020) revealed that majority 65.00 per cent of the respondents were in middle age group category36-55 years, 72.00 per cent had higher education level, 52.00 per cent small farmers, 84.00 per cent medium farm power possession, 55.00 per cent medium level of annual income and 75.00 per cent farmers had medium level of membership in different social organization found respectively

2. The knowledge level of potato growers with respect to package of practices.

Srivastava *et al.* (2012) revealed that regarding overall practices of potato cultivation a majority 71.30 per cent of potato growers had high level of knowledge followed by 16.60 per cent and 12.00 per cent of potato farmers who had medium and low level of knowledge respectively.

Patel *et al.* (2012) revealed that majority 95.84 per cent of potato growers had medium to high level of knowledge about potato production technology. As far as practices wise knowledge concerned majority of the potato growers had adequate knowledge except that chemical control of weed and disease control.

Pottappa *et al*. (2014) found that a majority 65.00 per cent of potato growers had medium level knowledge, whereas, 21.67 and 13.33 per cent of potato growers had high and low level of knowledge regarding recommended cultivation practices. More than 95.00 per cent of potato growers had correct knowledge on duration of the recommended variety, 98.34 per cent seed rate, 98.34per cent chemicals used for controlling termites, 98.34 per cent suitable month for sowing, 97.50 per cent number of eyes in cut tuber, 96.67 per cent appropriate weight for seed tubers, 95.84 per cent recommended variety, 95.84 per cent and earthing up after planting respectively.

Singh *et al.* (2015) revealed that a majority of the respondents 78.80 per cent had to low level of knowledge about scientific potato production technology. Majority of farmers were having knowledge about improved variety, method of fertilizer application, row to row and plant to plant spacing and planting operations.

Kumar *et al.* (2016) showed that the majority of 80-90 per cent respondents had good knowledge in land preparation, time of sowing, method of harvesting, spacing of potato cultivation practices and earthing up operations followed in potato crops. While knowledge of plant protection 52.50 per cent, correct dose of fertilizer and manures 46.60 per cent, method of fertilizer application 42.50 per cent and water management 40.00 per cent were found.

Sharma and Sharma (2016) revealed that majority of respondent 89.16 per cent were having knowledge level about land preparation where as 70.83 per cent method of sowing, 50.84 per cent full level of knowledge about popular varieties, 44.16 per cent seed treatment, 52.50 per cent manure and fertilizer,51.66 per cent irrigation, and 69.61 per cent had partial level of knowledge about plant protection measures, 47.50 per cent harvesting of potato and 69.16 per cent post harvest management. Majority of the respondents 49.16 per cent had medium level of overall knowledge found.

Kumar *et al.* (2016) reported that the highest knowledge level was found in soil selection of marginal farmers 74.16 per cent thus in case of small farmers 77.50 per cent in harvesting of potato crop, medium farmers 87.33 per cent in selection of soil and large farmers 88.21 per cent in fertilizers. However, knowledge levels of large farmers were found highest 81.60 per cent and lowest knowledge level 63.71 per cent of marginal farmers. Knowledge level of small and medium farmers had 70.42 and 75.91 per cent found respectively.

Das and Jha (2018) concluded that majority of the respondents had medium level of knowledge about the recommended potato production technology. While most of potato growers had knowledge on recommended method of showing followed by knowledge on suitable propagation technique, seed size, seed rate, spacing etc.

Singh *et al.* (2018) reported that majority of farmers 61.66 per cent had under overall medium level of knowledge category, whereas 22.50 per cent and 15.83 per cent belonged to overall low and high level of knowledge category, 95.00 per cent of potato growers had correct knowledge about the practices like seed rate per acre, lack of knowledge about plant protection chemicals respectively.

Mistry *et al.* (2018) revealed that majority of 89.38 per cent respondent had medium to high level of knowledge of potato cultivation technology. In relation to improved varieties 96.87 per cent, harvesting and grading 87.50 per cent, irrigation management 81.25 per cent, seed rate and sowing method 78.13 per cent farmers had high knowledge level of potato cultivation technology.

Yadav *et al*. (2018) observed that 55.00 per cent knowledge level of the farmers were the field preparation, 56.25 per cent the improved variety, 50.00 per cent seed rate, 62.50 per cent method of the sowing time, 47.50 per cent of the seed treatment, 57.00 per cent planting distance, 58.75 per centrow to row distance, 36.25 per centsowing time, 65.00 per cent sowing method, 60.00 per cent of weed management, 42.50 per cent use of FYM, 47.50 per cent belonged to the medium knowledge about insect pest and their management, 42.50 per cent low level of knowledge about major disease, 57.50 per cent high level of knowledge of irrigation, 58.75 per cent high knowledge about harvesting time, 63.75 per cent were under medium level knowledge about yield per hectare of the potato crop.

Kaur and Singh (2019) reported that knowledge levels of farmers about vegetable production were still very low. During the surveying of literature on the knowledge level of farmers about recommended cultural practices for vegetable production studied that majority of farmers had a medium level of knowledge followed by the low level of knowledge. Only a few farmers had high level of knowledge about recommended cultural practices vegetable production.

Ansari *et al.* (2019) concluded that maximum number of potato growers had medium level of knowledge where as 26.66 per cent of respondents had low level of knowledge, 36.66 per cent of the respondents were shows low level of knowledge. While only 34.00 per cent of respondents were found under the category of high level of knowledge.

3. The adoption level of potato growers with respect to package of practices.

Kubrevi (2009) reported that adoption by the respondents selected for improved practices of potato was low in latest technology such as soil testing, seed treatment, seed quantity and time of sowing. Majority 54.00 per cent of improved variety of potato growers was categories as medium level of adoption categories.

Kumar *et al.* (2010) reported that the highest adoption levels were found in soil selection of large potato growers 83.33 per cent and lowest 66.00 per cent of marginal potato growers. Adoption level of small and medium respondent were 71.67 per cent and 81.33 per cent, the average adoption level of the respondent were found to highest 71.10

per cent and lowest 51.93 per cent of marginal potato farmers, Where as adoption level of small and medium potato growers were 60.61 per cent and 64.80 per cent respectively.

Singh *et al.* (2010) concluded that about 82.00 per cent of vegetables growers had medium adoption of commercial potato cultivation practices. It means medium adopters were more energetic, knowledgeable, dynamic and having more interest in adopting modern vegetable technologies.

Patel *et al.* (2012) reported that majority of the potato growers 60.01 per cent had medium level of adoption followed by 22.52 per cent potato growers were had high level of adoption and 17.51 per cent potato growers had low level of adoption of improved production technology.

Uddin *et al.* (2013) revealed that the majority 46.55 per cent of the growers had medium adoption level compared to high level 29.74 per cent and low level 23.71 per cent adoption. Among the extent of a adoption of eleven selected technologies recommended irrigation was at top highest ranking as indicated by the adoption index whereas plant spacing was bottom lowest.

Karade *et al.* (2013) showed that majority of potato growers had low awareness for adoption of IPM practices. Education, annual income, area under potato crop, farm power, social participation, information sources utilization, extension participation, mass media exposure visit, economic motivation, attitude towards IPM, scientific orientation and knowledge level had significant association with adoption of IPM practices by the potato growers under the study.

Khalil *et al.* (2013) revealed that the highest proportion 68.40 per cent of potato farmers belonged to high adoption level. Whereas 6.50 per cent fall in medium adoption

category and 25.10 per cent in low adoption level of Bangladesh Agricultural Research Institute (BARI) recommended potato varieties. Extent of adoption of BARI recommended potato varieties were found more or less equal in three different study area, where the highest 72.60 per cent portion of the potato farmers were in high adoption category in mushiganj Sadar followed by 68.40 per cent in Shibganjand 67.50 per cent in Pirgachha respectively.

Shilpa and Nanjappa (2014) reported that 50.00 per cent had high level of adoption of improved cultivation practices of potato. Whereas, small farmers had medium level 40.00 per cent of adoption and marginal farmers had low level 40.00 per cent of adoption on cultivation practices of potato crop.

Chaivai et al. (2015) found that 95.45 per cent of the respondents had adopted improved varieties of potato, 93.63 per cent were storing produce, 92.72 per cent and the 86.36 per cent of adopted the recommended seed rate and planting distance, 86.63 per cent followed weeding 50-55 days after sowing and the 73.63 per cent adopted application of recommended N:P:K doses. Nearby three fourth 71.81 per cent adopted the control measures for Aphid, Jassids and whitefly, adoption of weedy side 50.00 per cent and 33.63 per cent of the farmers using fungicide for the control of blight disease.

Suryawanshi *et al.* (2016) showed that majority of the potato growers had 56.67 per cent low adoption behavior of improved practices followed by 33.33 per cent medium adoption behavior and 10.00 per cent had high adoption behavior regarding overall improved potato production production regarding package and practices respectively.

Mishra *et al.* (2017) revealed that majority 69.00 per cent of potato growers had medium of adoption level potato production technology. The study further indicates that

land holding, annual income, irrigation facilities, extension participation, social participation, extension contact, scientific orientation, risk orientation and knowledge had positively and highly significant correlation with potato growers.

Singh *et al.* (2018) studied that majority 58.33 per cent of the respondents belonged to medium adoption category. More than 80.00 per cent of the potato growers were fully adopted the practices like use of organic manure and seed treatment in potato cultivation.

Nath and Shil (2019) found that majority of the TPS growers 98.89 per cent adopted water management practices followed by 67.78 per cent were adopted the recommended practices for manuring and fertilization whereas 32.22 per cent and 28.89 per cent growers were not adopted the recommended practices related to manuring, fertilizer and plant protection measures respectively.

4. The constraints in adoption of improved cultivation practices faced by the potato growers.

Shivalingaiah *et al.* (2004) found that most of the potato growers faced problem in lack of technical guidance, irrigation, high transportation cost, high storage cost, unavailability of adequate cold storage facilities, lack of investment, pest and disease problem, high cost of input, and fluctuation in market prices.

Kubrevi (2009) reported that majority of the farmers 30.00 per cent of potato farmers face difficulties as improved seeds were not available at proper time, middleman takes more commission, seed not supply at the right time. Most of 58.00 per cent growers used local variety because improved variety of potato was expensive.

Arneja *et al.* (2009) reported that majority of the respondent's faced non availability of disease resistant variety and 68.00 per cent reported labour as the major problem.

Maximum number of respondents reported that there was no support price fixed by the government for potato crop.

Lal *et al.* (2011) found that majority of potato growers faced problem from involvement of middle man, cheating by the traders, low selling price of potato, shortage of electricity, gluts, poor quality and adulterated fungicide, lack of cold storage, low risk bearing ability, lack of motivation from SDA and State Department of Horticulture and unavailability of good quality potato seed to the farmers were the most serious constraints.

Sahu *et al.* (2013)found that major constraints in adoption of vegetable production technology like lack of knowledge about improved variety, seed rate and sowing time 88.33 per cent, lack of knowledge of IPM technologies 85.00 per cent, unavailability of improved seeds of vegetables 83.33 per cent, lack of irrigation facilities 80.00 per cent, non-remunerative price 78.33 per cent, lack of training of scientific vegetable production technology 75.00 per cent, and lack of subsidy 75.00 per cent respectively.

Sharma (2014) observed that high input rate of chemical, non-availability of disease-free seed, non-availability of chemical, lack of labour, lack of time, lack of technical knowledge, input problem, inadequate supply of storage material, lack of marketing facilities, less price of produce and price fluctuation were the main problem faced by vegetable growers in the adoption of recommended practices of major vegetable crops.

Deka *et al.* (2014) concluded that non-availability of quality seed, high cost of quality seed, lack of reasonable support price, price fluctuation in the market throughout the year, heavy frottage of potato tuber in storage, non-suitable local method of storage, no cold storage facility in the production site and lack of efficient marketing facilities at village level were the major potato production constraints faced by the farmers.

Peer *et al.* (2014) revealed that the major constraints for the adoption of crop production technologies faced by the potato growers were complicated seed treatment technique 100 per cent, non- availability of fertilizers at proper time 76.00 per cent, financial problem 72.89 per cent, non-availability of insecticide and pesticide at proper time 64.64 per cent, high cost of fertilizer 61.77 per cent, high cost of seed 60.04 per cent, high cost of fungicide 57.78 per cent and labour problem 54.66 per cent respectively.

Kumar *et al*. (2016) reported that high wages of labour, socioeconomic constraints, unavailability of newly released variety was 1st rank in technological constraints, high cost of irrigation, higher price of manure and fertilizer lack of knowledge about plant protection problem and their marketing facilities and post harvest technology were main constraints found in adoption of recommended practices.

Katyani *et al.* (2017) concluded that more than 50.00 per cent respondents always suffer with fluctuation of price as rank 1. Major constraints always faced by maximum respondents were unavailability of cold storage and lack of potato processing unit rank II and rank III untimely wage payment and no employment in odd season were identified least rank XIV and rank XV respectively.

Singh *et al.* (2018) identified major constraints as high wages of labour and socio–economic constraints. Unavailability of newly released variety, high cost of irrigation, higher price of manures and fertilizers, lack of knowledge about plant protection chemicals, marketing facilities and post harvesting technology found first rank in adoption of improved cultivation practices in potato.

Tikariha and Soni (2018) reported that major constraints of the farmers were Lack of knowledge about integrated disease management, followed by lack of credit for

manufacturing value added products of potato, lack of knowledge about integrated pest management. Minor constraints were Lower price of potato produce, higher margin of middlemen during marketing, lack of transportation facilities for potato, lack of scientific information about packaging of potatoes.

Singh *et al.* (2019) found that major constraints faced by potato growers in adoption of improved potato production technology were high cost of cultivation, higher participation by middleman, lack of knowledge about scientific recommended package and practices, lack and high price of best quality of seed, inadequate knowledge about seed plot technique, lack of labour during post harvest operations and late payment by the traders respectively.

Yadav *et al.* (2019) reported that most of the respondent faced the constraints in adoption of potato production technology such as lack of knowledge and awareness about plant protection 76.25 per cent another problem had less number of production technology information training centers 75.00 per cent response by the farmers, unavailability of high yielding variety 71.25 per cent and lack of knowledge about balanced fertilizer application 63.75 per cent**.**

Mishra *et al.* (2020) concluded that according to degree of seriousness of constraints skilled farm workers are hardly available. Under economic constraints the most important constraints e. g. costly diesel charges, corruption of credit sanctioned. Under technological constraints, the most important constraints were non-availability of quality HYV seeds. Under transportation was indigenous transport means viz. bullock cart, Dunlop and tonga take much time and causes more in conveniences in transporting the product. Under post harvest constraints lack of storage house of potato found.

Verma *et al.* (2020) found that constraints the maximum number of potato growers faced constraints, like socio psychological were found most important constraints, skilled farm worker are hardly available. Economical constraints were diesel cost high, corruption of credit sanctions. Technological constraints non availability of good quality seed, transportation charge is high, post harvest technological constraints, lack of space of potato farmers for storing the products.

Gupta *et al.* (2020) revealed that among the various types of constraints faced by vegetable growers regarding the adoption of IPM technologies included lack of knowledge of IPM technology followed by lack of knowledge regarding pesticides and their application pattern, bio-pesticides or other alternatives,high cost of inputs (seed, plant, seedling, fertilizer, pesticides, labour etc.) under the category of socio-economic constraints lack of proper marketing facilities under the category of institutional and infrastructural constraints and inadequate number of demonstration of new technologies under the category of extension communication constraints, were found in major constraint that perceived by the respondents.

RESEARCH METHODOLOGY

This chapter discuss the research design process, sample procedure, and scientific investigation tools and techniques used in light the objectives of the study. It is divided into three sections. These are the following:

3.1: Research design

3.1.1. Selection of locale

3.1.2. Selection of districts

3.1.3. Selection of blocks

3.1.4. Selection of village & respondents

3.2: Variables and their measurements

A. Independent variables

B. Dependent variables

3.3: Data collection procedure and statistical tools and techniques applied

3.3.1. Data collection procedure

3.3.2. Methods of statistical analysis

3.1: Research design:

Ex – post facto research design was used for the investigation

3.1.1. Selection of locale:

This study indicated the selection of zone the large state of Uttar Pradesh is broadly sub-division into three zones i.e. Western zone, Central zone and Eastern zone. The current research was carried out in Western Zone of Uttar Pradesh. Farmers in this area are cultivating vegetable crops on a massive scale and in close proximity to Delhi NCR in

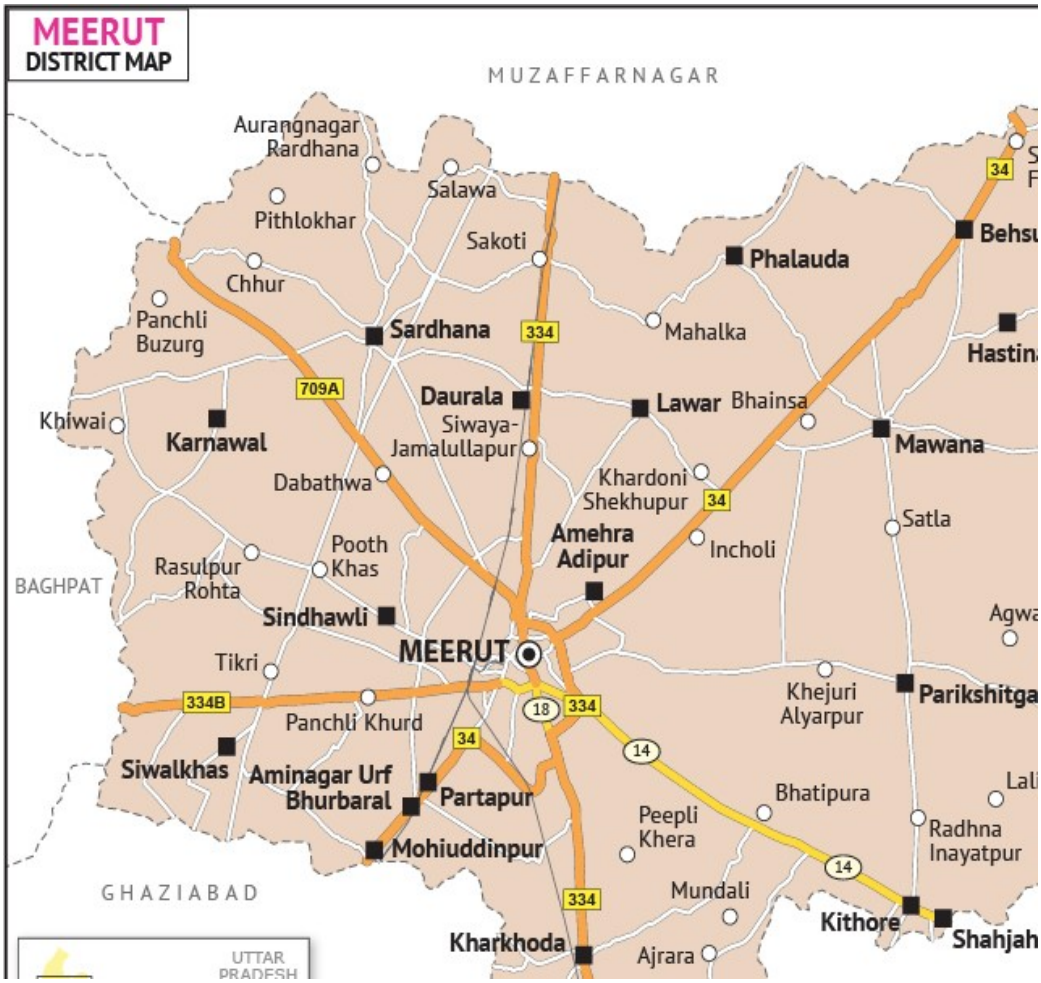
order to get maximise market benefits. As a result, vegetable growers may optimize their profit and return from vegetables farming, as well as improve their living standards.

3.1.2. Selection of districts:

In Uttar Pradesh, there are seventy-five districts in which Meerut has been chosen specifically for its availability of land and productivity of potato crop.

General Information about the Meerut district:

Meerut district is a part of the Meerut division in the Indian state of Uttar Pradesh. Meerut district is located in the Western Zone of U.P. Meerut is about 70 kilometres north of India's capital i.e. Delhi and about 450 kilometres from the state capital i.e.Lucknow. It is located between 28°57' and 29°02' North latitude and 77°40' to 77°45' East longitude.



Meerut district is divided into 3 Tehsils: Meerut, Mawana and Sardhana, and 12 blocks: Meerut, Rajpura, Kharkhauda, Jani, Rohata, Mawana, Parikshitgarh, Machhara, Hastinapur, Sardhana, Daurala and Saroorpur.

Topography:

The Northern and Southern boundaries of Meerut district are defined by Muzaffarnagar district, while the Southern and Western boundaries are defined by Ghaziabad and Baghpat districts. The Ganges River defines the district's Eastern boundary, separating it from Moradabad and Bijnor districts. The Hindonriver marks the district's Western boundary of the divided from Baghpat. The district is organized in a North-West to South-East direction. The entire district gives the impression of a very well and even field. There are no mountains or rocky areas at the bottom.

Soil:

The Meerut district's land is extremely fertile, with alluvial or loamy soil being the most common soil types. In Meerut district, the following types of soil can be found: loam soil, fine sandy loam, sandy loam, clay loam, silty clay loam, and loamy sand.

Climatic condition:

The climate of the district has been impacted by a humid semi-tropical environment with scorching summers and mild winters. Summers last from early April to late June and are extremely hot, with temperatures reaching 49 degrees Celsius (120 degrees Fahrenheit). The monsoon season begins in late June and lasts until the middle of September. Temperaturedrops slightly, with a lot of cloud cover and humidity. Temperature begins to increase again in October, and the town experiences a mild, dry winter season from late October until the middle of March.

Rainfall.

The rainy season in the Meerut district begins in June, increases in July and August, and concludes in September. The yearly rainfall is approximately 845 millimetres (33 in), which is adequate for agriculture production. During the monsoon, the majority of the rain falls. Humidity levels range from 30% to 100%.

Table-3.1: General Information of district Meerut:

S. No.	Particular		Meerut
1.	Total geographical area		2590 Km^2
2.	Net cultivated area (in ha)		298411
3.	Net irrigated area (in ha)		194622
4.	Population	Total	3443689
		Male	1825743
		Female	1617946
		Rural Population	1684500
		Urban Population	1759182
5.	Literacy rate (in percent)	Total literacy rate	74.80
		Male literacy rate	80.74
		Female literacy rate	63.98
6.	Total number of Tehsil		3
7.	Total number of block (C.D.B)		12
8.	Gram Panchayat		479
9.	NyayaPanchayat		92
10.	Total number of villages		681
11.	Number of Nagar PalikaParishad		02
12.	Number of Nagar Panchayat		10
13	Post office		206
14.	Police station		32
15.	Nationalized Bank& commercial Banks		362& 73
16.	Co-operative Bank		35
17.	Regional Rural Bank		13

Source: ZilaSankhikiyaPatrika, Meerut (2018)

3.1.3: Selection of Blocks:

In Meerut district, there are 12 blocks, two of which, Kharkhauda and Daurala, were chosen purposively for the area & productivity in potato crop. The Daurala block is located on N.H.-58, about 12 kilometres from Meerut City, and the Kharkhauda block is located on N.H.-334, about 19 kilometres from Meerut City.

3.1.4: Selection of villages and respondents:

Four villages were selected randomly from each block and 15 respondents were selected from each selected village, thus the total 08 villages and 120 respondents were selected for investigation.

Table- 3.1.: Name of the blocks and villages under taken for the investigation.

Sr. No.	Name of Block	Name of Selected village	Number of respondent from each village	Distance from Block Head quarter	Distance from district Head quarter
1.	**Kharkhauda**	Kharkhauda	15	0.5 Km	19 Km
		Lalpur	15	1 Km	20 Km
		Setkuan	15	5 Km	24 Km
		Chandpura	15	3 Km	22 Km
2.	**Daurala**	Pavlikhas	15	3 Km	19 Km
		Lawar	15	8 Km	24 Km
		Dhanju	15	3 Km	19 Km
		Mahalka	15	3 Km	19 Km
Total	**02**	**08**	**120**		

3.2: Variables and their measurements:

The variables of this study were chosen based on the study's objective. Independent variables and dependent variables are the two types of variables.

Table-3.3: Variables and their empirical measurements

Sr. No.	Variables	Measurements
A.	**Independent variables**	
1.	Age	A socio-economic status scale given by Singh *et. al.* (2005) with suitable modifications.
2.	Education	Do
3.	Marital status	Do
4.	Caste	Do
5.	Family type	Do
6.	Family size	Do
7.	Housing pattern	Do
8.	Landholding	Do
9.	Occupation	Do
10.	Social participation	Do
11.	Material possession	Do
12.	Source of information	Do
13.	Annual income	Do
B.	**Dependent variables**	
1.	Knowledge	Schedule developed
2.	Adoption	Schedule developed
C.	Constraints	Schedule developed

A. Independent variables:

In the proposed investigation, the features of independent variables such as age, education, caste, land holding size, and annual income can be observed, modified, or controlled by the researcher.

1. Age:

It refers to the respondents' age in whole years, which is divided into three categories based on their age: young age up to 30 years, medium age group 31-50 years, and old age group over 50 years. It was calculated using Singh *et al*. (2005) socio-economic status scale, with appropriate changes. It was divided into three categories.

S. No.	Age categories	Score
1	Young age group (Up to 30 years)	1
2	Middle age group (31 – 50 years)	2
3	Old age group (Above 50 years)	3

2. Caste:

The respondents' caste was classified as general caste, other backward caste, and schedule caste/schedule tribe (SC/ST), in this study. It was calculated using Singh *et al.* (2005) socio-economic status scale, with appropriate changes. It was divided into three categories.

S. No.	Particulars	Score
1.	General	1
2.	Other Backward Caste (OBC)	2
3.	Scheduled caste/Scheduled tribe (SC/ST)	3

3. Educational status:

The educational qualification of the respondents obtained from primary school, college, and university is referred to as their educational standing. It was calculated using

Singh *et al.* (2005) socio-economic status scale, with appropriate changes. It was divided into seven different categories.

S. No.	Particulars	Score
1.	Illiterate	1
2.	Primary school	2
3.	Middle school	3
4.	High school	4
5.	Intermediate	5
6.	Graduate	6
7.	Post Graduate	7

4. Marital status:

The term "marital status" refers to whether or not respondents were married on the day of data collection. It was calculated using Singh *et al.* (2005) socio-economic status scale, with appropriate changes. It was divided into two groups.

S. No.	Particulars	Score
1.	Unmarried	1
2.	Married	2

5. Type of Family:

This family size refers to the total number of people living in a single household at the time of the study. It was calculated using scale given by Singh *et al.* (2005) with appropriate modifications. It was categorized its two groups.

Sr. No.	Particulars	Score
1.	Joint Family	2
2.	Nuclear Family	1

6. Size of Family

This family size refers to the total number of people living in a single household at the time of the study.It was computed using Singh *et al.* (2005) socio-economic status scale with appropriate changes. It was divided into three categories.

Sr. No.	Family	Score
1.	Small (up to 4 member)	1
2.	Medium (5-8 member)	2
3.	Large (Above 8 members)	3

7. House type:

The houses were classified as Kuccha, Pucca or Mixed type to assess the housing patterns of the respondent. It was calculated using Singh *et al*. (2005) scoring system for socio-economic class and scale, with some modifications.

Sr. No.	Particulars	Score
1.	Kuccha	1
2.	Mixed	2
3.	Pucca	3

8. Occupation:

The occupation of the ‘respondents' was determined using the same pattern as the primary occupation, which contributes more than 50% of total income, and the subsidiary occupation, which contributes less than 50% of total income.It was determined using Singh *et al*. (2005) socioeconomic status scale, with appropriate modifications.

Sr. No.	Particulars	Score
1.	Agriculture	1
2.	Agriculture labour	2

3.	Agriculture with caste based occupation	3
4.	Agriculture with business	4
5.	Agriculture with service	5

9. Social participation:

It is the degree of involvement of the respondents from mere membership to position and their active participation in the activities of local formal organizations like gram panchayat, block panchayat and district panchayat. It absolutely was measured

with the assistance of the socio-economic standing scale given by Singh *et al.* (2005) with appropriate modifications. It was categorised into 3 groups.

S. No.	Participation	Score
1.	No member of any organization	1
2.	Member of one organization	2
3.	Member of more than one organization	3

10. Land holding:

The term land holding refers to the amount of land that farmers own that is under cultivation. It was measured with the help of Singh *et al.* (2005) socio-economic status scale, with suitable modifications. The size of land holding was divided into four categories.

S. No.	Land holding (in ha.)	Score
1.	Marginal (below 1 ha)	1
2.	Small (1 -2 ha)	2
3.	Medium (2 – 4 ha)	3
4.	Large (above 4 ha)	4

11. Irrigation facility:

It referred to the availability of water for irrigation of crops on the land of the respondent. Irrigation is one of the most important infrastructures in the potato

industry. Irrigation sources used by respondents for potato crop irrigation include government, private and rental. It was estimated using Singh *et al.* (2005) socio-economic status scale, with appropriate changes. It was divided into three categories.

S. No.	Sources of Irrigation	Score
1.	Government tube well	1
3.	Diesel tube well	2
4.	Electric tube well	4

12. Material possession:

The respondent's household items and materials, such as furniture, kitchen materials, transportation facilities, and farm assets, are taken into account. It was measured using Singh *et al.* (2005) socio-economic status scale, which was modified as needed.

(a) House hold materials:

S. No.	Home Appliance type	Score
1.	Chair	1
2.	Table	1
3.	Fan	2
4.	Electric press	2
5.	Gas stove/Gas cylinder	2
6.	Mixer grinder	2
7.	Cooler	3
8.	Hand pump	3
9.	Government water supply	3
10.	Electric hand pump	3
11.	Dining Table	4
12.	Dressing Table	4
13.	Refrigerator	5
14.	Double bed	5

15.	Mobile	5
16.	T.V.	6
17.	Toilet	6

(b) Transportation facility:

S. No.	Particulars	Score
1.	Cycle	1
2.	Motorcycle	2
3.	Bullock cart (Jota Buggy)	3
4.	Tractor-Trolley	4
5.	Car/Jeep/Taxi	5

(c) Agricultural Implements:

S. No.	Particulars	Score
1.	Cultivator	1
2	Harrow	1
3.	Pumping set	2
4	Seed drill machine	2
5.	Sprayer	2
6.	Zero tillage machine	2
7	Thresher	3
8	Ridge maker	3
9	Power tiller	3
10	Leveller machine	3
11	Rotavator	4
12	Tractor	5
13	Potato planter	5
14	Potato digger	5
15	Sugarcane Planter	5
16	Combine/ harvester	5

13. Annual income:

It was defined as the entire income obtained by the respondent from all sources, including a specific business, enterprise, or agricultural. It was calculated using the scale of Singh et al. (2005), with appropriate modifications.

S. No.	Particulars	Score
1.	Below Rs. 1,00,000	1
2.	Rs. 1,00,001-2,00,000	2
3.	Rs. 2,00,001-3,00,000	3
4.	Above to Rs. 3,00,001	4

14. Sources of communication:

It was described as the person's level of interaction with numerous information sources on a regular basis. In the farming community, sources of information have traditionally served as mass media and other sources of information. It was determined using Singh *et al.* (2005) socioeconomic status scale, with appropriate modifications.

(a) Extension contact:

Extension contact refers to the extent to which the respondent participates in a variety of extension activities provided by various extension agencies. It was calculated with the help of socioeconomic status scale Singh *et al.* (2005), which had been modified as needed. There were three categories of extension contact: Mostly, Often, and Never. Frequency of extension contact was scored as 2 for Mostly, 1 for Often, and 0 for Never.

S. No.	Extension worker	Frequency of contact		
		Mostly (2)	Often (1)	Never (0)
1.	Neighbours/Relatives			

2.	Progressive farmer			
3.	KVK/SMs			
4.	Scientists of University			
5.	Scientists I.C.A.R.			
6.	V.D. Os			
7.	D.H.O.			
8.	District Agricultural Officer			
9.	P.P. O			
10.	Farmers fair			

(b) Mass media contact:

The word "mass media" refers to any kind of communication that reaches and influences a large number of people in a short period of time. The table below shows how much the respondents were exposed to the media. The assigned score of 2 for receiving information "always,"1 for receiving information "sometimes," and 0 for receiving information "never."

S. No.	Particulars	Extent of use		
		Always (2)	Sometimes (1)	Never (0)
1.	News paper			
2.	Magazines			
3.	Journals			
4.	Pamphlet/folder			
5.	Radio			
6.	Television			
7.	Mobile Phone			
8.	WhatsApp			
9.	Face book			

10.	Internet			
11.	Kisan call centre			

B. Dependent variables:

The dependent variables used in this study were the circumstances or attributes that appeared or disappeared when the independent variables changed.

1. Knowledge level:

It corresponds to the knowledge of potato crop farming procedures. It refers to responsesof the potato growers to each question regarding respondent's knowledge of enhanced potato crop cultivation procedures. It was evaluated in terms of score and knowledge level was classified into three parts: poor knowledge, fair knowledge, and good knowledge, with a score of 1 for poor knowledge, 2 for fair knowledge, and 3 for good knowledge provided to each question. The percentage of the respondents who knew something was used to calculate their knowledge.

2. Adoption level:

It refers to the adoption of farming techniques by the potato crop growers. It was divided into three categories: fully adopt, partially adopt, and not adopt, with scores of 2, 1, and 0 assigned to each respectively.

3. Measurement of constraints faced by respondents:

The respondents indicated a variety of issues that are impacting the amount of adoption of scientific potato crop farming practices. In order to find out what percentage was used and how it was ranked from highest to lowest.

3.3: Data collection procedure, statistical tools and techniques applied:

3.3.1. Data collection procedure:

The data was obtained through personal interviews using a pre-structured interview schedule that's been pre-tested on a few respondents in order to collect accurate data after the interview schedule was modified based on the results of the testing.

3.3.2. Methods of statistical analysis:

The collected data was quantified by assigning scores to each appropriate response. Furthermore, statistical tests were used to arrive at results in light of the objectives. For exact, meaningful analysis and interpretations of the quantitative information, the following statistical tools were used in the study.

Frequency:

It was used to find out the number of characteristics of respondents in the particular cell.

Percentage:

For calculating percentage the particular cell was divided by total number of respondents in that particular category and multiplied by 100.

$$\text{Percentage} = \frac{\text{Frequency of a particular cell}}{\text{Total of respondents in that particular}} \times 100$$

Mean percentage score:

It was calculated by multiplying the total obtained score of the respondents by a hundred and dividing by the highest possible score under each constraint, as shown in the formula below.

$$\text{Mean percentage score} = \frac{\text{Total obtained score}}{\text{Maximum obtainable score}} \times 100$$

Rank order:

The various ranks were given on the basis of highest to the lowest percentage.

Average ($\overline{X}$):

The average ($\overline{X}$) was calculated by adding the total scores obtained by the respondents and divided it by the total number of respondents using the following formula:

$$(\overline{X}) = \frac{\sum X}{N}$$

Where,

($\overline{X}$) = Average

$\sum x$ = Total number of scores obtained by respondents

N = Total number of respondents

Standard deviation (S.D.):

S.D. **is the root** of the mean of the squares of all deviations, the directions being measured from the **expected value** of the distribution. It is commonly given by symbol sigma (σ).

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \overline{x})^2}$$

Where,

σ = Standard deviation

d^2 $(x_i - x)^2$ $\overline{\ }$ = Deviation of variables mean

N = Total number of items

Correlation coefficient (r):

The constant of simple Correlation (r) in a very measure of the mutual relationship between 2 variables that in x and y, wherever the connection is measured and normally term as product movement coefficient of correlation and is computed the subsequent formula:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y}}$$

$$r = \frac{\sum(X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum(X-\overline{X})^2}\sqrt{(Y-\overline{Y})^2}}$$

Where,

r = correlation coefficient

x = i^{th} value of x variables

$\overline{X}$ = mean of x

y = i^{th} value of y variables

$\overline{Y}$ = mean of y

The correlation coefficient (r) between different independent and dependent variables interprteted according to given below table.

Sr. No.	**Size of correlation**	**Interpretation**
1.	0.00 to 0.30 (- 0.00 to - 0.30)	Low positive (Low negative) correlation
2.	0.30 to 0.60 (- 0.30 to -0.60)	Moderate positive (Moderate negative) correlation
3.	0.60 to 0.90 (- 0.60 to 0.90)	High positive (High negative) correlation

RESULT AND DISCUSSION

CHAPTER- 4 RESULT AND DISCUSSION

This chapter is designed to focus point on the entire finding of the present research that has been indoors after the data was subjected to statistical analysis. The interpretation and discussion follow along with the finding of the study. The data were collected through the interview schedule on the basis of objectives of the study. The data collected were classified, tabulated, analysed, presented, interpreted and discussed systematically. The logical presentation of the results provides a clear picture about the research findings as well as the relevancy of the collected data, therefore to make the existing in the light of objective and selected variables of the study under the following heads.

1. To study the socio-economic status of potato growers.
2. To assess the knowledge level of potato growers with respect to package of practices.
3. To study the adoption level of potato growers with respect to package of practices.
4. To find out the constraints in adoption of improved cultivation practices faced by the potato growers.

1. Socio-economic status of potato growers.

The socio- economic status of the farmers studied the personal profile was some of the important characteristics like age, caste, educational profile, marital status, type of family, size of family, type of house, occupation, social participation, land holding, material possession, annual income etc. were studied.

4.1.1 Age

Table 4.1.1: Distribution of the respondent according to their age N=120

Sr. No.	Particulars	Frequency	Percentage
1.	Young age group	26	21.68
2.	Middle age group	53	44.16
3.	Old age group	41	34.16
	Total	**120**	**100**

Mean=46.93 SD=22.76

Table 4.1.1predict that maximum number of respondent (44.16 per cent) were belonging to middle age group followed by old age group (34.16 per cent) and remaining (21.68 per cent) belong to young age group respectively.

The findings of the study are in accordance with **Sani *et al*. (2017)**

4.1.2 Caste

Table-4.1.2: Distribution of the according to their caste. N=120

Sr. no.	Caste	Frequency	Percentage
1.	General category	23	19.16
2.	Other backward class	89	74.16
3.	Schedule caste/Schedule tribe caste	08	06.66
	Total	**120**	**100**

Table 4.1.2 indicate that maximum number of respondent (74.16%) belongs to other backward class followed by 19.16 per cent belong to General category and06.66 per cent belong to Schedule caste/Schedule tribe.

The other backward caste respondents were most interested in potato cultivation. The findings of the study are in accordance with **Verma *et al.* (2019)**

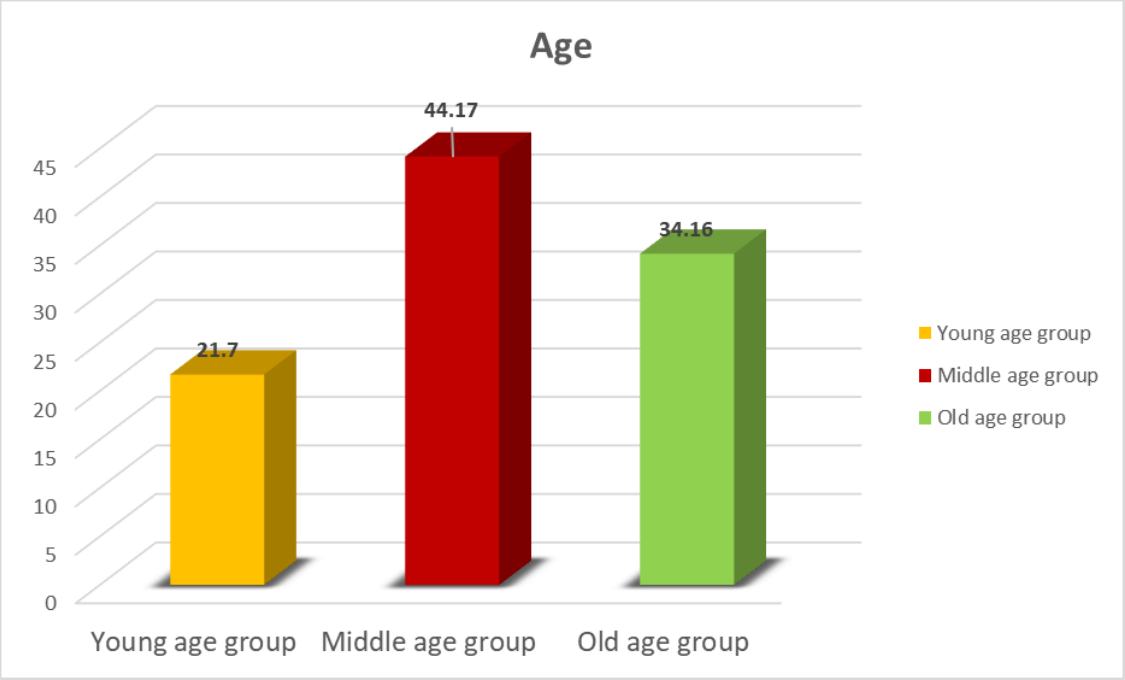


Fig no-2 Distribution of the respondent according to their age

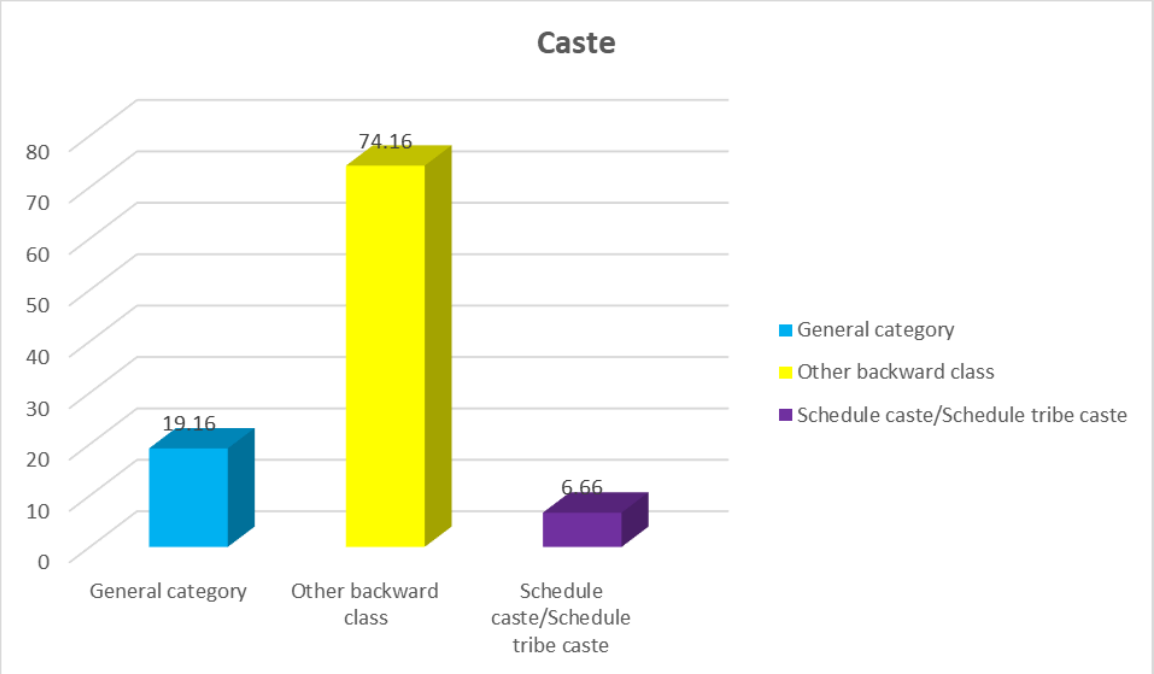


Fig no 3 - Distribution of the according to their caste

4.1.3 Educational status

We know that if people are educated then easily seeking the information and adopt them. The following table show that educational level of respondents.

Table-4.1.3 Distribution of the respondents according to their Education level N=120

Sr. No.	Education level	Frequency	Percentage
1.	Illiterate	08	06.66
2.	Primary school	04	03.33
3.	Middle school	09	07.50
4.	High school	41	34.16
5.	Intermediate	27	22.50
6.	Graduate	25	20.83
7.	Post graduate	06	05.00
	Total	**120**	**100**

Table- 4.1.3present that maximum number of the respondent (34.16 per cent) were having high school followed by (22.50 per cent) were intermediate, (20.83 per cent) graduate level, (7.50 per cent) middle school, (6.66 per cent) Illiterate, (5.00 per cent) post graduate and remaining the (3.33 per cent) primary school level of education were found.

The findings of the study are in accordance with **Mishra and Ghadei (2015)**

4.1.4 Marital status-

Table-4.1.4 Distribution respondents according to their marital status: N=120

Sr. No.	Marital status	Frequency	Percentage
1.	Unmarried	16	13.33
2.	Married	104	86.66
	Total	**120**	**100**

Table 4.1.4 indicates that most of the potato growers (86.66 per cent) were married and (13.33 per cent) respondent were unmarried.

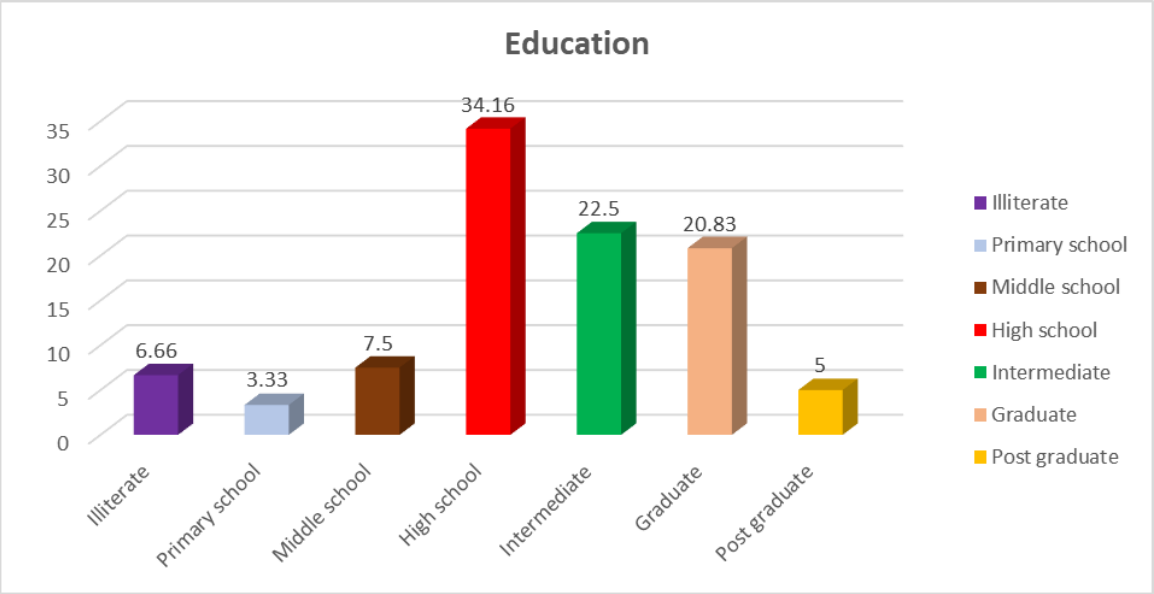


Fig no- 4 Distribution of the respondent according to their education

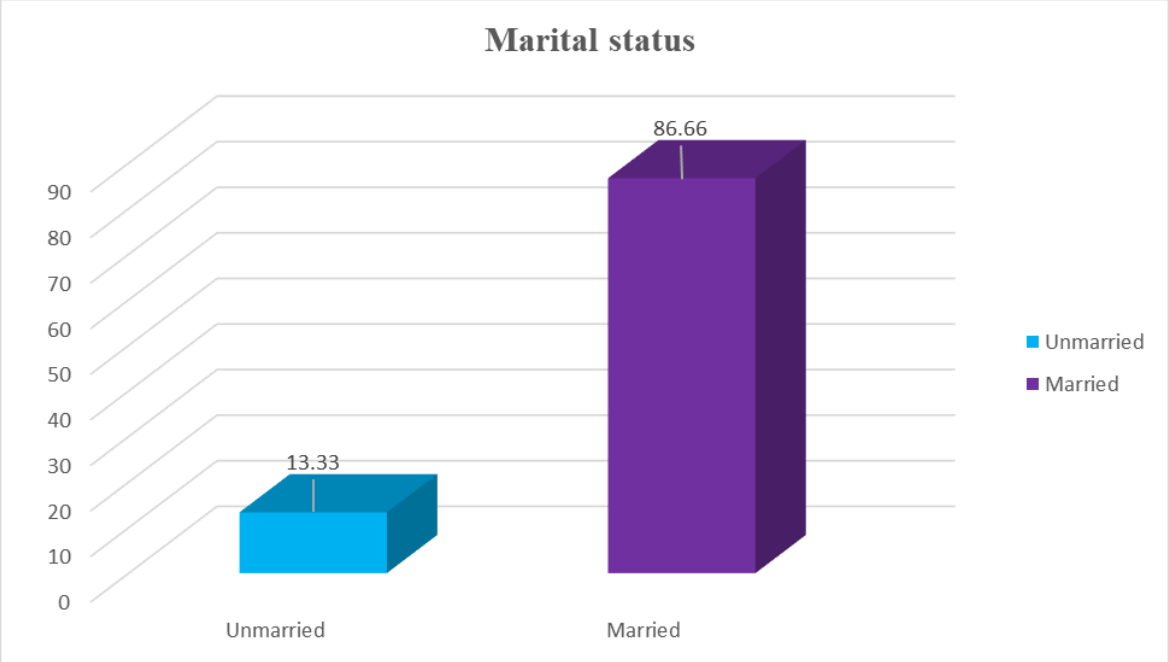


Fig no 5 Distribution of the respondent according to their marital status

It is concluded that maximum potato growers were married who interested in potato cultivation.

4.1.5 Family type

Table 4.1.5: Distribution of the respondents according to their family type N=120

Sr. No.	Type of family	Frequency	Percentage
1.	Nuclear family	31	25.83
2.	Joint family	89	74.16
	Total	**120**	**100**

The distribution of the farmers according to their type from table 4.1.5 predict that one third of respondents (74.16 per cent) were belonged in joint family system and remaining (25.83 per cent) were belonged to nuclear family system.

The finding shows that majority of potato growers who living in joint family system they were more interested in potato cultivation because they save labour charges to using family members.

4.1.6 Size of family

Table-4.1.6: Distribution of the respondent based on their family size. N=120

Sr. No.	Family size	Frequency	Percentage
1.	Small (up to 4 member)	13	10.83
2.	Medium (up to 5-8 member)	45	37.50
3.	Large (above 8 member)	62	51.66
	Total	**120**	**100**

The distribution of the respondent on the basis of their family from in table 4.1.6reveals that majority of respondents (51.66 per cent) were having large family size

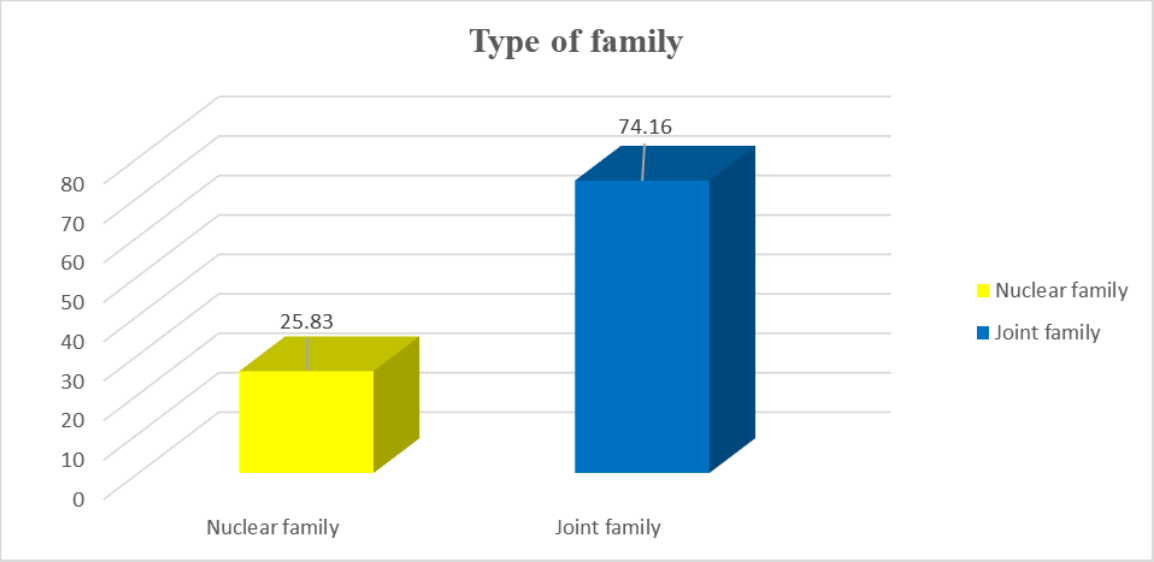


Fig no 6 Distribution of the respondent according to their type of family

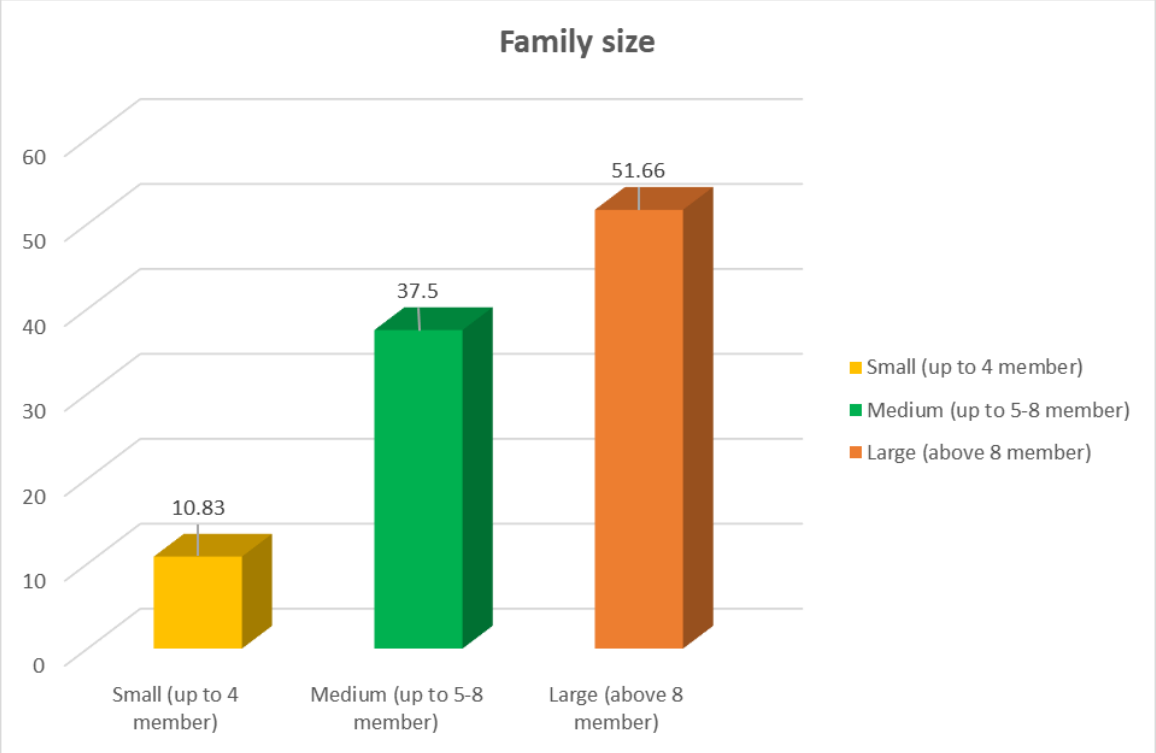


Fig no 7 Distribution of the respondent according to their family size

above 08 member in family and followed by (37.50 per cent) to medium family size up to 5 – 8 member and remaining (10.83 per cent) were small family size up to 04 member.

Thus, the findings indicated in the potato cultivation large amount of labour consume. So large family size belonging respondents take interest in potato cultivation.

4.1.7 Type of house

Table- 4.1.7: Distribution of the respondents on the basis of house types. N=120

Sr. No.	Type of house	Frequency	Percentage
1.	Kuccha house	03	02.50
2.	Mixed house	16	13.33
3.	Pucca house	101	84.16
	Total	**120**	**100**

Table 4.1.7presents more than third-fourth of respondents (84.16 per cent) had pucca house followed by the (13.33 per cent) had mixed type and (2.50 per cent) kuccha house**.** So, it may be concluded that most of the potato farmers had good economic condition that grow potato.

It may be concluded that the majority of respondents were having pucca house as compare to other.

4.1.8 Occupation:

Table 4.1.8: Distribution of respondents according to their occupation N=120

Sr. No.	Occupation	Frequency	Percentage
1.	Agriculture	91	75.83
2.	Agriculture labour	05	4.16
3.	Agriculture with caste based	03	2.50
4.	Agriculture with business	06	5.00
5.	Agriculture with service	15	12.50
	Total	**120**	**100**

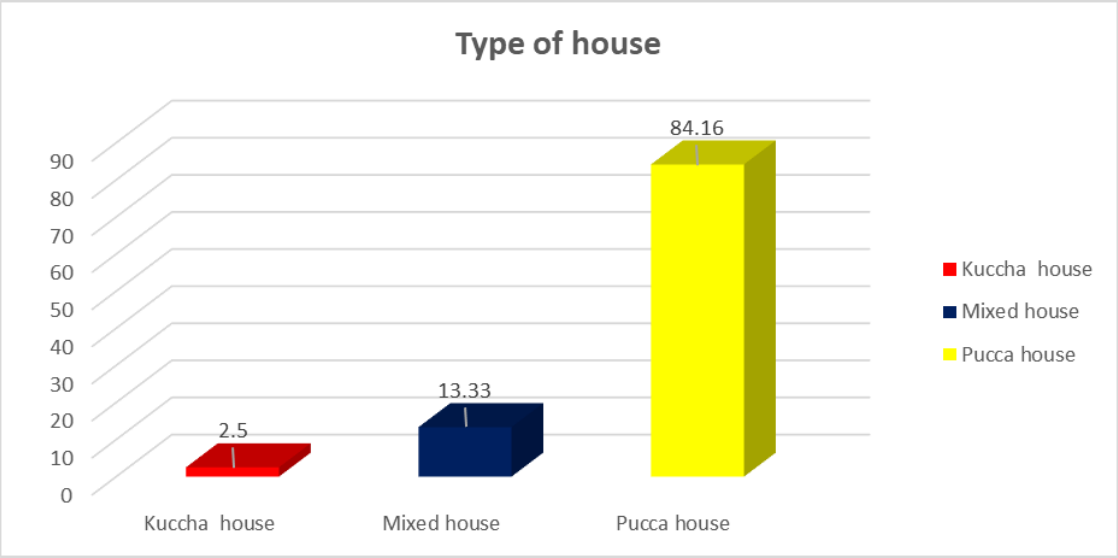


Fig no 8 Distribution of the respondent according to their type of house

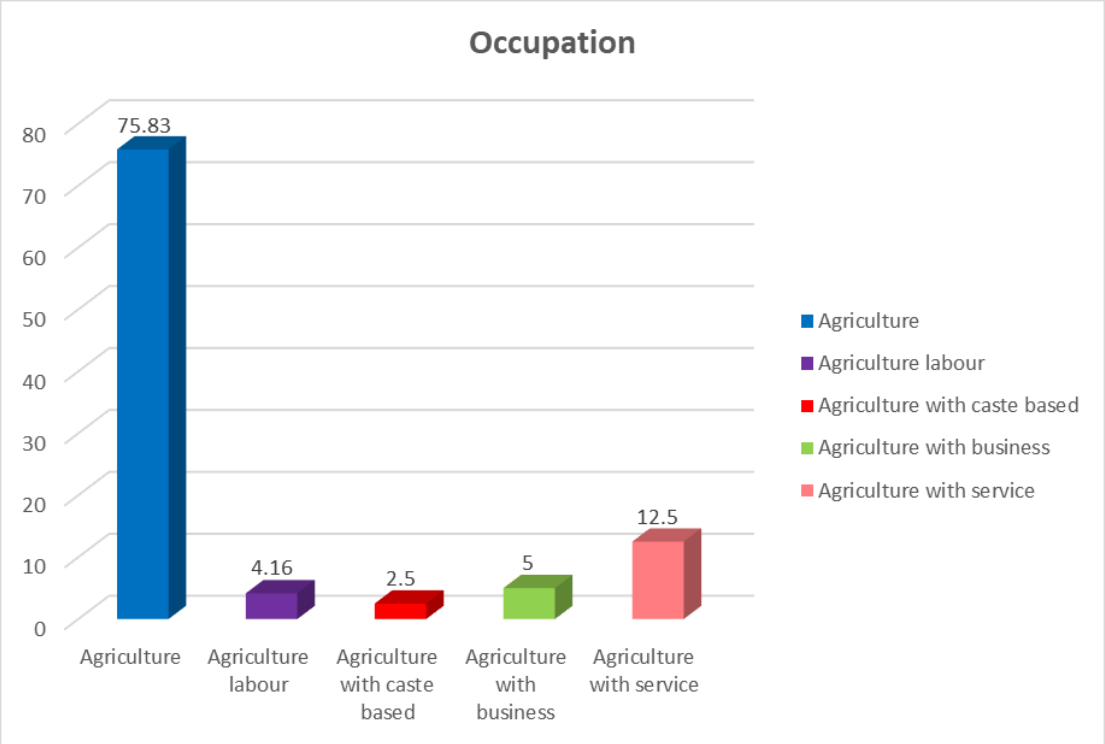


Fig no 9 Distribution of the respondent according to their occupation

Table 4.1.8, indicates that majority of respondents (75.83 per cent) were involved in agriculture, followed by (12.50 per cent) Agriculture with service, (05.00 per cent), agriculture with business operations, (4.16 per cent), agriculture with labour activities, and remaining (2.50 percent) were involved in agriculture with caste based occupation.

From the above finding majority of the respondents were engaged in agriculture and prime occupation and more active in potato cultivation as compare to other.

4.1.9 Social participation

A person who is closely involved in activity allows people in society or organisations to interact with anyone.

Table 4.1.9: Distribution of the respondents according to their social participation

N=120

Sr. No.	Social participation	Frequency	Percentage
1.	No member of any organization	78	65.00
2.	Member of one organization	37	30.84
3.	Member of more than one organization	05	04.16
	Total	**120**	**100**

Table4.1.9 reveale that the majority of respondents (65.00 per cent) do not belonged to any organisation, followed by those who belong to one organisation (30.84 per cent), and those who belong to more than one organisation (04.16 per cent).

From the above table found that the respondents were participate to any social organisations were more active in potato cultivation as compare to other.

Fig no 10 Distribution of the respondent according to their social participation

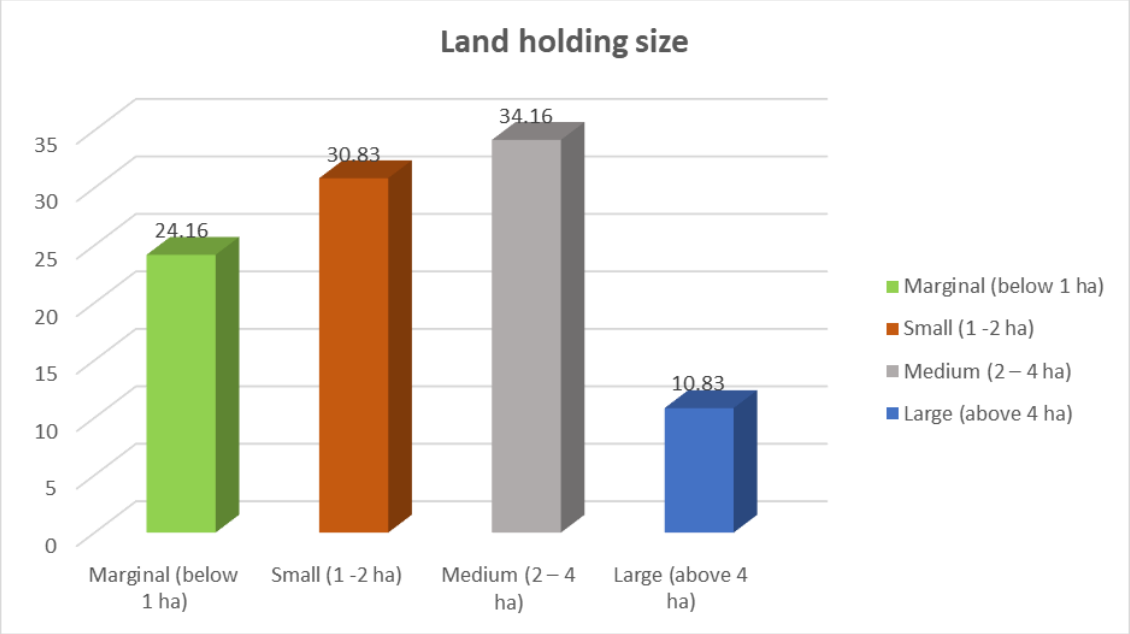


Fig no 11 Distribution of the respondent according to their land holding size

4.1.10 Landholding size

Table 4.1.10: Distribution of respondents according to their land holding size N=120

Sr. No.	Land holding size	Frequency	Percentage
1.	Marginal (below 1 ha)	29	24.16

2.	Small (1 -2 ha)	37	30.83
3.	Medium (2 – 4 ha)	41	34.16
4.	Large (above 4 ha)	13	10.83
	Total	**120**	**100**

An over view of table4.1.10 maximum respondent (34.16 per cent) having were medium land category 2 – 4 hectares followed by the (30.83 per cent) were having small land category 1-2 hectare, (24.16 per cent) marginal category below 1 hectare and remaining (10.83 per cent) were having large land holding size above 4 hectares.

It may be concluded that the majority of the potato growers belonged to medium land holding category and they were more active in potato cultivation.

4.1.11 Irrigation facility

4.1.11 Distribution of potato growers according to their irrigation facilities N=120

Sr. No.	Irrigation facility	Frequency	Percentage
1.	Government tube well	16	13.33
2.	Diesel tube well	14	11.66
3.	Electric tube well	90	75.00
	Total	**120**	**100**

Table 4.1.11Indicatesmajority of the respondents (75.00 per cent) were having electric tube well followed by the (13.33 percent) government tube well and remaining (11.66 per cent) diesel tube well.

Finding the above table that the most of the potato growers were having their own electric tube well and it seems that the respondents were having good irrigation facilities for potato cultivation.

Material Possession

4.1.12(A) Home appliances: -

Table 4.1.12(A): Distribution of the respondents according to home appliances they possess **N=120**

Sr. No	Materials	Frequency	Percentage
1.	Chair	107	89.16
2.	Table	102	85.00
3.	Fan	104	86.66
4.	Electric press	101	84.16
5.	Gas cylinder	120	100.00
6.	Mixer grinder	63	52.50
7.	Cooler	66	55.00
8.	Hand pump	101	84.16
9.	Government water supply	10	08.33
10.	Electric hand pump	60	50.00
11.	Dining Table	61	50.83
12.	Dressing table	59	49.16
13.	Refrigerator	75	62.50
14.	Double bed	93	77.50
15.	Mobile	120	100.0
16.	T. V.	104	86.66
17.	Toilet	98	81.66

Table 4.1.12(a) reveals that maximum number of the respondents (100.00 per cent) were having gas slender followed by the (100.00 per cent) mobile phone, (100.00 per cent) chair, (86.66 per cent) fan, (86.66 per cent) television, (85.00 per cent) table, (84.16 per cent) hand pump, (84.16 per cent) electric press, (81.16 per cent) toilets, (77.50 per

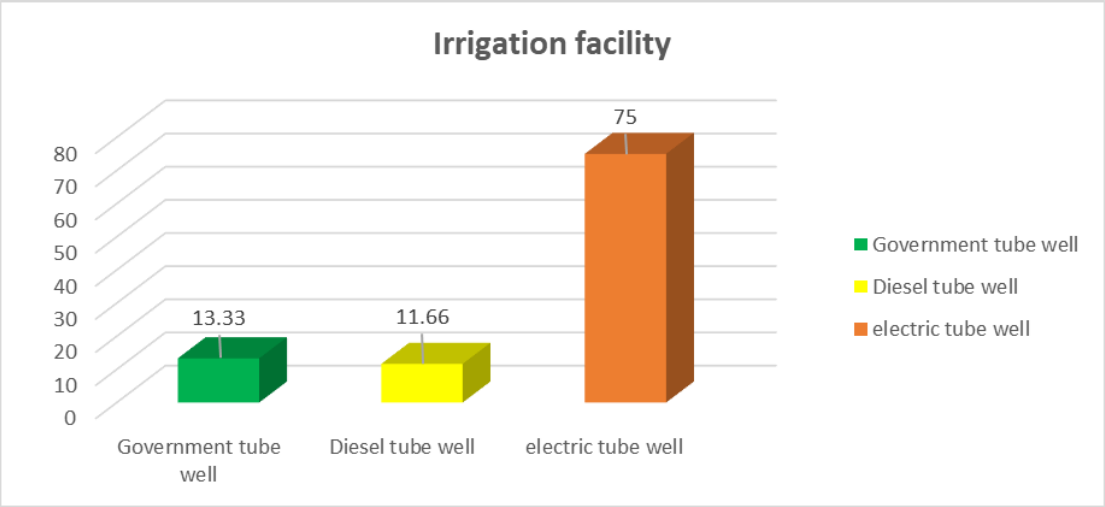


Fig no 12 Distribution of the respondent according to their irrigation facility

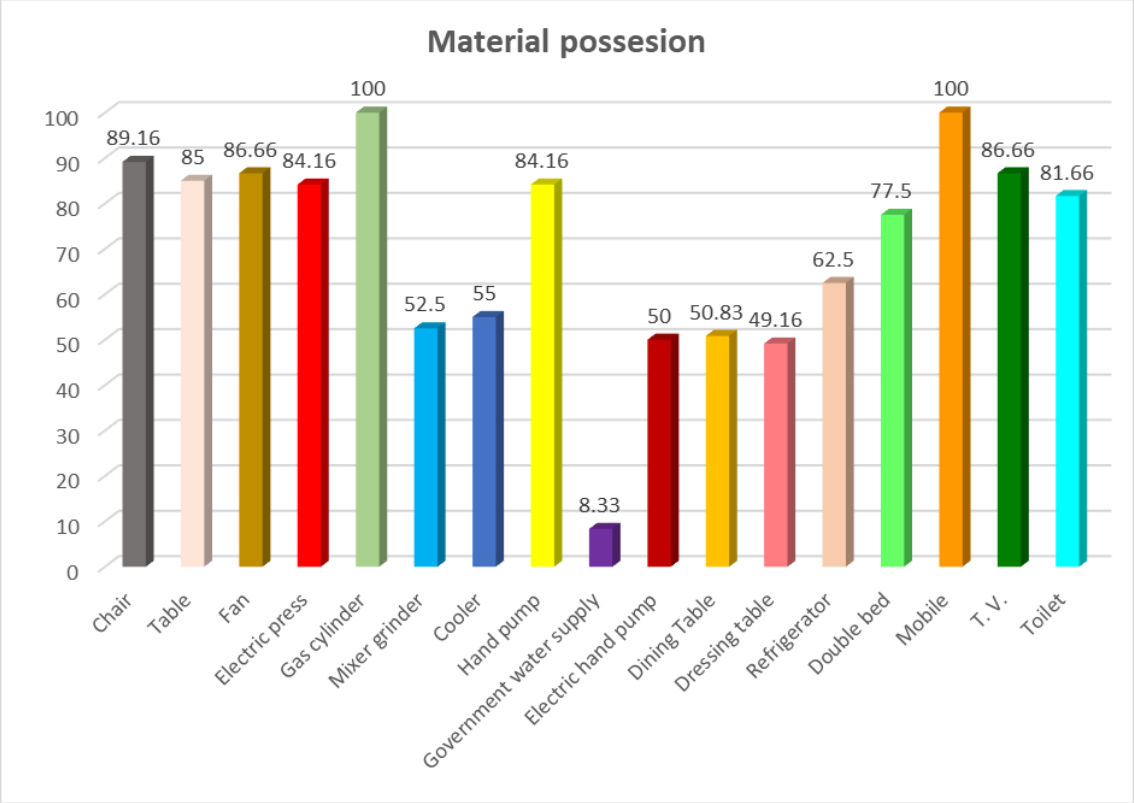


Fig no 13 Distribution of the respondent according to their material possession

cent) double bed, (62.50 per cent) refrigerator, (55.00 per cent) cooler, (52.50 per cent) mixer grinder, (50.83 per cent) dining table, (50.00 per cent) electric hand pump, (49.16

per cent) dressing table and remaining (08.33 per cent) were having government water supply.

Finding the above table concluded that most of the respondent was economically sound and having more interest in potato cultivation.

4.1.12 (B)Transportation facilities: -

Table 4.1.12(B): Distribution of the respondents according to their transportation facilities N=120

Sr. No.	Transportation materials	Frequency	Percentage
1	Cycle	106	88.33
2	Motorcycle	95	79.16
3	Bullock cart (Jota Buggy)	65	54.16
4	Tractor-Trolley	63	52.50
5	Car/Jeep/Taxi	26	21.66

The finding from the table 4.1.12(b) majority of respondent of respondent (88.33 per cent) were having cycle followed by (79.16 per cent) were having motorcycle, bullock cart (54.16 per cent), Tractor trolley (52.50 per cent) and remaining of the respondent who had a car or others transportation facility.

Finding the above study concluded that, most of the respondents were having cycle and motorcycle for transport.

4.1.12(C): Agricultural implements

Table 4.1.12(C): Distribution of respondents according to their Agricultural implements N=120

S. No.	Agricultural implements	Frequency	Percentage
1.	Cultivator	60	50.00
2.	Harrow	58	48.33
3.	Pumping set	36	30.00
4.	Seed drill machine	20	16.66
5.	Sprayer	42	35.00

6.	Zero tillage machine	04	03.33
7.	Thresher	29	24.16
8.	Ridge maker	32	26.66
9.	Power tiller	05	04.16
10.	Leveller machine	23	19.16
11.	Rotavator	45	37.50
12.	Tractor	63	52.50
13.	Potato planter	55	45.83
14.	Potato digger	51	42.50
15.	Sugarcane Planter	18	15.00
16.	Combine/ harvester	03	02.50

Table 4.1.12(c) which reveals the majority of the respondents (52.50 per cent) were having a tractor followed by the (50.00 per cent) cultivator, (48.33 per cent) harrow, potato planter (45.83 per cent), potato digger (42.50 per cent), rotavator (37.50 per cent), sprayer/duster (35.00 per cent), pumping set (30.00 per cent), ridge maker (26.66 per cent), thresher (24.16 per cent), leveller machine (19.16 per cent), seed drill machine (16.66 per cent), sugarcane planter (15.00 per cent), power tiller (04.16 per cent), zero tillage machine (03.33 per cent) and remaining of the combine/harvester (02.50 per cent).

So it may be say that majority of respondent were having farm equipment like tractor, trolley, cultivator, harrow etc. for proper and timely farm practices.

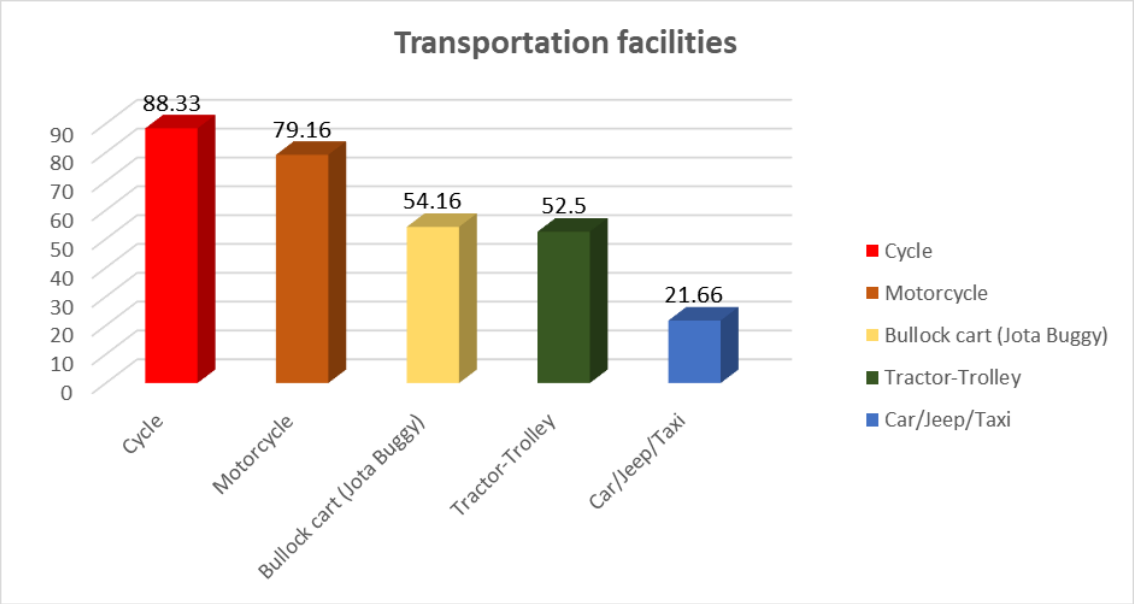


Fig no 14Distribution of the respondent according to their transportation facilities

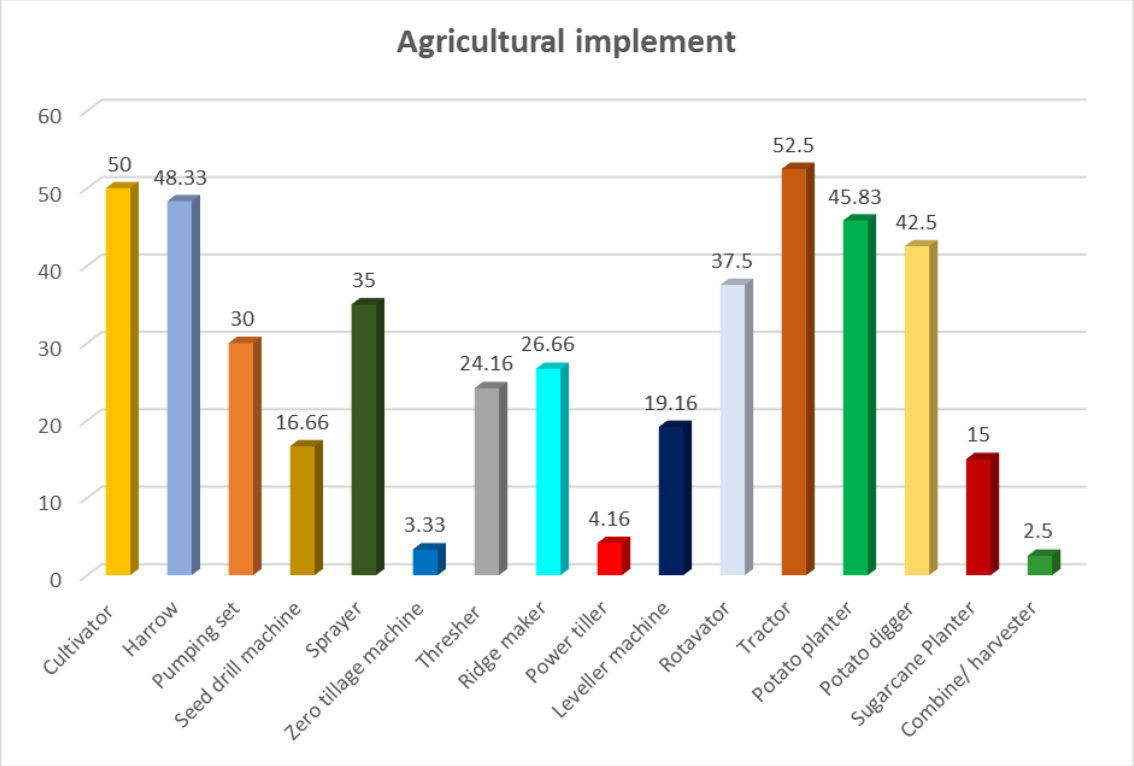


Fig no 15 Distribution of the respondent according to their agricultural implement

4.1.13 Annual income

Table 4.1.13: distribution respondent according to their income N=120

Sr. no	Income	Frequency	Percentage
1.	Below Rs.1,00000	37	30.83
2.	Rs. 1,00,000-2,00,000	55	45.83
3.	Rs. 2,00,000-3,00,000	24	20.00
4.	Above Rs. 3,00,000	04	03.33
	Total	**120**	**100**

The over view of the table 4.1.13, which reveals that majority of respondents were having income Rs. 1,00,000 - 2,00,000 per annum (45.83 per cent) followed by less than Rs. 1,00,000 (30.83 per cent), Rs. 2,00,000 –3,00,000 (20.00%) and the remaining were having income more than Rs. 3,00,000 (03.33 per cent).

It may be concluded that, most of the respondents were belong to Rs. 1,00,000-2,00,000 annual incomes. The probable reason was majority of the respondents were still struggling to obtain more income from Agriculture and allied sectors.

4.1.14 Source of communication

Table 4.1.14 (A): Distribution of the respondents according to their extension contact N=120

Sr. No.	Extension worker	Extension Contact						Total Score	Mean Score	Rank order
		Mostly		Often		Never				
		F	P	F	P	F	P			
1	Neighbors/Relatives	78	65.00	37	30.83	05	04.16	193	1.60	I
2	Progressive farmer	67	55.83	43	35.83	10	08.33	177	1.47	III
3	KVK/SMS	13	10.83	24	20.00	83	69.16	50	0.41	V

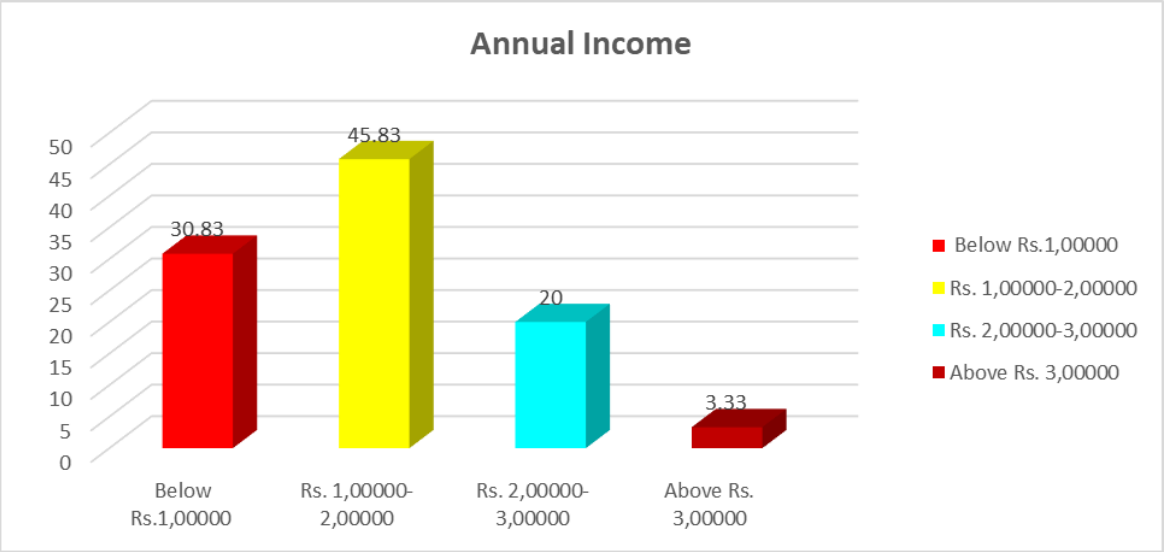


Fig no 16 Distribution of the respondent according to their annual income

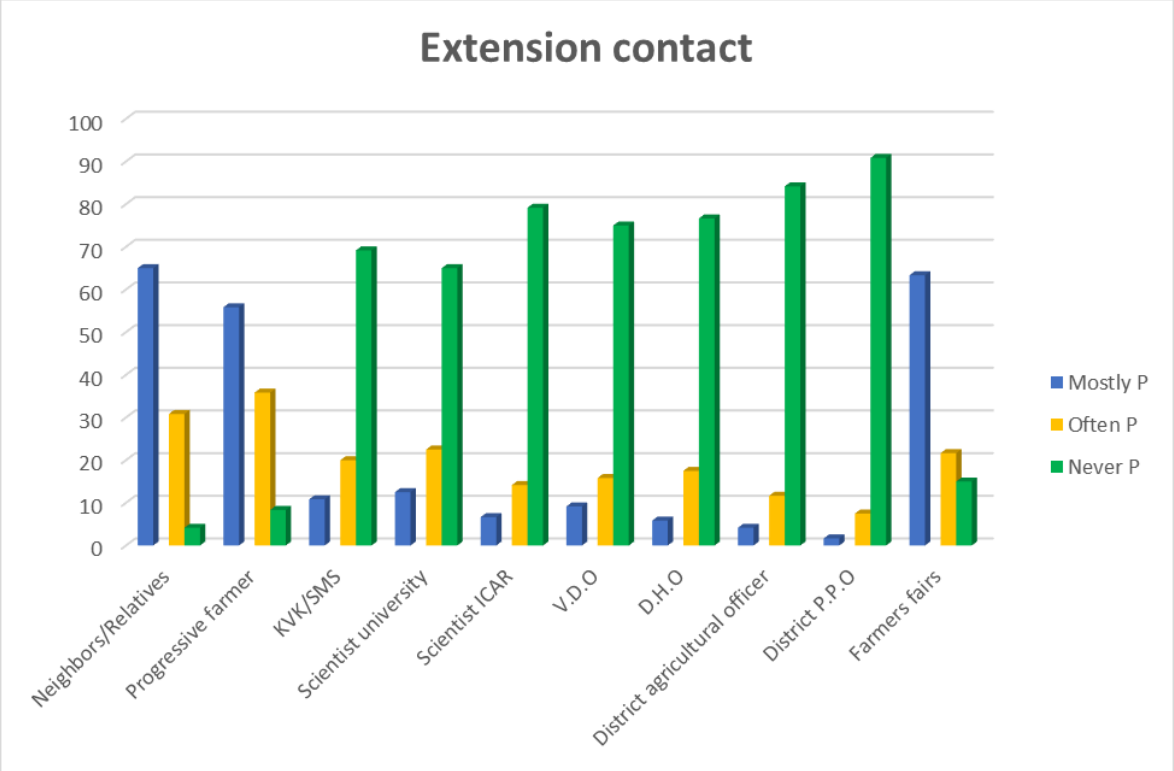


Fig no 17 Distribution of the respondent on the basis of extension contact

4	University Scientist	15	12.50	27	22.50	78	65.00	57	0.47	IV
5	ICAR Scientist	08	06.66	17	14.16	95	79.16	33	0.27	VIII

6	V.D. O	11	09.16	19	15.83	90	75.00	41	0.34	VI
7	D.H. O	07	05.83	21	17.50	92	76.66	35	0.29	VII
8	District agricultural officer	05	04.16	14	11.66	101	84.16	24	0.20	IX
9	P.P. O	02	01.66	9	07.50	109	90.83	13	0.10	X
10	Farmers fairs	76	63.33	26	21.66	18	15.00	178	1.48	II

The distribution of the respondent regarding their extension contact found most of the farmers took an information neighbours/relatives was get rank I, mean value is 1.60 followed by the farmers fair got rank II, mean value is 1.48, progressive farmers rank III, mean value 1.47, scientist university was rank IV, mean value 0.47, KVK/SMS rank V, mean value 0.41, V.D.O rank VI, mean value 0.34, DHO rank VII, mean value 0.29, scientist ICAR rank VIII, mean value 0.27, District Agricultural Officer rank IX, mean value 0.20 and remaining of respondent found a information through District P.P.O rank X, mean value 0.10.

4.1.14 (B) Mass media contact

Table 4.1.14 (B): Distribution of the respondents on the basis of mass media contact

N=120

Sr. No.	Particulars	Extent of Use						Total Score	Mean Score	Rank order
		Always		Sometime		Never				
		F	P	F	P	F	P			
1	Newspaper	69	57.50	34	28.33	17	14.16	172	1.43	I
2	Magazines	08	06.60	13	10.83	99	82.50	29	0.24	IX
3	Journals	06	05.00	16	13.33	98	81.66	28	0.23	X
4	Pamphlet/folder	03	02.50	15	12.50	102	85.00	21	0.17	XI
5	Radio	04	03.33	23	19.16	93	77.50	31	0.25	VII
6	Television	54	45.00	46	38.33	20	16.66	154	1.28	V

7	Mobile	65	54.16	40	33.33	15	12.50	170	1.41	II
8	What's app	57	47.50	42	35.00	21	17.50	156	1.30	III
9	Face book	43	35.83	52	43.33	25	20.83	138	1.15	VI
10	Internet	53	44.16	49	40.83	18	15.00	155	1.29	IV
11	Kisan Call Center	13	10.83	31	25.83	76	63.33	57	0.47	VIII

Table 4.1.14 (B) reveals that most of the farmers found the information through mass media thus distribution of the respondent reading Newspaper rank I, mean value 1.43 followed by the thorough mobile got rank II, mean value 1.41, What's app rank III, mean value is 1.30, internet rank IV, mean value 1.29, television rank V, mean value 1.28, face book rank VI, mean value 1.15, Radio rank VII, mean value 0.25, Kisan Call Center rank VIII, mean value 0.47, Magazines rank IX, mean value 0.24, Journal rank X, mean value is 0.23 and remaining of the respondent information through mass media is Pamphlet/Folder rank IX mean 0.17.

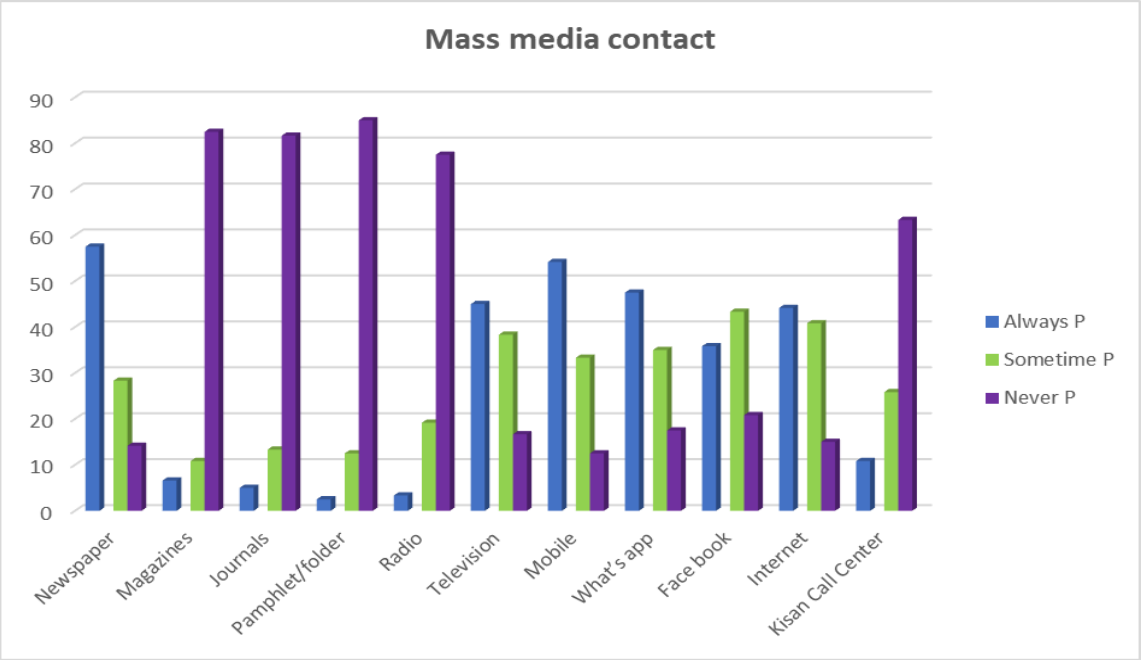


Fig no 18 Distribution of the respondent on the basis of mass media contact

Table no. 4.2.1: To assess the knowledge level of potato growers with respect to package of practices. **N=120**

Sr. no.	Particulars	Low knowledge		Medium knowledge		High knowledge		Mean value	MPS value	Rank order
		F	P	F	P	F	P			
1.	Recommended soil	9	07.50	46	38.33	65	54.16	2.46	82.00	II
2.	Soil pH.	79	65.83	29	24.16	12	10.00	1.44	48.00	XX
3.	Land preparation	8	06.66	42	35.00	70	58.33	2.51	83.66	I
4.	Soil testing	67	55.83	24	20.00	29	24.16	1.68	56.00	XVI
5.	Improved variety of potato	21	17.50	73	60.83	26	21.66	2.04	68.00	XI
6.	Recommended seed rate	26	21.66	58	48.33	36	30.00	2.08	69.33	IX
7.	Seed treatment	64	53.33	34	28.33	22	18.33	1.65	55.00	XVII
8.	Time of sowing	10	08.33	53	44.16	57	47.50	2.39	79.66	III
9.	Method of sowing	21	17.50	56	46.66	43	35.83	2.18	72.66	V
10.	Seed size	43	35.83	51	42.50	26	21.66	1.85	61.66	XV
11.	Spacing	23	19.16	69	57.50	27	22.50	2.01	67.00	XII
12.	Farm yard manure (FYM)	18	15.00	63	52.50	39	32.50	2.17	72.33	VI
13.	Chemical fertilizer	33	27.50	59	49.16	28	23.33	1.95	65.00	XIII
14.	Water management	23	19.16	68	56.66	29	24.16	2.05	68.33	X
15.	Inter-cultivation and weed control practices	19	15.83	64	53.33	37	30.83	2.15	71.66	VII
16.	Disease of potato	77	64.16	36	30.00	7	05.83	1.41	47.00	XXI
17.	Insect-pest of potato	69	57.50	41	34.16	10	08.33	1.50	50.00	XIX
18.	Crop rotation	65	52.50	33	30.00	21	17.50	1.61	53.66	XVIII
19.	Harvesting	17	14.16	74	61.66	29	24.16	2.10	70.00	VIII
20.	Yield	13	10.83	62	51.66	45	37.50	2.26	75.33	IV
21.	Storage	39	32.50	56	46.66	25	20.83	1.88	62.66	XIV

F= Frequency, P= Percentage, MPS = Mean Percentage Score

1. Recommended soil

Table 4.2.1 shows that maximum number of the respondent (54.16 per cent)who had a high level of knowledge followed by the (38.33 per cent) were having medium knowledge level and remaining (7.50 per cent) were having low knowledge level about recommended soil for potato cultivation. The rank of this practice found II, mean value 2.46 and MPS value is (82.00 per cent).

2. Soil pH

Table 4.2.1 observes that knowledge of soil pH majority of the respondents (65.83 per cent) had found low knowledge followed by (24.16 per cent) were having medium level knowledge and remaining (10.00 per cent) high knowledge level. The rank of this practice found XX, Mean value 1.44 and MPS value (48.00 per cent) respectively.

3. Land preparation

Table 4.2.1 shows that lots of the respondent regarding land preparation (58.33 per cent) was having high knowledge followed by the (35.00 per cent) medium knowledge and (06.66 per cent) had low knowledge. The rank of this practice found I, Mean value 2.51 and MPS value (83.66 per cent) respectively.

4. Soil testing

Table 4.2.1 indicates that most of the potato crop growers (55.83 per cent) had low knowledge level whenever (24.16 per cent) had high level of knowledge and (20.00 per cent) had medium level of knowledge soil testing. The rank of this practice found XVI, Mean value 1.68 and mean percent value (56.00 per cent) respectively

5. Improved variety of potato

Table 4.2.1 reveals that most of the potato growers were knowledge level of potato cultivation maximum number of respondents was (60.83 per cent) having medium level of

knowledge, (21.66 per cent) had high level of knowledge and remaining of the (17.50 per cent) having low level of knowledge. The rank of this practice found XI, Mean value 2.04 and mean percentage score (68.00 per cent).

6. Recommended seed rate

Table 4.2.1 indicates that knowledge level of respondents regarding recommended seed rate (48.33 per cent) had medium level of knowledge followed by (30.00 per cent) high level of knowledge and remaining of the (21.66 per cent) had low level of knowledge. The rank of this practice found IX, Mean value 2.08 and mean percent value (69.33 per cent) respectively.

7. Seed treatment

Table 4.2.1 shows that majority of the respondent (53.33 per cent) had a low level of knowledge about seed treatment, followed by the (28.33 per cent) who had a medium level of knowledge and the remaining (18.33 per cent) had high level of knowledge about seed treatment of potato. The rank of this practice found XVII, a mean value of 1.65, and a mean percent score of (55.00 per cent).

8. Time of sowing

Table 4.2.1 indicate that most of the respondent (47.50 per cent) had high level of knowledge, (44.16 per cent) had a medium level of knowledge and remaining of the respondent regarding time of sowing potato crop (08.33 per cent) had a low level of knowledge. The rank of this practice found III, a mean value of 2.39 and a mean percent score of (79.66 per cent).

9 Method of sowing

Table 4.2.1 shows that most of the respondents of potato growers (46.66 per cent) had a medium level of knowledge followed by the (35.83 per cent) had high level of knowledge and remaining (17.50 per cent) had a low level of knowledge about method

potato sowing. The rank of this practice obtained V, mean value of 2.18 and a mean percent score of (72.66 per cent).

10. Seed size

The table 4.2.1 indicate that maximum number of respondent (42.50 per cent) were having medium level of knowledge followed by the (35.83 per cent) low level of knowledge and remaining (21.66 per cent) had a high level of knowledge about seed size of potato. The rank of this practice found XV, mean value 1.85 and a mean percent score (61.66 per cent) respectively.

11. Spacing

Table 4.2.1 conclude that most of the farmer's knowledge level regarding spacing of potato (57.50 per cent) had a medium level of knowledge followed by (22.50 per cent) high level of knowledge and (19.16 per cent) were having low level of knowledge. It obtained rank XII out of 21 practices, mean value 2.01 and mean percent score (67.00 per cent) respectively**.**

12. Farm yard manure (FYM)

Table 4.2.1 indicates that most of the respondent (52.50 per cent) had medium level of knowledge followed by the (32.50 per cent) had high level and remaining of the farmers (15.00 per cent) was having low level of knowledge about farm yard manuring. It obtained rank VI out of 21 selected practices, mean value 22.17 and a mean percent score was (72.33 per cent) of farm yard manure.

13. Chemical fertilizer

Table 4.2.1 reveals that majority of the farmer of potato growers were reported (49.16 per cent) had a medium level of knowledge about chemical fertilizer followed by that (23.33 per cent) high level of knowledge and remaining (27.50 per cent) who had low

level of knowledge. It obtained rank XIII out of selected 21 practices, mean value 1.95 and a mean percent score was (65.00 per cent).

14. Water management

Table 4.2.1 shows that majority of the potato growers (56.66 per cent) were having medium level of knowledge about water management in potato crop followed by (24.16 per cent) had high level of knowledge and (19.16 per cent) had low level of knowledge. It found rank X out of selected 21 practices, mean value 2.05 and mean percent score was (68.33 per cent).

15. Inter-cultivation and weed control practices

Table 4.2.1 reveals that majority of the potato farmers (53.33 per cent) had a medium level of the knowledge about inter cultural operation and weed management followed by (30.83 per cent) were having high level of knowledge and (15.83 per cent) had low level of knowledge. It obtained rank VI out of selected 21 practices I, mean value 2.15 and mean percent score (71.66 per cent) respectively.

16. Disease of potato

Table 4.2.1 shows that majority of the respondent (64.16 per cent) had a low level of knowledge regarding disease control of potato followed by (30.00 per cent) had medium level of knowledge and remaining (05.83 per cent) had high level of knowledge. It obtained rank XXI out of selected 21 practices, mean value 1.41 and mean percent score was (47.00 percent) respectively.

17. Insect-pest of potato

Table 4.2.1 it clear that majority of the respondents (57.50 per cent) were having low level of knowledge regarding insect-pest of potato followed by (34.16 per cent) medium knowledge level and remaining of the (08.33 per cent) respondents were having

high level of knowledge. It was found the rank XIX, mean value 1.50 and mean per cent value was (50.00 per cent).

18. Crop rotation

Table 4.2.1 reveals that most of the respondents (54.16 per cent) were having low level of knowledge about crop rotation followed by (27.50 per cent) having medium level of knowledge and remaining (17.50 per cent) respondents were having high level of knowledge. It was found the rank XVIII, mean value 1.65 and mean percent score (55.00 per cent).

19. Harvesting

Table 4.2.1 indicates that maximum number of respondent (61.66 per cent) had medium level of knowledge about harvesting of potato followed by (24.16 per cent) high level of knowledge and remaining (14.16 per cent) had low level of knowledge about harvesting of potato crop. It was found the rank VIII, mean value 2.10 and mean percent score (70.00 per cent).

20. Yield

Table 4.2.1reveals that majority of the respondent (51.66 per cent) had medium level of knowledge about per hectare yield of potato followed by (37.50 per cent) were having high level of knowledge and remaining (10.83per cent) having low knowledge It was found the rank IV, means value 2.26 and mean per cent score (75.33 per cent)

21. Storage

Table 4.2.1 reports that most the respondent (46.66 per cent) were having medium level of knowledge about storage of potato followed by (32.50 per cent) had low level of knowledge and remaining (20.83 per cent) having high knowledge about storage of potato. It was found the rank XIV, mean value 1.88 and mean percent score was (62.66 per cent) respectively.

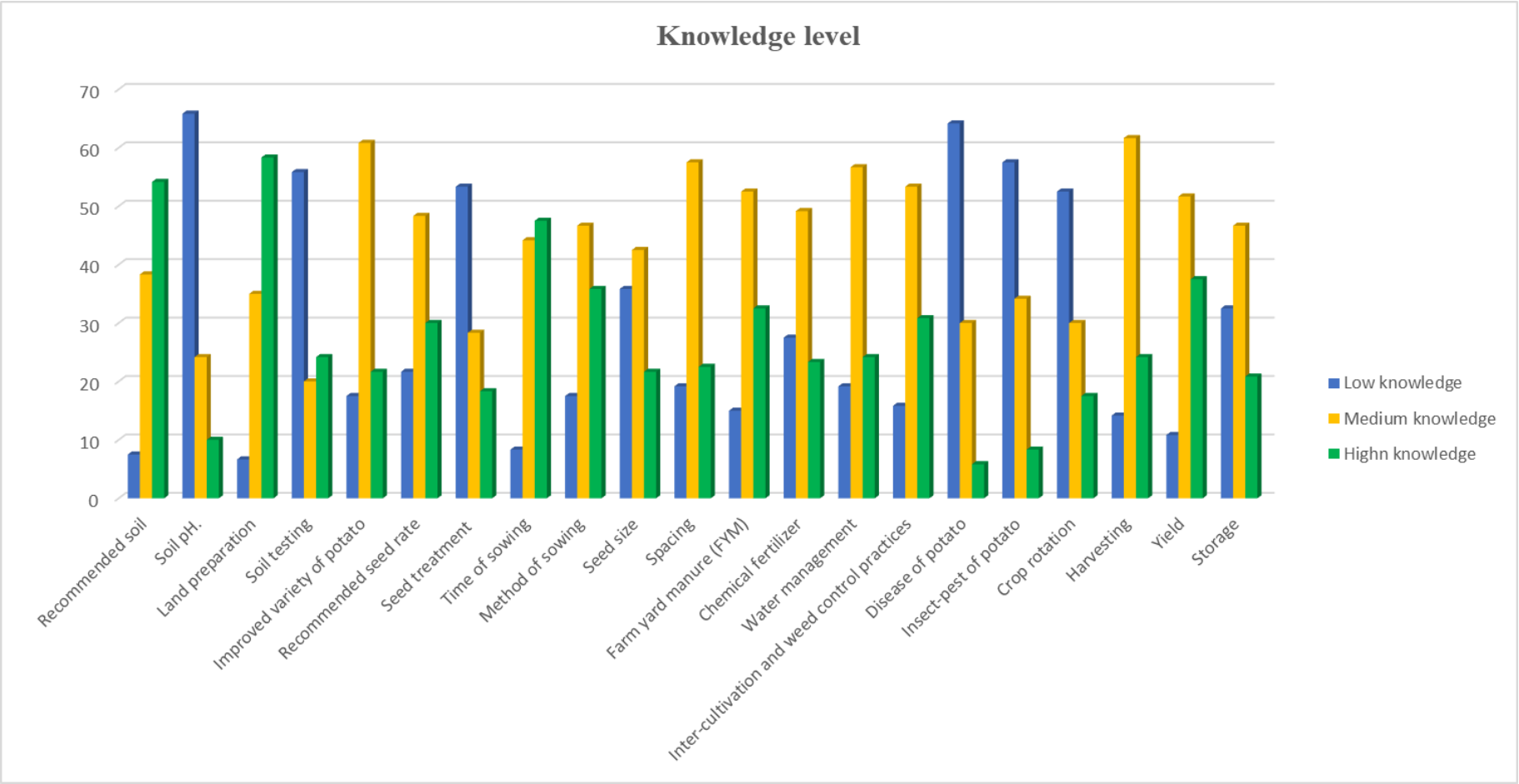


Fig no 19 Distribution of the respondent on the basis of knowledge leve

Statistical analysis: -

Table 4.2.2 - Correlation coefficient (r) between independent variables and knowledge level of potato growers regarding potato cultivation

Correlation between Independents variable and Knowledge level

Sr. No.	Independent variable	Correlation Coefficient (r) with Knowledge level
1.	Age	-0.00138
2.	Caste	-0.12846
3.	Education	0.080985*
4.	Marital status	0.096871
5.	Type of family	0.043493
6.	Size of family	0.022042
7.	Type of house	0.185197
8	Occupation	0.08051
9.	Social participation	0.014128
10.	Land holding	0.118708
11.	Irrigation facility	0.076896
12.	Home appliance	0.216773*
13.	Transportation facility	0.052946
14.	Agricultural Implements	0.192795
15.	Annual income	0.195623
16.	Extension Contact	0.17388*
17	Mass media contact	0.048037*

***Significant at 0.05% probability level**

The table 4.1.2 indicates that the independent variable home appliance having value of (0.216773), Extension contact (0.17388), Education (0.80985) and Mass media contact (0.048037) was found to have positive significant correlation with the knowledge level of respondents regarding potato crop cultivation. Other variables, like agriculture implement (0.192795), annual income (0.195623), type of house (0.185197), land holding (0.118708), , Marital status (0.096871), , Irrigation facility (0.076896), Transportation facility (0.052946), , type of family (0.043493), size of family (0.022042) ,occupation (0.08051),

and social participation (0.014128), were having no significant correlation with knowledge level of respondents. While, the variable caste (-12846) and Age (-0.00138) were having negative significant correlation with knowledge level of respondents regarding potato crop.

It may be concluded that the variables like “Home Appliance” , extension contact, mass media contact and education were having significant positive correlation with knowledge level whereas and caste and age were having negative significant correlation with knowledge level of respondents regarding Potato crop cultivation.

Table no. 4.3.1: To study the adoption level of potato growers with respect to package of practices. **N=120**
F= Frequency, P= Percentage, MPS = Mean Percentage Score

Sl. No.	Particulars	Never adoption		Partial adoption		Fully adoption		Mean value	MPS value	Rank order
		F	P	F	P	F	P			
1	Recommended soil	05	04.66	13	10.83	102	85.00	1.80	60.00	II
2	Soil pH.	88	73.33	25	20.83	07	05.83	0.32	10.66	XXI
3	Land preparation	00	00	17	14.16	103	85.83	1.85	61.66	I
4	Soil testing	83	69.16	27	22.50	10	08.33	0.39	13.00	XX
5	Improved variety of potato	09	07.50	33	27.50	78	65.00	1.57	52.33	VI
6	Recommended seed rate	05	04.16	38	31.66	77	64.16	1.60	53.33	V
7	Seed treatment	73	60.83	34	28.33	13	10.83	0.50	16.66	XIX
8	Time of sowing	04	03.33	24	20.00	92	76.66	1.73	57.66	III
9	Method of sowing	0 7	05.83	28	23.33	85	70.83	1.65	55.00	IV
10	Seed size	17	14.16	47	39.16	56	46.66	1.32	44.00	XI
11	Spacing	11	09.16	31	25.83	78	65.00	1.55	51.66	VII
12	Farm yard manure (FYM)	14	11.16	71	59.16	35	29.16	1.17	39.00	XIV
13	Chemical fertilizer	04	03.33	59	49.16	57	47.50	1.44	48.00	VIII
14	Water management	08	06.66	53	44.16	59	49.16	1.42	47.33	IX
15	Inter-cultivation and weed control practices	12	10.00	63	52.50	45	37.50	1.27	42.33	XI
16	Disease of potato	53	44.16	62	51.66	05	4.16	0.60	20.00	XVII
17	Insect-pest of potato	50	41.66	61	50.83	09	07.50	0.58	19.33	XVIII
18	Crop rotation	51	42.50	46	38.33	23	19.16	0.76	25.33	XVI
19	Harvesting	07	05.83	66	55.00	47	39.16	1.33	44.33	X
20	Yield	13	10.83	71	59.16	36	30.00	1.19	39.66	XIII
21	Storage	17	14.16	76	63.33	27	22.50	1.08	36.00	XV

1. Recommended soil:

Table 4.3.1 shows that majority of the respondents (80.83 per cent) were fully adopted recommended soil for the cultivation of potato crop followed by (17.50 per cent) partial adopted while, only (01.66 per cent) respondents those were never adopted recommended soil for the cultivation of potato. This practice occupied rank II, mean value 1.79 and MPS value is (59.66 per cent).

2. Soil PH:

Table 4.3.1 shows that majority of the respondents (73.33 per cent) were never adopted recommended soil PH for the cultivation of potato crop followed by (20.83 per cent) partial adopted while and (05.83 per cent) fully adopted. This practice occupied rank XXI, mean value 0.32 and MPS value is (10.66 per cent).

3. Land preparation:

Table 4.3.1 indicate that majority of the respondents (85.83 per cent) were fully adopted land preparation practices for the cultivation of potato crop followed by (14.16 per cent) partial adopted and no any respondents were found that never adopted land preparation practices. This practice occupied rank I, mean value 1.85 and MPS value is (61.66 per cent).

4. Soil testing:

Table 4.3.1showsthat majority of the respondents (69.16 per cent) were never adopted soil testing before the cultivation of potato crop followed by (22.50 per cent) partial adopted while only (08.33 per cent) fully adopted. The rank of this practice was found XX, mean value 0.39 and MPS value is (13.00 per cent).

5. Improved variety of potato:

Table 4.3.1indicate that majority of the respondents (65.00 per cent) were fully adopted improved varieties for the cultivation of potato crop followed by (27.50 per cent)

partial adopted while only (07.50 per cent) respondents never adopted improved varieties for the cultivation of potato. The rank of this practice was found VI, mean value 01.57 and MPS value is (52.33 per cent).

6. Seed rate:

Table 4.3.1indicate that majority of the respondents (64.16 per cent) were fully adopted seed rate for the cultivation of potato crop followed by (31.66 per cent) partial adopted and only (04.16 per cent) respondents never adopted actual seed rate for the sowing of potato seed. The rank of this practice was found V, mean value 01.60 and MPS value is (53.33 per cent).

7. Seed treatment:

Table 4.3.1observe that majority of the respondents (60.83 per cent) were never adopted seed treatment practice in the cultivation of potato crop followed by (28.33 per cent) partial adopted while (10.83 per cent) respondents fully adopted seed treatment practices in the cultivation of potato. The rank of this practice was found XIX, mean value 0.50 and MPS value is (16.66 per cent).

8. Time of sowing

Table 4.3.1 shows that majority of the respondents (76.66 per cent) were fully adopted time of sowing for the cultivation of potato crop followed by (20.00 per cent) partial adopted while only (03.33 per cent) never adopted. The rank of this practice was found III, mean value 1.73 and MPS value is (57.66 per cent).

9. Method of sowing

Table 4.3.1 reveals that majority of the respondents (70.83 per cent) were fully adopted method of sowing in the cultivation of potato crop followed by (23.33 per cent) partial adopted while (05.83 per cent) never adopted. The rank of this practice was found 198, mean value 1.65 and MPS value is (55.00 per cent).

10. Seed size

Table 4.3.1indicate that majority of the respondents (46.66 per cent) were having fully adoption seed size for the cultivation of potato crop followed by (39.16 per cent) partial adopted only (14.16 per cent) never adopted. The rank of this practice was found XI, mean value 1.32 and MPS value is (44.00 per cent).

11. Spacing

Table no-4.3.1shows that majority of the respondents (65.00 per cent) were fully adopted spacing at the time of potato sowing followed by (25.83 per cent) partial adopted spacing and only (09.16 per cent) never adopted spacing. The rank of this practice was found VII, mean value 1.57 and MPS value is (52.33 per cent).

12. Farm yard manure (FYM)

Table 4.3.1 shows that majority of the respondents (59.16 per cent) were partial adopted farm yard manure at the time of field preparation for potato followed by (29.16 per cent) fully adopted FYM whenever, only (11.16 per cent) never adopted. The rank of this practice was foundXIV, mean value 1.17 and MPS value is (39.00 per cent).

13. Chemical fertilizer

Table 3.1 indicate that majority of the respondents (49.16 per cent) were partial adopted chemical fertilizer or balanced fertilizer for the cultivation of potato crop followed by (47.50 per cent) fully adopted and only (03.33 per cent) never adopted. The rank of this practice was found VII, mean value 1.44 and MPS value is (48.00 per cent).

14. Water management

Table 4.3.1 shows that majority of the respondents (49.16 per cent) were fully adopted water management in potato cultivation followed by (44.16 per cent) partial adopted while, only (06.66 per cent) never adopted. The rank of this practice was found IX, mean value 1.42 and MPS value is (47.33 per cent).

15. Inter- cultivation and weed management

Table 4.3.1reveals that majority of the respondents (52.50 per cent) were partial adopted inter-cultivation and weed management operations in potato followed by (37.50 per cent) fully adopted while, only (10.00per cent) never adopted. The rank of this practice was found XII, mean value 1.27 and MPS value is (42.33 per cent).

16. Disease of potato

Table 4.3.1predictthat majority of the respondents (51.66 per cent) were partial adopted disease control chemicals inpotato crop followed by (44.16 per cent) never adopted while, only (4.16 per cent) fully adopted. The rank of this practice was found XVII, mean value 0.60 and MPS value is (20.00 per cent).

17. Insect pest of potato

Table 4.3.1 conclude that majority of the respondents (50.83 per cent) were partial adopted insect pest management in potato crop cultivation followed by (41.66 per cent) never adopted while, only (07.50 per cent) fully adopted. The rank of this practice was found XVIII, mean value 0.58 and MPS value is (19.33 per cent).

18. Crop rotation

Table 4.3.1 indicates that majority of the respondents (42.50 per cent) were never adopted crop rotation in cultivation of potato crop followed by (38.33 per cent) partial adopted and only (19.16 per cent fully. The rank of this practice was found XVI, mean value 0.76 and MPS value is (25.33 per cent).

19. Harvesting

Table 4.3.1 reveals that majority of the respondents (55.00 per cent) were partial adopted recommended harvesting technology in cultivation of potato crop followed by

(39.16 per cent) fully adopted and only (0.583 per cent) never adopted. The rank of this practice was found X, mean value 1.33 and MPS value is (44.33 per cent).

20. Yield

Table 4.3.1 shows that majority of the respondents (59.16 per cent) were partial adopted yield pattern in cultivation of potato crop followed by (30.00 per cent) fully adopted yield while, only (10.83 per cent) never adopted. The rank of this practice was found XIII, mean value 1.19 and MPS value is (39.66 per cent).

21. Storage

Table 4.3.1 shows that majority of the respondents (63.33 per cent) were partial adopted storage pattern of potato crop yield followed by (22.50 per cent) never adopted and only (14.16 per cent fully. The rank of this practice was found XV, mean value 1.05 and MPS value is (35.00 per cent).

Statistical analysis: -

B. Correlation coefficient (r) between independent variables and adoption level of regarding Potato cultivation technology

The correlation coefficient of independents variables (age, caste, education, marital status, type of family, size of family, type of house, occupation, social participation, land holding, irrigation facility, material possession, annual income, extension contact, mass media contact) and dependent variables (adoption level potato growers regarding Potato cultivation technology) were presented in table-4.3.2

Table 4.3.2 Correlation between Independents variable and Adoption level

Sr. No.	Independent variable	Correlation Coefficient (r) with Adoption level
1.	Age	-0.098641
2.	Caste	0.089286
3.	Education	0.018803*
4.	Marital status	0.076445
5.	Type of family	-0.205

6.	Size of family	-0.04459
7.	Type of house	0.010297
8	Occupation	0.05901
9.	Social participation	0.031265*
10.	Land holding	0.08285*
11.	Irrigation facility	0.038547
12.	Home appliance	0.011351
13.	Transportation facility	0.035046
14.	Agricultural Implements	0.09192
15.	Annual income	0.046527*
16.	Extension Contact	0.11806*
17	Mass media contact	0.03011*

***Significant at 0.05% probability level**

Table 4.3.2 indicates that out of 17 independence variables of studied, education (0.018803), Annual income (0.046527), Land holding (0.08285), Social participation (0.031265), Extension contact (0.11806) and Mass media contact (0.03011) were having positive significant correlation with adoption level of respondents regarding potato cultivation technology, whereas caste (0.089286), marital status (0.076445), irrigation facility (0.038547), Type of house (0.010297) ,transportation facility (0.035046),), Agricultural implement (0.09192), occupation (0.05901) and Home appliance (0.011351), and were having no significant correlation with adoption level of respondents regarding potato cultivation technology. While, other variables, like the variable, age(-0.098641), size of family (-0.04459), and Type of family (-0.205) were having negative significant correlation with adoption level of respondents regarding potato cultivation technology.

It may be concluded that the variables like education, Annual income, Land holding, Social participation, Extension contact and Mass media contact were having positive significant correlation with adoption level of respondents regarding potato cultivation technology.

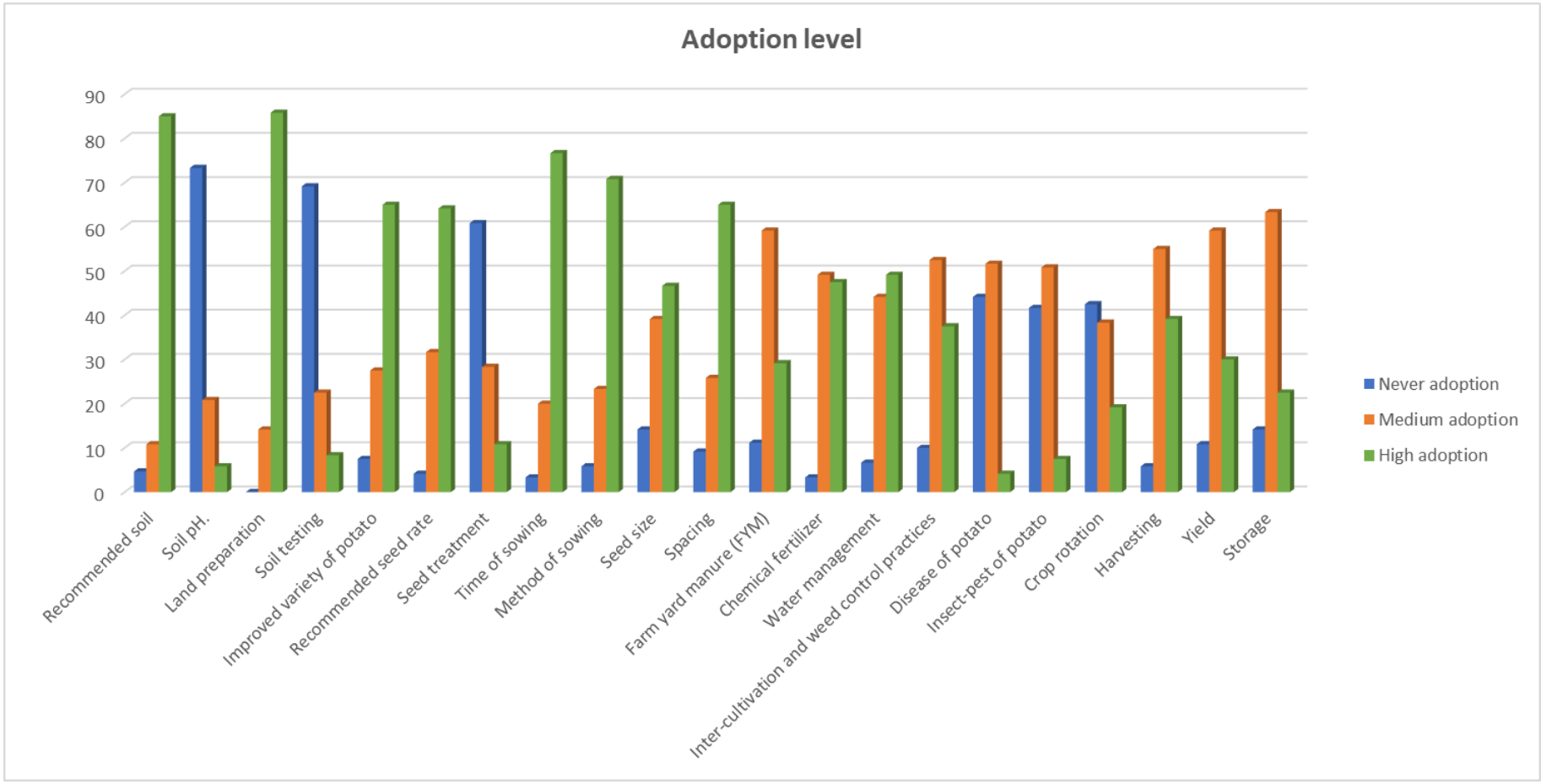


Fig no 20 Distribution of the respondent on the basis of adoption level

4.4.1. Distribution of the respondent's constraints in adoption of improved cultivation practices faced by potato growers.

Table No.4.4.1 Distribution of respondents on the basis of constraints N=120

Sr. No.	Particulars	F	P	Rank
A	**Input constraints as perceived by potato growers.**			
1.	Unavailability of improved seed	69	57.50	I
2.	Subsidy is not given on different agricultural inputs	65	54.16	II
3.	Unavailability of required fertilizers and manures	52	43.33	III
4.	Unavailability of recommended chemicals for seed treatment, insect control, pest control and disease control	49	40.83	IV
5.	Unavailability of inputs in time	41	34.16	V
B.	**Supply constraints as perceived by potato growers**			
1.	High wages and non-availability of labour	86	71.66	I
2.	Non availability sufficient quantity of seeds	56	46.66	II
3.	Non availability of certified seeds	44	36.66	III
4.	Insufficient irrigation water	32	26.66	IV
5.	Inadequate and irregular power supply	18	15.00	V
C.	**Extension constraints as perceived by potato growers**			
1.	Lack of proper training	75	62.50	V
2.	Lack of extension participation	78	65.00	IV
3.	Lack of extension contact	82	68.33	II
4.	Lack of print media subscription	79	65.83	III
5.	Lack of electronic media participation	87	72.50	I
6.	Lack of motivation from extension institution / personnel	69	57.50	VI
D.	**Technological constraints as perceived by potato growers**			
1.	Lack of availability of quality HYV seeds.	72	60.00	III
2.	Lack of knowledge about recommended dosage of plant protection chemicals	67	55.83	IV
3.	Lack of technical knowledge about recommended dosage of chemical fertilizer	39	32.50	VIII
4.	Lack of knowledge about seed rate and spacing	37	30.83	IX
5.	Lack of knowledge of disease resistant varieties	59	49.16	VI

6.	Lack of knowledge about post-harvest technologies	76	63.33	II
7.	Lack of knowledge about export quality produce	83	69.16	I
8.	Lack of knowledge and skill about weed management	42	35.00	VII
9.	Lack of skill for seed and soil treatment	63	52.50	V
E.	**Financial constraints as perceived by potato growers**			
1.	High cost of high yielding varieties	71	59.16	II
2.	High cost of improved implements	74	61.66	I
3.	High cost of irrigation	29	24.16	V
4.	Higher electricity charges	33	27.50	IV
5.	Lack of credit on marginal interest	69	57.50	III
F.	**Marketing constraints as perceived by potato growers**			
1.	Constant fluctuation in market price	73	60.83	III
2.	Intervention of middlemen	52	43.33	VII
3.	Lack of storage facility	81	67.50	I
4.	Lack of transport facility	27	22.50	VIII
5.	Lower price at harvesting time	77	64.16	II
6.	Absence of assured marketing at remunerative price and insurance facility	67	55.83	IV
7.	Malpractices of merchants in the mandies	56	46.66	VI
8.	Lack of export marketing in the area	61	50.83	V

A. Input constraints as perceived by potato growers.

Table 4.4.1 (A) indicates that maximum respondents were input constraints as perceived by potato growers. Unavailability of improved seed on government centres were limited for potato farmers, majority of respondents (57.50%) faces these problems and it obtained ranks I in terms of not having enough good seed. The (54.16 percent) who did not receive a subsidy on various agricultural inputs was ranked second, (43.33 per cent) who had an unavailability of required fertilizer and manure it was rank 3rd, (40.83 per cent) were having recommended chemical for seed treatment, insect-pest and disease control it

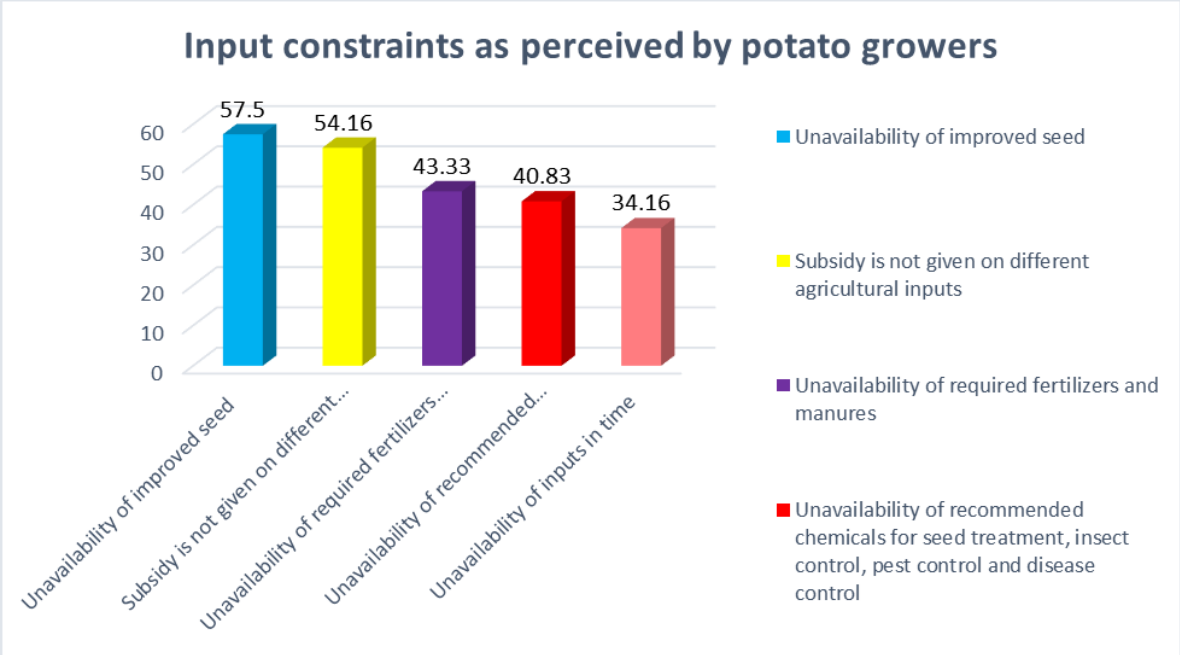


Fig no 21 Distribution of the respondent on the basis of input constraints

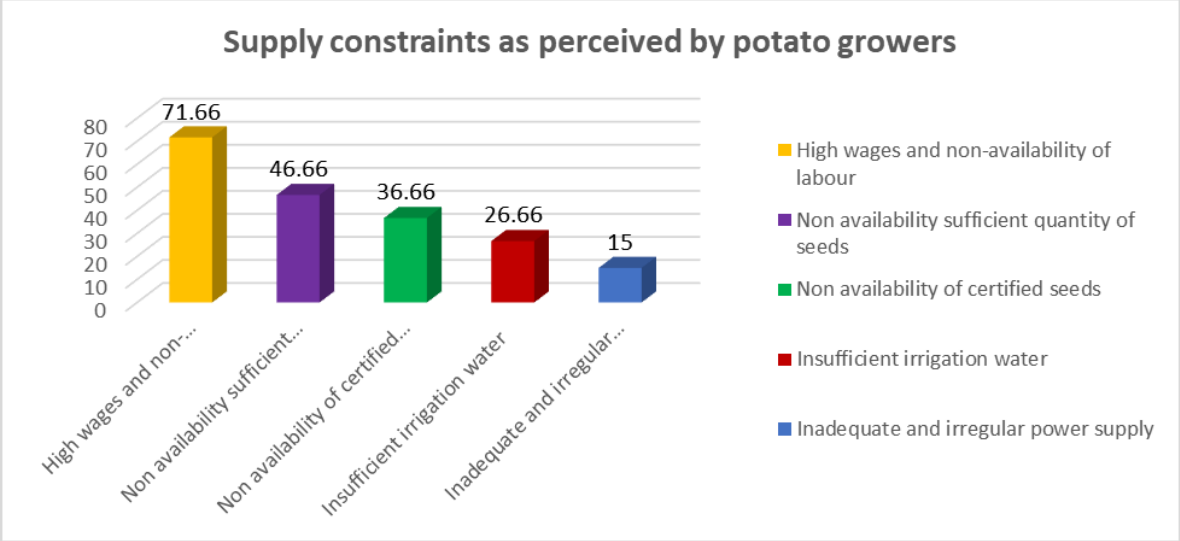


Fig no 22 Distribution of the respondent on the basis of supply constraints

got rank 4th and (34.16 per cent) were having unavailability of input in timely itgot rank 5th respectively

4.4.1 (B) Supply constraints as perceived by potato growers.

From table 4.4.(B) observe that related to supply constraints faced by potato growers, majority of respondent (71.66 per cent) were faced high wages and non-availability of labour, it obtained ranked 1st followed by the (46.66 per cent) who had a not availability sufficient quantity of seed got rank 2nd, (36.66 per cent) had found non availability of certified seed got the rank 3rd, (26.66 per cent) faced problem insufficient of irrigation water got rank 4th and (15.00 per cent) faced inadequate and irregular power supply got rank 5th.

4.4.1 (C). Extension constraints as perceived by potato growers.

From table 4.4.1 (C) report that maximum number of the respondent (72.50 per cent) were faced problem lack of electronic media participation, it found rank 1st followed by (68.33 per cent) lack of extension contact got rank 2nd, (65.83 per cent) lack of print media subscription got the rank 3rd, (65.00 per cent) lack of extension participation got the rank 4th, (62.50 per cent) lack of proper training ranked is 5th and remaining of the (57.50 per cent) were faced lack of motivation from extension institution and personal got ranked 6th. Sowed that major constraints electronic media participation faced by potato growers.

4.4.1 (D). Technological constraints perceived by potato growers.

Table 4.4.1 (B) shows that maximum number of potato growers (69.16 per cent) who had a lack of knowledge about export quality produce got rank 1st followed by the 63.33 per cent lack of knowledge about post-harvest technologies got rank 2nd, (60.00 per cent) low availability of high yielding variety of seed and got rank 3rd, (58.83 per cent) low

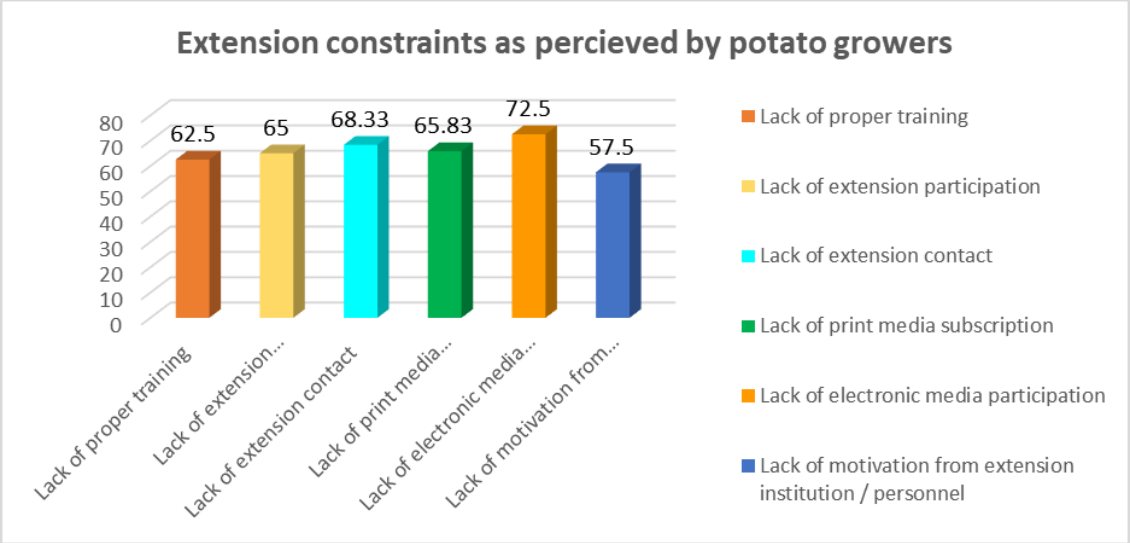


Fig no 23 Distribution of the respondent on the basis of extension constraints

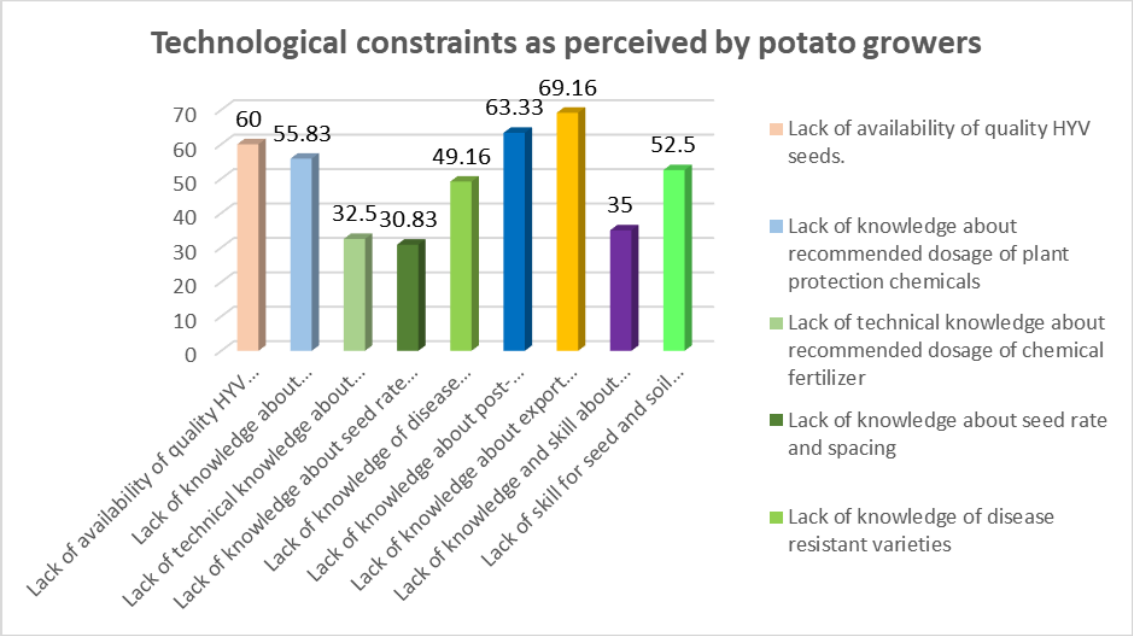


Fig no 24 Distribution of the respondent on the basis of technological constraints

knowledge about plant protection chemical rank 4th, (52.50 per cent) had low skills of soil and seed treatment got rank 5th, (49.16 per cent) lack of knowledge about disease resistant variety and got rank 6th, (35.00 per cent) low knowledge about weed management and rank is 7th, (32.50 per cent) low knowledge about chemical fertilizer got rank 8th, and remaining (30.83 per cent) had found lack of knowledge about seed rat and spacing and found the rank 9threspectively.

4.4.1 (E) Financial constraints as perceived by potato growers.

Table 4.4.1 (B) shows constraints related to financial as perceived by potato growers that lots of the potato growers (61.66 per cent) who had faced high cost of improved implement and got rank 1st followed by (59.16 per cent) high cost of high yielding variety and rank is 2nd, (57.50 per cent) lack of credit on marginal interest rank is 3rd, (27.50 per cent) higher electricity charges and rank is 4th and remaining (24.16 per cent) who had high cost of irrigation and rank is 5th. So it may concluded that major constraints implementation, variety cost is too much high.

4.4.1 (F). Marketing constraints perceived by potato growers.

Table 4.4.1(F)shows that marketing constraints perceived by potato growers (67.50 per cent) were having lack of storage facility and got rank 1st followed by (64.16 per cent) lower price at harvesting time got rank 2nd, (60.83 per cent) fluctuation in market price got rank 3rd, (55.83 per cent) absence of assured marketing in remunerative price and insurance facility got rank 4th, (50.83 per cent) lack of export marketing in this area and got rank 5th, (46.66 per cent) malformation by merchants in the mandies and got rank 6th, (43.33 per cent) intervention of middleman rank got 7th and remaining of the respondents (22.50 per cent) were faced problem lack of transport facility and obtained rank 8th respectively.

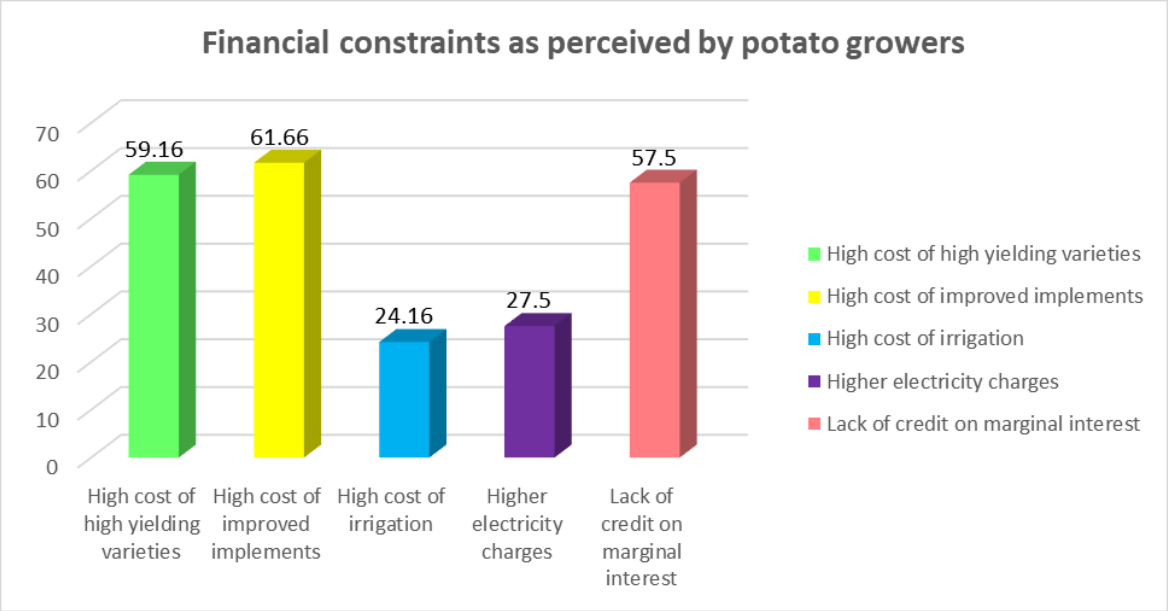


Fig no 25 Distribution of the respondent on the basis of financial constraints

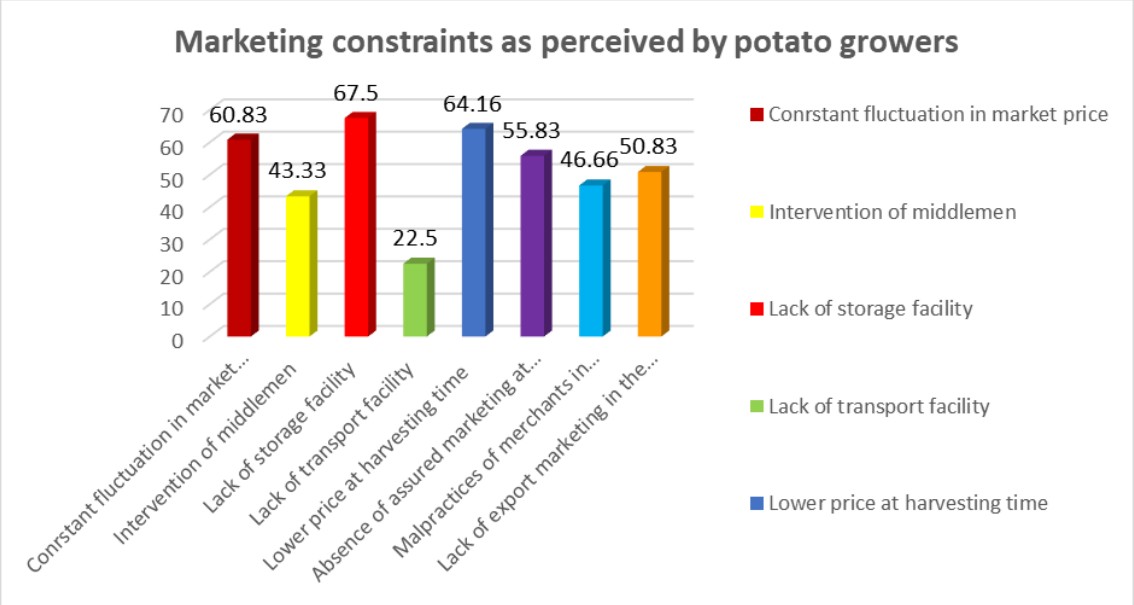


Fig no 26 Distribution of the respondent on the basis of marketing constraints

SUMMARY AND CONCLUSION

CHAPTER- 5 SUMMARY AND CONCLUSION

The present study entitled **"A study on knowledge and adoption level of improved cultivation practices among the potato growers in Meerut District of Uttar Pradesh"** was under taken.

There are 23 districts in Western Uttar Pradesh out of which Meerut district was selected for the investigation due to it has area of potato cultivation. Meerut district is divided into 12 blocks, out of which two blocks were purposefully chosen for the investigation on the basis of higher potato area and production. From each block 4 villages were chosen purposively for the investigation. After this prepare a comprehensive list of potato growers of all villages, from each village 15 potato growers were chosen randomly for the investigation. Thus, the total sample size was of 120 for the investigation.

The author himself had collected the data from the respondents with the help of pre-tested interview schedule. Analysis was done with the use of frequency, percentage, mean, Mean Percentage Score for drawing the inferences. The study also highlighted the knowledge, adoption level and constraints faced by the respondents in the adoption of potato recommended cultivation technology.

This study was conducted with the following objectives:

1. To study the socio-economic status of potato growers.
2. To assess the knowledge level of potato growers with respect to package of practices.
3. To study the adoption level of potato growers with respect to package of practices.
4. To find out the constraints in adoption of improved cultivation practices faced by the potato growers.

1. To study the socio-economic profile of potato growers.

- Majority of the respondents (44.17 per cent) were found in the category of 26-50 years of middle age group, while34.16 per cent old age group and 21.17per cent young age.

- Majority of the respondents (74.16 per cent) were found belonging to Other Backward Caste (OBC), while19.16 per cent were found General category and 06.66 per cent Schedule caste/Schedule tribes
- Majority of respondents were found to be literate, while 06.66per cent respondents were illiterate.
- Majority of respondents (86.66 per cent) were found married, while 13.33 per cent respondents were unmarried.
- Majority of respondents (74.16 per cent) were living in joint family system, while 25.83 per cent were living in nuclear family system.
- Majority of respondents (51.66 per cent) were having large family size above 08 members in their family, while37.50 per cent respondents belonged to medium size of family (above 05-08 member) and 10.83 per cent respondents were belong to small size family up to 04 member.
- Majority of respondents (84.16%) were having pucca house, while 13.33 per cent had mixed type of house and 0.2.50 per cent kuchha house
- Majority of the respondents (75.83%) were engaged in agriculture on the basis of main occupation, while 12.50 per cent respondents were having agriculture with service occupation and 02.50 per cent respondents were belong to agriculture caste-based occupation.
- Majority of respondents (65.00%) were not having membership of any organization, while 30.83 per cent respondents were having membership in one organization and 04.16 per cent were having more than one organization.
- Majority of respondents (34.16%) were having medium land category 2-4ha while 10.83 per cent belonged to large land size above 04 ha.
- Majority of respondents (75.00%) were having electric tube well for irrigation, while 11.66 per cent respondents were having private tube well with diesel engine for the irrigation.

- Most of the respondents (100.00%) were having gas slender and mobile while 08.33 government water supply.
- Majority of respondents (88.33%) were having cycle while 21.66 per cent car/jeep taxi for transportation facility.
- Majority of respondents (52.50%) were having tractor while 02.50 per cent were having combine/harvester for agricultural practices.
- Majority of respondent (45.83 per cent) were having annual income of Rs- 1,00,000-2,00,000/
- Majority of respondents (65.00 per cent) preferred the neighbor/relatives and input distributors as a major source of communication and information.
- Majority of the respondents 57.50 per cent using news paper while 02.50 per cent were having using pamphlet/folder for mass communication.

2. To assess the knowledge level of potato growers with respect to package of practices.

1. Majority of the respondents (54.16%) were having high knowledge about use of recommended soil in potato crop and their mean value was 2.46.

2. Majority of the respondents (65.83%) reported low knowledge about soil pH for potato cultivation and their mean value was 1.44.

3. Majority of the respondents (58.33%) were having high knowledge about land preparation for potato cultivation and their mean value was 2.51.

4. Majority of the respondents (55.83%) were having low knowledge about soil testing for potato cultivation and their mean value was 1.68.

5.Majority of the respondents (60.83%) were having medium knowledge about improved variety of potato cultivation and their mean value was 2.04.

6. Majority of the respondents (48.33%) were having medium knowledge about recommended seed rate of potato cultivation and their mean value was 2.08.

7. Majority of the respondents (53.33%) were having low knowledge about seed treatment in potato cultivation and their mean value was 1.65.

8.Majority of the respondents (47.50%) were having high knowledge about time of sowing and their mean value was 2.39.

9. Majority of the respondents (46.66 per cent) were having medium knowledge about method of sowing in potato cultivation and their mean value was 2.18.

10. Majority of the respondents (42.50%) were having medium knowledge about seed size of potato and their mean value was 1.85.

11. Majority of the respondents (57.50%) were having medium knowledge about spacing of potato and their mean value was 2.01.

12. Majority of the respondents (52.50%) were having medium knowledge about FYM application and their mean value was 2.17.

13. Majority of the respondents (49.16%) were having medium knowledge about balanced chemical fertilizer in potato cultivation and their mean value was 1.95.

14.Majority of the respondents (56.66%) were having medium knowledge about water management and their mean value was 2.05.

15. Majority of the respondents (53.33%) were having medium knowledge about inter cultivation and weed control practices of potato crop and their mean value was 2.15.

16. Majority of the respondent (64.16 per cent) were having low knowledge about disease control of potato and mean value was 1.41.

17. Majority of the respondents (57.50%) were having low knowledge about insect- pest of potato and mean value was 1.50.

18. Majority of the respondents (52.50 per cent) were having low knowledge about crop rotation and mean value was 1.61.

19. Majority of the respondents (61.66 per cent) were having medium knowledge about harvesting of potato crop and mean value was 2.10.
20. Majority of the respondents (51.66 per cent) were having medium knowledge about yield of potato crop and mean value was 2.26.
21. Majority of the respondents (46.66 per cent) were having medium knowledge about storage of potato crop and mean value was 1.88.

3. To study the adoption level of potato growers with respect to package of practices.

1. Majority of the respondents (85.00%) were having fully adoption about recommended soil of potato cultivation and their mean value was 1.80.
2. Majority of the respondents (73.33%) were not done soil pH in potato cultivation and their mean value was 0.32.
3. Majority of the respondents (85.33%) were fully adopted land preparation for potato cultivation and their mean value was 1.85.
4. Majority of the respondents (69.16%) were never adopted soil testing and their mean value was 0.39.
5. Majority of the respondents (65.00%) were fully adopted improved practices in potato cultivation and their mean value was 1.57.
6. Majority of the respondents (64.16%) were fully adopted selection of recommended seed rate for potato cultivation and their mean value was 1.60.
7. Majority of the respondents (60.83%) were having never adopted about seed treatment in potato cultivation and their mean value was 0.50.
8. Majority of the respondents (76.66%) were fully adopted time of sowing practices in potato cultivation and their mean value was 1.65.
9. Majority of the respondents (70.83%) were fully adopted method of sowing in potato cultivation and their mean value was 1.65.

10. Majority of the respondents (46.66%) were fully adopted seed size in potato cultivation and their mean value was 1.32.
11. Majority of the respondents (65.00%) were fully adopted method of spacing in potato cultivation and mean value was 1.55.
12. Majority of the respondents (59.16%) were partial adopted FYM practices and their mean value was1.17.
13. Majority of the respondents (49.16%) were partial adopted balanced chemical fertilizer in potato cultivation and their mean value was 1.44.
14. Majority of the respondents (49.16%) were fully adopted water management and their mean value was 1.42.
15. Majority of the respondents (52.50%) were having partial adoption about inter-cultural and weed management of potato crop and their mean value was 1.27.
16. Majority of the respondents (51.16 per cent) were having partial adopted about disease control in potato crop and mean value was 0.60.
17. Majority of the respondents (50.83%) were having partial adopted insect-pest of potato crop and mean value was 0.58.
18. Majority of the respondents (42.50 per cent) were having never adopted crop rotation and mean value was 0.76.
19. Majority of the respondents (55.00 per cent) were having partial adoption proper harvesting of potato crop and mean value was 1.19.
20. Majority of the respondents (59.16 per cent0 were partial adopted about actual yield of potato crop and mean value was 1.19.
21. Majority of the respondents (63.33 per cent) were partial adopted storage practices and mean value was 1.08.

4. To find out the constraints in adoption of improved cultivation practices faced by potato growers.

- The majority of potato growers were reported unavailability of improved seed and subsidy is not provide, non-availability of chemical and fertilizer, seed treatment and unavailability of input on timely.
- The majority of potato growers were faced problem high wages and non-availability of labour of cultivation.
- The majority of potato growers were faced problem lack of electronic media contact.
- The majority of potato growers were faced problem lack of knowledge about post-harvest, lack of availability of quality HYV seed, lack of knowledge about disease resistant variety, low knowledge about chemical fertilizer and low knowledge about seed rate and spacing.
- The majority of respondents were reported high cost of improved implement and high cost of high yielding variety.
- Majority of the respondents were face lack of storage facility and fluctuation of market price.

Statistical analysis: -

Correlation coefficient (r) between independent variables and dependent variables (Knowledge and Adoption level)

- Concluded that the variables like “Home appliance” were low to high positive correlated with knowledge level and caste and age very low negatively correlation with knowledge level of respondents regarding potato crop cultivation.
- Concluded that the variables like “Age” were highly positive correlated with adoption level of respondents regarding potato crop cultivation.

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APPENDIX

SARDAR VALLABHBHAI PATEL UNIVERSITY OF AGRICULTURE & TECHNOLOGY
MEERUT -250110, (U.P) INDIA
Department of Agricultural Extension & Communication

Respondent No:- ……..

Interview Schedule

A study on knowledge and adoption level of improved cultivation practices among the potato growers in Meerut district of Uttar Pradesh

Date.....
Investigator.....

General information about the respondent: -

Name of the Respondent …….....
Father's name of the respondent.....
Contact No…….....
Village……..... Block.....
District..... Tehsil.....
State..... Pin code.....

A. Independent variables: -

I. Socio-economic profile of potato growers.

1. Age: -

S. No.	Age categories
1	Young age group years (up to 30)
2	Middle age group (31-50 years)
3	Old age group (above 50 years)

2. Caste: -

S. No.	Particulars	
1.	General	
2.	Other Backward Caste (OBC)	
3.	Scheduled caste/Scheduled tribe (SC/ST)	

3. Educational status:

S. No.	Particulars	
1.	Illiterate	
2.	Primary school	
3.	Middle school	
4.	High school	
5.	Intermediate	
6.	Graduate	
7.	Post Graduate & above	

4. Marital status: -

S. No.	Particulars	
1.	Unmarried	
2.	Married	

5. Type of family: -

S. No.	Particulars	
1.	Nuclear Family	
2.	Joint Family	

6. Size of family: -

S. No.	Particulars	
1.	Small (up to 4 member)	
2.	Medium (5-8 member)	
3.	Large (Above 8 members)	

7. Type of house:

S. No.	House	
1.	Kuccha house	
2.	Mixed house (Kuccha+ Pucca)	
3.	Pucca house	

8. Occupation: -

Sr. No.	Particular	
1.	Agriculture	
2.	Agriculture Labour	
3.	Agriculture with Caste-based occupation	
4.	Agriculture with Business	
5.	Agriculture with Service	

9. Social participation:

S. No.	Participation	
1.	No member of any organization	
2.	Member of one organization	
3.	Member of more than one organization	

10. Size of land holding: -

S. No.	Land holding (in ha.)	
1.	Marginal (below 1 ha)	
2.	Small (1 -2 ha)	
3.	Medium (2 – 4 ha)	
4.	Large (above 4 ha)	

11. Irrigation facility:

S. No.	Sources of Irrigation	
1.	Government Tube well	

2.	Diesel Tube well	
3.	Electric Tube well	

12. Material possession:

(a) House hold materials:

S. No.	Home Appliance type	
1.	Chair	
2.	Table	
3.	Fan	
4.	Electric press	
5.	Gas cylinder	
6.	Mixer grinder	
7.	Cooler	
8.	Hand pump	
9.	Government water supply	
10.	Electric hand pump	
11.	Dining Table	
12.	Dressing table	
13.	Refrigerator	
14.	Double bed	
15.	Mobile	
16.	T. V.	
17.	Toilet	

(b) Transportation facility:

S. No.	Particulars	
1.	Cycle	
2.	Motorcycle/Scooter	
3.	Bullock cart (Jota Buggy)	
4.	Tractor-Trolley	
5.	Car/Jeep/Taxi	

(c) Agricultural implements:

S. No.	Particulars	
1.	Tractor / Trolley	
2.	Cultivator	
3.	Harrow	
4.	Seed drill machine	
5.	Zero tillage machine	

6.	Leveller machine	
7.	Rotavator	
8.	Ridge maker	
9.	Thresher	
10.	Power tiller	
11.	Sprayer/ Duster	
12.	Pumping set	
13.	Potato planter	
14.	Potato digger	
15.	Sugarcane Planter	
16.	Combine/ Harvester	

13. Sources of communication:

(a) Extension contact:

S. No.	Extension worker	Frequency of contact		
		Mostly	Often	Never
1.	Neighbours'/ Relatives			
2.	Progressive farmer			
3.	KVK/SMS			
4.	Scientist University			
5.	Scientist I.C.A.R.			
6.	V.D. Os			
7.	D.H.O.			
8.	District Agricultural Officer			
9.	District P. P. O			
10.	Farmers fair			

(b) Mass media contact:

S. No.	Particulars	Extent of use		
		Always	Sometime	Never
1.	News paper			
2.	Magazines			
3.	Journals			
4.	Pamphlet/folder			
5.	Radio			
6.	Television			
7.	Mobile Phone			
8.	What's app			
9.	Face book			
10.	Internet			
11.	Kisan Call Centre			

14. Annual income:

S. No.	Particulars	
1.	Below Rs. 1,00,000	
2.	Rs. 1,00,001-2,00,000	
3.	Rs. 2,00,001-3,00,000	
4.	Above Rs. 3,00,001	

B. Dependent variables: -

II and III Knowledge and adoption level of potato growers with respect to package of practices.

Sr. No	Parameters	Knowledge			Adoption		
		Low	Medium	High	F.A.	P.A.	N.A.
1	**Recommended soil**						
A	Sandy loam soil						
B	Clay loam soil						
C	Clay soil						
2	**Soil ph. between 6-7**						
3	**Land Preparation**						
A	1-2 ploughing by the harrow						
B	4-5 ploughing with cultivator						
C	Planking done after each ploughing						
4	**Soil testing**						
5	**Improved varieties of potato**						
A	**Early variety**						
	Kufri Alankar						
	Kufri Jyoti						
	Kufri Chandramukhi						
	Other						
B	**Mid variety**						
	Kufri Badsah						

	Kufri Chipsona 1,3						
	Kufri Lalima						
	Other						
C	**Late variety**						
	Kufri Sindhuri						
	Other						
6	**Recommended seed rate**						
A	Early variety (20-25q/ha}						
B	Mid variety (25-30q/ha)						
C	Late variety (30-35q/ha)						
7	**Seed treatment**						
A	Mancozeb						
B	Bavistin						
C	Carbon disulphide						
D	Thiourea						
E	Other						
8	**Time of sowing**						
A	Early crop - 25th Sep. to 10th Oct.						
B	Mid-crop - 15th Oct. to 25th Oct.						
C	Late variety - 25th Oct. to 10th Nov.						
9	**Method of sowing**						
A	Planting on ridge						
B	Flat method						
C	Flat surface followed by ridge						
10	**Seed size**						
A	2.5-3.0 cm (25-30gm)						
B	2.5-5.5 cm (25-75gm)						
C	3.5- 4.0 cm (40-50gm)						

11	**Spacing(cm)**						
A	60 x15 cm						
B	60 x 20 cm						
C	60 x 25 cm						
12	**Farm yard manure application (25-30 t/ha)**						
13	**Chemical Fertilizers**						
A	Nitrogen-120 kg/ha in two splits						
B	Phosphorus- 240kg/ha						
C	Potash – 120kg/ha						
D	Others						
14	**Water management**						
A	1st irrigation after 5–7-day planting						
B	Subsequent irrigation 7–15-day interval						
15	**Inter-cultivation practices**						
A	**Weed management**						
	Manual Weeding						
	Fluchloralin (0.7-1.0 kg a.i /ha)						
	Pendimethalin (0.5 kg a.i /ha)						
	Other						
B	**Earthing up**						
	1st Earthing up done after 20-30 day						
	2nd Earthing up done after 40-45 day						
C	**Dehulming** (10-15 day before harvest)						
16	**Disease of potato and control**						
A	**Late Blight** (spray mancozeb 0.25% or chlorothalonil 0.2% in 500-600 liter water)						
B	**Early Blight** (spray mancozeb 0.2% or copper oxychloride 0.3%)						
C	**Potato Scab** (treatment by thirum or carbendazim 3gm/ kg seed)						
D	Others						
17	**Insect - Pest of potato**						
A	**White fly** (spray carbaryl or						

	trichlorfon 0.1% in 500-600 lit. of water)						
B	**White grub** (spray dimethoate 0.3% in 500-700 lit. water)						
C	**Thrips** (spray dimethoate 0.3% or 0.02% in 500-700 lit. water interval of 15 day)						
D	Other						
18	**Crop Rotation** (potato -maize – rice)						
19	**Harvesting (75 – 120 day)**						
20	**Yield**						
A	Early variety 20 – 30 t/ha						
B	Late variety 30 - 40 t/ha						
21	**Storage**						

(F.A: full adoption; P.A: partial adoption; N.A: non-adoption)

IV. To find out the constraints in adoption of improved cultivation practices faced by the potato growers.

Problems faced by potato growers (√)

Sl. No.	**Statements**	**YES**	**NO**
A.	**Input constraints as perceived by potato growers**		
1.	Unavailability of improved seed		
2.	Subsidy is not given on different agricultural inputs		
3.	Unavailability of required fertilizers and manures		
4.	Unavailability of recommended chemicals for seed treatment, insect control, pest control and disease control		
5.	Unavailability of inputs in time		
B.	**Supply constraints as perceived by potato growers**		
1.	High wages and non-availability of labour		
2.	Inadequate and irregular power supply		
3.	Insufficient irrigation water		
4.	Non availability of certified seeds		
5.	Non availability sufficient quantity of seeds		

C.	**Extension constraints as perceived by potato growers**		
1.	Lack of proper training		
2.	Lack of extension participation		
3.	Lack of extension contact		
4.	Lack of print media subscription		
5.	Lack of electronic media participation		
6.	Lack of motivation from extension institution / personnel		
D.	**Technological constraints as perceived by potato growers**		
1.	Lack of availability of quality HYV seeds.		
2.	Lack of knowledge about recommended dosage of plant protection chemicals		
3.	Lack of technical knowledge about recommended dosage of chemical fertilizer		
4.	Lack of knowledge about seed rate and spacing		
5.	Lack of proper knowledge about plant protection measures		
6.	Lack of knowledge of disease resistant varieties		
7.	Lack of knowledge about post-harvest technologies		
8.	Lack of knowledge about export quality produce		
9.	Lack of knowledge and skill about weed management		
10.	Lack of skill for seed and soil treatment		
E.	**Financial constraints as perceived by potato growers**		
1.	High cost of high yielding varieties		
2.	High cost of improved implements		
3.	High cost of irrigation		
4.	Higher electricity charges		
5.	Lack of credit on marginal interest		
F.	**Marketing constraints as perceived by potato growers**		
1.	Constant fluctuation in market price		
2.	Intervention of middlemen		
3.	Lack of storage facility		
4.	Lack of transport facility		
5.	Lower price at harvesting time		
6.	Absence of assured marketing at remunerative price and insurance facility		
7.	Malpractices of merchants in the mandies		
8.	Lack of export marketing in the area		

ABSTRACT

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Thesis Title: "A study on knowledge and adoption level of improved cultivation practices among the potato growers in Meerut district of Uttar Pradesh"

Advisor : Dr. V. K. Singh

ABSTRACT

The present study was carried out during the year 2020-2021, in Meerut districts of Uttar Pradesh. It was observed that 44.17 per cent potato growers were observed in the middle age category between 31 to 50 years, most of the 34.16 per cent potato growers were educated high school level, 74.16 percent belonging other backward caste, 86.66 per cent married, 74.16 per cent living in joint family system, 51.66 percent having large size of family, 84.16 per cent having pucca house, 34.16 per cent potato growers were belonged to medium and 30.83 per cent potato growers small land category, 75.83 percent potato growers possessed main occupation as farming, 30.83 per cent had membership in one organization, 75.00 per cent potato growers having private electric tube well, 45.83 per cent were belonging annual income group Rs. 1,00,001 to 2,00,000, 65.00 per cent potato grower mostly information from neighbors and relatives about new agricultural practices, maximum potato growers were always using a newspaper as a source of mass media contact.

The maximum potato growers were having medium knowledge about recommended package of practices in potato production; these were higher knowledge in land preparation and use of recommended soil in potato production.

The maximum potato growers had moderate level of adoption of recommended package of practices in potato production. These were higher in case of land preparation, selection of improved varieties and time of sowing.

Most of the potato growers faced constraints in adaptation of recommended package of practices in potato production were high wage and non-availability of labours, lack of proper training and lack of knowledge about plant protection chemicals.

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VITAE

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