# PERCEPTION OF FARMERS ON HIGH YIELDING VARIETIES OF RICE RELEASED BY ASSAM AGRICULTURAL UNIVERSITY- A STUDY IN GOLAGHAT DISTRICT OF ASSAM

A Thesis

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**By**

**VARNA MURALI**

**Regn. No. 44 of 2019**
**[Roll No. 2019-AMJ-76]**

**DEPARTMENT OF EXTENSION EDUCATION**
**COLLEGE OF AGRICULTURE**
**ASSAM AGRICULTURAL UNIVERSITY**
**JORHAT-785013**
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# ASSAM AGRICULTURAL UNIVERSITY
## Faculty of Agriculture

## CERTIFICATE – I

This is to certify that the thesis entitled **"Perception of Farmers on High Yielding Varieties of Rice Released by Assam Agricultural University- A Study in Golaghat District of Assam"** submitted to the Faculty of Agriculture, Assam Agricultural University in partial fulfillment for the degree of **Master of Science (Agriculture)** in **Extension Education** is a record of original research work carried out by **Ms. Varna Murali** under my personal supervision and guidance.

All help received by her have been duly acknowledged.

No part of this thesis has been reproduced elsewhere for any degree.

Dated, Jorhat
The ……December, 2021

(Sundar Barman)
Major Advisor
Assistant Professor
Department of Extension Education
Assam Agricultural University
Jorhat – 785013 (Assam)

# CERTIFICATE – II

This is to certify that the thesis entitled **"Perception of Farmers on High Yielding Varieties of Rice Released by Assam Agricultural University- A Study in Golaghat District of Assam"** submitted by **Ms. Varna Murali, Roll No. 2019-AMJ-76** to the Assam Agricultural University in partial fulfillment of the requirement for the degree of **Master of Science (Agriculture)** in the discipline of **Extension Education** has been examined and approved by the Student's Advisory Committee after viva-voce.

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| _____ | _____ |
| (Sundar Barman) | Chairman |
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Members of the Advisory Committee:

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| (P. Mishra) | (A. Baishya) |
| Professor & Head | Director |
| Department of Extension education | Post-Graduate Studies Assam |
| Assam Agricultural University | Agricultural University |
| Jorhat-785 013 (Assam) | Jorhat-785 013 (Assam) |

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# ABSTRACT

The present study was conducted in Golaghat district of Assam with the objectives to determine the perception of farmers towards AAU released high yielding varieties of rice and its correlation between the selected profile characteristic of the respondents and the problems faced by the farmers in cultivating HYVs of rice along with their suggestive measures.

A multistage purposive cum random sampling design was followed for selecting 120 respondents for the study. Appropriate statistical tools *viz.* frequency, percentage, arithmetic mean, standard deviation, ranking, Pearson's correlation, and chi-square were used to analyze and interpret the data according to the objectives.

The analysis of the profile characteristics of the farmers revealed that the majority (70.83 %) of the respondents belonged to the age group of 30 to 50 years and most of them (94.17%) were male, had high school education *i.e.*, 9 to 10 years of formal educational experience, belonged to OBC category (50.83 %), with a medium-sized family of 5 to 6 members (55.83 %), Agriculture was primary source of income for the majority (83.33%) with average annual income of ₹ 110437.50. Marginal landholders (less than 1 ha) were the majority (60.00%) in the study area with 80 to 100 per cent of the total operational landholding under rice cultivation with least scatteredness of land holdings. The average farming experience of the respondents was 26.57 years with an average cropping intensity of 147.32 per cent. A major proportion of the respondents (58.33%) had a medium level of innovativeness, degree of commercialization (81.67%), economic motivation (63.33%), extension contact (70.00%), and mass media exposure (70.83%) with the highest extension contact with farmers' organizations and television was the highest utilized mass media. Irrigation facility was not available for the majority (79.17%) of the respondents. Most of them were having a medium degree of farm mechanization, a medium level of labour availability (6-12 number of labour), and a medium level of infrastructural facilities. Around 83.33 per cent of the total rice acreage (90.00 ha) in *Sali* season was occupied by HYVs of rice released by AAU. The dominating varieties in the study area were Ranjit, Ranjit Sub-1, Mahsuri and Bahadur Sub-1 in terms of percentage share of area and percentage adopters. The majority of the farmers had a moderate level of perception on quality of high yielding varieties of rice released by AAU. Greater productivity, climatic adaptability and good cooking quality and taste were the quality traits highly perceived by the farmers. Bina Dhan-11, Keteki Joha, and Ranjit Sub-1were the varieties perceived as high by the farmers in terms of quality dimensions. Annual income, caste, occupation, degree of land scatteredness, innovativeness, commercialization, economic motivation, extension contact, mass media exposure, the status of infrastructural facilities and family labour were found to have a significant association on perception level of farmers towards HYVs of rice. Fluctuating market price, uncertainty in rainfall, high cost of inputs, lack of irrigation, etc. were some of the severe problems faced by the farmers of the study area in the cultivation of HYVs of rice. It is discovered from the study that the majority of people have a moderate perception on quality dimension of HYVs of rice released by AAU.

To popularize the highly perceived high yielding varieties, the extension system should put sincere efforts for promotions through large-scale demonstrations, training, awareness programmes, etc. The varieties having a low level of perception need to be refined and recast quality.

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| | | |
|---|---|---|
| - | : | Minus |
| % | : | Percent |
| & | : | And |
| + | : | Plus |
| < | : | Less than |
| = | : | Equal to |
| > | : | Greater than |
| ° | : | Degree |
| ₹ | : | Rupees |
| $\chi^2$ | : | Chi-square |
| A | : | Agree |
| AAU | : | Assam Agricultural University |
| ADO | : | Agricultural Development Officer |
| AES | : | Agro Ecological Situations |
| APART | : | Assam Agribusiness & Rural Transformation Project |
| ATMA | : | Agricultural Technology Management Agency |
| BVZ | : | Barak Valley Zone |
| C.V. | : | Coefficient of Variation |
| CBVZ | : | Central Brahmaputra Valley Zone |
| E | : | East |
| *et al.* | : | And others |
| etc. | : | Et cetera |
| F | : | Frequency |
| Fig. | : | Figure |
| FMC | : | Field Management Committee |
| FPC | : | Farmer Producer Company |
| FPO | : | Farmer Producer Organization |
| GDP | : | Gross Domestic Product |
| GSDP | : | Gross State Domestic Product |
| $H_0$ | : | Null Hypothesis |
| $H_1$ | : | Alternative Hypothesis |
| ha | : | Hectare |
| HYVs | : | High Yielding Varieties |
| HZ | : | Hill Zone |
| *i.e.*, | : | That is |
| IMV | : | Improved Maize Varieties |
| KVK | : | Krishi Vigyan Kendra |
| LBVZ | : | Lower Brahmaputra Valley Zone |
| MV | : | Modern Varieties |
| MWS | : | Mean Weightage Score |
| N | : | North |

| | | |
|---|---|---|
| N | : | Total sample size |
| n | : | Sample size |
| NBPZ | : | North Bank Plains Zones |
| NIRV | : | New Improved Rice Varieties |
| OBC | : | Other Backward Class |
| p | : | Probability |
| r | : | Pearson's Correlation coefficient |
| RARS | : | Regional Agricultural Research Station |
| S. D. | : | Standard Deviation |
| SC | : | Scheduled Caste |
| SD | : | Strongly Disagree |
| Sl. No. | : | Serial Number |
| ST | : | Scheduled Tribe |
| TV | : | Television |
| UBVZ | : | Upper Brahmaputra Valley Zone |
| UD | : | Undecided |
| *viz.* | : | Namely |
| VLEW | : | Village Level Extension Worker |

# CHAPTER I

# INTRODUCTION

Rice is the important staple food in many states, among the major food grains grown in India. India occupies the second position in terms of total world rice production. Rice is the staple food of people of eastern and southern parts of India and it accounts for 20.00 per cent of all world rice production. The gross value of the output of paddy was ₹187 thousand crores during the period of 2018-19 and it constitutes about 51.6% of total cereals (Anon., 2021).

India had the highest rice export volume in the world in 2020-21andexported17.7 million tonnes of rice. According to the Ministry of Commerce, India's annual export was worth ₹65,000 crores, and reach about 75 countries (https://agriexchange.apeda.gov.in/indexp/Globalexport/India_Export_Statistics.aspx, 2021). Mainly India exports rice to countries like Saudi Arabia, UAE, Senegal, Iran, Iraq, South Africa, etc.

The gross area under rice in India was 43.8 million hectares as per the fourth advanced estimates, 2019-20. Production of rice in India was 118.4 million tonnes with a productivity of 2705 kg/ha during the 2019-20 period. West Bengal is the largest producer of rice in India with a contribution of 13.15 per cent to the total rice production of the country followed by Uttar Pradesh (13.11%) and Punjab (9.95%). Uttar Pradesh has the highest area under rice (5.74 million hectares) followed by West Bengal and Odisha. Punjab has the highest productivity in rice with a productivity of 4035 kg/ha. The state of Assam is the tenth largest producer of rice in the country with a production of 5.10 million tonnes which constitutes 4.3 per cent of the total rice production of the country. In terms of area, Assam occupies the eighth position with an area of 2.27 million hectares. The per cent share of area under rice in Assam to the total area under rice in India is 5.19 (Anon., 2020a).

**Rice Production in Assam**

Agriculture is of prime importance to Assam as it directly or indirectly employs 70 per cent of the population. It has a fundamental role in the state's economy, accounting for 15.6 per cent of the Gross State Domestic Product (GSDP) during 2019-20. Rice is one of the major providers to the agricultural GDP in the state and hence plays a

crucial role in the states' economy. It provides both food and nutritional security to the people residing in the state. Rice cultivated in an area of 2.4 million hectares which occupies more than 90 per cent of the area under total food grains and produced 5.21 million tonnes with a percentage share of 4.38 to the Indian rice production (Anon., 2020b).

Assam has three unique rice producing seasons due to agro-climatic changes and agriculture's reliance on rainfall: *Ahu* or autumn rice (March/April to June/July); *Sali* or winter rice (June/July to November/December); and *Boro* or summer rice (November/December to May/June). Also, the state is divided into six agro-climatic zones namely: North Bank Plains Zones (NBPZ), Upper Brahmaputra Valley Zone (UBVZ), Central Brahmaputra Valley Zone (CBVZ), Lower Brahmaputra Valley Zone (LBVZ), Hill Zone (HZ), and Barak Valley Zone (BVZ). Further, based on the variations in climate, soil, physiography, flood proneness, socio-economic, and cropping pattern, the districts in the state are again divided into various agro ecological situations. We can observe wide variations in the cultivation practices, varieties used across these zones, and agro-ecological situations.

**Role of High Yielding Varieties**

High yielding varieties of rice along with wheat have been at the heart of the "green revolution" in India and it has made India self-sufficient in food grains. The contributions of the various breeding programs conducted over the years to ensure national food security are significant. The Green Revolution which had occurred during the 1960s to 1980s had helped India to escape from starvation. The rice yield in India had increased immediately after the introduction of HYV in 1966, from 668 kg/ha in 1950-51 to 1032 kg/ha in 1967-68. As of 2019-20, it has increased to 2075 kg/ha. Now India is not only self-sufficient in the production of rice, but also the largest exporter of rice in the world. Adoption of HYVs had a significant role in attaining this position. The area under HYVs of rice in India was 7100 hectares in 1965-66 which has increased to 8.88 lakh hectares, accounting for 2.5 per cent of the total rice area in 1966-67 and it had increased gradually over the subsequent years. This reached up to 54.10 per cent of the total rice area in 1983-84 (Dalrymple, 1986). From the post green revolution era, the area under HYV of rice has been increasing every year.

From 1988-89 to 2005-06, the area covered under HYV of rice in Assam has increased marginally but steadily (Sharma & Sharma, 2015). In 2005-06 the area

covered by HYVs of rice accounted for 59.90 per cent of the total rice cropped area with an area of 14.50 lakh hectares. This has increased to 80 per cent of the total rice area with a total of 19.24 lakh hectares under HYV of rice in the year 2019-20.The HYV seeds are extensively grown in winter paddy, among the three rice seasons in the state. During 2019-20 winter paddy accounted for around 78.9 per cent of the area under HYVs of rice. Even though winter paddy constitutes the highest area, HYV seeds used in summer paddy showed the highest average productivity compared to the other two seasons. This can be because *Boro* rice season is relatively risk-free compared to the flood affected *Ahu* and *Sali* rice seasons which enable the farmers to adopt the improved cultivation practices (Anon., 2020b).

The Golaghat district of Assam has the highest area under high yielding varieties among the districts of the upper Brahmaputra valley zone. Also, the district is having the second largest area under HYVs of rice among the 33 districts of Assam. Golaghat district had an area of 115704 ha under high yielding varieties which constituted 5.85 per cent of the total area under HYVs of rice in 2019-20 (Anon., 2020b).

Since its establishment, Assam Agricultural University (AAU) has given great attention to narrowing the technological gap in rice cultivation in Assam. Assam Agricultural University is putting efforts to develop improved high yielding rice varieties which will help in increased production and productivity. The Directorate of Research (Agriculture) of Assam Agricultural University is conducting and coordinating various research activities in the field of Agriculture. To meet the diverse needs of the farmers and to develop suitable technologies the major crops including rice is studied extensively. Assam Agricultural University has developed many location specific widely accepted varieties and technologies especially in rice and AAU was able to develop 55 rice varieties through extensive research on plant breeding and genetics.

The development and spread of High yielding Varieties have undoubtedly contributed significantly to the increased food grain production over the years. The wide ranging breeding programmes have resulted in the development of many rice varieties that are widely adopted by farmers all over the state. Around 80 per cent of HYV coverage in the state is by varieties developed by AAU. Of the total 113 crop varieties released by AAU, 55 belong to rice, and many farmers have adopted and replaced traditional varieties with these AAU bred HYVs. Besides, some other varieties are under trial and on verge of notification by the department of agriculture.

Some of the high yielding varieties released by AAU have the potential to give 5-7 t/ha, provided the recommended practices have been followed. As, Assam is a chronically flood affected state, AAU have developed varieties that have submergence tolerance to protect the farmers from the crop damage and financial loss. Also, these varieties have the potential to attain the nutritional security of the state. Some of the important high yielding varieties and their specific characteristics are presented in Table 1.1.

**Table 1.1: Few High Yielding Varieties of rice released by AAU**

| Varieties | Adaptability |
|---|---|
| Ranjith Sub-1, Swarna Sub-1, Bahadur Sub-1 | Varieties having submergence tolerance up to 2 weeks |
| Luit, Kapilee, Disang, Dikhow and Kolong | Very short duration varieties (90-100 days duration) developed for growing as pre-flood *Ahu* as well as post-flood late *Sali* in flood endemic areas of Assam. |
| Jalashree, Jalkunwari and Plaban | Varieties that can withstand submergence for upto 15 days and are suitable for growing in the flash flood situation |
| Dehangi, Rongkhang and Inglonkiri | Varieties suitable for growing in hill regions of Assam under direct seeding stress condition |
| Chakra lahi, Diphalu, Dhansiri and Manah | High yielding long duration varieties suitable for growing in a waterlogged situation up to 50cm |
| TTB-404 and Gitesh | High Zn of as high as 45 ppm, |
| Keteki Joha | Improved premium or scented rice variety, which got popularity in the export market of the nation |
| Gitesh and Prafulla | Varieties suitable for staggered planting up to 60 days |
| Joymati and Kanaklata | Varieties with cold tolerance ability |
| Shraboni and Mulagabhoru | High yielding and multiple resistant medium duration varieties |

Source: Package of practices, *Kharif* and *Rabi,* AAU& Department of Agriculture, 2019

## 1.1 Statement of the problem

Even though the productivity of rice in the state is increasing over the years, the productivity of rice in Assam (2243 kg/ha) is less than the national average (2705 kg/ha). Deka and Devi (2014) proposed that as there is limited scope to increase the area under the crop due to the urbanization of the state, the solution to meet the food requirements of the state with an ever-increasing population is to increase the per capita productivity of the land. Recurring floods in Assam, submergence, drought, insufficient irrigation system, pest and disease incidence, lower resource base, etc. are the obstacles to

achieving higher productivity. So the solution is to cultivate the High Yielding Varieties suited to various agro-climatic situations on a large scale to increase the unit area production.

Assam Agricultural University has developed many location specific high yielding rice varieties over the years. Every year a good amount of funds have been reserved for and spent for research on developing improved rice varieties. The positive outcome from these researches will help to improve the rice productivity and get additional income to the farmers. But all the varieties have not been perceived and adopted well. This can be because breeders fail to take into account the perception of farmers on the variety in the development process. The researchers' or breeders' criteria for developing a variety and the farmers' criteria for choosing a variety can be often conflicting. Farmers develop a perception about a variety with his/her existing situations. They will compare a new variety with the existing varieties; analyze its relative advantages with existing varieties, compatibility with existing resource situations, the complexity of the cultivation practices, trialability, and observability of its effects. After developing a positive or negative perception by judging, understanding, and interpreting all these factors, they will decide to accept a variety or reject it. Hence, farmers' perceptions about the quality characteristics of the HYVs play a key role in choosing them over traditional varieties and it is interwoven with socio-economic and technical factors. The study will reveal the perception about the relative advantage of different attributes of the high yielding varieties and the breeders can incorporate these highly perceived characters into their various development programmes. Better perception of farmers towards HYVs of rice will positively influence its adoption. On studying the perception we will get information regarding the varieties which need refinement and recasting. The varieties with perceived high quality traits will get penetrated the farm community easily resulting in better production and productivity and increased income of farmers. So, it is important to know the perception of farmers towards these High Yielding Varieties.

Therefore, in this situation, a few researchable questions that arise are:

- How do the farmers perceive towards HYV of rice as compared to traditional varieties?
- What may be the problems faced by farmers in growing HYV of rice?
- Is there any relationship between the profile of farmers and their perception of the HYV of rice?

So, to find the answers to these aspects the proposed study with the title "Perception of farmers on High Yielding varieties of rice released by Assam Agricultural University- A study in Golaghat District of Assam" was carried out with the following objectives:

**1.2: Objectives of the study**

1. To determine the perception of farmers towards AAU released HYV of rice.
2. To study the correlation between the selected profile of the farmers and their perception towards HYV of rice.
3. To analyze the problems faced by the farmers in cultivating HYV of rice along with their suggestive measures.

**1.3 Scope and importance of the study:**

- The study will bring focus into various problems faced by farmers that may help Government planners and extension agencies to move towards developmental efforts to solve their problems
- The study will help to understand their views on the HYV of rice released by AAU. This may provide important clues whether farmers like to grow local varieties or HYV of rice.
- It will help the breeders to develop rice varieties as desired by farmers.

**1.4 Limitation of the study**

The present study was subjected to the following limitations:

- As the researcher is a post graduate student, the study had been restricted in time and resources. As a result of that and also due to the COVID-19 pandemic, the investigation had been limited to only one district of Assam.
- As the investigation was done only in six villages from the Golaghat district of Assam, the findings derived from the study may not be generalized to a larger area but can be applied to the area where a similar situation exists.
- Some people might have hesitated to respond correctly to certain scenarios of the study.
- The responses provided by the respondents may not be completely free of their personal biases.

## 1.5 Organization of the thesis

This manuscript is constructed in five major chapters. The first chapter "Introduction" consists of the preface, objectives, scope, and limitations of the study. The second chapter "Review of literature" deals with the relevant past literature reviewed by the investigator before and during the investigation process to gain knowledge on the methodology and other aspects which were necessary to complete the study. The third chapter "Research methodology" covers the methodology and procedures employed to carry out the study effectively. The fourth chapter "Findings and discussion" is presented with the findings obtained from the study along with tables, figures, and appropriate discussions. The last chapter consists of the summary and conclusion of the study. In the end, the bibliography and appendices have been presented.

# CHAPTER II

# REVIEW OF LITERATURE

This chapter covers the review of relevant past research works that have been conducted, related to the present study on the perception of farmers towards HYVs of rice. A thorough evaluation of the literature is required for each scientific inquiry to support the different components of the investigation and to have an understanding of the general background of the study. A detailed review of the literature is also helpful in operationalizing the concepts and developing the appropriate methodology for the study. The collected and reviewed published literature in the form of books, journals, published and unpublished thesis, and digitalized web pages on the study's theme are presented. To achieve the intended goals scientifically, an effort has been made to study and review all pertinent literature. The literatures reviewed are presented under the following heads:

2.1 Perception of farmers

2.2 Profile characteristics of farmers

2.3 Relationship between selected profile characteristics and perception of farmers

2.4 Problems in cultivating High Yielding Varieties

2.5 Suggestions of farmers for overcoming the problems

**2.1 Perception of farmers**

Van den Ban and Hawkins (1998) defined perception as the process through which our senses organize and interpret information received in order to form an understanding of the environment. It is a set of processes by which a person analyzes information and interprets it based on their past experiences. Duvel (1975) described perception as a fundamental variable in the behavioural change process.

Reddy and Ramesh (1978) from their study on Evaluative perceptions of Ragi growing farmers about High yielding ragi varieties in Karnataka discovered that perceptions of the farmers growing high yielding varieties indicated many advantages of these varieties over the local varieties.

Sall *et al*. (2000) demonstrated that in addition to farm and farmers' characteristics, perception of farmers on technology specific qualities have a significant impact on adoption decisions for improved rice varieties.

Kshirsagar *et al*. (2002) stated that adoption decisions of any new technology like that of improved varieties are mainly governed by the perception of farmers regarding the performance of new technology in comparison to that of existing technology.

Sahoo (2005) found that farmers had as a whole mixed perception towards the advantages of hybrid rice. The respondents' mean score value suggested that they had a better understanding of the benefits of hybrid rice, such as its ability to respond to fertilizer, high yield, more grain in panicle, high tillering, and low seed rate. 46.16 per cent and 57.69 per cent of the respondents had poor perception respectively on easy to cultivate and less pest and disease attack about hybrid rice. It was also found that respondents had a satisfactory perception of ecological conditions for hybrid rice cultivation. The perception of rice growers on extension support was very poor and they had a low perception towards government policy support in the adoption of hybrid rice cultivation.

Joshi and Pandey (2006) from the study in rainfed areas of Nepal found that an economic model including farmer perception variable was the prime factor in explaining adoption behaviour than the usual socio-economic variables. They suggested that extension strategies that provide accurate information for efficient revision of farmer perceptions are needed to increase the adoption rate.

Efisue *et al*. (2008) observed that including farmers' perception into crop breeding as a means of fostering variety adoption was cost-effective in terms of delivering the correct varieties and technology to farmers. By involving farmers early on, ensures breeding goals and variety selection criteria were made based on their preferences for varietal characteristics and crop management practices.

Pathak and Sharma (2008) from their study on farmers' perception of suitable upland '*Ahu*' rice varieties in Assam found that any upland '*Ahu*' rice variety that farmers in the study area would accept should be high yielding, non-lodging, semi-tall (120 cm), early maturing (100 days) with quick early vigour, deep green leaves, well exerted long and heavy panicles, reasonable seed dormancy, desired grain quality, and resistance to rice gundhi bug, stem borers, blast, and brown spot disease. The study also found that perception of farmers of a variety's suitability, even for similar growing environments; can differ due to ethnocultural diversity, implying that when deciding breeding goals, ethnocultural settings should be considered alongside agro-ecological parameters of the target environments.

Bagri (2011) on the estimation of farmers' perception on the utility of seed village programme found that majority (51.67%) of the respondents had moderately favourable perception, followed by 26.67 per cent of the respondent had highly favourable perception and 21.66 per cent of them had unfavourable perception regarding the utility of seed village programme conducted in Rewa block.

Patel *et al.* (2011) discovered from their study on Perception of the farmers about the transfer of technology system in North Gujarat that majority (62.50%) of the farmers perceived the transfer of technology system as useful, while around 24.17 per cent perceived it was less useful and only 13.33 per cent farmers as more useful.

Saikia and Barman (2014) from their study on measuring perceptions of recommended technologies of *Sali* rice by farmers of Assam found that a majority of the respondents perceived the recommended practices like variety, seed selection, field preparation, compost application, transplanting age, depth of planting of seedling, and manual intercultural operations to be relatively beneficial. The majority of the respondents perceived recommended practices like seed treatment, line transplanting, number of seedlings per hill, water management practices and plant protection measures were complex.

Shamna (2014) in her study found that the majority of respondents (40.13%) had a high perception on the attributes of Pokkali Rice followed by low (30.00%) and medium (29.87%) perceptions on attributes of Pokkali rice farming

Nagaraj (2015) in his study entitled 'Perception and Knowledge of Paddy growers towards improved production technologies in Tungabhadra project area of Karnataka found that 42.22 per cent of paddy growers had a high level of perception, whereas 32.78 and 25.00 per cent of paddy growers had a medium and low level of perception towards improved production technologies, respectively.

Dharmendra (2016) from the study on perception of paddy growers on SRI technology found that the majority of the paddy farmers (45.84%) had a high perception about SRI technology, while 32.50 per cent of the farmers showed medium perception and 21.66 per cent of them had low perception about SRI technology. On analysis of the perception of farmers on different aspects of SRI technology, it was found that economic viability was perceived first with a mean perception score of 1.63, followed by insect and disease management (1.51), nutrient management (1.48), transplanting (1.39), nursery management (1.33), seed management (1.25), mortality (1.13), labour requirement (1.07),

water management (1.06) and weed management with the lowest mean perception score of 0.98.

Anandrao (2017) on studying the perception of farmers towards dryland agricultural technologies recommended found that the majority of the respondents had a medium level of perception of dryland agricultural technology, while one-fourth (25%) had a low level of perception and 23.33 per cent of them had a high level of perception.

Beyene (2019) on studying the perception of farmers for improved maize varieties on local maize variety found that yield potential, shattering resistance characteristics, disease resistance characteristics, and market characteristics were the most perceived preference attributes of improved varieties of maize.

Kumari (2020) in her study revealed that a higher per cent *i.e.*, near to half about 49.37% of respondents had a favourable level of perception followed by the rest with a least favourable level of perception 31.87% and 18.75% of the most favourable level of perception towards rice-wheat cropping system.

**2.2 Profile characteristics of Paddy farmers**

**2.2.1 Age**

Sahoo (2005) according to his study reported that half of the rice farmers (50.00%) were in the age group of 36 to 50 years followed by 26.83 per cent of the rice farmers in the old age group and 23.07 per cent of the farmers belonged to young age group.

Kumawat (2010) from his study conducted in Shahdol district of Madhya Pradesh on adoption behaviour of farmers in the system of rice intensification (SRI) practices of paddy cultivation reported that the majority of the rice farmers (45.83%) belonged to the young age group (less than 35 years) followed by 35.84 per cent of farmers in the middle age group of 35 to 55 years and rest of the farmers (18.33%) in old age group (greater than 55 years).

Bagri (2011) indicated that the majority (43.20%) of the respondents were middle aged, followed by 34.40 per cent of the respondents in the young age group and 22.40 per cent of them in the old age group.

Farida *et al.* (2011) observed that 45 per cent of the System of rice intensification (SRI) rice farmers were over 45 years old, followed by 40 per cent farmers

in the age group of 35 to 45 years, 9.7 per cent of the farmers in the age group of 25 to 35 years and 5.3 per cent in the 20 to 25 years category.

Saikia and Barman (2014) found that the majority of the respondents in the study area belonged to the age group of 36-50 years, followed by 36.67 per cent of the respondents who belonged to 51 years and above and 15.83 per cent of them belonged to up to 35 years of age group.

Shamna (2014) found out that majority of the Pokkali rice farmers were of the middle age group (55%), followed by 38.33 per cent farmers in the old age group and the remaining were young age group (6.67%).

Adedoyin *et al.* (2016) reported from their study that the average age of farmers engaged in rice cultivation was 54 years. This finding indicates that rice cultivation is mainly managed by older farmers in the area. It suggests that the rice farmers in the area were not in their prime working years.

Aanandrao (2017) in his study revealed that 54.17 per cent of the respondent dryland farmers were of the middle age group (36 to 55 years) followed by 25.83 per cent of them in the young age group (up to 35 years). Two fifths of the respondents (20.00%) belonged to old age group (56 years and above) category.

Sharma (2019) found that the majority (56.43%) of the respondents belonged to the age group of 41-53 years, while 27.14 per cent of the respondents belonged to 54 years and above category and 16.43 per cent of the respondents who belonged to 41 to 53 years age group.

Wakhet (2019) discovered that 60.84 per cent of the respondents were of age group 39 to 59 years, followed by 20.83 within the age group of 60 and above and 18.33 per cent within the age group of 27 to 38 years.

### 2.2.2 Gender

Efisue *et al.* (2008) from their study on farmers' perceptions on rice varieties in the Sikasso region of Mali and their implications for rice breeding found that in upland regions majority (85%) of the rice farmers were male, while the lowlands (64%) and irrigated (54%) ecologies were dominated with the female.

Habiba *et al*. (2012) found that majority of the farmers were male in all categories. In both irrigated and non-irrigated areas, 88 per cent and 82 per cent of owner

farmers, 79 per cent and 87 per cent of owner-cum-tenant farmers, and 75 per cent and 67 per cent of tenant farmers were male.

Adedoyin *et al*. (2016) from their study on the effect of improved high yielding rice variety on farmers' productivity reported that a high majority (94.6%) of the rice farmers were male compared to only 5.4 per cent of females. They inferred that the reason for this could be that men farmers have a significant role in their households as the breadwinners and providers of all other necessities.

Abebrese *et al*. (2019) from the study conducted in Gana for finding farmer preferred traits and potential for adoption of hybrid rice reported that the majority of the farmers were male. Male farmers constituted 76 per cent of the sampled population and 24 per cent of the farmers were female.

Wakhet (2019) revealed in the study on Paddy farmers' perspective towards sustainable practices in Agriculture: A study in Tinsukia district of Assam that a huge majority *i.e.,* 98.34% of the farmers involved in paddy cultivation were male. Only 1.66% of the respondents constituted females.

**2.2.3 Education**

Sahoo (2005) observed that majority of the respondents (42.31%) had high school education, while 34.62 per cent of the respondents had education at the college level, 19.22 per cent of the respondents had primary level education, and the remaining 3.85 per cent of the respondents had middle school education.

Kumawat (2010) found from his study that the majority of the paddy farmers (26.67%) had high school level education, followed by 20 per cent of the paddy farmers who were illiterate, 16.67 per cent of the farmers were having education up to middle school, whereas 15 per cent of the farmers had primary school education, 11.67 per cent of paddy farmers were having an educational level of college and above and the last 10 per cent of the farmers were having higher secondary level education.

Bagri (2011) observed that the majority (34.40%) of the respondents had up to middle school education, whereas 28.80 per cent of the respondents had only up to primary school education. 19.20 per cent of them had an education of high school level and above and 17.6 per cent of the respondents were illiterate.

Shamna (2014) from her study discovered that majority of the Pokkali rice farmers were having high school education (47.5%), followed by higher secondary

(25.83%), Primary school(17.5%), functionally illiterate(7.5%), and graduation and above(1.67%).

Adedoyin *et al.* (2016) conducted a study in Mada, Malaysia on the effect of improved variety on farmers' productivity and found that majority of the rice farmers had an educational level of 9 years.

Anandrao (2017) found that half (50.00%) of the respondents were educated up to secondary school level, while 24.17 per cent of the respondents were educated up to higher secondary level remaining 19.17 per cent respondents had received graduate and post-graduate, 05.83 per cent respondents had received primary education and only 0.83 per cent of respondents were illiterate.

Sharma (2019) discovered from the study conducted among paddy growers of the Upper Brahmaputra valley zone of Assam that 46.07 per cent of the paddy farmers had high school education, followed by 30.71 per cent of the paddy farmers who had minimum education up to primary school. 16.43 per cent of the paddy farmers had higher secondary education and only 6.79 per cent of them had graduation/ post-graduation.

Wakhet (2019) observed that majority of the respondents were educated up to middle school level, 30.00per cent of the respondents were educated up to high school level, 15.83 of them were educated up to primary school level, 9.17 per cent of the respondents were educated up to higher secondary level, 8.33 per cent were able to read and write and 2.50 per cent of the respondents were graduates and there was no illiterate respondents.

**2.2.4 Caste**

Sahoo (2005) revealed that a higher majority (80.77%) of the respondents belonged to the general caste and 19.23 per cent of the respondents belonged to the backward caste. He inferred that as rice cultivation requires more area compared to vegetables, fruits, fishery, animal enterprises, it is not frequently chosen by the lower classes. According to the study, rice growing is practiced by upper-class persons who own more land.

Bagri (2011) reported that the majority (38.40%) of the respondents were of general category, 27.2 per cent of the respondents belonged to other backward castes (OBC) category, followed by 19.20 per cent of them in the scheduled tribe category and 15.20 per cent of them were belonging to scheduled caste category.

Dharmendra (2016) reported in his study that 34.00 per cent of the respondents belonged to the schedule tribe category followed by 24.18 per cent in the general category, 21.66 per cent belonged to the OBC category and 20 per cent of them belonged to the scheduled caste category.

**2.2.5 Family Size**

Kumawat (2010) reported that the majority of the rice growers (56.67%) belonged to joint family type and the rest 43.33 per cent of the rice growers belonged to nuclear families. It can be stated that the majority of paddy growers belonged to the joint to nuclear family size category.

Bagri (2011) found that the majority (39.20%) of the respondents had a medium sized family with 5 to 7 members, 32.80 per cent of them had a high family size with above 7 members and 28.00 per cent of them had a low family size of up to 4 members.

Adedoyin *et al.* (2016) from the analysis of socio-economic variables for the study conducted in Mada, Malaysia on the effect of improved high yielding varieties on farmers' productivity found that the average household size of rice farmers was 5.07 per home.

Anandrao (2017) found that in the study area majority of the respondents (50.83%) had a medium size of family with 5 to 9 members, followed by 33.33 per cent of the respondents with a small size of family with up to 4 members and the remaining 15.83 per cent of the respondents with large size of family with 10 and more number of family members.

Darshan (2018) observed that the majority (60.83%) of the farmers were having medium size family with 5-7 members, while 35.00 per cent of the farmers were having a small family with less than 4 members and 4.17 per cent of them were having a large family size with more than 7 members.

Sharma (2019) observed that the majority of the respondents (62.50%) had a family size of 5 to 7 members followed by 24.28 per cent of the respondents who had a family size of less than 5 members and only 13.21 per cent of them had a family size of 7 or more members.

Wakhet (2019) reported that majority (75.83%) of the respondents had a family size of 4-6 members, followed by 21.67 per cent respondents with more than 6

members in the family and the remaining 2.50 per cent of the respondents had family size with less than 4 members.

Medhi *et al*. (2020) revealed that the majority of the respondents (70.00%) had medium family size with 4-6 members followed by 21.67 per cent of the respondents who had large families with 7 and more members and the remaining 8.33 per cent of the respondents had small family size with up to 3 members.

**2.2.6 Occupation**

Bagri (2011) observed that the majority (41.60%) of the respondents' occupation was agriculture. 38.80 per cent of the respondents took up agriculture and labour as an occupation while the rest of the 21.60 per cent of the respondents were depending on agriculture and other occupation for earning their livelihood.

Barik (2013) found that the majority (68.33%) of the respondents were entirely dependent only on agriculture while 13.33 per cent of the respondents were involved in both farming and labour, 10 per cent of the respondents were involved in both farming and business and the remaining 8.33 per cent of the respondents took up their caste occupation along with farming.

Goyari (2014) reported that the study region was predominantly agrarian, with agricultural workers accounting for roughly 91% of all workers. The occupational diversity of the area was very limited.

Sharma *et al*. (2015) reported from their study that only cultivation was the most common occupation among participants (76.67%) and non-participants (75.00%), followed by cultivation + business among participants (11.67%) and cultivation + skilled labour among non-participants (18.33%).

Abebrese *et al*. (2019) found that in the study area, the primary occupation of the majority of the respondents (95.00 %) was agriculture. Three per cent of the respondents were teachers, while 2 per cent of them were craftsmen and one per cent of the respondents were engaged in petty trading.

Dhanraj (2019) observed that the majority (76.67%) of the respondents in the study area engaged only in farming. Around 8.33 per cent of the respondents had a job in the service sector along with agriculture, while 6.67 per cent of the respondents were engaged in caste occupation along with agriculture followed by 5.00 per cent of the

respondents who were engaged in agriculture along with labour and only 3.3 per cent of them were engaged in business along with agriculture.

Medhi *et al*. (2020) from their study conducted in the West Garo Hills district of Meghalaya found that farming was the primary occupation of the majority of the respondents.

**2.2.7 Annual Income**

Sahoo (2005) found that in the study area majority of the rice farmers had a better annual income and only 3.85 per cent of the respondents had income less than ₹10000.

Bagri (2011) observed that the majority (46.40%) belonged to the medium annual income category, followed by 32.80 per cent of the respondents belonging to the low annual income category and 20.80 per cent of them were in the high annual income category.

Barik (2013) reported that the majority (52.50%) of the respondents were having medium income ranging from ₹1-2 lakhs followed by 31.70 per cent of the respondents having a high level of income and 15.80 per cent were having a low level of income.

Sharma *et al*. (2015) from the study conducted in Assam for assessing the effect of technologies showcasing programme on the adoption of the demonstrated technologies found that the annual farm income of majority of the respondents was between ₹ 35,000 to ₹70,000.

Aanandrao (2017) revealed that a high majority of the respondents (69.17%) had a medium level of annual income, followed by 15.80 per cent of them with a high annual income category and 15.00 per cent of them with low annual income.

Darshan (2018) found that 45.00 per cent of the farmers had a low annual income of less than ₹50000, followed by 37.50 per cent of the farmers with medium annual income ranging from ₹ 50,000- ₹ 1,00,000 and 21.00 per cent of them had a high annual income greater than ₹1,00,000.

Sharma (2019) reported that in the study area majority (58.57%) of the paddy farmers had annual income of ₹ 95,720- ₹ 2,03,280, while 28.57 per cent of the paddy farmers had annual income of more than ₹ 2,03,280 and 12.86 per cent of them had an annual income less than ₹ 95,720.

Medhi *et al.* (2020) reported that in the study area majority of the farmers (87.50%) had a medium level of annual income ranging from ₹ 25,900.00 to ₹1,65,067.00. While 10.00 per cent of the farmers belonged to high income category with income above ₹1,65,066 and 2.50 per cent of the farmers belonged to low income category with an annual income less than ₹ 33,281.

**2.2.8 Size of operational land holdings**

Sahoo (2005) reported that only 15.38 per cent of the respondents were marginal farmers with holdings of less than 1 ha. Equal proportions of the respondents were belonging to both the small and marginal categories.

Kumawat (2010) found that in the study area majority (48.33%) of the paddy farmers had a landholding size of 1-2 ha *i.e.*, the small size of the landholding followed by the medium landholders (29.17%), 14.17 per cent farmers were having marginal land size and 8.33 per cent of them were large farmers.

Bagri (2011) reported that in his study area 43.20 per cent of the respondents had small landholding size (up to 1 ha), 36.80 per cent of the respondents had medium (1.1 to 2 ha) landholding size and 20.00 per cent of them had large size of landholding (above 2 ha).

Farida *et al.* (2011) found that the majority of paddy growers (40%) owned 3-4 ha, followed by farmers with 2-3 ha (26.7%), 26.7 per cent farmers with less than one ha, and 6.60 per cent farmers with 1 to 2 ha.

Shamna (2014) reported in her study that the majority of the respondents were marginal farmers (90.83%), followed by 6.67% small farmers and 2.5% of semi-medium farmers.

Adedoyin *et al.* (2016) from their study on the effect of improved high yielding rice varieties on farmers' productivity found that in the study area the average farm size be 2.53 ha and the majority of the farmers in Mada had a small farm size

Anandrao (2017) observed that nearly half (49.17%) of the respondents had a medium size of landholding (4.01 to 10.00 ha), followed by 33.33 per cent respondents with semi-medium landholding size (2.01 to 4.00 ha), while 10.83 per cent of them had small landholding size ranging from 1.01 to 2.00 ha. It was followed by 1.67 per cent of the marginal landholders with landholding up to 1.00 ha and 5.00 per cent of the respondents who had a large size of landholding (10.01 ha and above).

Saikia *et al.* (2017) discovered that operational land holding of the respondents had a positive and significant relationship with the extent of adoption of recommended *Boro* paddy cultivation practices. A farmer's large size of the operational landholdings may assist him to generate more annual income and give him more confidence in adopting enhanced *Boro* paddy cultivation practices to a greater extent.

Dev *et al.* (2018) from the study conducted in Uttarakhand hills on the impact of fragmentation and scatteredness of holdings on the adoption of modern technology for wheat production reported the average size of operational landholdings was 0.52 ha in high-hill farms, 0.31 ha in mid-hill farms, and 0.22 ha in valley farms of the study area.

Sharma (2019) observed that the majority (50.71%) of the respondents were having a semi-medium size of landholding of 2-4 ha, followed by 20.71% of the respondents who had a small size of landholding of 1-2 ha. 14.28 per cent of the respondents had a medium size of landholding of 4-10 ha, 11.07 per cent of them had a marginal sized landholding of less than one ha land and only 3.21 per cent of them had large landholding size of more than 10 ha.

Medhi *et al*. (2020) found that 70.83 per cent of the respondents were marginal farmers possessing landholding size up to 1.0 hectare while 27.50 per cent of the respondents were small farmers with landholding between 1.01 to 4.0 hectares and 1.67 per cent of them were having large landholding size of above 4.0 hectares.

**2.2.9 Area under rice**

Singh *et al*. (2015) according to the findings of the study reported that approximately half of the farmers choose to cultivate more than one paddy variety, including basmati variants, and the total area covered by such farmers was 342.2 hectares (36.40% of total area surveyed ). 113.2 hectares (12.04%) of the total area under basmati rice were under the variety Pusa Basmati 1121, while 229 ha (24.36%) were under Pusa Punjab Basmati 1509. Variety PR 121 was the most prevalent non-basmati rice variety, accounting for 16.43 per cent of the total area, followed by HKR 47 (10.64%) and Pusa 44 (8.98 %).

Dev *et al.* (2018) revealed that 71.10 per cent of the total area was under HYV seeds and it was observed that utilization of HYV seeds in the sample area was highest in valleys and lowest in mid-hill situation.

Bannor *et al*. (2020) from the study on adoption and impact of modern rice varieties on poverty in Eastern India revealed that 73.7 percent of adopters had allocated more than 90 percent of their entire land size to the cultivation of modern varieties, while roughly 12 percent had allocated between 31 percent and 60 percent, with only 5.2 percent devoting less than 30 percent.

**2.210 Varieties grown by farmers**

Pathak and Sharma (2008) from their study on farmers' perception of suitable upland '*Ahu*' rice varieties in Assam found that traditional varieties like Ikorguni, Kolabor, Ikhajoi, Betguti and Bogilai were the popularly grown *Ahu* rice varieties in the study area. Kauri guni, Kapow guni, Dighali, Kutkong, Rongadoria, Amrow and Mesap (aromatic variety), etc. were some other traditional varieties grown in the area. There was not a single modern variety reported to be growing in the upland ecosystem. On the other hand, the farmers were reported to be cultivating improved rice varieties like Ranjit, Bahadur, and Jaya under a transplanted rice production system.

Singh *et al*. (2015) reported from a study conducted in Kapurthala district of Punjab that paddy is grown on roughly 1 lakh hectares in Kapurthala district, with diverse varieties such as Pusa 1121, Pusa Punjab Basmati 1509, PR 111, HKR 47, PR 121, PR 122, and others.

Adedoyin *et al.* (2016) discovered from their study on the effect of improved high yielding rice variety on farmers' productivity that adoption of local varieties was at 54.5 per cent and that of improved HYV was 45.5 per cent. This implies the majority of the farmers use local varieties for their production.

Mehar *et al*. (2017) from their study on the examination of the role of gender, risk and time preferences in farmers' rice variety selection in Eastern India reported that in the *Kharif* season of 2013, the respondents were growing multiple varieties. These included Modern high yielding varieties, stress tolerant rice varieties, Hybrid varieties, traditional varieties and unclassified varieties *i.e.*, the varieties of which the name and origin were unclear or farmers did not know the name. The varieties like Swarna Sub-1, Samba Mahsuri, lalat, Arize 6444, Sarju 52, Swarna, Pooja, Lalat and Moti were the most popular varieties that were grown.

Wakhet (2019) documented that majority of the farmers were found to cultivate traditional rice varieties. Twenty different traditional rice varieties were found to be grown by the respondents, followed by seven high yielding varieties. Only two hybrid

varieties were found to be grown by the farmers in the sample study area. The important traditional rice variety cultivated was ‘Joha’, grown by 28.33 per cent of the farmers. ‘Ranjit’ was the most grown HYV of rice, grown by 89.16 per cent of the farmers. The hybrid rice varieties cultivated were Sava-127 and Rajalaxmi (CRHR-5).

### 2.2.11 Degree of land Scatteredness

Tan (2005) reported that agricultural landholdings in China were only 0.53 hectares on average and were divided into six plots on average, indicating a high degree of fragmentation.

Hristov (2009) conducted a study on assessment of high fragmented land upon productivity and profitability of the farm amongst the Macedonian vegetable growers using Cobb-Douglas production function as well as General Linear Model and found out that the findings of the regression estimations supported the negative and statistically significant impact of land fragmentation over productivity and profitability of growing vegetables in the area studied.

Vijulie *et.al* (2012) conducted a study on assessment of agricultural land fragmentation in Romania and found that the degree of land scatteredness was maximum in big farms while the small farms were compact. Many scattered fields turned into fallow land due to long distances between different plots and consequently the production was dropped.

Alemu *et al*. (2017) from their study on the effects of land fragmentation on productivity revealed that the land productivity was negatively and significantly affected by the number of plots cultivated or the degree of land fragmentation in Northwestern Ethiopia.

Dev *et al.* (2018) from their study reported that the greatest number of plots per holding was 44.77 in valleys compared to 38 in high hills and 23.4 in mid-hills. The average number of locations in which the landholding was scattered was 4.87, compared to 6.79 for hills and 6.16 for the valley. According to their findings, the problem of fragmentation and scatteredness was severe in valleys and high-hills than in mid-hills situations where the average plot size was 0.029 ha.

### 2.2.12 Farming Experience

Devi *et al*. (2013) from the study conducted in Chittoor district of Andhra Pradesh found that the majority of the respondents (69.17%) had a medium farming

experience while 15.83 per cent of the respondents had low farming experience and 15.00 per cent of the respondents had high farming experience in the study area.

Shamna (2014) from her study revealed that the majority of the Pokkali rice farmers had medium farming experience (57.5%), followed by high (24.17%) and low farming experience (18.3%).

Adedoyin *et al.* (2016) reported that with an average age of 26.87, the majority of the farmers had 21-30 years of farming experience. This suggests that rice farmers have more than 20 years of solid rice farming experience, which influences their management know-how and decision-making to some level.

Darshan (2018) found that the majority (50.00%) of the farmers had a moderate farming experience of 8-16 years followed by 29.17 per cent and 20.83 per cent of the farmers who had less (less than 8 years) and more (more than 16 years) farming experience respectively.

Sharma (2019) observed that the majority (62.85%) of the respondents had 16.1 to 23.7 years of agricultural experience, followed by 25.71 per cent of them who had more than 23 years of agricultural experience and the rest of the 11.42 per cent of the respondents had experience below 16 years.

Wakhet (2019) found that the majority (67.50%) of the respondents had 14-33 years of farming experience, followed by 16.67 per cent of the respondents with farming experience below 14 years and 15.83 per cent of them had farming experience above 33 years.

Kumari (2020) in her study in Rohtas district of Bihar discovered that the majority of the respondents (62.50%) in the study area had a medium (13-43 years) level of experience in farming, followed by high (>43 years) and low (≤13 years) level of experience which accounted for 21.25% and 16.25% respectively.

### 2.2.13 Cropping Intensity

Meshram *et al*. (2012) from the study conducted in the Balaghat district of Madhya Pradesh discovered that cropping intensity showed a positive and highly significant association over the adoption pattern of SRI technology of paddy farmers.

Goyari (2014) found from the study conducted in the Udalguri district of Assam that cropping intensity was 130 across the study area. Almost all non-rice crops are

cultivated only once during an agricultural year. As a result, rice acreage determined the overall cropping intensity in the study area.

Sharma *et al*. (2015) reported from their study that three fourth of both the participants and non-participant respondents had medium level (100-200%) cropping intensity, followed by respondents with high and low cropping intensity.

Santosh *et al.* (2017) found that the largest cropping intensity was observed on small sized sample farms (205.55%), followed by marginal farms (187.07%), medium (177.32%), and average sample farms (160.20%) in their study on cropping intensities of farms in Uttar Pradesh.

Barman (2019) observed that the majority (60.25%) of the respondents were in the category of medium cropping intensity, while 20.75 per cent of them were in the category of high cropping intensity and 19.00 per cent of them were in the low cropping intensity category.

**2.2.14 Degree of Innovativeness**

Kalyan (2011) reported that in the study area 59.17 per cent *i.e.*, more than half of the respondents had a medium level of innovativeness followed by 20.83 per cent of the respondents who had a high level of innovativeness and 20.00 per cent of them had a low level of innovativeness.

Barik (2013) observed that the majority (57.50%) of the respondents in the study area belonged to the medium innovativeness category followed by 20.83 per cent of the respondents in the low innovativeness category and 21.66 per cent of them in the high innovativeness category.

Devi *et al*. (2013) found that more than half (65.83%) of the sugarcane farmers had medium innovativeness followed by 17.50 per cent of the respondents who had a high level of innovativeness and 16.67 per cent of them had a low level of innovativeness.

Gogoi (2016) observed from the study that the majority (65.63%) of the respondents had moderate level of innovation proneness. Around 20.83 per cent of the respondents had a high level of innovation proneness and the remaining 13.54 per cent of them had a low level of innovation proneness.

Reddy (2016) revealed from the study that the majority of the respondents (43.33) had a medium level of innovativeness while 32.50 per cent of the respondents had a high level and 24.17 per cent of them had a low level of innovativeness.

Darshan (2018) reported that majority (45.83%) of the farmers had high level of innovativeness, while 31.67 per cent of the farmers had medium level of innovativeness and 22.50 per cent of the farmers had low level of innovativeness.

Dhanraj (2019) discovered that in the study area, the majority (60.00%) of the respondents were in the medium innovativeness category, followed by 25.00 per cent and 15.00 per cent of the respondents in the high and low innovativeness category, respectively.

Sharma (2019) found that the majority of the respondents (55.35%) had a moderate level of innovativeness, high innovativeness was found among 23.92 per cent of the respondents and 20.71 per cent of the respondents in the study area had a low level of innovativeness.

Medhi *et al.* (2020) from the study conducted in West Garo Hills District of Meghalaya found that half of the respondents (50.00%) had a medium level of innovation proneness followed by 28.34 per cent respondents who had a high level of innovation proneness and 21.66 per cent of the respondents had a low level of innovation proneness.

**2.2.15 Degree of commercialization**

Kshirsagar *et al*. (2002) from the study on farmer perceptions, varietal characteristics and technology adoption found out in his study that, improved varieties have replaced traditional varieties where production is commercially oriented.

Martey *et al.* (2012) reported that the average degree of total agricultural commercialization was 66.00 per cent, with maize and cassava commercialization ranging from 53.00 to 72.00 per cent.

Sharma *et al*. (2016) from the study conducted in the Nagaon district of Assam observed that level of commercialization of the farmers ranged from 63.30 per cent to 74.00 per cent. They also found that larger farm sizes and easy access to markets motivated farmers to pursue higher levels of commercialization.

Barman (2019) observed that the majority (70.00%) of the respondents were having a medium degree of commercialization followed by 15.50 per cent of the

respondents who had a low degree of commercialization and 14.50 per cent of them had a high degree of commercialization.

### 2.2.16 Economic Motivation

Kumawat (2010) reported that the majority (45 %) paddy growers had medium economic motivation, followed by 37.50 per cent of the paddy farmers in the low economic motivation category and 17.50 per cent of them had high economic motivation.

Barik (2013) found that the majority (63.33%) of the respondents were having a medium level of economic motivation, while 20.83 per cent of the respondents were having a low level of economic motivation and 15.83 per cent of them had a high level of economic motivation.

Shamna (2014) from her study on farmers' perception on prospects and problems of Pokkali rice farming in the state of Kerala found that majority (59.17%) of the farmers had medium economic motivation, followed by 25.83 per cent farmers with low and 15 per cent of farmers with high economic motivation.

Dharmendra (2016) in his study on Farmers' perception about the System of Rice Intensification found that the majority of the respondents (46.66%) had a medium economic motivation, 30.00 per cent had a high economic motivation and 23.34 per cent had a low economic motivation.

Reddy (2016) reported that the majority of the black gram growers (59.17%) had a medium economic motivation, while 20.83 per cent of the growers had a low economic motivation and 20.00 per cent of them had a high economic motivation.

Sharma (2019) found that majority of the paddy farmers (63.92%) in the study area had a moderate level of economic motivation, followed by 19.64 per cent of the paddy farmers who had a high level of economic motivation and 16.42 per cent of the paddy farmers who had a low level of economic motivation.

### 2.2.17 Extension Contact

Kumawat (2010) discovered from his study that the majority, 54.17 per cent of the paddy farmers had medium extension participation, followed by 31.67 per cent of the paddy farmers with a low level of extension participation and 14.16 per cent of the farmers with high extension participation.

Shamna (2014) found that the majority (52.5%) of the respondents possessed medium extension agency contact followed by high (25%) and low (22.5%) extension agency contact. It was reported that the majority of the farmers contacted the farmer organizations.

Reddy (2016) observed from the study area that the majority (46.67%) of the farmers had medium extension contact followed by 42.50 per cent of the farmers with high extension contact. Only 10.83 per cent of them had low extension contact.

Darshan (2018) found that 43.34 per cent of the farmers had high extension agency contact, followed by 30.83 per cent of the farmers with medium extension agency contact and 25.83 per cent of the farmers with low extension agency contact.

Dhanraj (2019) found that most of the respondents had medium extension contact, while 19.17 per cent of them had a high level of extension contact and 14.16 per cent of them had low extension contact.

Sharma (2019) reported that training was regularly attended by 40.00 per cent of the respondents and 60.00 per cent of them attend it occasionally. Field days are attended by 20.35 percent of respondents on a regular basis, whereas Krishi Mela is attended by 12.50 percent. However, only a small percentage of respondents (3.92%) had participated in demonstrations, group discussions (4.28%), or field visits (5.35%).

Wakhet (2019) reported that the majority of the respondents had medium level extension contact followed by 24.16 per cent of the respondents with a low level of extension contact and the remaining 10.84 per cent of the respondents had a high level of extension contact.

**2.2.18 Mass Media Exposure**

Kumawat (2010) reported that most of the rice farmers (60.00%) had medium exposure to mass media, followed by rice farmers with low (25.83%) and high (14.17%) exposure to mass media. It was also revealed that television was the most used mass media, followed by newspaper and radio.

Bagri (2011) found that more than half (52.00%) of the respondents utilized mass media to a medium extent, followed by 29.60 per cent respondents utilized mass media to a low extent and 18.40 per cent of them utilized mass media to a high extent.

Devi *et al*. (2013) reported that more than half (69.17%) of the respondents were having medium mass media exposure followed by 20.00 per cent of the respondents

who had high and 10.83 per cent of the respondents who had low levels of mass media exposure.

Deepthi and Rao (2014) reported from their study conducted in East Godavari district of Andra Pradesh that the majority of the respondents (53.34%) had medium mass media exposure and they perceived that radio, television, newspapers and agricultural magazines in that order provide the majority of the information.

Reddy (2016) observed that in the study area, the majority (45.00%) of the respondents had medium mass media exposure, while 31.66 per cent of the respondents had high mass media exposure and 23.33 per cent of them had low mass media exposure.

Darshan (2018) reported from the study that the majority (40.00) of the farmers had a high level of mass media participation, followed by 32.50 per cent and 27.50 per cent of the farmers who had medium and low levels of mass media participation respectively.

**2.2.19 Irrigation facility**

Kumawat (2010) reported that the majority of the paddy growers from the study area had medium irrigation facilities, followed by 29.17 per cent of the paddy farmers with high irrigation facilities and 25.83 per cent of the paddy farmers were dependent on rainfed cultivation.

Habiba *et al*. (2012) found from the study conducted in Northwestern Bangladesh that 51.00 per cent of the owner farmers were from irrigated areas while 35.00 per cent of them were from non-irrigated areas. While among owner-cum-tenant farmers 19.00 per cent were from the irrigated areas and 23.00 per cent were from non-irrigated areas and among the tenant farmers 30.00 per cent of them are from irrigated villages and 42.00 per cent of them were from non-irrigated villages.

Goyari (2014) found that in the sample region, water from small dams supplied the majority of the water required for paddy cultivation. It was responsible for 56% of HYV paddy and 78% of Traditional variety paddy. Secondly, borewells and pump sets provided artificial irrigation to 14 percent of HYV paddy lands. In comparison to this, the sample farmers used a very small percentage of borewells and pum psets irrigation in the production of traditional variety paddy (less than 2%). In the overall sample region, as much as 29% of the total area under paddy cultivation is still rainfed.

Dhanraj (2019) observed that in the Marthwada region two-third of the respondents (66.67%) had well as their irrigation source, while 26.67 per cent of the respondents had bore well as irrigation facility, 3.33 per cent of the respondents had pond as their irrigation source and about 2.50 per cent of them used the canal as an irrigation source. Only 0.83 per cent of the farmers had farm ponds as the irrigation source and nobody depended on a river or a dam as a source of irrigation.

Wakhet (2019) reported that a high majority (79.17%) of the respondents had no irrigation facility while 20.83 per cent of them had irrigation facilities for paddy farming.

**2.2.20 Farm mechanization**

Sahoo (2005) the bulk of the respondents owned an iron plough, a sprayer, intercultural tools, and a paddy thresher. A sizable percentage of the respondents (11.54%) also owned a tractor. These farmers not only tend their own fields but also leased out their work to other farms. Despite the fact that the research region was a canal irrigated area, 19.23% of the respondents had their own pump set, indicating the farmers' progressiveness and awareness in farming. However, none of the respondents had power tillers, dusters, or seed drills, all of which are critical in improving farming. Overall, the study found that farmers in the study area had a superior supply of farm implements.

Archana (2012) reported that 39.17 per cent of the respondents had low farm implements and machinery status, while 36.67 per cent of them had medium and 24.16 per cent of them had high farm implements and machinery status.

Harilal and Eswaran (2015) reported that only half of the respondents (50.00%) utilized machines for harvesting, while a slightly greater proportion used machines for threshing and winnowing. Machines were rarely employed on garden land and the use of machinery in transplanting was quite limited.

Mishra (2018) found that about two-third (66.66 %) of respondents generated a ten per cent profit by mechanizing paddy cultivation, while another 34.16 per cent of respondents were able to lower the cost of cultivation by 40-50 per cent. Approximately 30.00 per cent of the farmers who responded earned an additional income of up to 2 lakhs by renting out their machines and equipment.

Wakhet (2019) found that power tiller was used by 62.50 per cent of the respondents for the paddy cultivation, while sprayer was used by 58.33 per cent of them, a

tractor was used by 10.83 per cent of the respondents and rotavator was used by 2.50 per cent of the respondents. Nobody had used a harvester for paddy cultivation.

### 2.2.21 Labour Availability

Senthilkumar *et al*. (2009) found from their study that due to full or part-time off-farm employment, just 26.00 per cent of their total labour was committed to farming. At least two permanent labourers were employed on every farm, and they were given a fixed monthly wage.

Somvanshi *et al*. (2016) found that labour availability of the majority (78.75%) of the respondents was at medium level with 4 to 11 labours working in their farms.

Mohapatra *et al*. (2017) reported from the study conducted in Bargarh district of Odisha that a total of 35.65 man days of man labour, 22.84 days of woman labour, 2.96 pair days of bullock labour, and 3.57 hours of machine labour were used in the manual cultivation of rice in the research region.

Wakhet (2019) observed that 1-3 family members engaged in paddy cultivation as labour for 53.33 per cent of the respondents, while 4-6 family members engaged as labour for 43.33 per cent of the respondents, and 7-9 family members engaged as labour in paddy cultivation for only 3.34 per cent of the respondents.

### 2.2.22 Status of infrastructural facilities

Binswanger (1993) studied on 13 states of India and observed that investments in rural infrastructure lowers transportation costs, increases farmers' access to market and leads to substantial agricultural expansion.

Thorat *et al*. (2003) observed that public investment in transportation, power, irrigation, and research infrastructure had a favourable impact on agricultural output and rural poverty reduction in India.

Ashok and Balasubramanian (2006) analyzed the impact of infrastructure on total factor productivity. The findings of the study show that investments in rural infrastructure such as roads, irrigation, rural markets, and rural literacy boost total factor productivity in Tamil Nadu agriculture.

Narayanamoorthy and Hanjra (2006) from the study on rural infrastructure and agricultural output linkages showed that the districts with better rural infrastructure

development (irrigation, roads, literacy, educational facilities, rural electrification, and fertilizer) had higher agricultural output values than other districts.

Patel (2010) observed that farmers' access to institutional finance and markets, as well as increased crop yields, has a direct and strong association with rural infrastructure and encourages agricultural expansion. Also reported that, in comparison to economically advanced states, the agriculturally backward eastern states have a terrible state of rural roads and the state of Assam was deficient in infrastructure, especially in gross irrigated area and electricity.

Das and Saikia (2020) on studying the agro-economic background of Sonitpur district of Assam found that electricity was available for all purposes; however, it was only available for 12 to 14 hours per day on average.

**2.3 Relationship between selected profile characteristics and perception of farmers**

Sahoo (2005) found that the respondents' age and caste structure had no impact on their perceptions of the need for hybrid rice production. All other socio-economic variables, such as education (r= 0.303), extension contact (r= 0.543), holding size (r=0.285), farm implement ownership (r=0.391), and annual income (r=0.474), had a positive and significant impact on rice growers' perceptions of hybrid rice farming.

Bagri (2011) found that there was no significant relationship between age and perception of the beneficiary farmers regarding the utility of seed village programme. Education had a significant association with the perception of the beneficiary farmers. Caste and social participation had a non-significant association with the perception of farmers. Size of operational land holding, occupation of the beneficiaries, annual income, training received, input use behaviour, source of information, mass media, preference in selection of varieties and usefulness of seed village programme showed significant association with perception of beneficiary farmers regarding the utility of seed village programme at 5.00 per cent level of significance.

Patel *et al.* (2011) from their study on perception of the farmers about the transfer of technology system in North Gujarat found a significant and positive relationship with perception of farmers about the usefulness of transfer of technology and eight independent variables such as training received (0.3329), innovativeness (0.2927), reading habit (0.3068), risk orientation (0.3971), achievement motivation (0.4480), economic motivation (0.3786), extension participation (0.2976) and mass media exposure (0.4769).

Ghimire *et al*. (2015) from the study on factors affecting adoption of Improved Rice Varieties among rural farm households in Central Nepal found that there was no substantial relationship between gender or family labour and adoption of improved rice varieties. Age, education, farm size, seed access, extension service, production potential, and consumer acceptability of rice varieties are all factors that influence adoption, according to the study. Furthermore, the econometric research found that favourable terrain type (e.g. lowlands) and animal power (e.g. oxen) are the two most important factors determining the likelihood of New Improved Rice Varieties (NIRV) adoption.

Adedoyin *et al*. (2016) on analysis of factors influencing the use of improved high yielding variety discovered that socio-economic variables like educational level, farm size, gender, experience had a significant influence on the adoption of improved high yielding varieties. Farmers' educational level had a positive and significant relationship with the adoption of improved varieties. This infers that the use of improved HYVs increases as their educational level increases. It was also found that farm size was positive and significant at 1.00 per cent level. This implies farmers with large farm sizes adopted the improved HYV. The relationship between farming experience and adoption of HYV was also positive and significant at 1 per cent level. Gender and adoption of improved HYV had a significant relationship. It can be due to the fact that men have a significant role in household decision-making.

Dharmendra (2016) found that education, farming experience, size of landholding, annual income, cosmopolitness of the respondents, source of information, economic motivation, risk orientation, and achievement motivation had a significant relationship with the perception of farmers about SRI technology at 0.05 probability level. The respondent's age, caste, or social participation, on the other hand, had no significant relationship with their perceptions of SRI technology.

Anandrao (2017) revealed from his study that perception of the respondents showed a positive and significant relationship with personal, socio-economic and psychological characteristics of the respondents like education of the respondents, size of the landholding, annual income, social participation, risk orientation, sources of information and utilization of technology.

Mehar *et al*. (2017) from their study on the examination of the role of gender, risk and time preferences in farmers' rice variety selection in Eastern India

observed that the female and male farmers had differences in varietal preferences due to inequalities in their available resources and knowledge. Among the females, the varieties Swarna, Samba Mahsuri, Sarju 52, and Swarna were more popular due to the qualities like easiness in cooking, good taste, high yield, and availability and accessibility of the seeds. Female farmers, who are more risk averse, chose rice types based on cooking quality (e.g., good taste, high cooking quality, and good straw quality) and stress tolerance, according to the findings. When compared to male farmers, they are less likely to choose hybrid rice and are also less inclined to make decisions based on market considerations. Because of several valued features, certain rice cultivars produced many decades ago remain popular among farmers. They also found the strong influence of caste as the accessibility of resources such as labour and credit varies with caste and upper caste farmers are more likely to have access to these resources. They also observed that the decision to adopt a new variety and new technologies were impacted by family size and family status.

Saikia *et al*. (2017) reported that there was a positive and significant relationship between the economic motivation of the respondents and the extent of adoption of recommended cultivation practices of *Boro* paddy. It interprets that higher the economic motivation higher will be the extent of adoption.

Danso-Abbeam *et al*. (2017) found that in the study area the adoption of improved maize varieties was significantly influenced by personal, socio-economic factors of farmers like, household size, formal education, distance from home to the plots, participation in farm demonstrations, membership of farmer-based organizations, farm size and previous income from maize crop. The number of years spent in formal education is statistically significant and has a positive link with Improved Maize Variety (IMV) adoption intensity (Tobit model coefficient-0.0746). The intensity of IMV was influenced by the size of the household in a significant and beneficial way. Farming is more intense in SSA, particularly in the study region, because mechanization is still uncommon. As a result, having a larger household size aids agricultural operations, as IMV necessitates some farm cultural practices such as frequent weeding and pesticide application.

Paltasingh *et al*. (2017) found that the factors that influenced the adoption behaviour of modern varieties (MV) in an irrigated ecosystem differed from those that influenced MV adoption in a rainfed ecosystem. Education, farm size, land position, extension visits, loan accessibility, local market, seed availability, perception about the taste of MVs, and shorter maturation length of MVs all influenced adoption behaviour in

the irrigated ecosystem. However, in the rainfed ecosystem, factors such as the number of nonfarm activities, soil quality, land position, seed availability, and perception about shorter maturity of and higher yield of MVs were the significant drivers of adoption intensity of MVs.

Dev *et al.* (2018) from their study in Uttarakhand hills found that the adoption of proper doses of HYV seeds and fertilizers in wheat cultivation was significantly affected by the scatteredness and fragmentation of the landholdings. It was also found that the problem of scatteredness and fragmentation was more serious in the valley situation. The cost of production was higher in the most fragmented farms, while the net return was higher in the least fragmented holdings.

Sharma (2019) found from the study that extent of adoption of IPM practices had positive and significant relationship with characteristics of respondents like operational land holding (r=0.1979), annual income (r = 0.1124), attitude towards IPM practices (r = 0.3775), innovativeness (r=0.4151), extension participation (r = 0.2159) and knowledge level (r = 0.8710).

Bannor *et al*. (2020) found that rice yield, perception of modern varieties as high yielding, having disease resistance and the seed availability of modern rice varieties positively affected the discrete decision to adopt and intensity of adoption of modern varieties. Further, according to the findings, demographic factors such as age and education had a positive and significant impact on the decision to adopt MVs, but only household size had a positive impact on the intensity of adoption. In contrast, a farmer's judgment was negatively influenced by his or her household size and experience. The discrete and continuous adoption decisions were positively influenced by management qualities such as a farmer's risk aversion. Participation in off-farm jobs and the quantity of credit received by the farmer had a negative impact on the farmer's decision to use MVs. Adoption was positively influenced by production variables such as land area, while adoption intensity was negatively influenced. Similarly, the cost of seeds, pesticides, and fertilizer had a negative impact on adoption and adoption intensity.

**2.4 Problems in cultivating High Yielding Varieties**

Sahoo (2005) observed from the study on perception of farmers towards hybrid rice cultivation in Orissa that primarily perceived constraints by rice farmers in limiting them from cultivating hybrid rice were lack of choiceable varieties, sophisticated management, increased pest and disease attack, insufficient extension support, lack of

government policy consideration, insufficient training, insufficient demonstration, lack of timely guidance, lack of incentives to motivate, and insufficient credit facilities.

Bagri (2011) reported that the major barriers faced by the farmers on rank order were the complexity of seed certification process (59.2%), lack of information about loan and subsidy (55.20%), seed storage problem (52.80%), non-availability of timely agriculture information (49.6%) and problems in marketing (47.20%).

Nirmala and Suhasini (2013) in their study conducted in the Khunti district of Jharkhand found that the main constraints in the cultivation of hybrid rice were higher seed costs, poor grain quality and lower pricing ability. Lower profitability, poor cooking quality, high management requirement, lower head rice recovery, high shedding and lack of demand were some other constraints faced by the farmers.

Saikia and Barman (2013) observed that a large number of small and marginal farmers, inadequate irrigation facilities, poor of mechanization, and other issues all contribute to a low rate of rice technology adoption in Assam.

Shah *et al.* (2014) Comparing the selected technological aspects of hybrid rice with the inbred variety (e.g. Bri Dhan 28), farmers reported that cultivating hybrid rice requires a higher level of technical knowledge, and all the required complementary inputs (manure and fertilizer like urea, TSP, MP, and insecticides and irrigation). It is more vulnerable to risk and uncertainty, involves longer growth duration, and necessitates higher production costs. It produces higher yields (fodder and grain) and profitability, but household use of inbred rice is much better than that of hybrid rice. Farmers are overburdened with the operational costs of hybrid rice that influence the subsistent farmers to resist or discontinue cultivating hybrid rice.

Anandrao (2017) reported that high input costs, lack of knowledge regarding biofertilizer seed treatment and strip cropping, groundwater recharge, and insufficient capital were the main challenges highlighted by dryland farmers.

Deka *et al.* (2018) from their study conducted in NICRA village in Dhubri district of Assam found out the major constraints faced by the farmers in rice cultivation. On the basis of yield loss, the major problems faced by the farmers were damage caused on the *kharif* crops by flood, submergence of the crop by the flash flood and non-availability of quality seeds. They inferred that shortage of government seed firms and village level seed producers may be the cause of the problem of quality seed. Heavy rainfall, non-use of recommended fertilizers, high incidence of pests and diseases, early season drought and

lack of knowledge on scientific cultivation of rice were the other problems related to yield loss. The major socio-economic constraints faced by the farmers in rice cultivation were the shortage of labour, high cost of inputs and lack of assured market. The other socio-economic constraints faced by the farmers were poor economic condition, post-harvest storage problem, high incidence of intervention of middlemen, lack of proper extension services and high rate of interest on loan charge by the professional money lender.

Wakhet (2019) discovered that the main and foremost constraint experienced by all respondents in the study area was a lack of adequate irrigation. Heavy floods during the crop period were ranked as the second most important problem as mentioned by 98.33 per cent of the respondents. Another major problem was the scarcity of labour during peak hours and it was expressed by 97.50 per cent of the respondents. 91.66 per cent of the respondents mentioned the problem of non-availability of quality seeds on time. Improper land preparation, high cost of labour, drought during crop period, the infestation of pests and diseases, indiscriminate use of plant protection chemicals, stray cattle disturbances, non-availability of sufficient FYM and imbalanced application of fertilizers were some other important problems faced by the paddy farmers in the study area.

Medhi *et al.* (2020) reported that inadequate availability of quality seed at the proper time was mentioned as the most important problem faced by the rice cultivators (95.83%). Lack of knowledge about scientific cropping pattern and cropping system and their method of application(92.50%), non-availability of improved implements and other critical inputs such as FYM/organic manures, etc. (87.50%), low price of the product in the local market (76.67%), lack of storage and marketing facilities (75.00%), lack of guidelines about seed treatment (74.16%) were some of the major problems highlighted by the rice farmers.

**2.5 Suggestions of farmers for overcoming the problems**

Sahoo (2005) reported that the important suggestions proposed by the farmers in area expansion of hybrid rice were the development of preferred varieties from farmers' perspective, ensuring quality seed supply, and development of skill competency of the farmers, suitable advisory services, and price assistance in the disposal of the produce.

Bagri (2011) reported the suggestions proposed by the beneficiary farmers to enhance the utility of seed village programme were seed certification process should be

made simple and easier (64.80%), there should be timely availability of loan (58.40%), seed storage facilities should be available nearby village (54.40 per cent), timely availability of seed and other inputs (45.6 per cent), and more information should be provided about improved seed and seed production.

Medhi *et al.* (2020) reported some of the important suggestive measures proposed by the respondents to solve the problems were strong extension network for effective transfer of latest technologies, improvement of credit and market facilities and crop insurance are required, organizing as many as awareness and training programme towards improved practices covering more village in the district, to encourage the integrated pest management approach for effective control of pests and diseases by emphasizing the need based application of pesticides.

# CHAPTER III

# RESEARCH METHODOLOGY

This chapter describes the methodology followed during the present study and in the preparation of the manuscript. A careful attempt was made to use suitable methods and techniques to attain reliable and realistic conclusions. This chapter includes the description of the research design of the investigation, tools, and techniques employed for the data collection, sampling procedure, variables, and their measurements and statistical procedures used for the analysis of data. The particulars of the research methodology adopted for conducting the present study are presented in this chapter under subsequent heads.

3.1 Research design

3.2 Locale of the study

3.3 Sampling procedure

3.4 Selection and measurement of variables

3.5 Tools and techniques of data collection

3.6 Formulation of hypothesis

3.7 Statistical analysis and interpretation of data

## 3.1 Research design

An ex-post-facto research design was selected for conducting the study as the variables chosen for the study had already occurred. According to Ray and Mondal, (2011) ex-post-facto research is one in which the investigator tries to link a previously occurred effect to its probable causes. The effect is the dependent variable and the likely causes are the independent variables. The investigator has no direct control over the independent variables in the ex-post-facto research.

## 3.2 Locale of the study

The present study was conducted in the state of Assam. The study areas of the present study are shown in Fig. 3.1. The state of Assam is situated in north-eastern

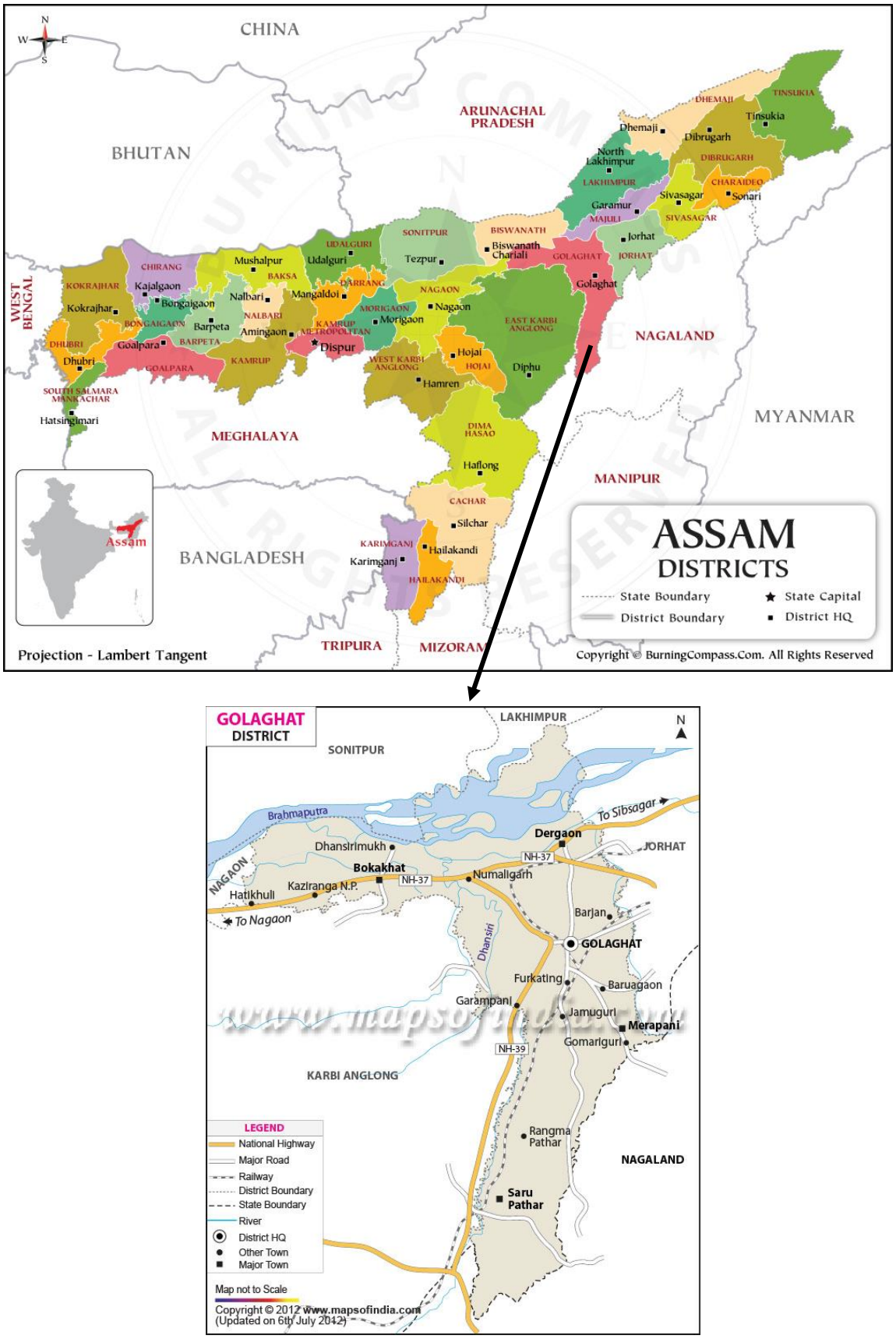



**FIG. 3.1: MAP OF LOCALE OF STUDY**

India, along the Brahmaputra and Barak river valleys and to the south of eastern Himalayas. Assam has a total geographical area of 78,438 sq. km. With Dispur as its capital, Assam has 33 districts.

### 3.3 Sampling procedure

In the present study, the purposive cum random sampling technique was followed for the selection of respondents. The sampling plan is depicted in (Fig.3.2) and the sampling procedure is described in the following subheads.

#### 3.3.1 Selection of the district

The district Golaghat of Assam is purposively selected for the present study from the Upper Brahmaputra Valley Zone of Assam since the district is having the highest area under High Yielding Varieties (HYVs) of rice in UBVZ. The agro-climatic situation of Golaghat district is suitable for growing a variety of crops. However, the principal crop of the district is rice. The total area under high yielding varieties of rice in the district was 115704 ha during the 2019-20 period (Anon., 2020).

***Profile of the district***

Golaghat district of Assam lies along 93°16’ to 94°10’ East longitude and 25°50’ to 26°47’ North latitudes. The district is bounded by the river Brahmaputra on the north and south by Nagaland and Kabri Anglong district, on the east by Jorhat, and on the west by Kabri Anglong and Nagaon districts. The principal river of the district is Dhansiri, which originates from Laisang peak of Nagaland. The border between Golaghat and Jorhat district is marked by the river Kakodonga. The district has a total geographical area of 3502 sq. km. The district ranks $7^{th}$ in terms of the total area among the districts of Assam. The district of Golaghat is constituted by 6 Revenue Circles and 8 blocks.

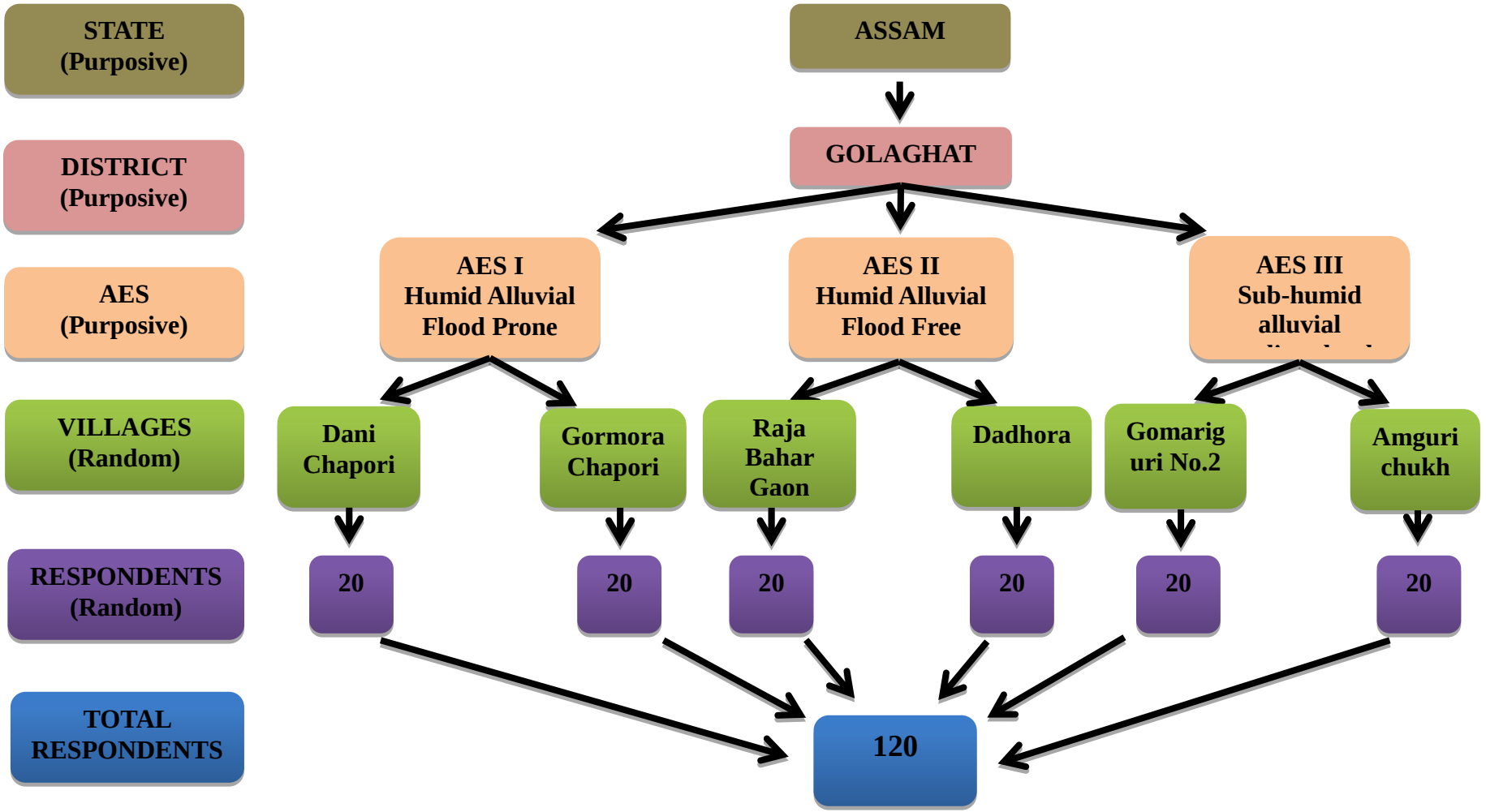



FIG. 3.2: SAMPLING PLAN OF THE STUDY

***Demographic profile of the district***

According to Census 2011, the total population of Golaghat District is 10,66,888 with 5,43,161 males and 5,23,727 females. The district has a population density of 305 people per square kilometer which can be said relatively less dense compared to the population density of the state (398 people per $km^2$) (Anon., 2016). 969152 people live in the district's rural parts, while 97736 people live in the district's urban areas. Only 9.2 per cent of the district's population lives in cities. So the majority of the population lives in the district's rural areas (Anon., 2011)

***Rainfall and climate***

The district's climate is characterized by a highly humid atmosphere with relative humidity above 80 per cent and abundant rains and general coolness. The average rainfall of the district ranges from 2000mm to 3000mm. The district experiences a higher amount of rainfall during June-September and scanty but evenly distributed rainfall during the rest of the months. Like most of the districts of Assam, Golaghat district also experiences heavy floods in the rainy seasons. Out of 8 blocks, Golaghat West, Golaghat North, and Kakodonga are severely affected by the flood. Gomariguri Development and South Development Blocks located in rain shadow areas might experience moderate to severe drought, resulting in low crop growth and yield.

***Soil type***

The arable soils of Golaghat district are mainly of two types; inceptisol (old alluvial) and entisol (recent alluvial). The major portions of the arable soils of the district are, however, alluvial soils. The texture of surface soil ranges from fine loamy, coarse silty and fine soil. 58% of the total is categorized under fine loamy soil under Inceptisol. The major part of the soils of Golaghat district is acidic in nature. The organic matter content of the soil is medium to high. The available N is medium, while available P and K are low to medium.

***Major crops and cropping intensity***

The principal food crop of the district is rice. Tea, sugar cane, vegetables, oilseeds, tuber crops, and to some extent fruits are the main crops grown in old alluvial soils of the district as the soil conditions are suitable for these crops. Banana, citrus, pineapple, arecanut and coconut are the horticultural crops that are grown extensively by the farmers in the area. The average productivity of the district is reported to be marginally higher than the state-level productivity. Individual crop productivity, on the other hand, is

lower than the national average and significantly lower than the potential productivity of crops.

The net cropped area of the district is 132929 hectares and the gross cropped area is 163214 hectares. The net cropped area constitutes 47 per cent of the total geographical area.

**3.3.2 Selection of the Agro-ecological situations (AES)**

Physiography, soil, climate, cropping pattern, flood proneness, and socioeconomic status all show significant differences in the district. The district is divided into four agro-ecological situations based on these differences, excluding tea gardens and forests. They are:

1. AES I – Humid Alluvial Flood Prone
2. AES II – Humid Alluvial Flood Free
3. AES III – Sub Humid Alluvial Medium Land
4. AES IV – Sub Humid Alluvial high Land

Out of these four AES, three AES: AES I, AES II and AES III were selected for the study as rice is the major cop in these regions. Profiles of the agro-ecological situations are given below:

***AES I – Humid Alluvial Flood Prone***

This agro-ecological situation exists in the major parts of Golaghat North, Golaghat East, Kakodonga, and some parts of Golaghat East block. This AES accounts for 22.17 per cent of the total block area (Anon., 2016). Floods are a common occurrence in this situation, wreaking havoc on farmers' crops and cattle. Rice, rape and mustard, summer vegetables, livestock, and fisheries are some of the crops and enterprises in this region.

***AES II – Humid Alluvial Flood Free***

This AES covers 6 blocks and accounts for 40.49 per cent of the district's total block area (Anon., 2016). Rice, sugarcane, vegetables, piggery, fisheries, sericulture, and dairy are some of the key crops and enterprises in the AES. This scenario is nearly level, and the soil type ranges from sandy to clay in nature.

***AES III – Sub Humid Alluvial Medium Land***

A major part of Gomariguri block and Golaghat South block comes under this Agroecological situation. This AES accounts for 27.53 per cent of the district's total block area (Anon., 2016). The important crops and enterprises in this situation are rice, sugarcane, vegetables, horticulture, and animal husbandry.

### 3.3.3 Selection of the villages

Initially, a list of villages from the three agro-ecological situations is prepared by consulting with Krishi Vigyan Kendra, Golaghat, RARS, Titabar and the Department of agriculture. From the list of villages, two villages were selected randomly from each AES. Thus a total of 6 villages were selected for the present study. Villages were Dani Chapori and Gormora Chapori from Humid Alluvial Flood Prone situation (AES I), Dadhora and Raja Bahar from Humid Alluvial Flood Free Situation (AES II) and Gomariguri and Amgurichukh villages from Sub Humid Alluvial Medium Land situation (AES III) were the selected six villages.

***Profile of the villages***

**Dani Chapori:**

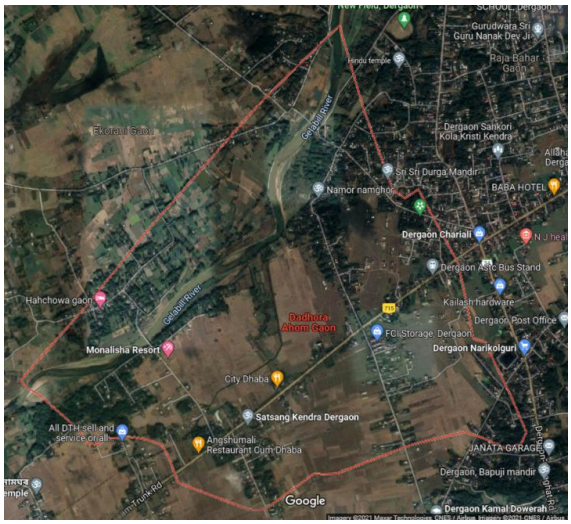
The village Dani Chapori covers a total area of 313.34 hectares and is situated between 26°46’08.2” N and 26°47’06.5” N latitudes and 93°54’24.8” E and 93°55’20.9” E longitudes. Dani Chapori is a village in Assam's Golaghat district, in the Dergaon block. It is 10 kilometers from the sub-district headquarters in Dergaon and 35 kilometers from the district headquarters in Golaghat. The population of Dani Chapori is 2,405 people. In Dani Chapori village, there are approximately 369 households. The net sown area of the village is 252.75 ha.

**Gormora Chapori No.1:**

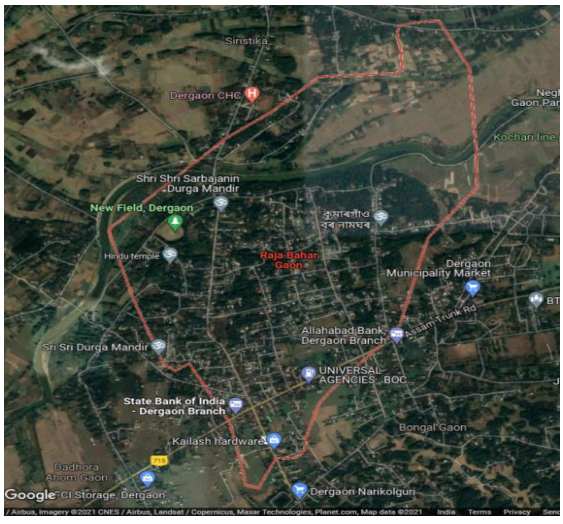
Gormora Chapori No. 1 is a village in Golaghat district of Assam, in Dergaon block. The village occupies an area of 931.72 hectares and is located between 26°45’27.2” N and 26°46’27.11” N latitudes and 93°54’29.6” E and 93°55’47.6” E longitudes. It is 12 kilometers from the sub-district headquarters in Dergaon and 36 kilometers from the district headquarters in Golaghat. A total of 1,209 people live in Gormora Chapori No 1. Gormora Chapori No 1 village has around 240 homes. The net sown area of the village is 402.04 ha.


**Dani Chapori**

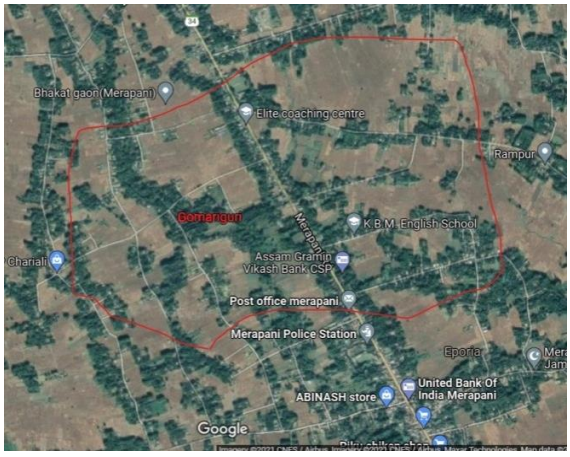

**Gormora Chapori No.1**



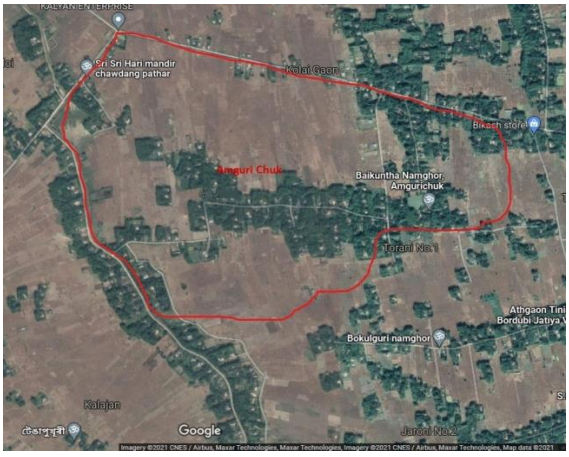

**Dadhora Ahom Gaon**




**Raja Bahar Gaon**




**Gomariguri**




**Amguri Chuk**

**FIG 3.3: MAP OF VILLAGES**

**Dadhora Ahom Gaon:**

The village of Dadhora Ahom Gaon is located in the Dergaon block of the Golaghat district of Assam, India. The village covers a total area of 448.48 hectares and is situated between 26°41’56.8” N and26°43’32.7” N latitudes and 93°56’31.1” E and 93°58’23.7” E longitudes. It is 3 kilometers from the sub-district headquarters in Dergaon and 25 kilometers from the district headquarters in Golaghat. Pub Misamora is the gram panchayat of Dadhora Ahom Gaon village. A total of 1,978 people live in Dadhora Ahom Gaon. In Dadhora Ahom Gaon village, there are approximately 438 houses.Net sown area of the village is 431.37 ha.

**Raja Bahar Gaon**

Raja Bahar Gaon is a village in Assam's Golaghat district, in the Dergaon Tehsil. The village is situated between 26°42’30.4” N and 26°44’23.7” N latitudes and 93°57’42.55” E and 93°59’01.4” E longitudes. It is 3 kilometers from the sub-district headquarters in Dergaon and 25 kilometers from the district headquarters in Golaghat. Pub Misamora is the gram panchayat of Raja Bahar Gaon village. A total of 870 people live in Raja Bahar Gaon. In Raja Bahar Gaon village, there are approximately 215 houses. The village covers a total area of 355.97 hectares. The net sown area of the village is 238.11 ha.

**Gomariguri**

Gomariguri is a village in Assam's Golaghat Tehsil, which is part of the Golaghat district. The village is located between 26°19’28.9” N and 26°20’28.3” N latitudes and 94°04’31.4” E and 94°05’41.6” E longitudes. It is 30 kilometers from Golaghat, which is the district and sub-district headquarters of Gomariguri village. Arunachal is the gram panchayat of Gomariguri village, according to 2009 statistics. The village covers a total area of 457 hectares. The population of Gomariguri is 5,378 people. In Gomariguri village, there are approximately 1,091 houses. The net sown area of the village is 400 ha and is dependent entirely on rain.

**Amguri Chuk**

Amguri is a village that comes under Golaghat and Gomariguri block. The village is located between 26°18’19.6” N and 26°19’04.3” N latitudes and 94°01’43.4” E and 94°03’07.7” E longitudes. It is 20 kilometers from Golaghat, the district and sub-district headquarters of Amguri hamlet. Ratanpur is the gram panchayat of Amguri village. The population of Amguri is 394 people. In Amguri village, there are approximately 80 households. The area is entirely dependent on rainfed cultivation. The village covers a total area of 36.5 hectares.

### 3.3.4 Selection of the respondents

To collect the responses for the study, a total of 120 respondents were selected for the study. From each of the selected villages, 20 rice growing farmers were selected randomly as respondents.

### 3.4 Selection and measurement of variables

Considering the objectives of the study and by consultation with the experts and based on the review of relevant literature available to the investigator one dependent variable, 22 independent variables, and two descriptive variables were selected for the present study.

The operational definitions and the techniques used for the measurement of the variables are explained in subsection 3.4.1. The selected variables with their conceptual definitions and measurement techniques are presented in Table 3.1.

**Table 3.1: Variables with their measurement techniques**

| Sl. no | Variables | Operational Definition | Measurement |
|---|---|---|---|
| **I** | **Dependent Variable** | | |
| 1 | Perception of farmers about HYVs of Rice | The level of farmers' understanding and interpretation of High Yielding Varieties of rice released by AAU compared to the local varieties. | Structured schedule developed |
| **II** | **Independent Variables** | | |
| 1 | Age | Chronological age of the respondent | Structured schedule developed |
| 2 | Gender | Gender is the distinction between male, female, and other genders. | Structured schedule developed |
| 3 | Formal educational experience | No of years completed in formal education | Structured schedule developed |
| 4 | Caste | Caste assigned to the respondent by birth. | Structured schedule developed |
| 5 | Family Size | Number of members in the family of the respondents | Structured schedule developed |
| 6 | Occupation | Activities in which the respondents and their family is engaged to earn their income | Structured schedule developed |
| 7 | Annual Income | Total income earned by the family in rupees in a year. | Structured schedule developed |
| 8 | Size of operational land holdings | Land area used by the respondent for cultivation. | Structured schedule developed |
| 9 | Area under rice | Land area used by the respondent for cultivation of rice. | Structured schedule developed |

| Sl. no | Variables | Operational Definition | Measurement |
|---|---|---|---|
| 10 | Varieties grown | Varieties of rice grown by the respondents. | Structured schedule developed |
| 11 | Degree of Land Scatteredness | The number of plots into which the respondent's total operational landholding is divided. | Structured schedule developed |
| 12 | Farming Experience | The number of years of experience respondents had in rice cultivation. | Structured schedule developed |
| 13 | Cropping Intensity | Land area used by the respondent for cultivation in terms of hectare. | Structured schedule developed |
| 14 | Degree of innovativeness | Socio-psychological orientation of a farmers to get linked with the changes, ideas, practices etc**.** | Moulik's self-rating innovative proneness scale (1965) followed by Sakharkhar (1995) |
| 15 | Degree of commercialization | Fraction of farm produce sold during the last year | Structured schedule developed. |
| 16 | Economic motivation | Degree to which the farmers attain occupational success in terms of profit maximization and relative value placed on economic needs**.** | Followed the scale developed by Singha (1991) with suitable modification. |
| 17 | Extension Contact | Extension contact refers to the degree of contact to which a respondent maintained contact with the different extension personnel. | Structured schedule developed. |
| 18 | Mass media exposure | It refers to the frequency of using various mass media sources by the respondents. | Structured schedule developed |
| 19 | Irrigation facility | Sources of water for irrigation which is used by the respondents. | Structured schedule developed |
| 20 | Degree of farm mechanization | Number of farm operations operated using machineries and implements. | Structured schedule developed |
| 21 | Labour availability | Number of family labour, permanent or temporary hired labour used by the respondents. | Structured schedule developed |
| 22 | Status of infrastructural facilities | Availability of farm infrastructural facilities. | Structured Schedule developed |
| **III** | **Descriptive Variable** | | |
| 1 | Problems faced by the farmers | Problems faced by farmers in cultivating High Yielding Varieties of rice released by AAU. | Structured schedule developed |
| 2 | Suggestive Measures | Solutions suggested by farmers to solve the constraints faced by them in cultivating HYVs of rice. | Open ended question |

### 3.4.1 Conceptual definition and measurement of the variables

**I. Dependent Variable**

**1. Perception of farmers towards HYVs of rice**

For the present study, perception is conceptualized as farmers' level of understanding or interpretation of quality of HYVs of rice as compared to other varieties. For measuring the perception of farmers towards HYVs of rice released by AAU, a total of 31 statements were prepared by extensive review of literature and on consultation with experts. A Google form was created for sending this for judges rating. The Google form was send through mail to the various experts and scientists from department of plant breeding and genetics, RARS, Titabor, KVK etc. After examining all the responses, 18 statements out of 31 statements were selected for the measurement of the variable.

The variable consisted of total 18 statements with 16 positive statements and two negative statements. These statements were also grouped into four categories namely: Plant characteristics (includes 9 statements), Climatic adaptability (includes 5 statements), Technological aspects (2 statements), and grain quality (2 statements).The responses for these statements were recorded in a five point continuum of 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' for which scores of 5, 4, 3, 2, and 1 were assigned. For the negative statement, the scores were reversed.

The overall perception score of a respondent is calculated by summing up the scores obtained for all 18 statements. Based on the scores obtained, the respondents were grouped into 3 categories namely: low perception, medium perception and high perception, keeping the mean and standard deviation as check. Also, for in depth understanding, classification of respondents according to their perception about HYVs in the three different AES was also done.

| Sl. No. | Category | Criteria | Score |
|---|---|---|---|
| 1 | Low | < Mean - S. D. | <61.26 |
| 2 | Medium | Mean ± S. D. | 61.26 -76.49 |
| 3 | High | > Mean + S. D. | >61.26 |

To understand the quality attributes which the farmers perceive more, ranking of the statements were done based on the weightage mean score for all the

perception statements. The mean weightage score for a statement was computed using the formula:

$$P_{twg} = f_{xi} \times 5 + f_{xi} \times 4 + f_{xi} \times 3 + f_{xi} \times 2 + f_{xi} \times 1$$

Where, $P_{twg}$ = Total weightage score for a statement

$f_{xi}$ = frequency of respondents in respective category

$$P_{mwg} = \frac{P_{twg}}{N}$$

Where, $P_{mwg}$ = Mean weightage score for a statement

N = Total number of respondents

Further, for better interpretation of the data, the variable was studied at multiple levels namely, dimension wise perception and varietal perception.

Further, the respondents were categorized into low, medium and high perception categories under each quality dimension of HYVs of rice *viz.*, Plant characteristics, Climatic adaptability, Technological aspects and grain quality. Based on the scores obtained for each dimension, keeping mean and standard deviation as check, the respondents were categorized as follows:

| Category | Plant Characteristics | Climatic Adaptability | Technological Aspects | Grain Quality |
|---|---|---|---|---|
| **Low** | < Mean - S. D. | < Mean - S. D. | < Mean - S. D. | < Mean - S. D. |
| **Medium** | Mean ± S. D. | Mean ± S. D. | Mean ± S. D. | Mean ± S. D. |
| **High** | > Mean + S. D. | > Mean + S. D. | > Mean + S. D. | > Mean + S. D. |

Perception of farmers on each variety was analyzed in terms of its perceived qualities by taking the mean weightage score for each quality dimension. The varieties were ranked according to the total mean weightage score obtained. The following formula was used for calculation of mean weightage score:

$$P_{twg} = f_{xi} \times 3 + f_{xi} \times 2 + f_{xi} \times 1$$

Where, $P_{twg}$ = Total weightage score for a statement

$f_{xi}$ = Frequency of respondents

$$P_{mwg} = \frac{P_{twg}}{N}$$

Where, $P_{mwg}$ = Mean weightage score for a statement

N = Total number of respondents

**II. Independent Variables**

**1. Age**

In the present study, age refers to the chronological age of the respondents in completed years at the time of the interview.

Number of completed years was taken as respondent score on age and respondents were categorized as follows:

| Sl. No | Category | Age |
|---|---|---|
| 1 | Young age | Below 30 years |
| 2 | Middle age | 30- 50 years |
| 3 | Old age | Above 50 |

**2. Gender**

Operationally gender is defined as the distinction between male, female, and other genders.

Based on the gender, respondents were categorized and scores were assigned as follows:

| Sl. No. | Category | Score |
|---|---|---|
| 1 | Female | 3 |
| 2 | Male | 2 |
| 3 | Other | 1 |

**3. Formal educational experience**

Education refers to the formal education level of the respondents. Education is operationalized as number of years completed in formal education by the respondent at the time of interview. Numbers of years completed formal education was taken as respondent's score and on the basis of that respondents were categorized in the following:

| Sl. No | Category | Score |
|---|---|---|
| 1 | Illiterate | 0 |
| 2 | Primary school level | 1-5 |
| 3 | Middle School level | 6-8 |
| 3 | High school level | 9-10 |
| 4 | Higher Secondary level | 11-12 |
| 5 | Graduate level and above | 13-15 |

**4. Caste**

A caste is a form of social stratification characterized by endogamy, hereditary transmission of a style of life which often includes an occupation, ritual status in a hierarchy, and customary social interaction and exclusion based on cultural notions of purity and pollution. Caste is operationalized as the caste of the family to which she/ he was born into. The respondents were categorized into different caste and scored properly.

| Sl. No. | Category | Score |
|---|---|---|
| 1 | SC | 1 |
| 2 | ST | 2 |
| 3 | OBC | 3 |
| 4 | General | 4 |

**5. Family Size**

Family size refers to the number of members in the family of the respondents. It was categorized as follows:

| Sl. No. | Category | Range |
|---|---|---|
| 1 | Small family | Up to 4 members |
| 2 | Medium family | 5 – 6 members |
| 3 | Large family | 7 members and above |

**6. Occupation**

Occupation is operationalized as the activities in which the farmer and his/ her family are engaged and get their major income. The occupation is classified into different categories as below:

| Sl. No. | Category |
|---|---|
| 1 | Agriculture |
| 2 | Agriculture + Service |
| 3 | Agriculture +Business |
| 4 | Agriculture + Agricultural labour |

Based on the contribution to the total family income, again the occupation is classified into primary and secondary occupations.

**7. Annual Income**

Total annual family income refers to the total earning of the respondent and his/ her family members from various sources like farm and non-farm activities expressed in terms of rupees. Based on the annual income of the respondents they were categorized into different groups keeping the mean and standard deviation as check.

| Sl. No. | Category | Criteria | Score Range |
|---|---|---|---|
| 1 | Low | < Mean – ½ S. D. | < ₹ 69101 |
| 2 | Medium | Mean ± ½ S. D. | ₹ 69101 to ₹ 151774 |
| 3 | High | > Mean + ½ S. D. | > ₹ 151774 |

**8. Size of operational land holding**

The size of the operational landholding is the land area used by the respondents for cultivation expressed in hectares. It was calculated using the formula given below:

Size of Operational Land Holding = (land owned + land leased in) - land leased out

On the basis of size of the land holding, farmers were categorized as given below:

| Sl. No. | Category | Range |
|---|---|---|
| 1 | Marginal | Less than 1 ha |
| 2 | Small | 1 to 2 ha |
| 3 | Semi Medium | 2 to 4 ha |
| 4 | Medium | 4 to 10 ha |
| 5 | Large | Above 10 ha |

**9. Area under rice**

It is conceptualized as the land area used by the respondents for rice cultivation expressed in hectares. Based on the area under rice cultivation the farmers were classified into the following categories:

| Sl. No. | Category |
|---|---|
| 1 | Less than 1 ha |
| 2 | 1 to 2 ha |
| 3 | 2 to 4 ha |
| 4 | 4 to 10 ha |
| 5 | Above 10 ha |

Further, the percentage share of area under rice is calculated using the following formula:

$$\text{Per cent share of area under rice} = \frac{\text{Area under Rice}}{\text{Total operational land holding}} \times 100$$

It refers to the percentage share of area under the rice to the total operational land holding possessed by the respondent. The maximum and minimum per cent shares were 100 and 40 respectively. Based on the per cent share of rice area obtained, the respondents were categorized into three groups as follows:

| Sl. No. | Category |
|---|---|
| 1 | 40 % -60% |
| 2 | 60% -80% |
| 3 | 80% -100% |

**10. Varieties grown**

Varieties grown refers to the rice varieties, both high yielding and local varieties of rice grown by the respondents during the rice seasons in the previous year. Details of varieties grown in the three rice seasons *viz.*, *Ahu*, *Sali*, and *Boro* were collected. The results were expressed in the form of frequencies and percentages.

**11. Degree of land scatteredness**

The degree of land scatteredness is operationally defined as the number of plots into which the respondent's total operational landholding is divided. Based on the land scatteredness the respondents were classified into the following categories.

| Sl. No. | Category | Range |
|---|---|---|
| 1 | Not scattered | 1 |
| 2 | Least scattered | 2 - 3 |
| 3 | Moderately scattered | 4 - 5 |
| 4 | Highly scattered | More than 5 |

**12. Farming Experience**

It refers to the number of years completed since the respondent has been involved in farming. Based on the number of years of experience in farming, the respondents were categorized into three groups as follows:

| Sl. No. | Category | Criteria | Score |
|---|---|---|---|
| 1 | Low | <(Mean –S. D.) | <15.41 |
| 2 | Medium | Mean ± S. D. | 15.41 – 37.72 |
| 3 | High | >(Mean + S. D.) | >37.72 |

**13. Cropping Intensity**

It refers to the proportion of gross cropped area to the net sown area possessed by a respondent. The cropping intensity (CI) was calculated using the following formula:

$$\mathbf{CI} = \frac{X_{GPA}}{X_{NCA}} \times 100$$

Where,

$X_{GPA}$= Gross Cropped area of $X^{th}$ respondent

$X_{NPA}$= Net sown area of $X^{th}$ respondent

Based on the total scores obtained the respondents were classified into three categories, keeping the mean and standard deviation as check.

| Sl. No. | Category | Criteria | Score range |
|---|---|---|---|
| 1 | Low | < (Mean-S.D.) | <114.55 |
| 2 | Medium | Between (Mean ± S.D.) | 114.55 – 188.38 |
| 3 | High | >(Mean +S.D.) | >188.38 |

**14. Degree of innovativeness**

It refers to the behavior pattern of an individual who has an interest and desire to seek change in farming techniques and is ready to introduce such changes into his/ her operations when practical and feasible. It is defined as the degree to which an individual adopts new ideas, relatively earlier than others in his/ her social system (Rogers and Svenning, 1969).

Moulik's (1965) self-rating innovative proneness scale followed by Sakharkar (1995) was used to measure the degree of innovativeness of the farmer. The

scale consists of three sets of statements; each set of statements contained three statements with scoring weights 3, 2, and 1 indicating a high, medium, and low degree of innovativeness. After obtaining the respondent's most like and least like choices in the original scale, response for each of the three sets of statements, 3 score was given to most like response and 1 score for least like a response. The scoring was done by summing up the scores of the weights of the "most like" statements and the weight of "least like" statements. As there were three sets of statements for the innovativeness scale, the sum scores for the three set was considered as respondents' self-rating score for the degree of innovativeness. The score ranges from 18 to 54. The respondents were categorized into 3 categories *viz.,* high, medium, and low based on mean and standard deviation as the measure of the check.

| Sl. No. | Category | Range | Score |
|---|---|---|---|
| 1 | Low | <(Mean-S.D.) | <21.46 |
| 2 | Medium | Between (Mean ± S. D.) | 21.46 – 28.66 |
| 3 | High | > (Mean +S.D.) | >28.66 |

**15. Degree of commercialization**

It refers to the fraction of farm produced sold during the last year. The degree of commercialization was measured with the help of the following formula:

$$\text{Degree of commercialization} = \frac{\text{Value of farm produce sold annually}}{\text{Gross value of all production on the farm in that year}} \times 100$$

Based on the total scores obtained the respondents were classified into three categories, keeping the mean and standard deviation as check.

| Sl. No. | Category | Criteria | Score Range |
|---|---|---|---|
| 1 | Low | < (Mean- S.D.) | <57.84 |
| 2 | Medium | Between (Mean ±S.D.) | 57.84 – 98.69 |
| 3 | High | > (Mean+ S.D.) | > 98.69 |

**16. Economic motivation**

It refers to the degree to which the farmers attain occupational success in terms of profit maximization and the relative value placed on economic needs (Singha, 1991).

A five point scale developed by Singha (1991) *i.e.,* strongly agree, agree, undecided, disagree, and strongly disagree was used to measure the variable. The

statements consist of one negative and five positive statements. The scores are given as below:

| Sl. No. | Response(Category) | Score |
|---|---|---|
| 1 | Strongly Agree (SA) | 5 |
| 2 | Agree(A) | 4 |
| 3 | Undecided(UD) | 3 |
| 4 | Disagree(DA) | 2 |
| 5 | Strongly Disagree(SDA) | 1 |

The scoring procedure was reversed for the negative statement. The total score on this range from 6-42. Categorization was done by finding mean and standard deviation and the score range was given as below:

| Sl. No. | Category | Range | Score |
|---|---|---|---|
| 1 | Low | < (Mean-SD) | <20.51 |
| 2 | Medium | Between (Mean ± SD) | 20.51 – 25.63 |
| 3 | High | > (Mean +SD) | >25.63 |

**17. Extension Contact**

Extension contact refers to the degree of contact to which a respondent maintained contact with the different extension personnel like ADOs, VLEW, KVK personnel, ATMA personnel, And Village Panchayat members to get information on High Yielding varieties of rice and its cultivation practices.

Sources of extension contact between the respondent and different extension personnel were given and scored as follows:

| Category | Score |
|---|---|
| Once in a week | 4 |
| Once in one/ two months | 3 |
| Need Based | 2 |
| Never | 1 |

Based on the scores, the respondents were categorized into three categories *viz*., high, medium, and low based on mean and standard deviation as the measure of check.

| Sl. No. | Category | Criteria | Score Range |
|---|---|---|---|
| 1 | Low | < (Mean- S. D.) | < 9.53 |
| 2 | Medium | Between (Mean ±S. D.) | 9.53 – 13.32 |
| 3 | High | > (Mean+ S.D.) | > 13.32 |

To rank the extension agencies contacted, total weightage and mean weightage score for each extension agency were calculated by following formulae:

$$P_{twg} = f_{xi} \times 4 + f_{xi} \times 3 + f_{xi} \times 2 + f_{xi} \times 1$$

Where,

$P_{twg}$ = Total weightage score for an extension agency

$f_{xi}$ = Frequency of respondents for each category

$$P_{mwg} = \frac{P_{twg}}{N}$$

Where,

$P_{mwg}$= Mean weightage score for an extension agency

N= Total number of respondents

**18. Mass media exposure**

It refers to the frequency of using various mass media such as radio, television, newspapers, and farm magazine by the respondents. Each respondent was asked to indicate their degree of participation in terms of listening habit, viewing habit, and reading habit. The data was collected and analyzed.

| Category | Score |
|---|---|
| Regular | 3 |
| Occasional | 2 |
| Never | 1 |

Based on the scores obtained by the respondents on mass media exposure, they were grouped into three categories, keeping mean and standard deviation as check.

| Sl. No. | Category | Criteria | Score Range |
|---|---|---|---|
| 1 | Low | < (Mean- S. D.) | <10.71 |
| 2 | Medium | Mean ±S. D. | 10.71 to 13.79 |
| 3 | High | > (Mean+ S. D.) | >13.79 |

To rank the extension agencies contacted, total weightage and mean weightage score for each extension agency were calculated by following formulae:

$$P_{twg} = f_{xi} \times 3 + f_{xi} \times 2 + f_{xi} \times 1$$

Where,

$P_{twg}$ = Total weightage score for a mass media

$f_{xi}$ = Frequency of respondents for each category

$$P_{mwg} = \frac{P_{twg}}{N}$$

Where,

$P_{mwg}$ = Mean weightage score for a mass media

N = Total number of respondents

**19. Irrigation facility**

It refers to the sources of water for irrigation such as tank, canal, open well, tube well, etc. those respondents depend on for irrigation.

| Sl. No. | Category | Score |
|---|---|---|
| 1 | Tank | 1 |
| 2 | Canal | 2 |
| 3 | Open well | 3 |
| 4 | Tube well | 4 |
| 5 | River | 5 |
| 6 | Others (Bore wells, Lift Irrigation, Micro irrigation) | 6 |

**20. Degree of farm mechanization**

The degree of farm mechanization has been operationalized as the number of farm operations in rice cultivation operated by using farm machinery and implements. For each operation that uses an implement or machinery is given a score of '1' and if no machinery were used score '0' is given. The degree of farm mechanization was calculated in percentage as follows:

$$\text{Degree of farm mechanization} = \frac{\text{No. of farm operations operationalized}}{\text{Total number of farm operations}} \times 100$$

Based on the scores obtained, the respondents were categorized into three groups based on mean and standard deviation.

| Sl.No. | Category | Criteria | Score Range |
|---|---|---|---|
| 1. | Low Farm mechanization | < Mean – S.D. | < 23.42 |
| 2. | Medium Farm mechanization | Mean ± S.D. | 23.42 – 36.97 |
| 3. | High Farm mechanization | > Mean + S.D. | >36.97 |

Further, details of different types of machinery used for different farm operations were also collected. Details of machinery used were represented with frequency and percentage.

**21. Labour availability**

In the present study, labour availability is operationalized as the number of labour used by the respondent including both family labour and hired labour. The total number of labour available was calculated by adding both available family labour and hired labour used.

Based on the score obtained, the respondents were classified into three groups based on mean and standard deviation.

| Sl. No. | Category | Criteria | Score |
|---|---|---|---|
| 1 | Low | < Mean – S. D. | <6.53 |
| 2 | Medium | Mean ± S. D. | 6.53-12.62 |
| 3 | High | > Mean + S. D. | >12.62 |

**22. Status of infrastructural facilities**

The status of infrastructural facilities implies those facilities that help the farmer in the process of sowing to selling; namely- irrigation, road connectivity, storage facilities, primary processing facilities, and telecommunication facilities. Total 8 basic infrastructural facilities were selected and for each facility available a score of 1 is given and total scores were calculated.

The status of infrastructural facilities was calculated as the percentage of the number of available infrastructural status available to the respondent to the total number of selected infrastructural facilities.

$$\text{Infrastructural Status} = \frac{\text{Number of available infrastructural facilities}}{\text{Total number of available infrastructural facilities}} \times 100$$

Based on the percentages obtained, the respondents were grouped into 3 categories, keeping mean and standard deviation as check.

| Sl. No. | Category | Criteria | Range |
|---|---|---|---|
| 1 | Low infrastructural status | < Mean – SD | < 55.45 |
| 2 | Medium infrastructural status | Mean ± SD | 55.45 -84.34 |
| 3 | High infrastructural status | > Mean + SD | >84.34 |

**III. Descriptive Variables**

**1. Problems faced by farmers**

The problem means a situation that is deemed undesirable or unsuitable and requires attention and resolution. In the present study, it is operationalized as the problems faced by farmers in growing high yielding varieties of rice released by Assam Agricultural University.

The problems faced by the paddy farmers were collected through the open ended question. The farmers were asked about the problems they are facing and then their level of seriousness. The severity of the problem was measured in three continuums *viz*., very severe, moderately severe and least severe. The problems were categorized into seven categories namely: economic problems, market related problems, infrastructural facilities, extension related, technology related, cultivation related, and institutional problems. Based on the responses given by the farmers, frequency distribution, percentages were calculated for each problem.

| Category | Score |
|---|---|
| Very severe | 3 |
| Moderately severe | 2 |
| Least severe | 1 |

Problems faced by the farmers were ranked according to the severity mean weightage score obtained for each problem.

$$P_{twg} = f_{xi} \times 3 + f_{xi} \times 2 + f_{xi} \times 1$$

Where,

$P_{twg}$ = Total weightage score for a problem

$f_{xi}$ = frequency of respondents for each severity

$$P_{mwg} = \frac{P_{twg}}{N}$$

Where, $P_{mwg}$ = Mean weightage score for a problem

N = total number of respondents

**2. Suggestive Measures**

It is operationalized as the solutions proposed by the respondents for solving the constraints faced by them in cultivating the HYV of rice. The suggestions of farmers were collected through focus group discussions with a few farmers from each selected village.

**3.5 Tools and techniques of data collection**

For collecting data from the respondents for the present study, the main tool used was the structured schedule developed as given in the appendix. The structured schedule was developed considering the objectives of the study and the dependent and independent variables selected for the study. Proper care was taken in the preparation of the schedule. The questions were framed in such a way that they were well understood by the respondents and would make it easy for them to respond.

The research schedule consisted of four parts. The first part consisted of the general information on the respondents, Part II was on the profile of the respondents, Part III was regarding the perception of farmers on High Yielding Varieties of rice released by AAU and Part IV was regarding the problems faced by the respondents in growing HYVs of rice and their suggestive measures.

Before collecting the data from the study area, the prepared structured schedule was pretested in a non-sample area. Based on the experience obtained from the pretesting, necessary modifications were made to the schedule. The data collection was done through a personal interview method. Respondents were interviewed at their residence. The interviews were collected during the month of October 2021. It was made sure that the questions were rightly understood by the respondents and clarified and elaborated the questions wherever needed. As the researcher is not a native of the state, the help of interpreters had been used. It is important to establish a good rapport with the respondents for collecting accurate information. Before the interview, respondents were given confidence by explaining the study's genuine goals. They were assured that the information they submitted would be kept strictly confidential. The interview went off without a hitch in a comfortable and welcoming environment.

**3.5.1 Pre-testing of research schedule**

For the pre-testing of the schedule before the final use, a group of 30 members of farmers was selected from the village ‘Timtimiya’ of Jorhat district of Assam. The necessary modifications and the suggestions were incorporated after the pre-testing before finalizing the schedule.

### 3.5.2 Validity

Validity of a data collection instrument refers to “the accuracy with which it measures what it is intended to measure”. To ensure the maximum validity of the prepared interview schedule following measures were taken:

- The interview schedule was meticulously discussed with the extension scientists and rice breeders and their suggestions were incorporated.
- Pre-testing of the interview schedule gave an additional check to ensure that the instruments were valid for the study.
- Each question's relevance to the study's objectives, logical arrangement, and wording were all thoroughly scrutinized.

## 3.6 Formulation of Hypothesis

The current investigation was tested using a set of specific hypotheses. Depending upon the theoretical supports, the relationships have been predicted in stating the alternative hypotheses. The hypotheses assumed herein are the verbal statements of the null hypothesis ($H_o$) along with their alternative hypothesis ($H_1$). Based on available theoretical supports, the directions of relationships were predicted in stating the alternative hypothesis. 20 hypotheses were investigated in the present study, which is given below:

**Hypothesis 1:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the age of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the age of the respondents.

**Hypothesis 2:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the gender of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the gender of the respondents.

**Hypothesis 3:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the education of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the education of the respondents.

**Hypothesis 4:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the caste of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the caste of the respondents.

**Hypothesis 5:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the occupation of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the occupation of the respondents.

**Hypothesis 6:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the annual income of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the annual income of the respondents.

**Hypothesis 7:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship size of operational land holding of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the operational landholding of the respondents.

**Hypothesis 8:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the area under rice of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the area under rice of the respondents.

**Hypothesis 9:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the land scatteredness of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the land scatteredness of the respondents.

**Hypothesis 10:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the farming experience of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the farming experience of the respondents.

**Hypothesis 11:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the cropping intensity of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the cropping intensity of the respondents.

**Hypothesis 12:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the degree of innovativeness of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the degree of innovativeness of the respondents.

**Hypothesis 13:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the degree of commercialization of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the degree of commercialization of the respondents.

**Hypothesis 14:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the economic motivation of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the economic motivation of the respondents.

**Hypothesis 15:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the extension contact of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the extension contact of the respondents.

**Hypothesis 16:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with mass media exposure of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with mass media exposure of the respondents.

**Hypothesis 17:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the degree of farm mechanization of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the degree of farm mechanization of the respondents.

**Hypothesis 18:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the status of infrastructural facilities of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the status of infrastructural facilities of the respondents.

**Hypothesis 19:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the family labour of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the family labour of the respondents.

**Hypothesis 20:**

Null hypothesis ($H_0$): The perception of farmers on High Yielding Varieties of rice has no significant relationship with the irrigation facility of the respondents.

Alternative hypothesis ($H_1$): The perception of farmers on High Yielding Varieties of rice has a significant relationship with the irrigation facility of the respondents.

## 3.7 Statistical analysis and interpretation of data

With the use of various appropriate statistical procedures like frequency, percentage, mean, standard deviation, class interval, Pearson's correlation, and chi-square the collected data were coded, categorized, and analyzed considering the objectives of the study.

The definitions and equations of the statistical tools used are presented in the following subheads.

### 3.7.1 Frequency and percentage

Frequency is used to indicate how frequently a response appears in a class or category. In the present study, frequency or the number of observations was used to know the distribution pattern of the respondents according to the selected variable.

Percentage values were calculated to make simple comparisons. The percentage is the number, amount, rate, etc. expressed as if it is a part of the total which is 100.

$$\text{Percentage } (\%) = \frac{n}{N} \times 100$$

Where, n = Frequency of respondents

N = Total number of respondents

**3.7.2 Class interval:**

An exclusive method of class intervals was used to categorize variables. Class interval is the difference between the upper and lower limit of a class and is calculated using the following formula.

$$\text{C. I.} = \frac{\text{Maximum score} - \text{Minimum score}}{\text{No. of classes}}$$

Under the exclusive type of class intervals, the items whose values are equal to the upper limit are grouped in the next higher class.

**3.7.3 Arithmetic Mean ($\bar{X}$)**

It is defined as the sum of all values of the observations divided by the total number of observations. Symbolically it is represented as $\bar{X}$.

$$\text{Arithmetic Mean } (\bar{X}) = \frac{\Sigma x}{n}$$

Where, $\bar{X}$ = Arithmetic Mean

$\Sigma$ x = Sum of all items

n = Number of items

**3.7.4 Standard Deviation (S.D.)**

To find out the extent of variability shown by the variables, *i.e.*, the dispersion of the variables around the mean and standard deviation (SD) was used. It is the positive square root of the mean of the squared deviations taken from the arithmetic mean. It is represented by the symbol 'σ'.

$$\text{SD } (\sigma) = \sqrt{\frac{1}{n}\left[\sum x^2 - \frac{(\sum x)^2}{n}\right]}$$

Where, $\sum x^2$= Sum of squares of observations

$(\sum x)^2$= Square of sum of observation values

n = Number of observations

### 3.7.4 Coefficient of Variation

Depending upon the units of measurement, the standard deviation is an absolute measure of dispersion. So we compute the Coefficient of Variation (C.V.) for each distribution for comparing the variability of two distributions. A smaller C.V. denotes a distribution with more homogeneous or uniform or less variable than the other and the series with greater C.V. is said to be more heterogeneous or more variable than the other. C. V. is calculated using the formula given below:

$$\text{Coefficient of variation, } C.V. = \frac{\sigma}{\bar{x}} \times 100$$

Where,

σ = Standard deviation

$\overline{X}$ = Mean

### 3.7.5 Pearson's Correlation Coefficient (r)

This test was used to study the relationship between the scores of independent variables and the scores of dependent variables. It measures the degree of relationship between the two sets of variables.

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

Where,

r = Correlation coefficient

Σx = Sum of scores of independent variables

Σy = Sum of scores of dependent variables

$\Sigma x^2$= Sum of the squares of scores of an independent variables

$\Sigma y^2$= Sum of the squares of scores of a dependent variable

Σxy = The sum of productivity of x and y

n = Size of the sample

### 3.7.6 Chi-square test

Chi-square ($\chi^2$) test was used to find out the association between the qualitative independent variables (having nominal and ordinal scale) and dependent

variables. Chi-square ($\chi^2$) test was used to analyze the test of independent, *i.e.*, whether one factor is independent of the other or not.

The formula of Chi-square ($\chi^2$) test is:

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where,

$O_{ij}$ = Observed frequencies of $ij^{th}$ cell of contingency table

$E_{ij}$ = Expected frequencies of $ij^{th}$ cell of contingency table

r = Number of rows of contingency table

$$E_{ij} = \frac{\text{Marginal total of } i^{th} \text{row frequency} \times \text{Marginal total of } j^{th} \text{column frequency}}{n}$$

Where,

n = Total number of respondents

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**FARMERS IN THEIR FIELDS AND WITH THEIR PRODUCE**

# CHAPTER IV

# FINDINGS AND DISCUSSION

This chapter covers the findings from the study and the related discussion. Results on profile characteristics of the farmers, their perception on HYVs of rice released by AAU, its relationship to the profile of the respondents, problems faced by farmers in cultivating HYVs of rice and the suggestive measures proposed by them were discussed according to the objectives of the study and meaningful discussions were elucidated in this chapter.

The data gathered for the study was coded, tabulated, categorized, and evaluated in accordance with the objectives of the study. The facts and findings obtained from the present study are presented and discussed in the following heads:

4.1 Profile characteristics of the rice farmers

4.2 Perception of farmers on High Yielding Varieties of rice released by AAU.

4.3 Relationship between selected profile characteristics and perception of farmers on HYVs of rice released by AAU

4.4 Problems faced by the farmers in cultivating HYVs of rice and the suggestive measures given by the farmers

## 4.1 Profile characteristics of the respondents

To understand the profile characteristics of the respondents, a total of 22 personal, socio-economic, and psychological characters were analyzed in the present study. Categorization of respondents under each of these characteristics was done and frequency and percentage were also calculated to understand the distribution of respondents. In addition, the mean, Standard deviation (S.D.), and coefficient of variation (C.V.) were calculated.

The following paragraphs are presented with variable-wise discussion.

### 4.1.1 Age

From Table 4.1, it is observed that the majority (70.83%) of the respondents belonged to 30-50 years of age group, followed by 21.67 per cent of the respondents who were above 50 years of age and 7.50 per cent of them were below 30 years of age. The

mean age of farmers involved in rice cultivation was found to be 42.36 with a standard deviation of 9.74. The coefficient of variation was 23.00 which indicated a low degree of variation among the respondents in terms of age.

**Table 4.1: Distribution of respondents according to their age**

**N=120**

| Sl. No | Category | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| 1 | Below 30 years | 9 | 7.50 | | | |
| 2 | 30-50 years | 85 | 70.83 | 42.36 | 9.74 | 23.00 |
| 3 | Above 50 | 26 | 21.67 | | | |
| | **Total** | **120** | **100** | | | |

From the results, it can be concluded that the majority of the rice growers belong to the age group of 30-50 years followed by farmers who belonged to the age group above 50 years. It can be noted that the younger generation *i.e.* people who are below 30 years who are engaged in rice cultivation are very less in number. A probable reason can be that young people prefer to work in other trades and jobs which fetch more income compared to rice farming. Because of the low profitability and drudgery involved in farm work, the younger generation did not prefer to pursue farming as a career. The result is in line with the findings of Shmana (2014), Adedoyin *et al.* (2016), Sharma (2019) and Wakhet (2019).

### 4.1.2 Gender

The data presented in Table 4.2 reveals that a high majority (94.17%) of the respondents was male and females were only 5.83 per cent. This means that males are more involved in rice cultivation compared to females in the region. The probable reason might be that the responsibilities of taking care of the household and children often fall entirely upon women due to which they are unable to take up agricultural activities. Similar results are reported by Adedoyin *et al*. (2016), Abebrese *et al*. (2019) and Wakhet (2019).

**Table 4.2: Distribution of respondents according to their gender**

**N=120**

| Sl. No. | Category | Frequency | Percentage |
|---|---|---|---|
| 1 | Female | 7 | 5.83 |
| 2 | Male | 113 | 94.17 |

### 4.1.3 Formal educational experience

Formal educational experience helps a person to understand and utilize the knowledge in a better way, hence the assessment of respondents' educational experience will provide a better understanding of their actions and decisions. The findings given in Table 4.3 and Fig. 4.1 indicate that 41.67 per cent of the respondents had high school education (9-10 years of formal education), followed by 29.17 per cent of the respondents who had higher secondary education (11-12 years of formal education), 20.00 per cent of them had middle school level education (6-8 years) whereas 5.00 per cent of the respondents had primary level education (1-5 years) and 4.17 per cent of them had graduation or above (13-15 years). None of the respondents from the study area were illiterate.

**Table 4.3: Distribution of respondents according to their formal educational experience (years)**

**N=120**

| Sl. No. | Category | Score Range | Frequency | Percentage |
|---|---|---|---|---|
| 1 | Illiterate | 0 | 0 | 0.00 |
| 2 | Primary | 1 to 5 | 6 | 5.00 |
| 3 | Middle School | 6 to 8 | 24 | 20.00 |
| 4 | High School | 9 to 10 | 50 | 41.67 |
| 5 | Higher Secondary | 11 to 12 | 35 | 29.17 |
| 6 | Graduation and above | 13 to 15 | 5 | 4.17 |

It can be concluded that the majority of the rice farmers from the study area were having 6 to 12 years of educational experience. They had middle school level to higher secondary level of education. All of the farmers were educated and it can be inferred that people are aware of the importance of education and or it might be due to the availability of schools and colleges in the study area. The finding of the present study is in line with the findings of Shamna (2014), Anandrao (2017), Sharma (2019) and Wakhet (2019).

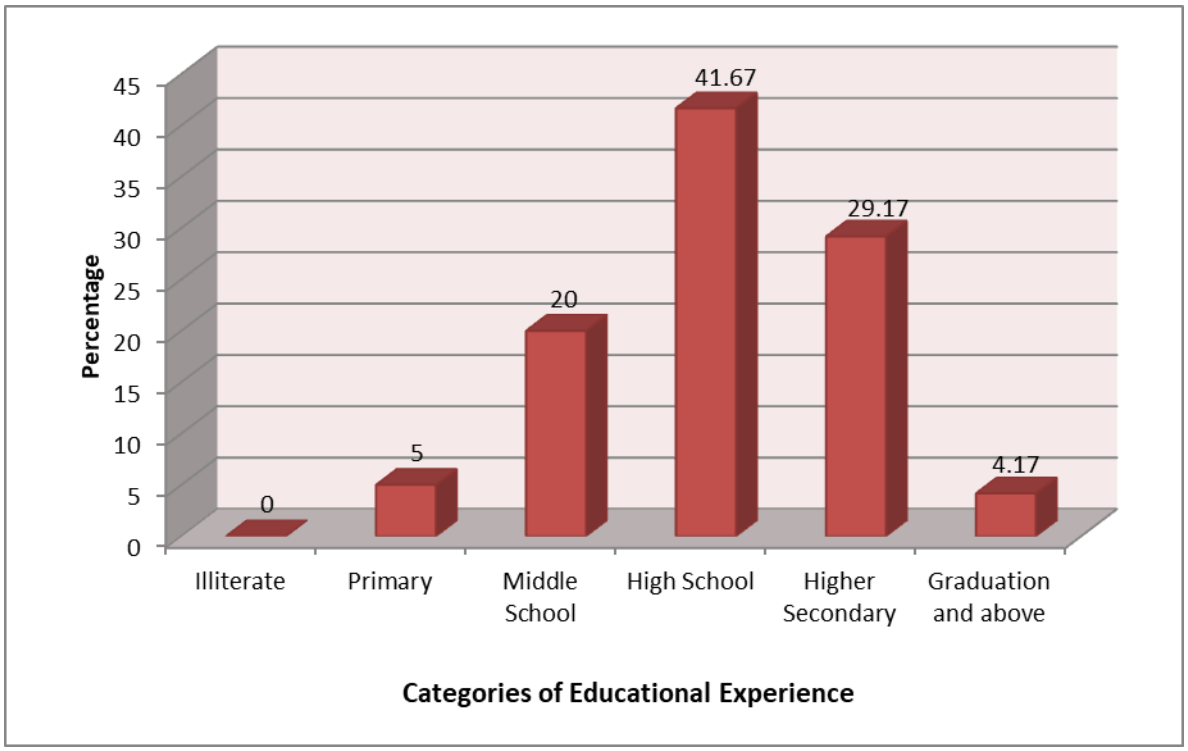


**FIG 4.1 DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR FORMAL EDUCATIONAL EXPERIENCE (YEARS)**

### 4.1.4 Caste

Our society is mostly caste-based, which has a significant impact on the adoption or rejection of new technology. People's traditions, rituals, social interactions, etc. are highly associated to his/ her caste. A person's relative status in society is also determined by the caste structure. Table 4.4 and Fig 4.2 show that the majority of the respondents belonged to the OBC category, followed by 31.67 per cent of the respondents who belonged to the ST category, 12.50 per cent of them belonged to the SC category and 5.00 per cent of them belonged to the general category.

**Table 4.4: Distribution of respondents according to their Caste**

**N=120**

| Category | Frequency | Percentage |
|---|---|---|
| SC | 15 | 12.50 |
| ST | 38 | 31.67 |
| OBC | 61 | 50.83 |
| General | 6 | 5.00 |

It can be concluded that the majority of the farmers of the study area belonged to the OBC category followed by ST and SC. This pattern of distribution can be

due to the fact that usually the people of Assam, especially who belong to tribal communities and scheduled castes tend to live as a community.

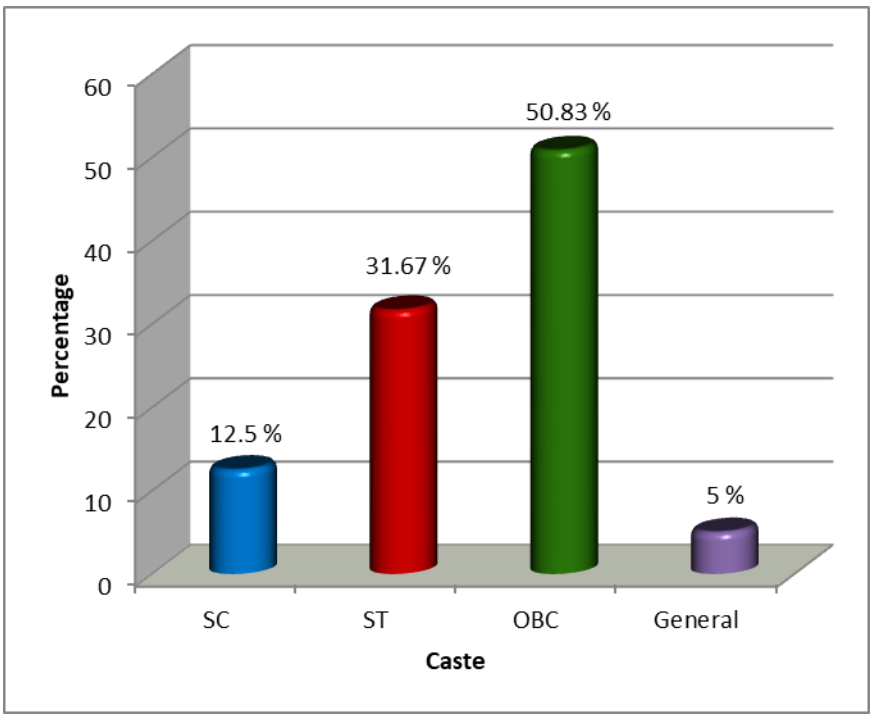


**FIG 4.2: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR CASTE**

### 4.1.5 Size of the family

The data in Table 4.5 and Fig. 4.3 depicts that more than half of the respondents (55.83%) had medium family size with 5 to 6 members, followed by 40.00 per cent of the respondents with small family size with up to 4 members and only 4.17 per cent of the respondents had large family size with more than 6 members. The mean family size was 4.82 with a coefficient of variation of 23.62 per cent.

**Table 4.5: Distribution of respondents according to their family size (No.s)**

**N=120**

| Category | Score | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Small | Up to 4 | 48 | 40.00 | | | |
| Medium | 5 to 6 | 67 | 55.83 | 4.82 | 1.14 | 23.62 |
| Large | Greater than 6 | 5 | 4.17 | | | |

It is evident from Table 4.5 and Fig. 4.3 that most of the farmers had a family size of 5 to 6 members followed by up to 4 members. It implies that mostly they were nuclear families. The joint family system is fading away and most people prefer nuclear families. More or less similar findings were observed by Darshan (2018), Sharma (2019), Wakhet (2019) and Medhi *et al*. (2020).

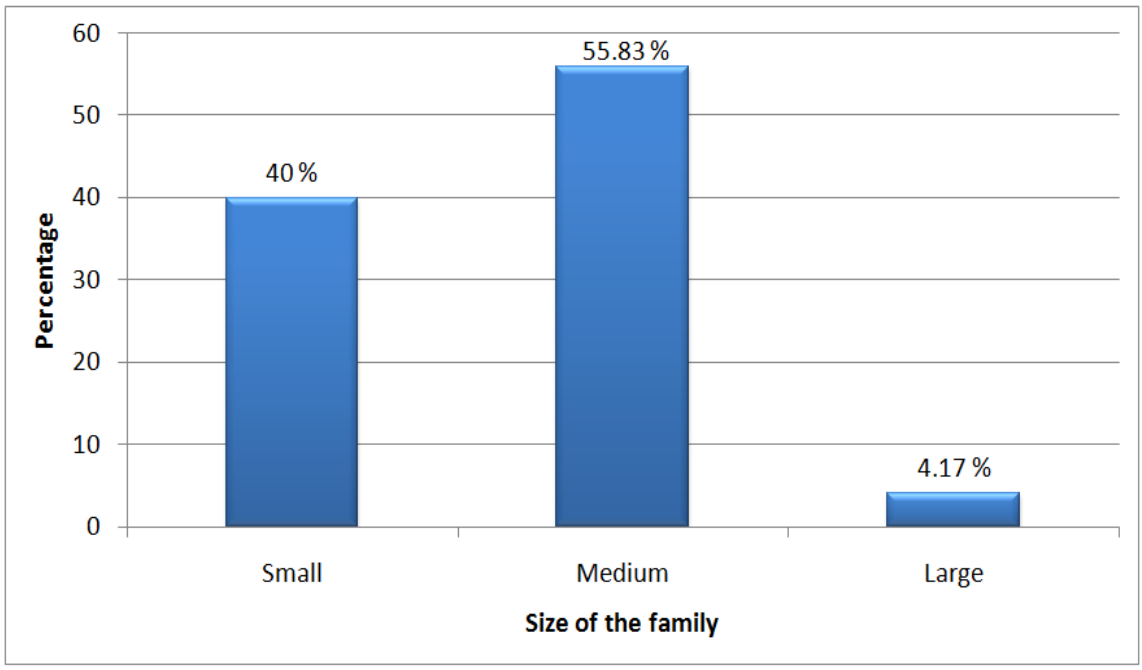


**FIG 4.3: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR FAMILY SIZE**

### 4.1.6 Annual Income

Annual income includes the income earned from agriculture and other occupation by all the family members throughout the year. It is apparent from Table 4.6 and Fig. 4.4 that majority (41.67%) of the farmers had low annual income (< ₹ 69101), followed by 39.17 per cent of the farmers with a medium annual income (₹ 69101 to ₹ 151774) and 19.17 per cent of the farmers with a high annual income (> ₹ 151774). The mean annual income of the respondents was ₹110437.5.

**Table 4.6: Distribution of respondents according to their annual income (₹)**

**N=120**

| Category | Category | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | < ₹ 69101 | 50 | 41.67 | | | |
| Medium | ₹ 69101 to ₹ 151774 | 47 | 39.17 | 110437.5 | 82673.72 | 74.86 |
| High | > ₹ 151774 | 23 | 19.17 | | | |

It is evident from the results that the majority of the respondents (41.67%) were having an annual income of less than ₹ 69101. The families having low annual income might be depending solely on agriculture. The families with medium and high

annual income might be earning from other occupations along with agriculture. Similar results were reported by Sharma *et al*. (2015) and Darshan (2018).

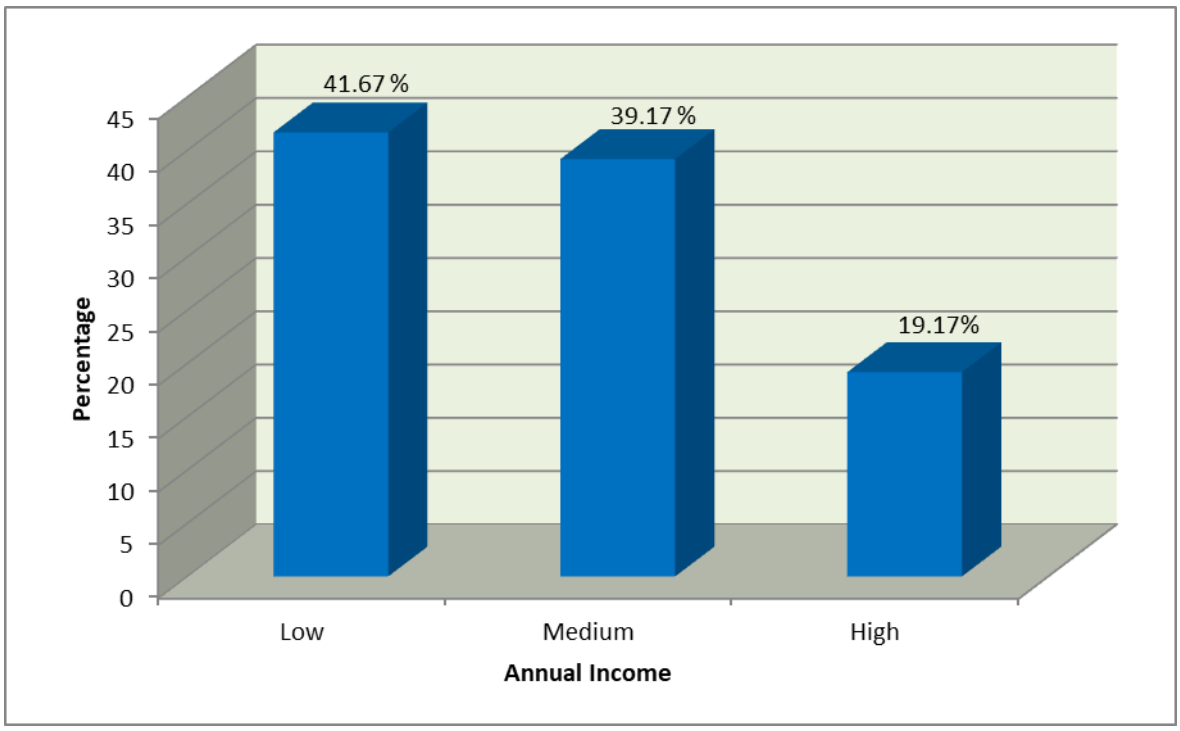


**FIG 4.4: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR ANNUAL INCOME (₹)**

### 4.1.7 Occupation

It is seen from the data presented in Table 4.7 and Fig. 4.5 that agriculture was one of the occupational activities of all the respondents and the majority (51.67%) of them engaged only in agriculture. Whereas 30.83 per cent of the respondents were engaged in business along with agriculture, 10.00 per cent of the respondents were working in the service sector along with agriculture and 7.50 per cent of them were doing labour along with agriculture.

**Table 4.7: Distribution of respondents according to their occupation**

**N=120**

| Sl. No. | Source of Income | Frequency | Percentage |
|---|---|---|---|
| 1 | Agriculture | 62 | 51.67 |
| 2 | Agriculture + Service | 12 | 10.00 |
| 3 | Agriculture +Business | 37 | 30.83 |
| 4 | Agriculture + Labour | 9 | 7.50 |

It can be inferred that agriculture is the major livelihood occupation for most of the respondents. But, besides agriculture respondents were depending upon other occupations such as business, service and labour as livelihood options. Similar results were reported by Bagri (2011), Barik (2013), Sharma *et al*. (2015), Dhanraj (2019) and Barman (2019).

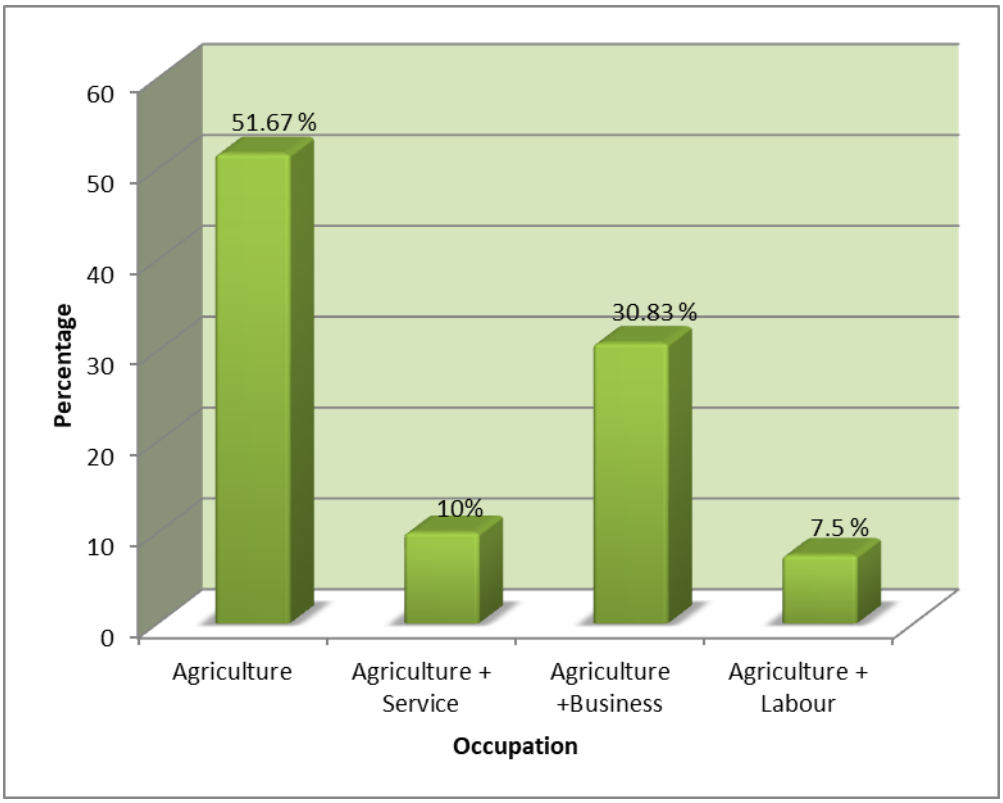


**FIG 4.5: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR OCCUPATION**

**Table 4.8: Distribution of respondents according to their primary source of income**

**N=120**

| Sl. No. | Primary source of income | Frequency | Percentage |
|---|---|---|---|
| 1 | Agriculture | 100 | 83.33 |
| 2 | Service | 11 | 9.17 |
| 3 | Business | 9 | 7.50 |
| 4 | Agricultural labour | 0 | 0.00 |

Based on the contribution of occupation to total family income, occupations were categorized further into the primary and secondary occupations. The occupation which contributes more than 50.00 per cent to the family income is categorized as primary and which has minor contribution categorized as the secondary occupation. The distribution of respondents based on their primary and secondary source of income is presented in Table 4.8 and Table 4.9. It can be seen that agriculture was the primary

occupation for 83.33 per cent of the respondents and the remaining 16.67 per cent of the respondents had agriculture as the secondary occupation. Service and business was the primary occupation for 9.17 per cent and 7.50 per cent of the respondents, respectively (Table 4.8 and Fig. 4.6). Similar results were found by Sivagnanam (2016) and Barman (2019).

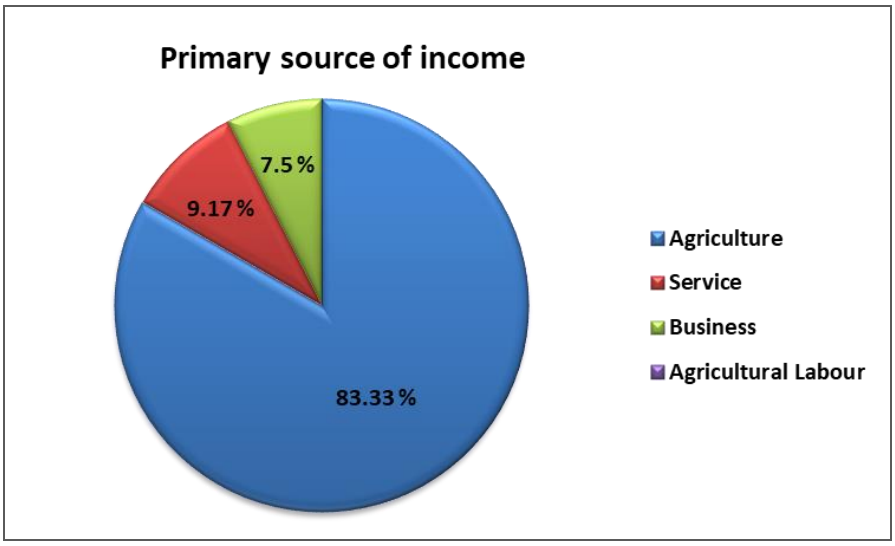


**FIG 4.6: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR PRIMARY SOURCE OF INCOME**

The secondary source of income was business for 23.33 per cent of the respondents and agriculture for 16.67 per cent of the respondents. Agriculture labour was the secondary occupation for 7.50 per cent of the respondents and service for 0.83 per cent of the respondents (Table 4.9).

**Table 4.9: Distribution of respondents according to their secondary source of income**

| Sl. No. | Secondary source of income | Frequency | Percentage |
|---|---|---|---|
| 1 | Agriculture | 20 | 16.67 |
| 2 | Service | 1 | 0.83 |
| 3 | Business | 28 | 23.33 |
| 4 | Agricultural labour | 9 | 7.50 |
| | **Total** | **58** | **48.33** |

It can be inferred that other occupations like business, agricultural labour and business were the secondary occupations of the respondents which contributed to their family annual income. The findings are supported by the findings of Barik (2013), Sharma *et al*. (2015) and Dhanraj (2019).

### 4.1.8 Size of operational landholding

Table 4.10 and Fig. 4.7 indicate that most of the respondents (60.00%) were having marginal landholdings of size less than 1 hectare, followed by 33.33 per cent of the respondents who were having small landholdings of size 1to 2 hectares, 4.17 per cent of the respondents were having semi-medium landholdings of size 2 to 4 hectares and remaining 2.50 per cent of the respondents were having medium land holdings of size 4 to 10 hectares. None of the respondents were having a large operational landholding size. The average size of operational land holding of the farmers from the study area was 1.10 ha with C.V. value of 74.25 per cent.

**Table 4.10: Distribution of respondents according to their size of operational landholding (ha)**

**N=120**

| Sl. No. | Category | Score | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|---|
| 1 | Marginal | Less than 1 ha | 72 | 60.00 | 1.10 | 0.81 | 74.25 |
| 2 | Small | 1 to 2 ha | 40 | 33.33 | | | |
| 3 | Semi Medium | 2 to 4 ha | 5 | 4.17 | | | |
| 4 | Medium | 4 to 10 ha | 3 | 2.50 | | | |

The majority of the respondents were marginal farmers with landholding size less than 1 hectare. The average landholding size of 1.10 ha shows that most of the farmers were having marginal and small size of operational landholdings. Similar results were found by Shamna (2014), Dev *et al.* (2018) and Medhi *et al.* (2020).

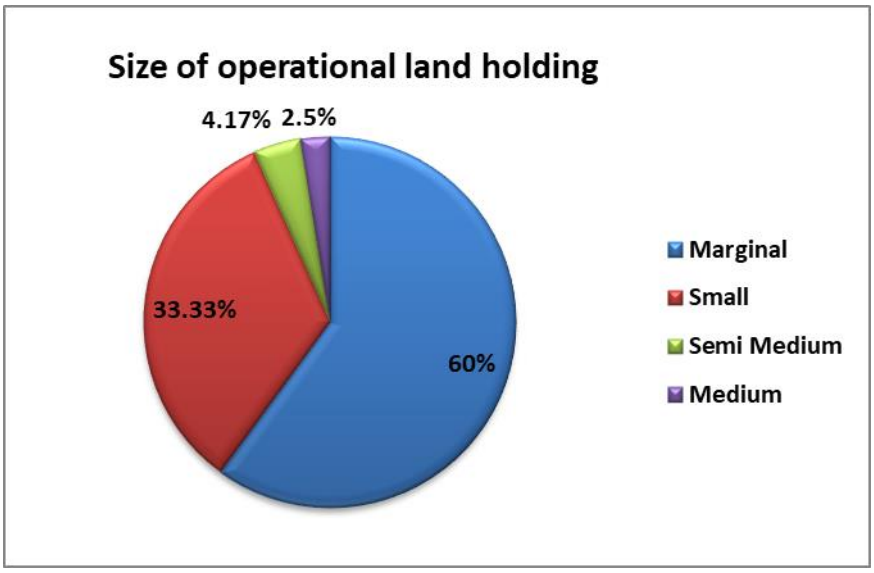


**FIG 4.7: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR SIZE OF OPERATIONAL LANDHOLDING**

### 4.1.9 Area under rice

From Table 4.11 it is evident that the majority (71.67%) of the respondents had less than one hectare of area under rice, followed by 24.17 per cent of the respondents who had 1 to 2 hectares of area under rice, 3.33 per cent of the respondents had an area of 2 to 4 hectares under rice and only 0.83 per cent of them had 4 to 10 hectares of area under rice. The mean area under rice in the study area was 0.90 hectares.

**Table 4.11: Distribution of respondents according to their area under rice (ha)**

**N=120**

| Sl. No. | Rice Area | Frequency | Percentage | Mean | S. D. | C. V. |
|---|---|---|---|---|---|---|
| 1 | Less than 1 ha | 86 | 71.67 | | | |
| 2 | 1 to 2 ha | 29.00 | 24.17 | | | |
| 3 | 2 to 4 ha | 4.00 | 3.33 | 0.90 | 0.52 | 57.73 |
| 4 | 4 to 10 ha | 1.00 | 0.83 | | | |
| | **Total** | **120** | **100.00** | | | |

The area under rice is less than 1 hectare for the majority of the respondents. It can be due to the fact that the size of operational landholding is marginal in size (less than 1 ha). From Table 4.12 and Fig. 4.8 it could be seen that 80-100 per cent of the total operational land holding was under rice cultivation for the majority (60.83%) of the respondents. Whereas, 33.33 per cent of the respondents had 60-80 per cent of their operational landholding under rice and only 5.83 per cent of the respondents' 40-60 per cent of the total operational landholding was under rice.

**Table 4.12: Distribution of respondents according to their percentage share of rice area to the total operational landholding**

| Sl. No. | Category | Frequency | Percentage | Mean | S. D. | C.V. |
|---|---|---|---|---|---|---|
| 1 | 40-60 | 7 | 5.83 | | | |
| 2 | 60-80 | 40 | 33.33 | 86.35 | 15.17 | 17.57 |
| 3 | 80-100 | 73 | 60.83 | | | |

It is apparent from Table 4.12 and Fig. 4.8 that the majority of the farmers were cultivating rice in a major portion of their operational landholdings. So it can be inferred that the majority of the respondents from the study area were primarily rice cultivators. It can be because the majority of them might have taken up rice cultivation following their ancestors and another reason can be that rice is the staple food of the people of Assam. Most of the farmers cultivate rice for their home consumption also.

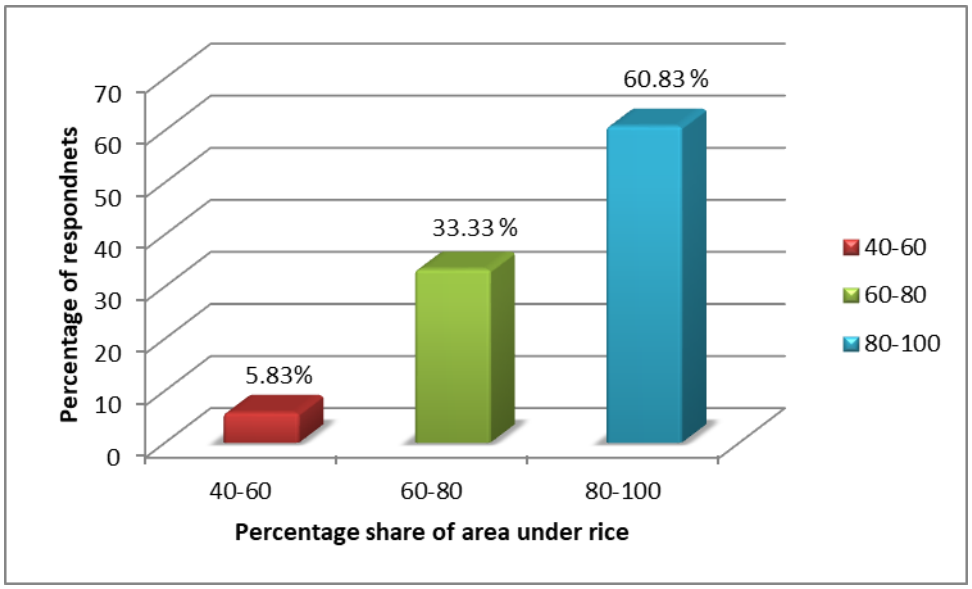


**FIG 4.8: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR PERCENTAGE SHARE OF RICE AREA TO THE TOTAL OPERATIONAL LANDHOLDING**

### 4.1.10 Degree of land scatteredness

Data from Table 4.13 and Fig. 4.9 reveals that the land area of the majority (65.00%) of the respondents was least scattered (scattered into 2 to 3 plots). Whereas the land area of 20.83 per cent of the respondents was not scattered and 12.50 per cent of the respondents' land area was moderately scattered into 4 to 5 plots and for very few (1.67%) of the respondents' land was highly scattered (scattered in more than 5 plots).

**Table 4.13: Distribution of respondents according to their degree of land scatteredness**

**N=120**

| Sl. No. | Category | Score | Frequency | Percentage |
|---|---|---|---|---|
| 1 | Not scattered | 1 | 25 | 20.83 |
| 2 | Least scattered | 2 to 3 | 78 | 65.00 |
| 3 | Moderately scattered | 4 to 5 | 15 | 12.50 |
| 4 | Highly scattered | > 5 | 2 | 1.67 |

The operational landholdings of most of the respondents were least scattered and the probable reason can be that the size of operational landholding of the majority of the respondents is less than 1 hectare.

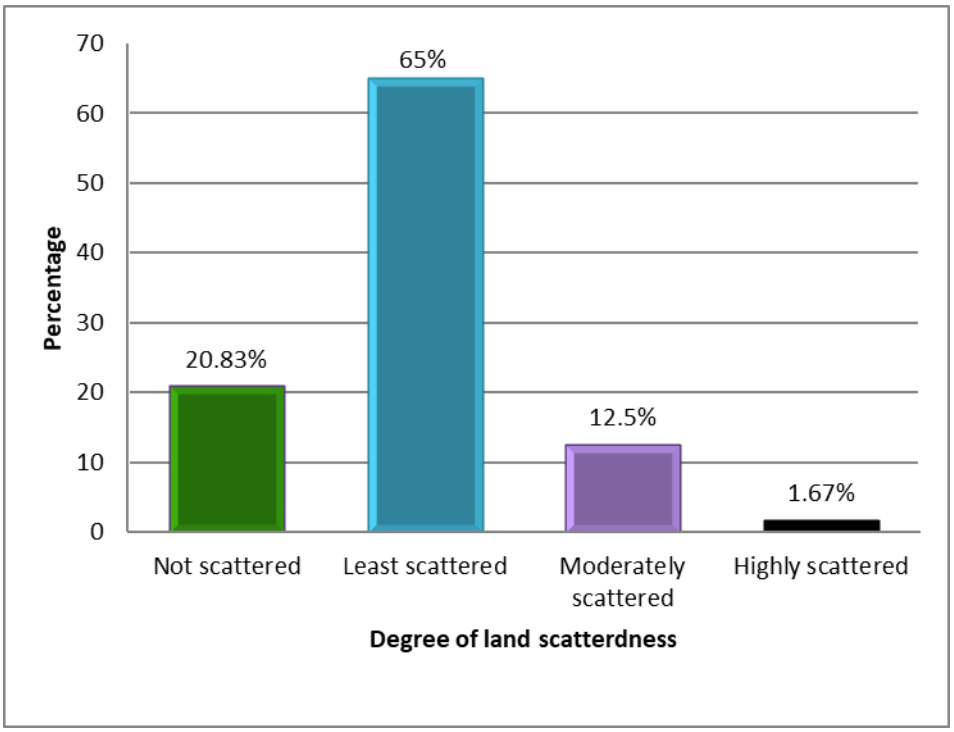


**FIG 4.9: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR DEGREE OF LAND SCATTEREDNESS**

### 4.1.11 Farming experience

The findings presented in Table 4.14 and Fig. 4.10 depicts that the majority (58.33%) of the respondents had medium farming experience followed by 22.50 per cent of the respondents who had high farming experience and 19.17 per cent of them had low farming experience.

**Table 4.14: Distribution of respondents according to their farming experience (years)**

**N=120**

| Category | Range | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | < 15.41 | 23 | 19.17 | | | |
| Medium | 15.41 -37.72 | 70 | 58.33 | 26.57 | 11.16 | 41.99 |
| High | > 37.72 | 27 | 22.50 | | | |

Most of the farmers in the study area were having a medium level of farming experience and the mean years of farming experience were 26.57. This shows that the majority of the farmers have a good number of years of experience in farming. The probable reason is that majority of the farmers belonged to the age group of 30-50 years and as the majority of them start to engage in farming activities immediately after their schooling or on completing their education. The proportion of respondents who are below 30 years was very less, as they take up other white collar jobs. The standard deviation of

11.16 with C.V. of 41.99 per cent suggests that the farmers were moderately heterogeneous regarding their farming experience.

This finding is in conformity with the findings of Adedoyin *et al.* (2016), Wakhet (2019) and Kumari (2020).

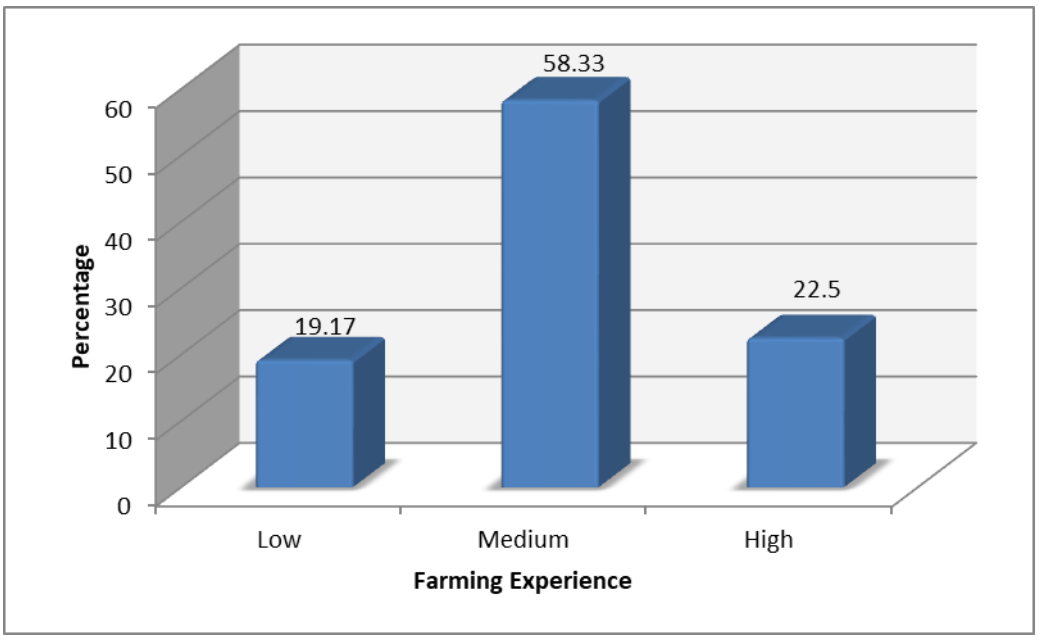


**FIG 4.10: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR FARMING EXPERIENCE**

### 4.1.12 Cropping intensity

A perusal of Table 4.15 and Fig. 4.11 shows that the majority (60.00%) of the respondents belonged to a medium cropping intensity category with cropping intensity of 114.66-179.97 per cent, followed by 21.67 per cent of the respondents with low cropping intensity of less than 114.66 per cent and remaining 18.33 per cent of the respondents with high cropping intensity of greater than 179.97 per cent. The average cropping intensity of the farmers from the study area was 147.32 per cent with C. V. of 22.17 per cent.

**Table 4.15: Distribution of respondents according to their cropping intensity**

**N=120**

| Category | Range | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | < 114.66 | 26 | 21.67 | | | |
| Medium | 114.66 – 179.97 | 72 | 60.00 | 147.32 | 32.65 | 22.17 |
| High | > 179.97 | 22 | 18.33 | | | |

The majority of the respondents had medium cropping intensity and the probable reason may be the as the respondents were from flood prone areas and humid alluvial medium land where water inundation occurs during the heavy monsoons and since the *Kharif* crop is a chance crop, they go for cultivation of maize, vegetables and other crops to get sustainable income. Also, it was noted that the majority of the respondents were marginal farmers whose major source of income was agriculture, so to get a sustainable income from farming they go for other crops after the *Sali* rice. This finding is in line with the findings of Sharma *et al*. (2015) and Barman (2019).

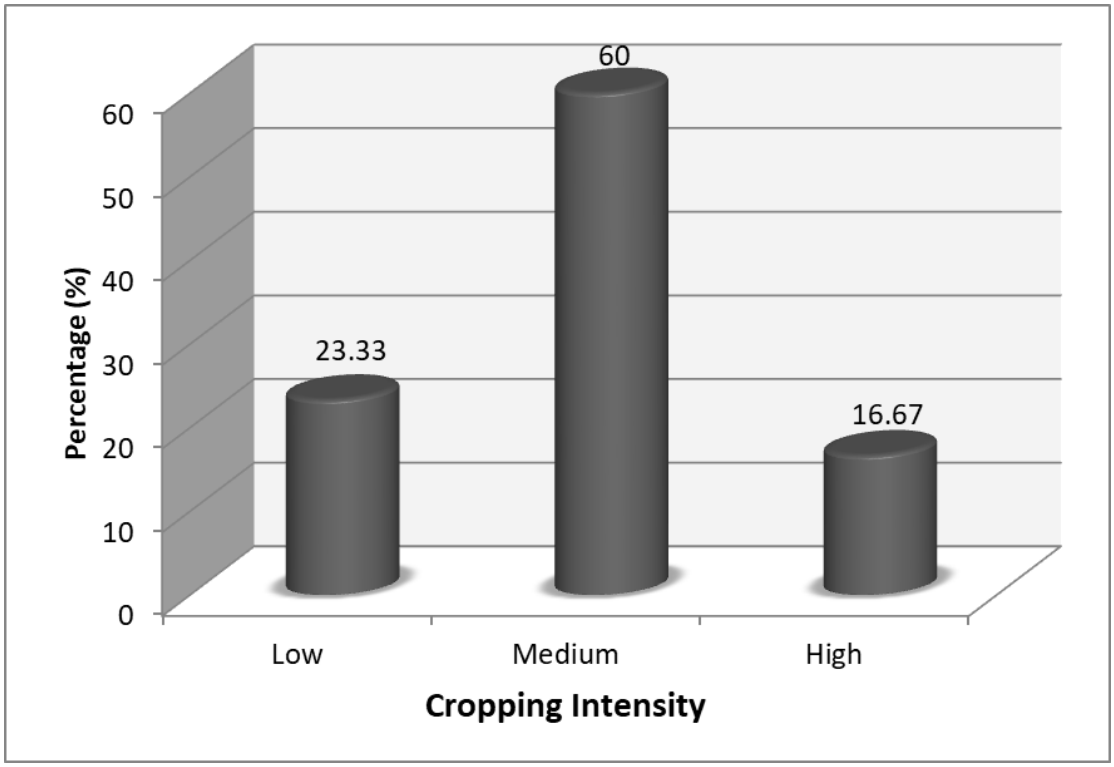


**FIG 4.11: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR CROPPING INTENSITY**

### 4.1.13: Degree of innovativeness

From the data given in Table 4.16 and Fig. 4.12, it is observed that the majority (58.33%) of the respondents were found to be having a medium degree of innovativeness, followed by 25.00 per cent of the respondents who had a high degree of innovativeness and remaining 16.67 per cent of the respondents had a low degree of innovativeness. The average degree of innovativeness among the sample farmers was medium, as indicated by the mean value (25.06). The C.V. value of 14.38 per cent shows that variation of innovativeness among the sample farmers was low level.

**Table 4.16: Distribution of respondents according to their degree of innovativeness**

**N=120**

| Category | Score range | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| **Low** | < 21.46 | 20 | 16.67 | | | |
| **Medium** | 21.46-28.66 | 70 | 58.33 | 25.06 | 3.60 | 14.38 |
| **High** | > 28.66 | 30 | 25.00 | | | |

Even though most of the farmers were in the medium degree of innovativeness, from the data obtained it can be said that the majority of the farmers had medium to high degree of innovativeness. Most of the farmers were dependent on agriculture for their livelihood, so in order to get a reasonable income from farming they will try to maximize their profits by taking up innovative ideas and technologies that are introduced. Also, it can be due to good extension contact and mass media exposure of the respondents. This can be the probable reason for the medium to a high degree of innovativeness of the farmers in the study area. Similar results were found by Gogoi (2016), Reddy (2016), Dhanraj (2019), Sharma (2019) and Medhi *et al*. (2020).

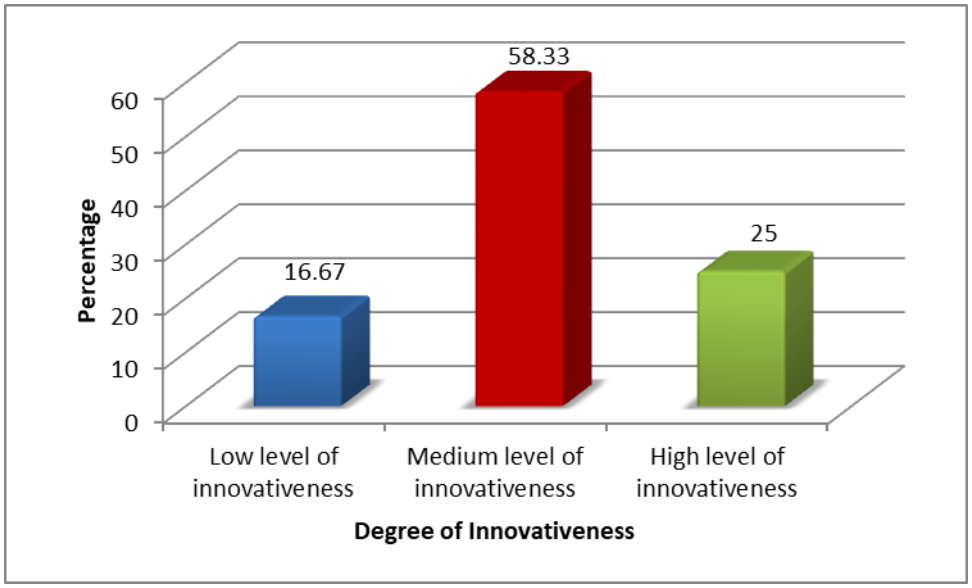


**FIG 4.12: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR DEGREE OF INNOVATIVENESS**

### 4.1.14 Degree of commercialization

From Table 4.17 and Fig. 4.13 it can be interpreted that a high (81.67%) per cent of the respondents had a medium degree of commercialization while 13.33 per cent of the respondents had a low degree of commercialization and only 5.00 per cent of them had a high degree of commercialization. The mean value of the degree of commercialization was 78.26 with a C.V. of 26.10.

**Table 4.17: Distribution of respondents according to their degree of commercialization**

**N=120**

| Category | Score | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | Less than 57.84 | 16 | 13.33 | | | |
| Medium | 57.84 - 98.69 | 98 | 81.67 | 78.26 | 20.42 | 26.10 |
| High | Greater than 98.69 | 6 | 5.00 | | | |

The majority of the respondents were having a medium degree of commercialization. The mean value of 78.26 indicates that the average degree of commercialization of the farmers in the study area was 78.26 per cent, *i.e.*, they are selling on an average 78.26 per cent of their annual produce. This high value of mean shows the majority of the farmers were cultivating the crops not only for home consumption but also for commercial purposes. The value of C.V. (26.10) shows moderate variation among the farmers in terms of the degree of commercialization. This finding is in conformity with the finding of Barman (2019).

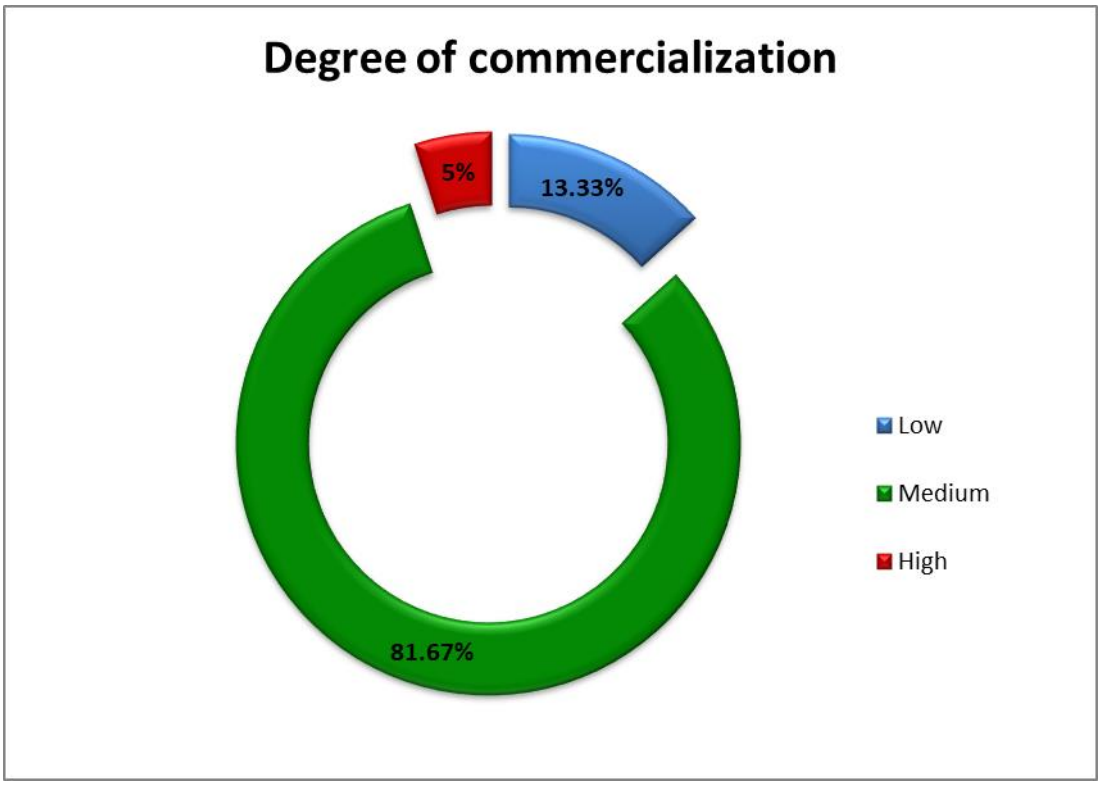


**FIG 4.13: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR DEGREE OF COMMERCIALIZATION**

### 4.1.15 Economic motivation

The findings presented in Table 4.18 and Fig. 4.14 show that the majority (63.33%) of the respondents were having a medium level of economic motivation, followed by 19.17 per cent of the respondents with a low level of economic motivation and 17.50 per cent of them with a high level of economic motivation. The mean value was 23.07 with a C.V. of 11.10 per cent.

**Table 4.18: Distribution of respondents according to their economic motivation**

**N=120**

| Category | Range | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | < 20.51 | 23 | 19.17 | | | |
| Medium | 20.51 - 25.63 | 76 | 63.33 | 23.07 | 2.56 | 11.10 |
| High | > 25.63 | 21 | 17.50 | | | |

Similar findings were reported by Barik (2013), Shamna (2014), Dharmendra (2016) and Reddy (2016).

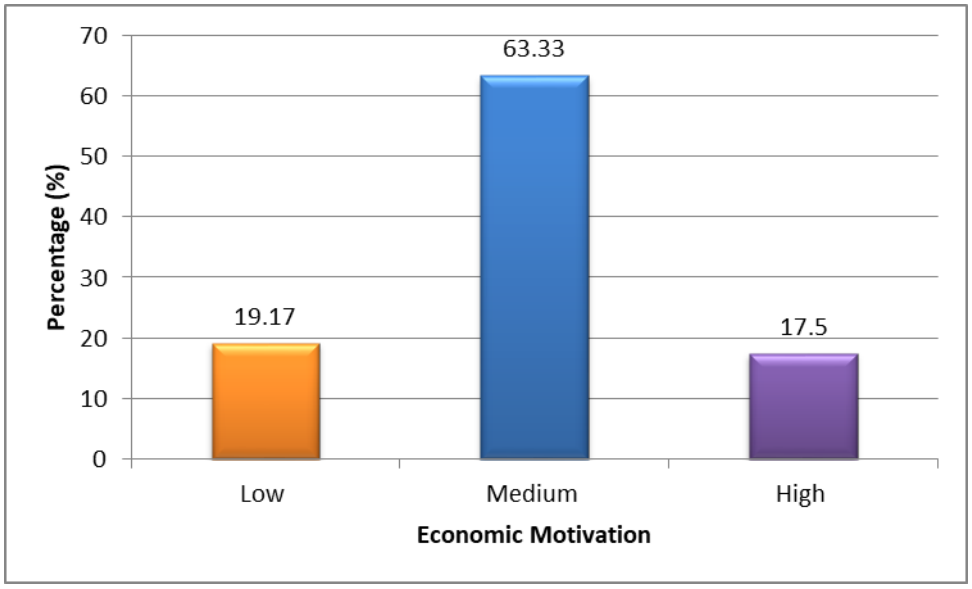


**FIG 4.14: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR ECONOMIC MOTIVATION**

### 4.1.16: Extension contact

From Table 4.19 it is visible that the majority (70.00%) of the respondents had a medium level of extension contact. While an equal percentage of respondents had low and high levels of extension contact. The mean value of extension contact was 11.43 with a C.V. of 16.55 per cent. It can be concluded that the majority of the farmers in the study area had a medium level of extension contact. The medium level of extension contact

is a good indication that the extension services reach almost all the regions. But still, the extension contacts can be improved as still 15 per cent of the respondents had low extension contact. The probable reason for their low extension contact can be that farmers were not able to make regular contacts with extension agencies due to lack of time, or it can be that the extension agencies/ institutes are situated far away from their village, lack of interest and participation in the meetings by the farmers, or it can be due to lack of visits by the extension agents to those areas or inability of the extension agents to cover all the areas. So, appropriate measures can be taken to improve the overall extension contact of the farmers and make them aware and adopt the recent varieties and technologies. This finding is in conformity with the findings of Shamna (2014), Reddy (2016) and Dhanraj (2019).

**Table 4.19: Distribution of respondents according to their extension contact**

**N=120**

| Category | Range | Frequency | percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | Less than 9.53 | 18 | 15.00 | | | |
| Medium | 9.53 to 13.32 | 84 | 70.00 | 11.43 | 1.89 | 16.55 |
| High | More than 13.32 | 18 | 15.00 | | | |

From Table 4.20 and Fig. 4.15, it is evident that farmers had most contact with the "farmers' organization" (MWS-2.88). As the farmers' organizations like '*Pothar parihalana Samiti*' or 'Field Management Committee (FMC)' will be situated in their own villages and most of them were members in these organizations, they will be having very frequent contact through the weekly meetings and other activities. "Extension functionaries from RARS, APART and scientists from RARS and AAU" ranked second with a mean weightage score of 1.97, in terms of extension contact with the farmers. It indicates that farmers had contact with the activities of the RARS, APART (Assam Agribusiness & Rural Transformation Project) functionaries and AAU scientists like training and projects to a good extent. "VLEW" (village level extension worker) ranked third among the 7 extension agencies with a WMS of 1.73. "ADO" occupied 4$^{th}$ rank with a WMS of 1.45 followed by "KVK personnel" in the 5$^{th}$ rank with a WMS of 1.28. The 6$^{th}$ rank was occupied by "ATMA" and the &7$^{th}$ rank was occupied by "others" including the private extension personnel, input dealers, etc. with a WMS of 1.08 and 1.04 respectively in terms of extension contact of farmers.

**Table 4.20: Ranking of Extension agents**

| Sl. No. | Extension Agency | Weightage Score | | | | Total Weightage Score | Mean Weightage Score | Rank |
|---|---|---|---|---|---|---|---|---|
| | | Once in a week | Once in 1 month/ 2 month | Need Based | Never | | | |
| 1 | VLEW | 40 | 60 | 34 | 73 | 207 | 1.73 | III |
| 2 | ADO | 0 | 15 | 88 | 71 | 174 | 1.45 | IV |
| 3 | KVK personnel | 0 | 6 | 60 | 88 | 154 | 1.28 | V |
| 4 | ATMA | 0 | 6 | 10 | 113 | 129 | 1.08 | VI |
| 5 | Farmers' Organization | 164 | 96 | 78 | 8 | 346 | 2.88 | I |
| 6 | Extension functionaries from RARS, Scientists from RARS, AAU and APART | 112 | 39 | 12 | 73 | 236 | 1.97 | II |
| 7 | Others | 0 | 3 | 6 | 116 | 125 | 1.04 | VII |

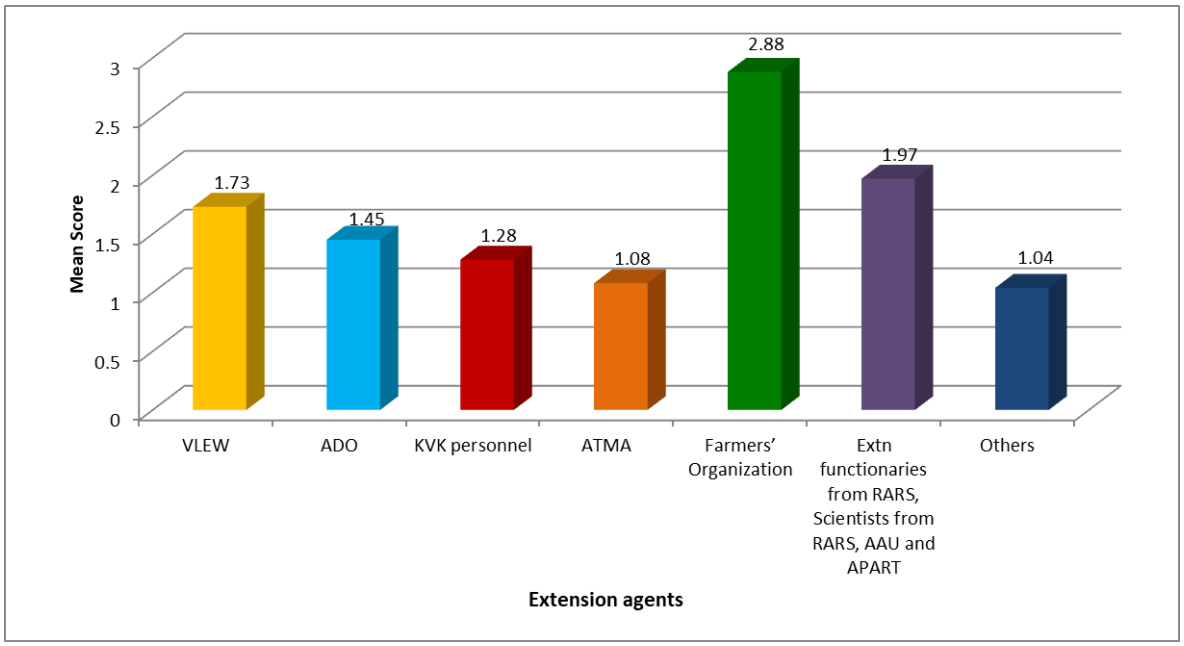


**FIG 4.15: DISTRIBUTION OF EXTENSION AGENTS ACCORDING TO THEIR MEAN WEIGHTAGE SCORE**

### 4.1.17: Mass media exposure

Table 4.21 reveals that mass media exposure was at a medium level for the majority (70.83%) of the respondents, followed by 20.83 per cent of the respondents with high mass media exposure and the remaining 8.33 per cent of the respondents with low mass media exposure.

**Table 4.21: Distribution of respondents according to their Mass media Exposure**

| Category | Score | Frequency | Percentage | Mean | S.D. | C.V. |
|---|---|---|---|---|---|---|
| Low | < 10.71 | 10 | 8.33 | | | |
| Medium | 10.71 to 13.79 | 85 | 70.83 | 12.25 | 1.54 | 12.53 |
| High | > 13.79 | 25 | 20.83 | | | |

The data reveals that most of the farmers had a medium level of mass media exposure and it is skewed towards the high level of mass media exposure. The mean value of 12.25 indicates the medium level of mass media exposure, but at the higher end of the medium level. The variation among the farmers was found to be low as indicated by the C. V. value (12.53). Similar results were found by Devi *et al*. (2013), Deepthi and Rao (2014) and Reddy (2016).

From Table 4.22 and Fig. 4.16 it is clear that "T.V." (Television) ranked first followed by "internet" in the second position and "radio" in the third position among

the mass media sources utilized by the respondents with mean weightage scores of 2.93, 2.40 and 1.97 respectively. The "exhibitions" ranked 4th with a MWS of 1.50, followed by farm literature which ranked 5th with a mean score of 1.31, "newspaper" ranked 6th with a WMS of 1.09 and the 7th rank was occupied by "agricultural books". We can understand from the findings that the majority of the respondents were using electronic mass media more than print media. T. V. and the internet were utilized by the majority of the respondents as it has become an integral part of their day-to-day life. Most of the farmers have T. V. in their house and watching T.V. is part of their daily lives and so telecasting information regarding agriculture through T.V. as audio-visual programmes will be an effective method. In this current scenario of technological development, these farmers were also able to utilize the technology as it is evident from the second position of the internet among mass media utilized. With the internet people were able to get and share information through various social media platforms like WhatsApp groups, Facebook groups, etc. Also, they can contact the extension functionaries easily through these social media platforms for suggestions and solutions. Another factor is, they can easily access information regarding most of the farming practices, recent technologies from the internet and they can also watch YouTube videos regarding the same. Radio was the third most utilized mass media; this shows the radio programmes are still very much prevalent among the farming communities. Exhibitions were also one of the important mass media sources utilized by the respondents for getting information regarding agriculture and rice cultivation. The farmers are somewhat keen to attend these exhibitions and participate in them. The extent of utilization of print media like agricultural literature (magazines, leaflets, newsletter, pamphlets, etc.) newspaper, and agricultural books by the farmers were low.

**Table 4.22: Ranking of the mass media**

| Sl. No. | Mass Media | Weightage Score | | | Total Weightage score | Mean Weightage Score | Rank |
|---|---|---|---|---|---|---|---|
| | | Always | Often | Never | | | |
| 1 | Newspaper | 12 | 6 | 113 | 131 | 1.09 | VI |
| 2 | Farm Literature | 6 | 66 | 85 | 157 | 1.31 | V |
| 3 | Agricultural Books | 3 | 10 | 114 | 127 | 1.06 | VII |
| 4 | Radio | 81 | 124 | 31 | 236 | 1.97 | III |
| 5 | T.V. | 333 | 18 | 0 | 351 | 2.93 | I |
| 6 | Internet | 216 | 48 | 24 | 288 | 2.40 | II |
| 7 | Exhibitions | 27 | 84 | 69 | 180 | 1.50 | IV |

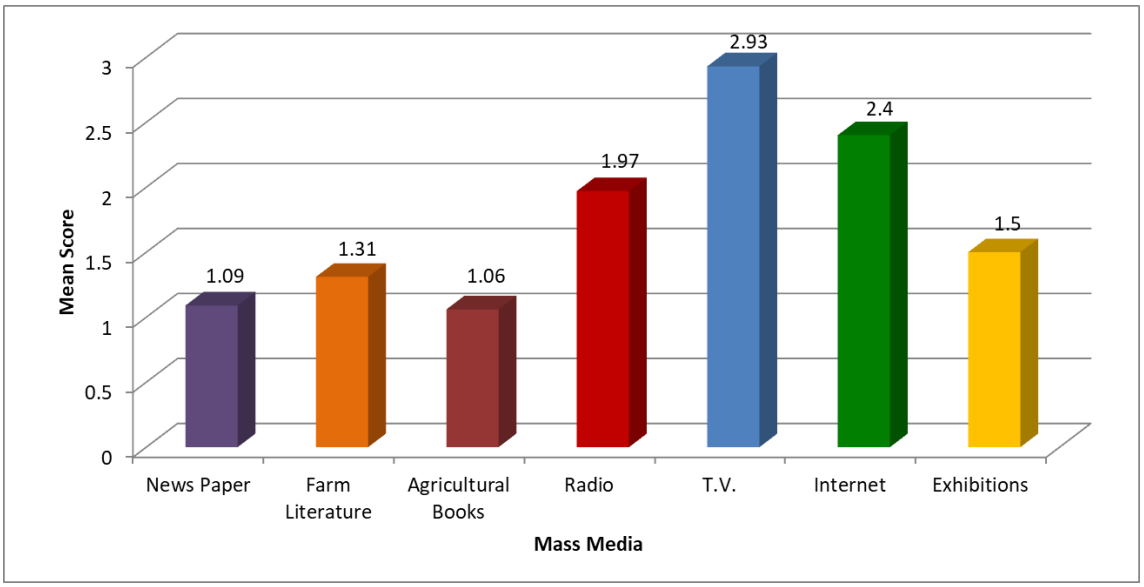


**FIG 4.16: DISTRIBUTION OF MASS MEDIA ACCORDING TO MEAN WEIGHTAGE SCORE**

### 4.1.18: Availability of irrigation facility

Table 4.23 and Fig. 4.17 reveal that 79.17 per cent of the respondents did not have an irrigation facility while 20.83 per cent did have access to irrigation for rice cultivation. The majority of the farmers had no irrigation facility for rice cultivation, which indicates that they are entirely dependent on rains for cultivation. The agriculture in Assam is generally rainfed and a similar situation is observed here. The possible reason can be that the respondents in the study area are mostly marginal farmers and they might not be having the financial capacity to have a pump set or construct a tube well. Another probable reason can be the lack of electrical connectivity to the farms to operate the pump set, and if it is available the problem of high electrical charges. Similar findings were reported by Wakhet (2019).

**Table 4.23: Distribution of respondents according to availability of irrigation facilities**

**N=120**

| Category | Frequency | Percentage |
|---|---|---|
| Available | 25 | 20.83 |
| Not available | 95 | 79.17 |

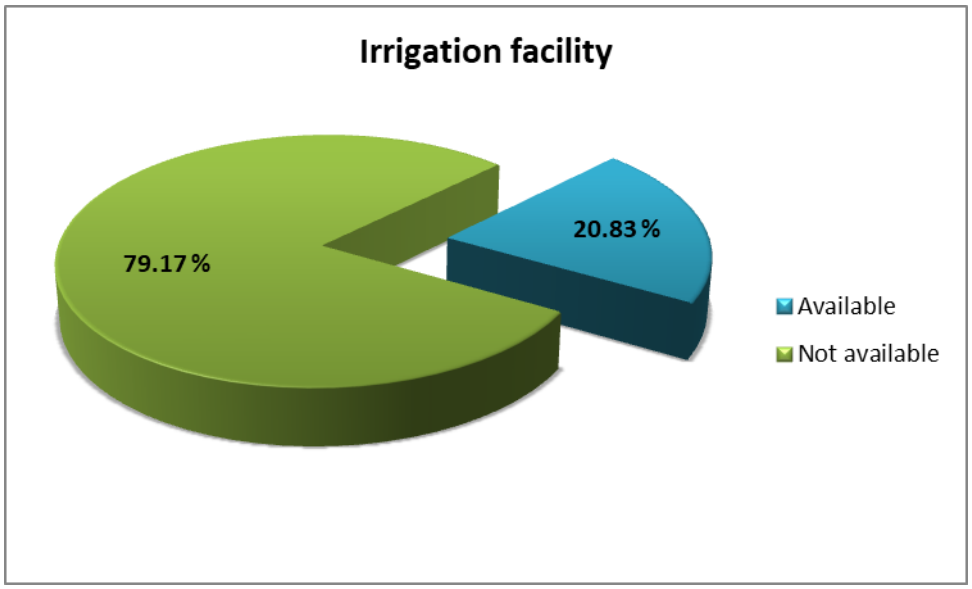


**FIG 4.17: DISTRIBUTION OF RESPONDENTS ACCORDING TO AVAILABILITY OF IRRIGATION FACILITIES**

From Table 4.24 it can be seen that the major source of irrigation among the 20.83 per cent of the respondents who had irrigation facilities was tube wells (12.50%) and the next available source was river (utilized by 8.33 per cent of the respondents for irrigation). The two villages of the study area had a nearby river, but not all the respondents were able to utilize the river for irrigation purposes due to the lack of electricity at farms and the lack of facilities to bring river water to the farms.

**Table 4.24: Distribution of respondents according to their irrigation facility**

**N=120**

| Category | Frequency | Percentage |
|---|---|---|
| Not Available | 95 | 79.17 |
| Tank | 0 | 0.00 |
| Canal | 0 | 0.00 |
| Open well | 0 | 0.00 |
| Tube well | 15 | 12.50 |
| River | 10 | 8.33 |
| Others ( Lift Irrigation, Micro irrigation) | 0 | 0.00 |

### 4.1.19: Degree of farm mechanization

It is evident from Table 4.25 and Fig.4.18 that majority (40.00%) of the respondents were having a medium degree of farm mechanization, followed by 35.83 per cent of the respondents who were having a low degree of farm mechanization and 24.17 per cent of the respondents were having a high degree of farm mechanization. The mean

value of the degree of mechanization was 30.19 which indicates that about one-third of the farm operations were mechanized. Even though the majority of the farmers were categorized as having a medium degree of farm mechanization, this low percentage shows that the overall degree of farm mechanization in the study area was low.

**Table 4.25: Distribution of respondents according to their degree of farm mechanization**

**N=120**

| Category | Score | Frequency | Percentage | Mean | S. D. | C. V. |
|---|---|---|---|---|---|---|
| Low | <23.42 | 43 | 35.83 | | | |
| Medium | 23.42-36.97 | 48 | 40.00 | 30.19 | 6.78 | 22.44 |
| High | >36.97 | 29 | 24.17 | | | |

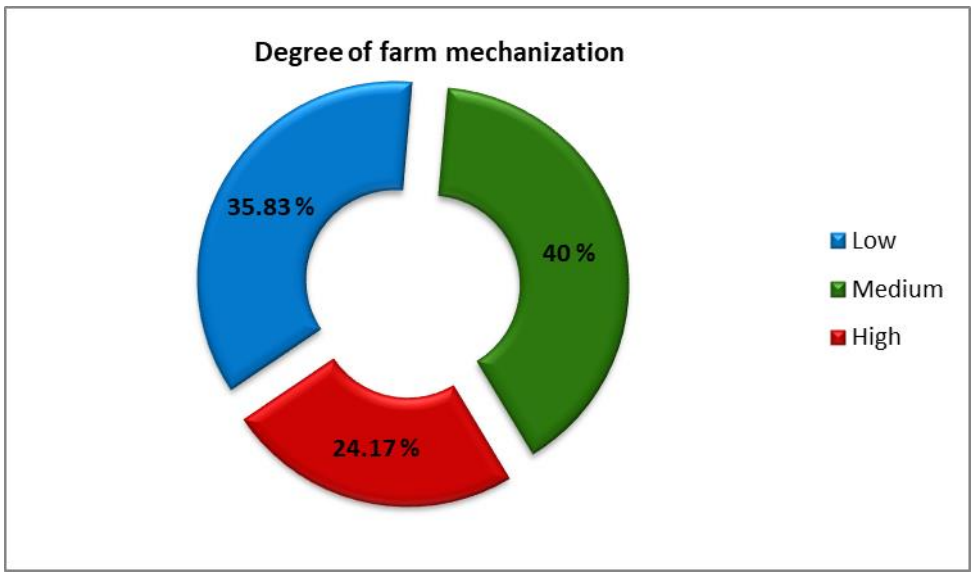


**FIG 4.18: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR DEGREE OF FARM MECHANIZATION**

From Table 4.26 it is clear that out of the total 12 farm operations in rice cultivation only 5 were mechanized in the study area. Field preparation which includes the ploughing and puddling, irrigation, pesticide application, threshing and milling were the mechanized farm operations. This overall low degree of farm mechanization can be due to the marginal landholding size, non-availability of machinery and high hiring fee for the machinery.

The farm operation mechanized by the majority of the respondents (96.67%) was field preparation which included both ploughing and puddling followed by threshing which was mechanized by 91.67 per cent of the respondents. 50.83 per cent of the respondents were milling the rice in rice mills, 30.83 per cent of the farmers were

applying pesticides using sprayers and irrigation was mechanized by 20.83 per cent of the respondents. The farm operations like nursery bed preparation, sowing, transplanting, weeding, harvesting, winnowing and drying were done manually.

**Table 4.26: Distribution of respondents according to farm operations mechanized**

| Sl. No. | Farm Operations for Rice | Frequency | Percentage |
|---|---|---|---|
| 1 | Nursery bed Preparation | 0 | 0 |
| 2 | Field Preparation | | |
| | Ploughing | 116 | 96.67 |
| | Puddling | 116 | 96.67 |
| 3 | Sowing | 0 | 0 |
| 4 | Transplanting | 0 | 0 |
| 5 | Irrigation | 25 | 20.83 |
| 6 | Weeding | 0 | 0 |
| 7 | Pesticide application | 37 | 30.83 |
| 8 | Harvesting | 0 | 0 |
| 9 | Threshing | 110 | 91.67 |
| 10 | Winnowing | 0 | 0 |
| 11 | Drying | 0 | 0 |
| 12 | Milling | 61 | 50.83 |

Table 4.27 and Fig. 4.19 show the machinery used by the farmers for various farm operations in rice cultivation. It can be seen that for ploughing, 50.83 per cent of the farmers used mould board plough (MB plough) and 45.83 per cent of the farmers 9 tine cultivator. Cage wheel was used by 38.33 per cent of the farmers and power tiller by 57.50 per cent of them for puddling of the field. The rice farmers who had irrigation sources used water pumps (20.83%) and 30.83 per cent of the farmers used sprayers for pesticide application. For the threshing purpose, the majority of the farmers (67.50%) had used threshers and 24.17 per cent of the farmers had used tractors. For milling of rice 50.83 per cent of the respondents had used rice mills. None of the farmers had used other modern machinery and implements like rotavator, harvester, or combined harvesters, etc. for rice cultivation.

**Table 4.27: Distribution of respondents according to farm machinery used.**

| Sl. No. | Machinery | Frequency | Percentage |
|---|---|---|---|
| 1 | MB Plough | 61 | 50.83 |
| 2 | 9 tine cultivator | 55 | 45.83 |
| 3 | Cage wheel | 47 | 38.33 |
| 4 | Power tiller | 69 | 57.50 |
| 5 | Water Pump | 25 | 20.83 |
| 6 | Sprayer | 37 | 30.83 |
| 7 | Threshers | 81 | 67.50 |
| 8 | Tractor | 29 | 24.17 |
| 9 | Mill | 61 | 50.83 |

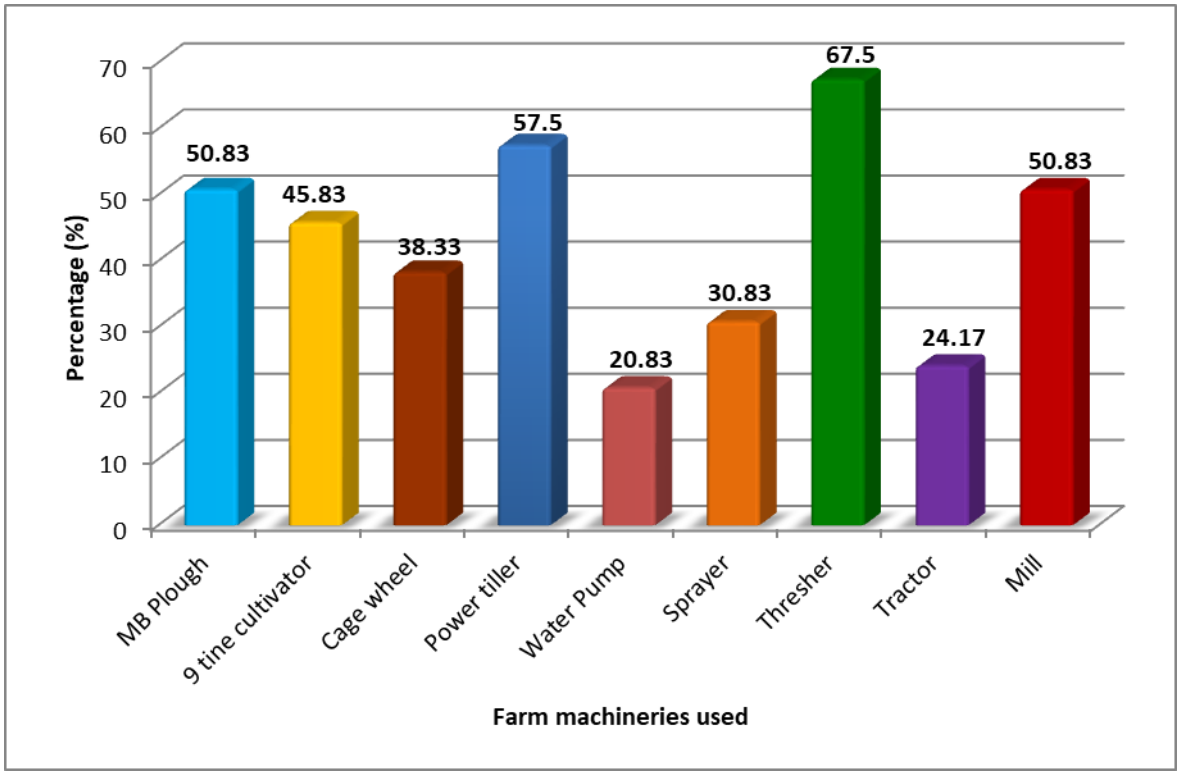


**FIG 4.19: DISTRIBUTION OF RESPONDENTS ACCORDING TO FARM MACHINERY USED FOR DIFFERENT FARM OPERATIONS**

### 4.1.20 Labour availability

The data in table 4.28 and Fig. 4.20 depicts that the majority (64.17%) of the respondents had medium labour availability in terms of the number of labour, followed by 21.67 per cent of the respondents who had low labour availability and only 14.17 per

cent of the respondents had high labour availability. The number of labour available includes both family labour available and hired labour utilized.

**Table 4.28: Distribution of respondents according to their labour availability**

**N=120**

| Category | Score | Frequency | Percentage | Mean | SD | CV |
|---|---|---|---|---|---|---|
| Low | < 6.53 | 26 | 21.67 | | | |
| Medium | 6.53-12.62 | 77 | 64.17 | 9.45 | 6.11 | 64.70 |
| High | > 12.62 | 17 | 14.17 | | | |

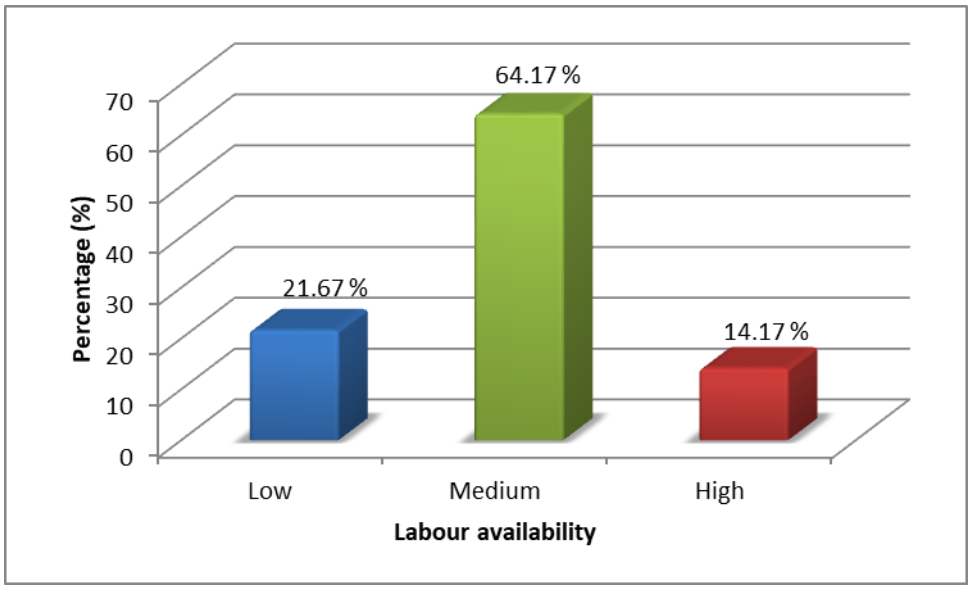


**FIG 4.20: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR LABOUR AVAILABILITY**

### 4.1.21 Status of Infrastructural facilities

The data presented in Table 4.29 and Fig. 4.21 represents that more than half (55.83%) of the respondents had medium infrastructural facilities followed by 24.17 per cent of the respondents who had high infrastructural status and rest 20.00 per cent of the respondents had low infrastructural facilities. The mean value of the variable was 69.90 which implies that on average the farmers had 69.90 per cent of infrastructural facilities available out of the total available infrastructural facilities in the study area. The C.V. value of 20.67 per cent indicates that the variation among the respondents regarding the status of infrastructural facilities was low.

**Table 4.29: Distribution of respondents according to their status of infrastructural facilities**

**N=120**

| Category | Score | Frequency | Percentage | Mean | S. D. | C. V. |
|---|---|---|---|---|---|---|
| Low | < 55.45 | 24 | 20.00 | | | |
| Medium | 55.45 -84.34 | 67 | 55.83 | 69.90 | 14.45 | 20.67 |
| High | >84.34 | 29 | 24.17 | | | |

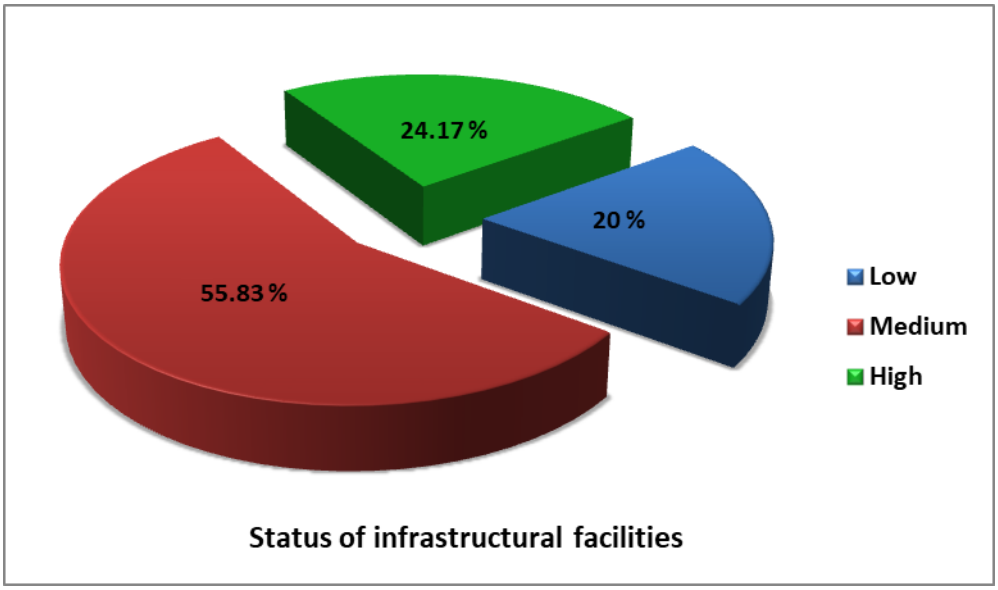


**FIG 4.21: DISTRIBUTION OF RESPONDENTS ACCORDING TO THEIR STATUS OF INFRASTRUCTURAL FACILITIES**

**Table 4.30: Distribution of respondents according to their available infrastructural facilities**

**N=120**

| Sl. No. | Infrastructural Facilities | Frequency | Percentage |
|---|---|---|---|
| 1 | Electricity | 120 | 100.00 |
| 2 | Room for keeping Implements and machinery | 31 | 25.83 |
| 3 | Storage rooms for seeds, fertilizers and other inputs | 79 | 65.83 |
| 4 | Storage space for keeping rice and straw | 119 | 99.17 |
| 5 | Milling facility | 56 | 46.67 |
| 6 | Irrigation system | 25 | 20.83 |
| 7 | Transportation facility | 115 | 95.83 |
| 8 | Telecommunication facilities | 119 | 99.17 |

Table 4.30 and Fig. 4.22 show the available infrastructural facilities in the study area. All the respondents (100.00%) of the respondents had electricity at their homes, while 99.17 percent of the respondents had telecommunication facilities and storage space for keeping rice and straw and 95.83 per cent of the respondents had transportation facilities in their area. Separate storage rooms for seeds, fertilizers and other inputs were available for 65.83 per cent of the respondents, whereas the milling facility was available for 46.67 per cent of the respondents. The percentage of respondents who had room for keeping implements and machinery was 25.83 and only 20.83 per cent of the respondents had irrigation facilities.

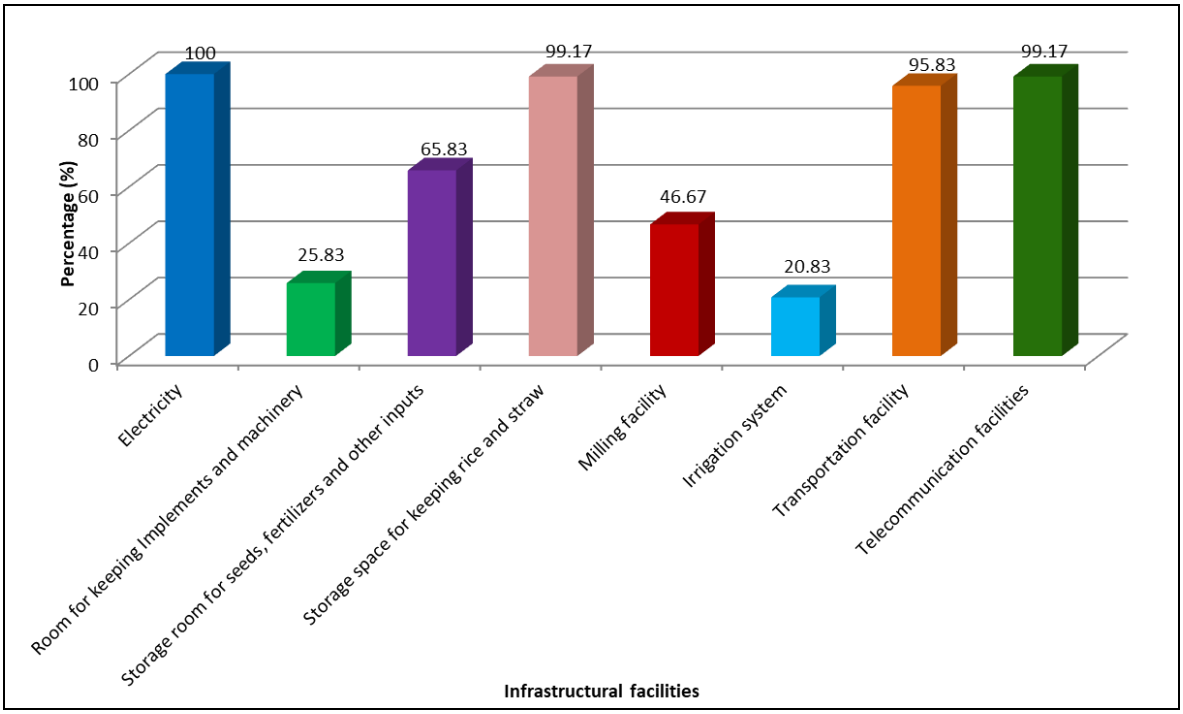


**FIG 4.22: INFRASTRUCTURAL FACILITIES AVAILABLE**

### 4.1.22 Rice varieties grown

The following sections present the data of various rice varieties grown by the farmers of the study area. Rice varieties cultivated by the farmers in the three rice growing seasons and in different AES are also presented separately. The details of rice varieties grown in the study area are presented in the following sections.

#### 4.1.22.1 High Yielding Varieties of rice grown in the study area

Table 4.31 and Fig. 4.23 depict the details of HYVs of rice cultivated in the study area. The majority (58.33%) of the respondents cultivated the variety Ranjit, followed by 29.17 per cent of the respondents who cultivated the variety Ranjit Sub-1 and

25.00 per cent of them cultivated Mahsuri. Bahadur sub-1 was cultivated by 18.33 per cent of the respondents and the variety Numoli was cultivated by 9.17 per cent of the respondents. Numoli is a new AAU variety that was released recently. It has begun to penetrate the farmer community, although it is yet to be adopted by the majority of farmers. Whereas the variety Keteki Joha which is an early release of AAU was cultivated by only 3.33 per cent of the respondents in the study area. The other varieties cultivated by the respondents of the region in *Sali* season were Jalashree (2.50%), Bina Dhan-11 (2.50%) and Swarna Sub-1 (0.83%). In *Boro* season 3.33 per cent of the respondents cultivated the variety Jaymoti, followed by 2.50 per cent of the respondents who cultivated Boro-1 and 1.67 per cent of them cultivated Boro-9.

**Table 4.31: Distribution of respondents and percentage of shared area under High Yielding Varieties of rice**

**N=120**

| Sl. No. | Varieties | TOTAL | | |
|---|---|---|---|---|
| | | Frequency (%) | Area in Ha | % Share of area |
| | ***Sali*** | | | |
| 1 | Ranjit | 70 (58.33) | 36.4 | 33.7 |
| 2 | Ranjit Sub-1 | 35 (29.17) | 18.6 | 17.22 |
| 3 | Bahadur Sub-1 | 22 (18.33) | 12.33 | 11.42 |
| 4 | Mahsuri | 15 (25.00) | 10.2 | 9.44 |
| 5 | Jaashree | 3 (2.50) | 2.6 | 2.41 |
| 6 | Swarna Sub-1 | 1 (0.83) | 0.27 | 0.25 |
| 7 | Bina Dhan 11 | 3 (2.50) | 1.2 | 1.11 |
| 8 | Keteki Joha | 4 (3.33) | 1.33 | 1.23 |
| 9 | Numoli | 11 (9.17) | 7.07 | 6.54 |
| | **Total Area under HYV in *Sali*** | | **90.00** | **83.33** |
| | ***Boro*** | | | |
| 1 | Joymati | 4 (3.33) | 2 | 1.85 |
| 2 | Boro-1 | 3 (2.50) | 3.47 | 3.21 |
| 3 | Boro-9 | 2 (1.67) | 2.00 | 1.85 |
| | **Total area under HYV in *Boro*** | | **7.47** | **6.91** |

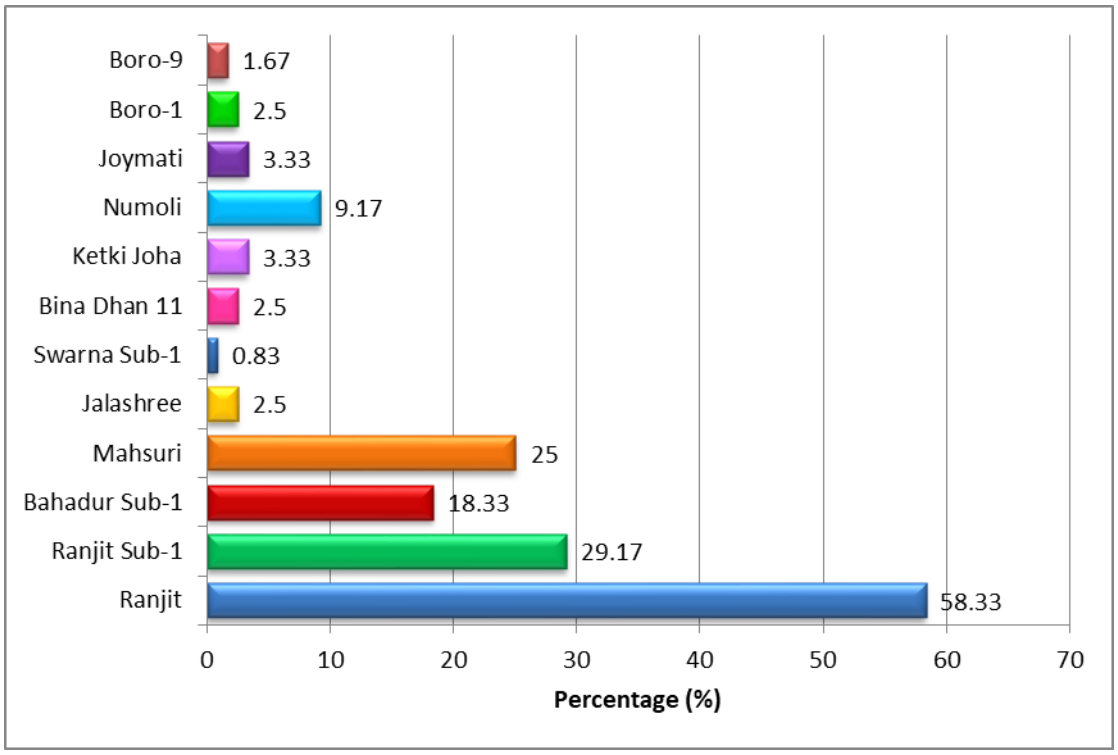


**FIG. 4.23: PERCENTAGE OF ADOPTERS OF HIGH YIELDING VARIETIES**

Table 4.31 and Fig. 4.24 reveal that the total area under HYVs of rice in *Sali* season was 90.00 hectares with a percentage share of 83.33 to the total rice-growing area of the study region. It is in accordance with the state and district percentage share of area under HYVs of rice. The highest area was under the variety Ranjit which constituted 33.70 per cent of the total rice cultivated area and it was cultivated by the majority of the farmers. Ranjit Sub-1 occupied second highest area under the HYVs with 18.6 ha which accounted for 17.22 per cent of the total area under rice. The third highest area was occupied by the HYV Bahadur Sub-1 with an area of 12.33 ha which accounted for 11.42 per cent of the total rice area. However on the basis of the number of adopters it was in fourth position with 18.33 per cent of adopters while the third most adopted variety was Mahsuri with 25.00 per cent of adopters but in terms of the area it was in the fourth position with an area of 10.20 ha and 9.44 per cent share to total rice area. The variety Numoli was cultivated in an area of 7.07 hectares, accounting for 6.54 per cent of the total rice-growing area and the variety Keteki Joha covered an area of 1.33 hectares with a percentage share of 1.23 to the total rice acreage. The variety Jalashree covered an area of 2.6 ha (2.41 per cent of total rice area), Bina Dhan-11 covered an area of 1.2 ha (1.11%) and Swarna Sub-1 was cultivated in an area of 0.27 ha (0.25%).

The highest area in *Boro* season paddy was occupied by the HYV, Boro-1 which constituted 3.21 per cent of the total rice growing area with an area of 3.47 hectares. The variety Joymati accounted for only 1.85 per cent of the total rice area but it was cultivated by 3.33 per cent of the respondents likewise the variety Boro-9 was also occupied 1.5 per cent of the total rice area and it was cultivated by 1.67 per cent of the respondents. The total per cent share of HYVs in *Boro* paddy to the total rice acreage was 6.91 per cent with an area of 7.47 hectares.

From the data set presented, it can be implied that a major proportion of the land area was covered by the HYVs of rice released by AAU in *Sali* season. A total of 90 hectares was under the HYVs of rice and the variety Ranjit and Submergence tolerant varieties like Ranjit Sub-1, bahadur Sub-1 were adopted by the majority of the respondents and were having the highest area. The possible reason can be that the high perception of farmers about the quality characteristics of these varieties and primarily their higher yield compared to traditional varieties. The study area includes the flood prone regions also, and farmers might be using the submergence tolerant HYVs to get a subsistence yield during flood occurrences.

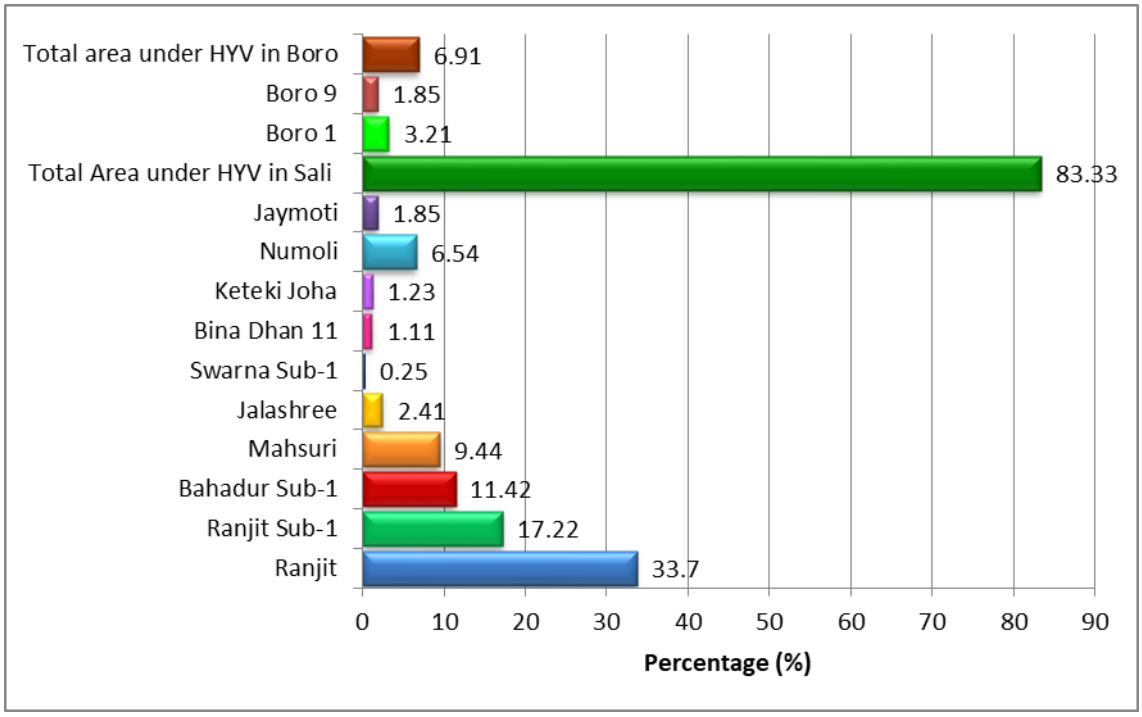


**FIG 4.24: PERCENTAGE SHARE OF AREA UNDER HIGH YIELDING VARIETIES OF RICE**

### 4.1.22.2 Other varieties of rice grown in the study area

Table 4.32 and Fig. 4.25 indicate the details of other varieties cultivated in the study area. It is observed that that the respondents of the study area had cultivated 16 other varieties in *Sali* season and two in *Boro* season and three traditional rice varieties in *Ahu* season. The traditional variety Bora Chokuwa was cultivated by 15.83 per cent of the respondents followed by Joha an aromatic rice variety which was cultivated by 9.17 per cent of the respondents. The variety Rongdoi was cultivated by 6.67 percent of the respondents and 5.00 percent of the respondents cultivated the varieties Kon Joha, Porimal, and Lavanya-12. The other varieties cultivated in *Sali* season were Solpona, Black rice, Gethu, Ronga Bao, Lavanya-7, Lavanya-15, Jal Duvi, Black Bahu, Jahinga, and Moinagiri. During the *Boro* season, 3.33 percent of respondents grew the cultivars Bora Dhan and Pusa. The varieties grown in *Ahu* season were traditional varieties like Rongadoria, Borhoola and Koleguma. It can be seen that these varieties were grown by a mere 0.83 per cent of the respondents.

**Table 4.32 Distribution of respondents and percentage of shared area under other varieties of rice** **N=120**

| Sl. No. | Varieties | Total | | |
|---|---|---|---|---|
| | ***Sali*** | **Frequency (%)** | **Area in Ha** | **% Share of area** |
| 1 | Joha | 11 (9.17) | 2.6 | 2.41 |
| 2 | Kon Joha | 6 (5.00) | 1.4 | 1.30 |
| 3 | Bora Chokuwa | 19 (15.83) | 3.93 | 3.64 |
| 4 | Ronga Bao | 1 (0.83) | 0.27 | 0.25 |
| 5 | Gethu | 2 (1.67) | 0.27 | 0.25 |
| 6 | Black Rice | 3 (2.50) | 0.67 | 0.62 |
| 7 | Porimal | 6 (5.00) | 1.13 | 1.05 |
| 8 | Lavanya-7 | 2 (1.67) | 0.67 | 0.62 |
| 9 | Lavanya-12 | 6 (5.00) | 1.8 | 1.67 |
| 10 | Lavanya-15 | 1 (0.83) | 0.13 | 0.12 |
| 11 | Jahinga | 1 (0.83) | 0.07 | 0.06 |
| 12 | Moinagiri | 1 (0.83) | 0.07 | 0.06 |
| 13 | Rongdoi | 8 (6.67) | 1.8 | 1.67 |
| 14 | Jal Duvi | 1 (0.83) | 1.2 | 1.11 |
| 15 | Black Bahu | 1 (0.83) | 0.13 | 0.12 |
| 16 | Solpona | 3 (2.50) | 1.73 | 1.60 |
| | **Total** | **72** | **17.87** | **16.59** |
| | ***Boro*** | | | |
| 1 | Bora Dhan | 4 (3.33) | 3.20 | 2.96 |
| 2 | Pusa | 4 (3.33) | 1.33 | 1.23 |
| | **Total** | **8** | **4.53** | **4.20** |
| | ***Ahu*** | | | |
| 1 | Borhoola | 1 (0.83) | 1.07 | 0.99 |
| 2 | Koleguma | 1 (0.83) | 0.27 | 0.25 |
| 3 | Rongadoria | 1 (0.83) | 0.93 | 0.86 |
| | **Total** | **3** | **2.27** | **2.10** |

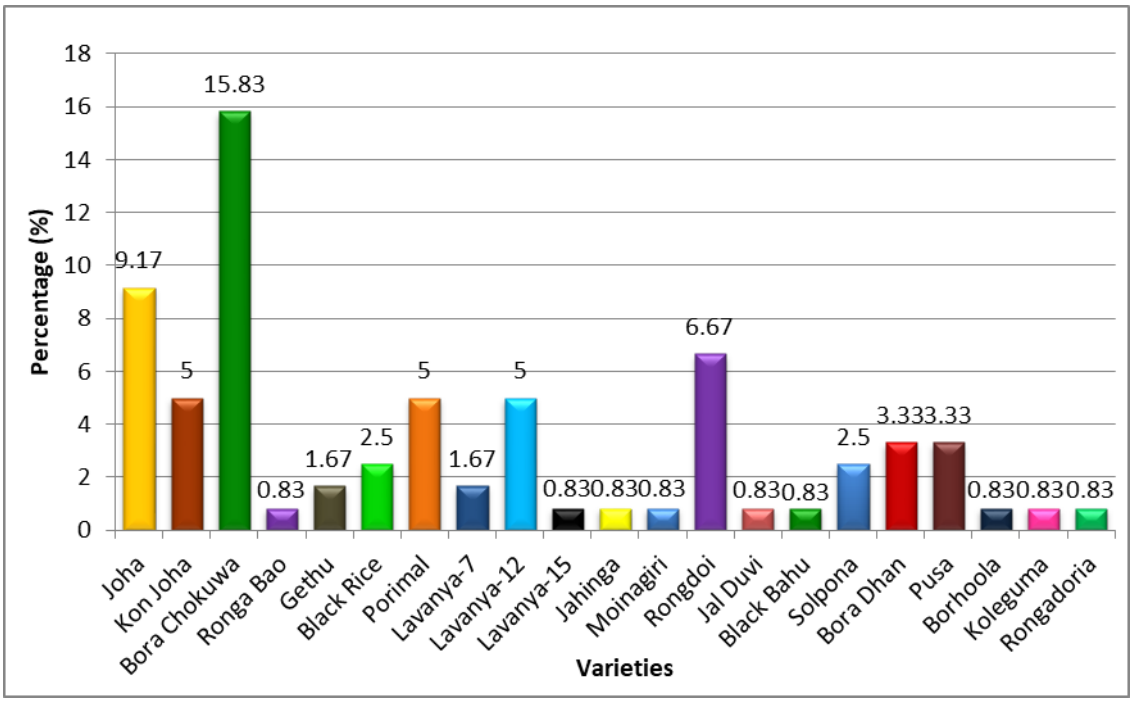


**FIG 4.25: PERCENTAGE OF ADOPTERS OF OTHER VARIETIES**

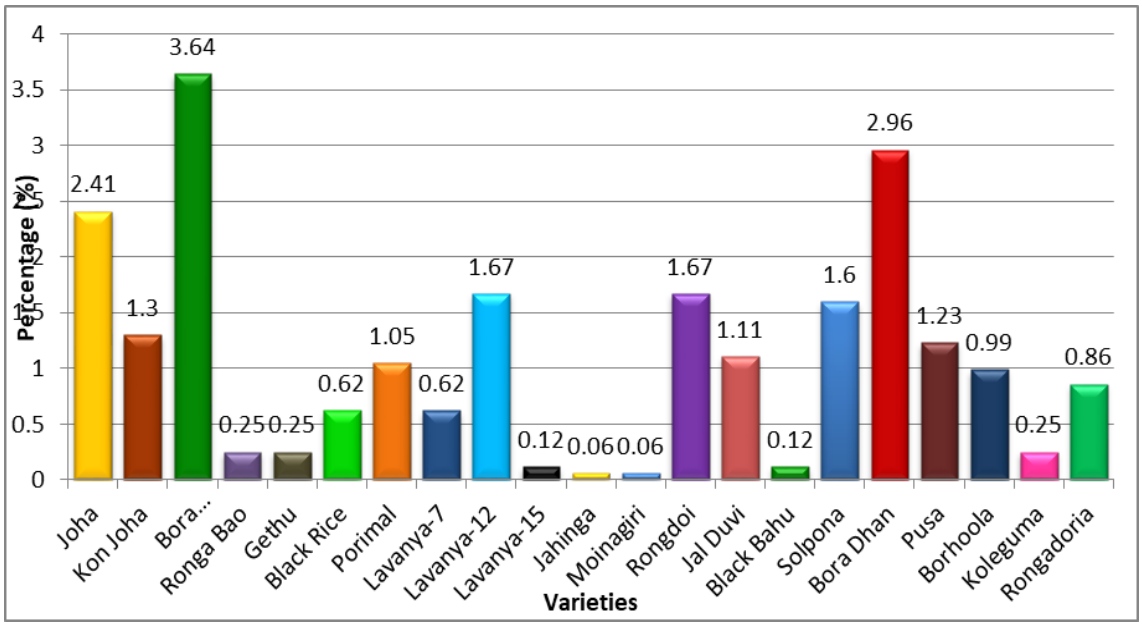


**FIG 4.26: PERCENTAGE SHARE OF AREA UNDER OTHER VARIETIES OF RICE**

From Table 4.32 and Fig. 4.26 it is clear that the 16 varieties other than together accounted for 16.59 per cent of the total area under rice in the *Sali* season with an area of 17.87 hectares. The highest area was occupied by the variety Bora Chokuwa (3.93 ha), which accounted for 3.64 per cent of total area under rice. Aromatic traditional variety Joha with 2.6 ha occupied the second highest area among the other varieties and it accounted for 2.41 per cent of the total area under rice.

The farmers are still continuing to cultivate traditional varieties of rice and other varieties. Even though the number of traditional varieties was more compared to the HYVs, percentage of adopters and the area covered were less compared to the HYVs of rice released by AAU. The reason for the continued cultivation of the traditional varieties can be that these varieties might be associated with the customs and traditions of the people. The other HYVs which are not released by AAU, such as Porimal and Pusa were cultivated by farmers and they might have gotten these varieties from private agencies.

**4.1.22.3 HYVs of rice grown in AES I**

The data given in Table 4.33 and Fig. 4.27 indicate that in AES I the farmers had cultivated 7 *Sali* and 3 *Boro*, HYVs of rice released by AAU. The majority (52.50 %) of the respondents cultivated the variety Ranjit Sub-1 in AES I, followed by Ranjit variety which was cultivated by 40.00 per cent of the respondents and Mahsuri was cultivated by 25.00 per cent of the respondents. Whereas 15 per cent of the respondents had cultivated Bahadur Sub-1 and 7.50 per cent of the respondents cultivated the variety Jalashree. The variety Bina Dhan-11 was also cultivated by 7.50 per cent of the respondents and Swarna Sub-1 was cultivated by 2.50 per cent of the respondents. As the AES I is a flood prone region (Humid alluvial flood prone), we can identify that majority of the farmers cultivate various submergence tolerant varieties like Ranjit Sub-1, Bahadur Sub-1, Swarna Sub-1, Jalashree, and Bina Dhan-11 in the region. We can observe that the variety Ranjit was also cultivated by 40.00 per cent of the respondents. It shows the popularity of the variety Ranjit among the farmers. The farmers might be growing Ranjit in the regions where flood incidence is comparatively less. The percentages of farmers who grow HYVs of rice like Ranjit Sub-1, Ranjit, Mahsuri, and Bahadur Sub-1 were the highest.

**Table 4.33: Distribution of respondents and percentage of shared area under High Yielding Varieties of rice in AES I n=40**

| Sl. No. | Varieties | AES I | | |
|---|---|---|---|---|
| | | Frequency (%) | Area in Ha | %Share |
| | ***Sali*** | | | |
| 1 | Ranjit | 16 (40.00) | 9.33 | 24.14 |
| 2 | Ranjit Sub-1 | 21 (52.50) | 11.00 | 28.45 |
| 3 | Bahadur Sub-1 | 6 (15.00) | 3.20 | 8.28 |
| 4 | Mahsuri | 10 (25.00) | 5.60 | 14.48 |
| 5 | Jalashree | 3 (7.50) | 2.60 | 6.72 |
| 6 | Swarna Sub-1 | 1 (2.50) | 0.27 | 0.69 |
| 7 | Bina Dhan 11 | 3 (7.50) | 1.20 | 3.10 |
| | **Total Area under HYV in *Sali*** | | **33.20** | **85.86** |
| | ***Boro*** | | | |
| 1 | Joymati | 1 (2.50) | 0.53 | 4.49 |
| 2 | Boro-1 | 3 (7.50) | 3.47 | 8.97 |
| 3 | Boro-9 | 2 (5.00) | 2.00 | 5.17 |
| | **Total Area under HYV in *Boro*** | | **6.00** | **19.94** |

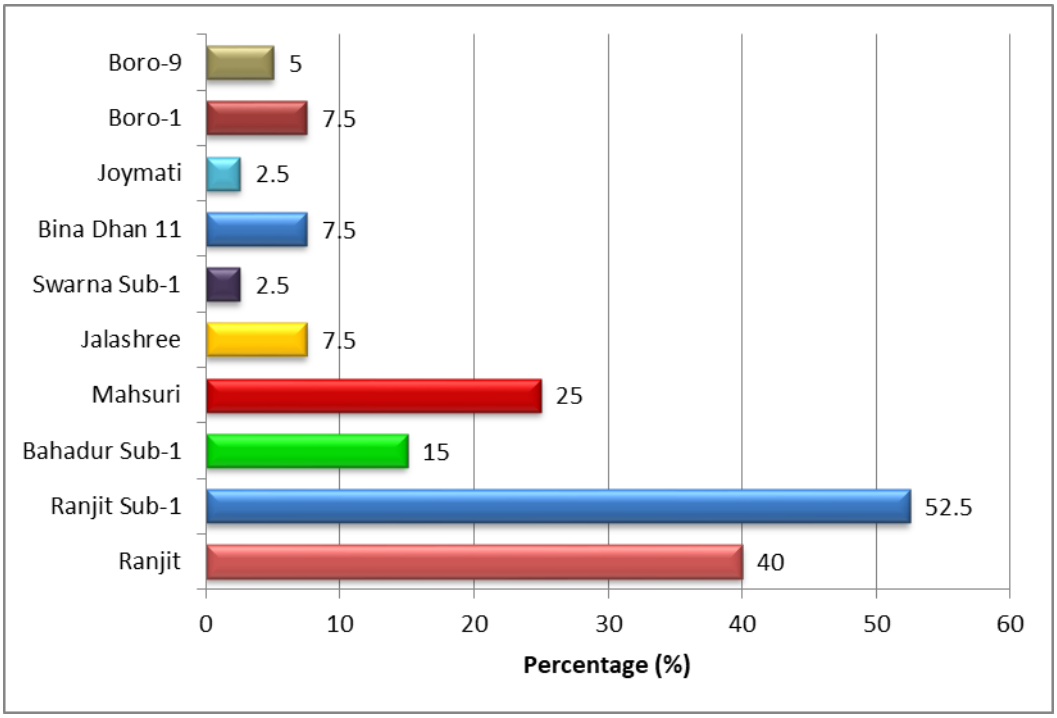


**FIG 4.27: PERCENTAGE OF ADOPTERS OF HIGH YIELDING VARIETIES IN AES I**

Table 4.33 and Fig. 4.28 indicate that AES I had 85.86 per cent of its total rice area under HYVs of rice released by AAU with an area of 33.20 hectares. In *Boro* season 19.94 per cent of the total rice area was under HYVs of rice released by AAU with an area of 6.00 hectares. The HYV which covered the highest area in AES I was Ranjit Sub-1 which accounted for 28.45 per cent of the total rice area with an area of 11.00 ha. The second most adopted and the variety which covered the second highest area was Ranjit which covered an area of 9.33 ha and it accounted for 24.14 per cent of the total rice area. The variety Mahsuri covered 14.48 per cent of the total rice area and it was the third most cultivated variety in AES I. The varieties Bahadur Sub-1 and Jalashree covered respectively 8.28 and 6.72 per cent of the total rice area of AES I. The variety Bina Dhan 11 accounted for 3.10 per cent and Swarna Sub-1 accounted for 0.69 percent of the total area under rice.

The highest area was covered by Boro-1 variety among the high yielding *Boro* rice varieties which accounted for 8.97 per cent of the total area under rice, followed by Boro-9 and Joymati which accounted for 5.17 and 4.49 per cent of the total area under rice respectively.

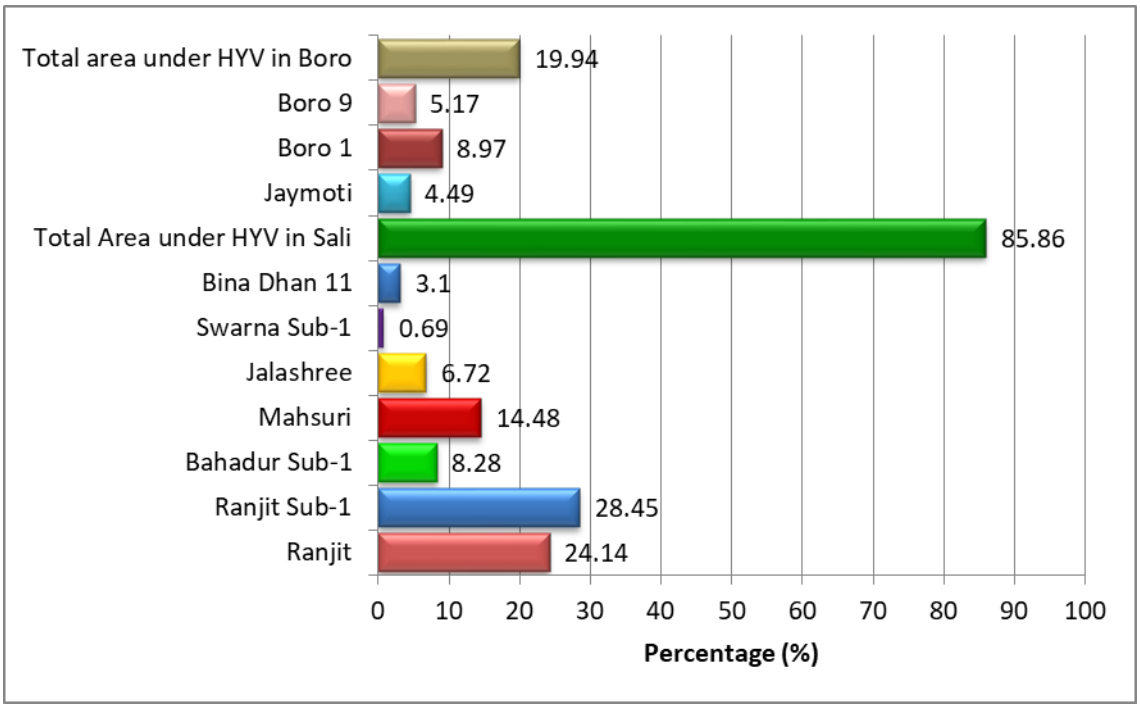


**FIG 4.28: PERCENTAGE SHARE OF AREA UNDER HYVS OF RICE IN AES I**

### 4.1.22.4 Other varieties of rice grown in AES I

It is observed from Table 4.34 and Fig. 4.29 that farmers of AES I had cultivated 7 traditional rice varieties in *Sali* season. Traditional aromatic variety Joha was cultivated by 10.00 per cent of the respondents, and 7.50 per cent of the respondents cultivated the varieties Black rice and Solopona. The variety Gethu was cultivated by 5.00 per cent of the respondents and 2.50 per cent of them cultivated the varieties Ronga Bao and Black Bahu. The variety Bora Dhan was cultivated by 10.00 per cent of the farmers in *Boro* season. In the *Ahu* season of AES I, two traditional varieties Borhoola and Rongadoria were cultivated by 2.5 per cent of the respondents each.

**Table 4.34: Distribution of respondents and percentage of shared area under other varieties of rice in AES I** **n=40**

| Sl. No. | Varieties | AES I | | |
|---|---|---|---|---|
| | ***Sali*** | **Frequency (%)** | **Area in Ha** | **% Share** |
| 1 | Joha | 4 (10.00) | 1.2 | 3.1 |
| 2 | Ronga Bao | 1 (2.5) | 0.27 | 0.69 |
| 3 | Gethu | 2 (5.00) | 0.27 | 0.69 |
| 4 | Black Rice | 3 (7.50) | 0.67 | 1.72 |
| 5 | Jal Duvi | 1 (2.5) | 1.2 | 3.1 |
| 6 | Black Bahu | 1 (2.5) | 0.13 | 0.34 |
| 7 | Solpona | 3 (7.50) | 1.73 | 4.48 |
| | **Total (*Sali)*** | **15** | **5.47** | **14.14** |
| | ***Boro*** | | | |
| 1 | Bora Dhan | 4 (10.00) | 3.2 | 8.28 |
| | ***Ahu*** | | | |
| 1 | Borhoola | 1 (2.5) | 1.07 | 2.76 |
| 2 | Rongadoria | 1 (2.5) | 0.93 | 2.41 |
| | **Total (*Ahu*)** | **2** | **2.00** | **5.17** |

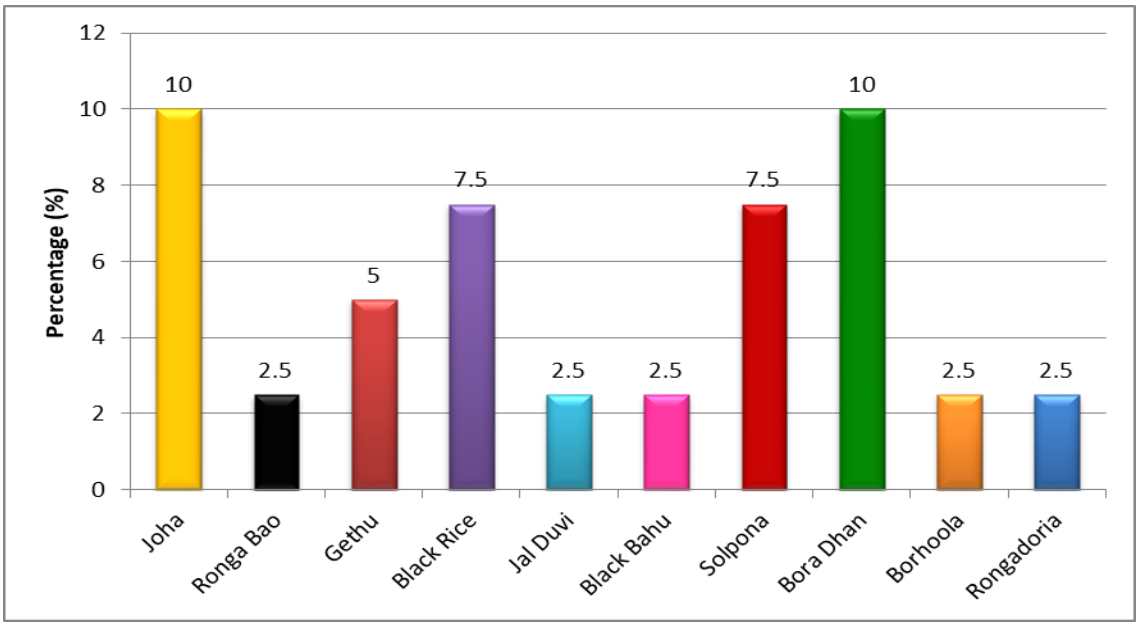


**FIG.4.29: PERCENTAGE OF ADOPTERS OF OTHER VARIETIES IN AES I**

Table 4.34 and Fig. 4.30 show that 14.14 per cent of the total area under rice was covered by traditional varieties of rice in the *Sali* season of AES I. In terms of area, variety Solpona occupied the highest area (1.73 ha) among the traditional varieties and accounted for 4.48 per cent of the total rice area followed by the varieties Jal Duvi and Joha which covered an area of 1.2 hectares each. In *Boro* season only one variety, Bora Dhan was cultivated by the farmers and it covered an area of 3.20 ha which accounted for 8.28 per cent of the total area under rice. The traditional varieties Borhoola and Rongadoria cultivated in *Ahu* season, which together accounted for 5.17 per cent of the total rice cultivated area.

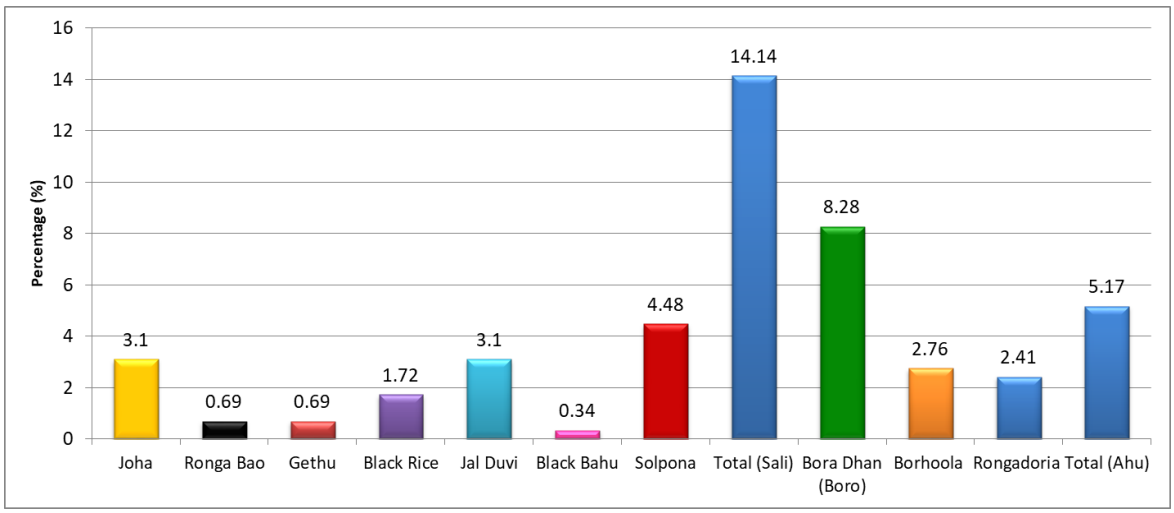


**FIG 4.30: PERCENTAGE SHARE OF AREA UNDER OTHER VARIETIES IN AES I**

**4.1.22.5 HYVs of Rice grown in AES II**

Table 4.35 and Fig.4.31 show that farmers of AES II had cultivated 3 HYVs of rice in *Sali* and one HYV in *Boro* seasons. All the respondents (100.00%) of AES II had cultivated the variety Ranjit, followed by 50.00 per cent of the respondents who had cultivated Mahsuri and 10.00 per cent of them had cultivated Keteki Joha. The *Boro* variety, Joymati was cultivated by 7.50 per cent of the respondents.

Table 4.35 and Fig.4.32 show that in AES II, a total of 24.07 hectares was under HYVs in *Sali* season which constituted 75.84 per cent of the total area under rice. The percentage share of area under HYVs (75.84%) on AES II was less compared to the overall percentage share of HYVs (83.33%). The HYV, Ranjit covered the highest area (18.13 ha) among HYVs and it accounted for 57.14 per cent of the total area under rice in AES II. The variety Mahsuri was cultivated by 50.00 per cent of the respondents but in terms area it accounted only for 14.50 per cent of the total area under rice. Keteki Joha was cultivated in an area of 1.33 hectares which accounted for 4.20 per cent of the total area under rice. Variety Joymati was cultivated in an area of 1.47 ha and it accounted for 4.62 per cent of the total rice growing area in AES II.

**Table 4.35: Distribution of respondents and percentage of shared area under High Yielding Varieties of rice in AES II**

**n=40**

| Sl. No. | Varieties | AES II | | |
|---|---|---|---|---|
| | | f (%) | Area in Ha | % Share |
| | ***Sali*** | | | |
| 1 | Ranjit | 40 (100.00) | 18.13 | 57.14 |
| 2 | Mahsuri | 20 (50.00) | 4.60 | 14.5 |
| 3 | Keteki Joha | 4 (10.00) | 1.33 | 4.20 |
| | **Total Area under HYV** | **64** | **24.07** | **75.84** |
| | ***Boro*** | | | |
| 1 | Joymati | 4 (7.50) | 1.47 | 4.62 |

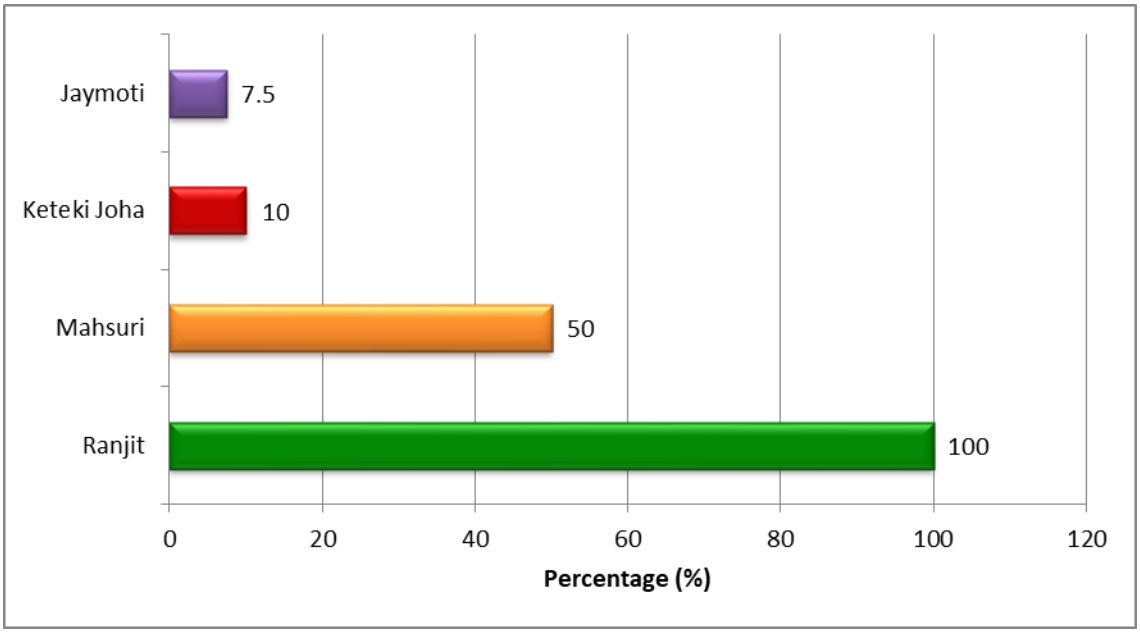


**FIG 4.31: PERCENTAGE OF ADOPTERS OF HIGH YIELDING VARIETIES IN AES II**

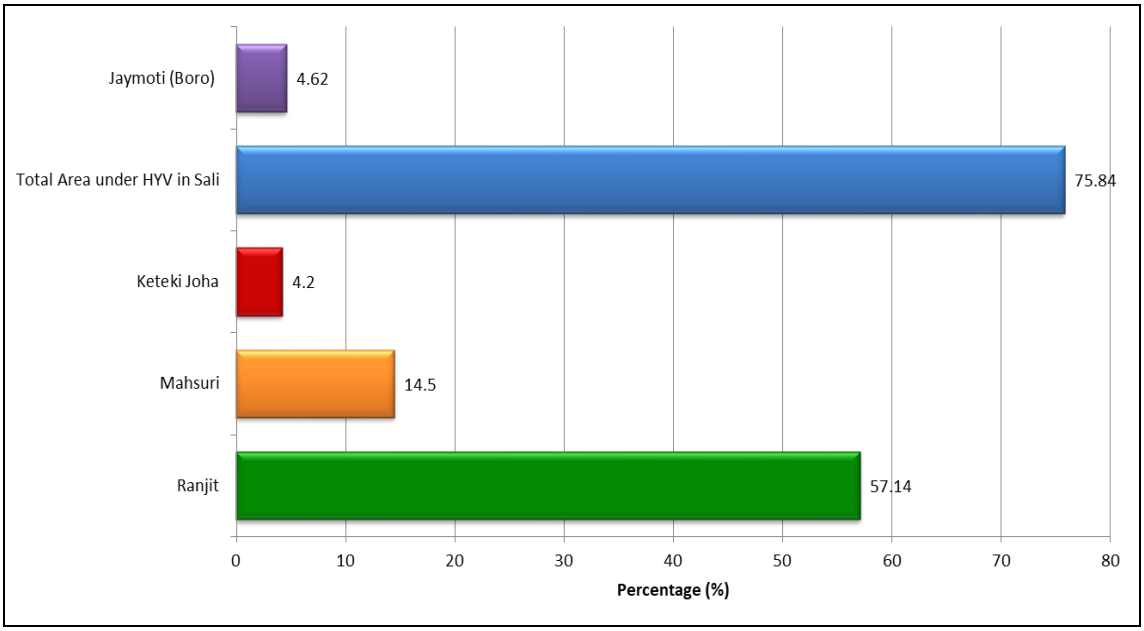


**FIG 4.32: PERCENTAGE SHARE OF AREA UNDER HYVS OF RICE IN AES II**

### 4.1.22.6 Other varieties grown in AES II

FromTable 4.36 and Fig. 4.33 it is observed that 47.50 per cent of the respondents cultivated Bora Chokuwa, followed by 20.00 per cent of the respondents who cultivated the variety Rongdoi and 15.00 per cent of them who cultivated the variety Porimal. Joha was cultivated y 5.00 per cent of the respondents and Jahinaga and Moinagiri were cultivated by 2.50 per cent of the respondents. The *Boro* variety Pusa was cultivated by 10.00 per cent of the respondents and *Ahu* variety Koleguma was cultivated by 2.50 per cent of the respondents.

**Table 4.36: Distribution of respondents and percentage of shared area under other varieties of rice in AES II** **n=40**

| Sl. No. | Varieties | AES II | | |
|---|---|---|---|---|
| | ***Sali*** | **Frequency (%)** | **Area in Ha** | **% Share** |
| 1 | Joha | 2 (5.00) | 0.53 | 1.68 |
| 2 | Bora Chokuwa | 19 (47.50) | 3.93 | 12.39 |
| 3 | Porimal | 6 (15.00) | 1.13 | 3.57 |
| 4 | Jahinga | 1 (2.50) | 0.07 | 0.21 |
| 5 | Moinagiri | 1 (2.50) | 0.07 | 0.21 |
| 6 | Rongdoi | 8 (20.00) | 1.8 | 1.67 |
| | **Total** | **37** | **7.53** | **19.73** |
| | ***Boro*** | | | |
| 1 | Pusa | 4 (10.00) | 1.33 | 4.2 |
| | ***Ahu*** | | | |
| 1 | Koleguma | 1 (2.50) | 0.27 | 0.84 |

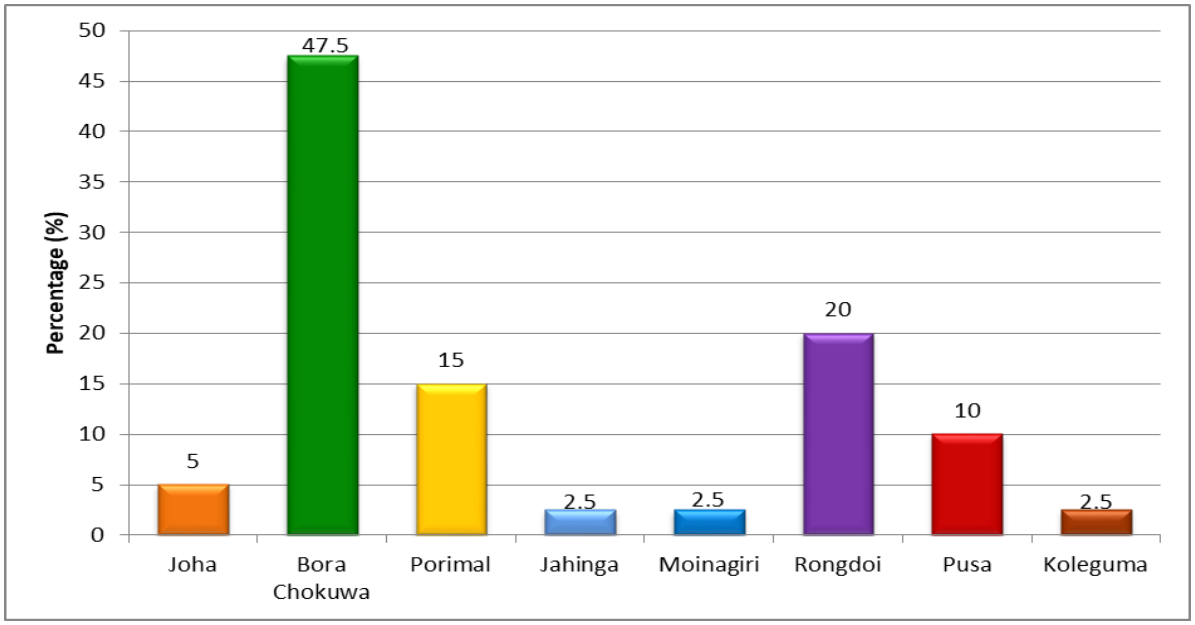


**FIG.4.33: PERCENTAGE OF ADOPTERS OF OTHER VARIETIES IN AES II**

Table 4.36 and Fig. 4.34 show the area under varieties other varieties of rice. It was found that 19.73 per cent of the total rice area was occupied by six of these varieties in Sali season of AES II, which covered an area of 7.53 hectares. It can be noted that the traditional Sali variety Bora Chokuwa covered highest area (3.93 ha) among the other Sali varieties, which accounted for 12.39 per cent of the total rice growing area. In the AES, the variety Pusa was cultivated in *Boro* season which covered an area of 1.33 ha (4.2%) and the variety Koleguma was cultivated in *Ahu* season in only 0.27 ha (0.84% of the total area).

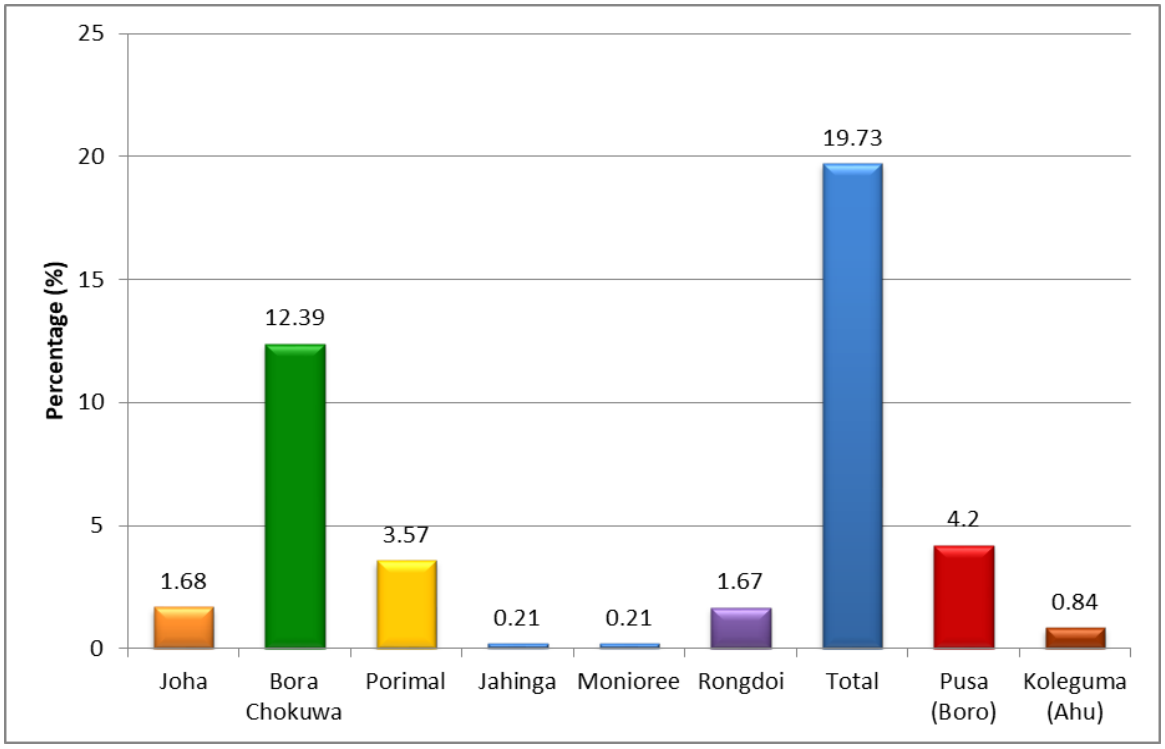


**FIG 4.34: PERCENTAGE SHARE OF AREA UNDER OTHER VARIETIES IN AES II**

### 4.1.22.7 HYVs of Rice grown in AES III

Table 4.37 and Fig. 4.35 indicate that four HYVs of rice were cultivated by the farmers of AES III in *Sali* season and the majority (40.00%) of the respondents cultivated the HYV Bahadur Sub-1, and 35.00 per cent of the respondents cultivated Ranjit and Ranjit Sub-1 varieties. The variety Numoli was cultivated by more than one-fourth (27.50 %) of the respondents of AES III. This means the farmers started to adopt this variety. The farmers of AES III mostly cultivate the varieties Bahadur Sub-1 and Ranjit Sub-1 as some of the regions are prone to submergence during the heavy monsoons.

**Table 4.37: Distribution of respondents and percentage of shared area under High Yielding Varieties of rice in AES III n=40**

| Sl. No. | Varieties | AES III | | |
|---|---|---|---|---|
| | ***Sali*** | **F (%)** | **Area in Ha** | **% Share** |
| 1 | Ranjit | 14 (35.00) | 8.93 | 23.76 |
| 2 | Ranjit Sub-1 | 14 (35.00) | 7.6 | 20.21 |
| 3 | Bahadur Sub-1 | 16 (40.00) | 9.13 | 24.29 |
| 4 | Numoli | 11 (27.50) | 7.07 | 18.79 |
| | **Total Area under HYV** | 55 | **32.73** | **87.06** |

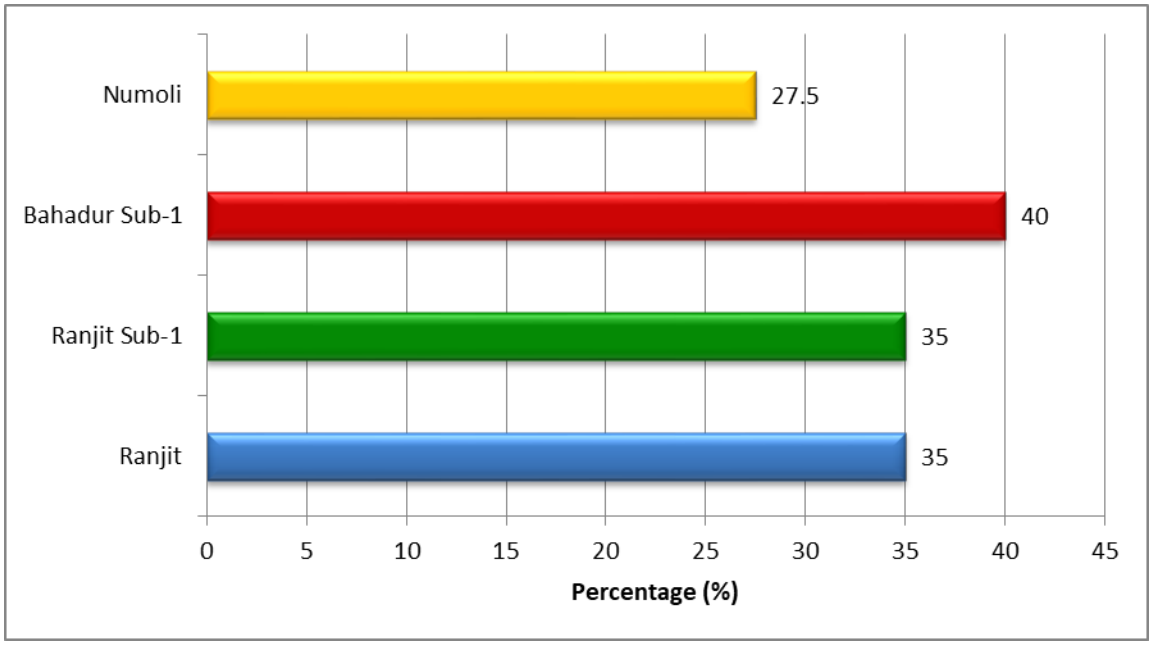


**FIG 4.35: PERCENTAGE OF ADOPTERS OF HIGH YIELDING VARIETIES IN AES III**

Table 4.37 and Fig. 4.36 show that. HYVs of rice covered an area of 32.73 hectares and it accounted for 87.06 per cent of the total rice acreage in AES III. Farmers of AES III do not cultivate rice in *Ahu* and *Boro* season. Bahadur Sub-1 covered the highest area among the HYVs of rice and it covered an area of 9.13 ha, which accounted for 24.29 per cent of the total area under rice in AES III. The second position was occupied by Ranjit variety which covered an area of 8.93 and accounted for 23.76 per cent of the total rice area. Ranjit Sub-1 cultivated in 7.60 ha, which constituted 20.21 per cent of the total rice

area, and Numoli covered an area of 7.07 hectares which accounted for 18.76 per cent of the total rice area.

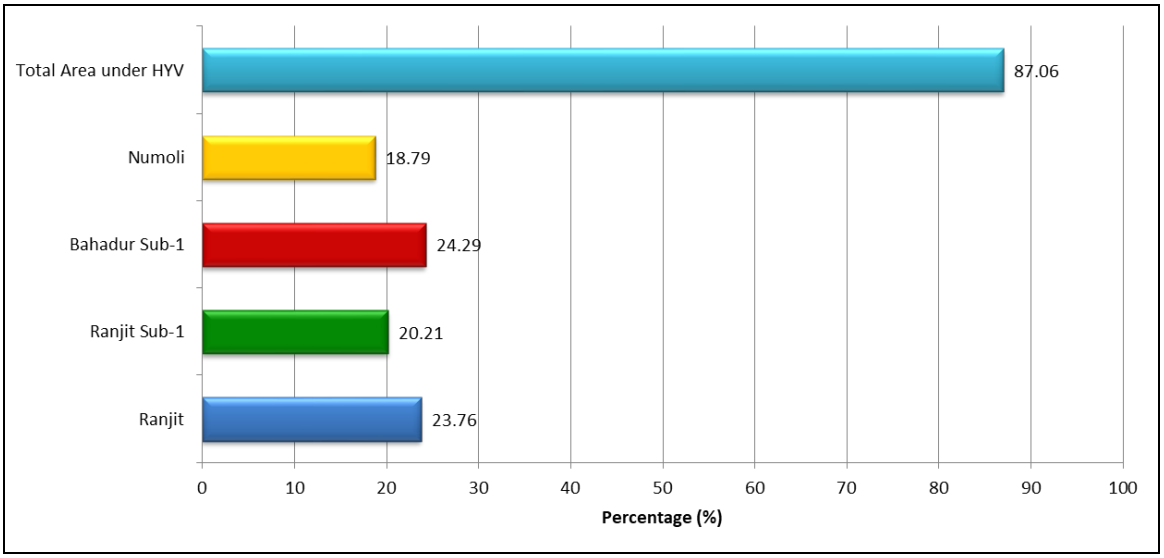


**FIG 4.36: PERCENTAGE SHARE OF AREA UNDER HYVS OF RICE IN AES III**

### 4.1.22.8 Other varieties grown in AES III

Table 4.38 and Fig. 4.37 reveal that the majority (15.00%) of the respondents cultivated both Kon Joha and Lavanya-12, followed by 12.50 per cent of the respondents who cultivated Joha. Lavanya-7 was cultivated by 5.00 per cent of the respondents while Lavanya-15 was cultivated by 2.50 per cent of the respondents. The varieties Lavanya-7, Lavanya-12 and Lavanya-15 were cultivated by the farmers as part of the varietal trials conducted by RARS, Titabor.

**Table 4.38: Distribution of respondents and percentage of shared area under other varieties of rice in AES III** **n=40**

| Sl. No. | Varieties | AES III | | |
|---|---|---|---|---|
| | ***Sali*** | **Frequency (%)** | **Area in Ha** | **% Share** |
| 1 | Joha | 5 (12.50) | 0.87 | 2.30 |
| 2 | Kon Joha | 6 (15.00) | 1.40 | 3.72 |
| 3 | Lavanya-7 | 2 (5.00) | 0.67 | 1.77 |
| 4 | Lavanya-12 | 6 (15.00) | 1.80 | 4.79 |
| 5 | Lavanya-15 | 1 (2.50) | 0.13 | 0.35 |
| | **Total** | **20** | **4.87** | **12.94** |

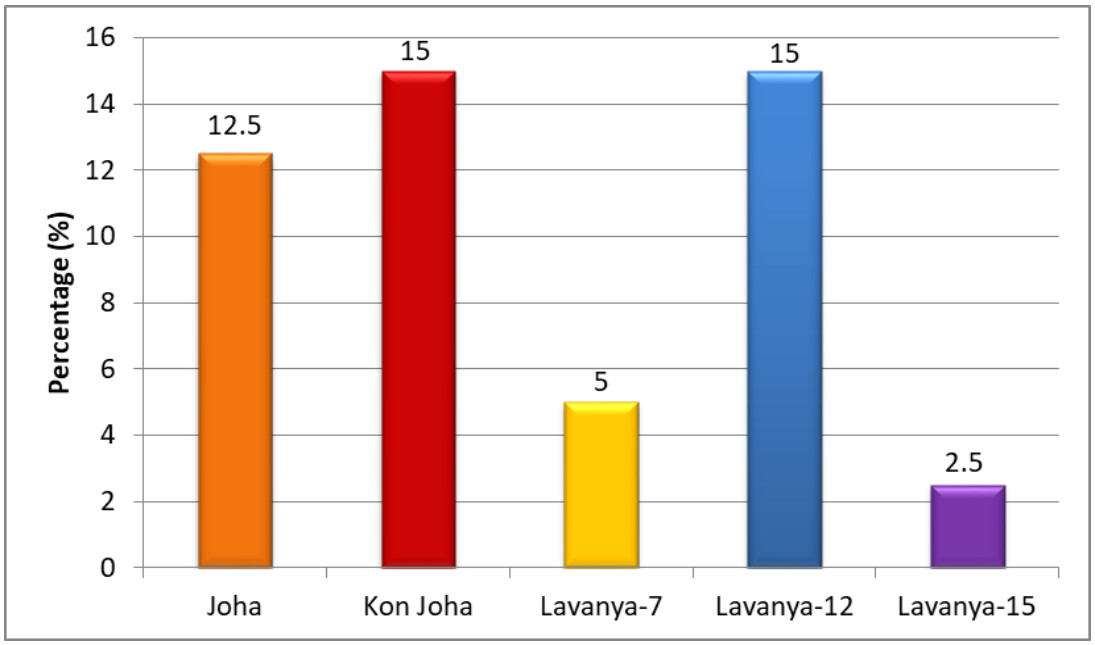


**FIG.4.37: PERCENTAGE OF ADOPTERS OF OTHER VARIETIES IN AES III**

Table 4.38 and Fig. 4.38 indicate that the five varieties Joha, Kon Joha, Lavanya-7, Lavanya-12 and Lavanya-15 together accounted for 12.94 per cent of the total rice growing area in AES III with an area coverage of 4.87 hectares. The variety Lavanya-12 was cultivated in the highest area (1.8 ha) which accounted for 4.79 per cent of the total area under rice in the AES which was followed by Kon Joha which was cultivated in an area of 1.40 hectares (3.72%).

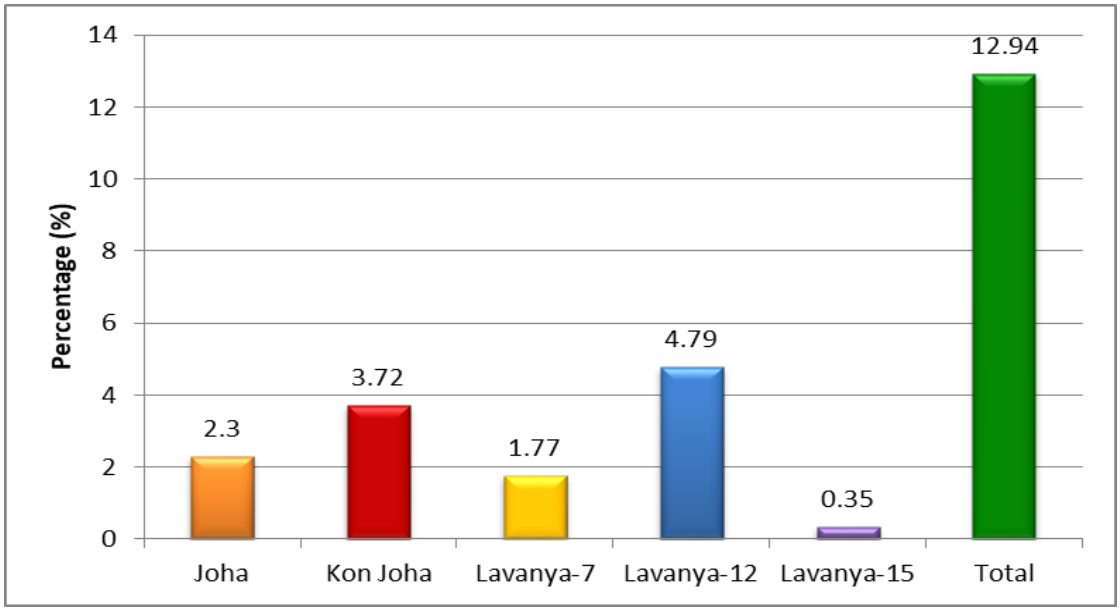


**FIG 4.38: PERCENTAGE SHARE OF AREA UNDER OTHER VARIETIES IN AES III**

## 4.2 Perception of farmers on High Yielding Varieties of rice released by AAU.

### 4.2.1 Perception of farmers on quality dimensions of HYVs of rice.

The data presented in Table 4.39 and Fig. 4.39 depict that majority (64.17%) of the respondents had a medium level of perception on quality characteristics of HYVs of rice released by AAU, followed by 19.17 per cent of the respondents who had a high level of perception and 16.67 per cent of them had a low level of perception. The mean value of overall perception towards HYVs of rice was 68.88 with a C.V. value of 11.05 per cent. For a detailed analysis if we look into the perception of farmers in different AES we can find some variations. In AES I, the majority (60.00%) of the respondents had a medium level of perception, while an equal proportion (20.00%) of the respondents had a low level and high level of perception. The mean value of perception in AES I was 67.53 with a C.V. of 11.80 per cent. In AES II also majority (65.00) of the respondents were having a medium level of perception, followed by 30.00 per cent of the respondents who had a low level of perception and 5.00 per cent of the respondents who had a high level of perception towards HYVs of rice. Whereas in AES III majority (67.50) of the respondents had a medium level of perception followed by 32.50 per cent of the respondents who a had high level of perception and none of them had a low level of perception towards quality characteristics of HYVs of rice released by AAU.

**Table 4.39: Distribution of respondents according to overall perception on quality dimensions about HYVs of rice**

| Category | Score | AES I ($n_1$=40) | | AES II ($n_2$=40) | | AES III ($n_3$=40) | | TOTAL (N=120) | |
|---|---|---|---|---|---|---|---|---|---|
| | | f | % | f | % | f | % | F | % |
| Low | <61.26 | 8 | 20.00 | 12 | 30.00 | 0 | 0 | 20 | 16.67 |
| Medium | Between 61.26 to 76.49 | 24 | 60.00 | 26 | 65.00 | 27 | 67.50 | 77 | 64.17 |
| High | >61.26 | 8 | 20.00 | 2 | 5.00 | 13 | 32.50 | 23 | 19.17 |
| **Mean** | | **67.53** | | **65.38** | | **73.73** | | **68.88** | |
| **SD** | | **7.97** | | **7.23** | | **4.74** | | **7.61** | |
| **CV** | | **11.80** | | **11.06** | | **6.44** | | **11.05** | |

We can infer from the results that the majority of the farmers were having a medium level of perception on quality characteristics of HYVs of rice released by AAU. The mean value of 68.88 indicates that overall perception is at a medim level and the C.V. value 11.05 per cent shows that the data is consistent and there was less variation among the farmers regarding the perception. We can observe the similar situation in all three AES. Even though the majority of the farmers had a medium level of perception in AES II, the mean value of perception, 65.37 implies the distribution was slightly skewed towards the low level. The majority of the farmers in AES III had a medium level of perception on HYVs and the mean value of 73.73 indicates that it is at the higher end of the medium level. So we can state that the farmers of AES III had a medium to high level of perception on quality dimensions of HYVs. Similar results were reported by Bagri (2011), Shamna (2014) and Dharmendra (2016).

For an in-depth analysis, the ranking of the perception statements under the four dimensions *viz*. plant characteristics, climatic adaptability, technological aspects and grain quality had done and it was presented in Table 4.40.

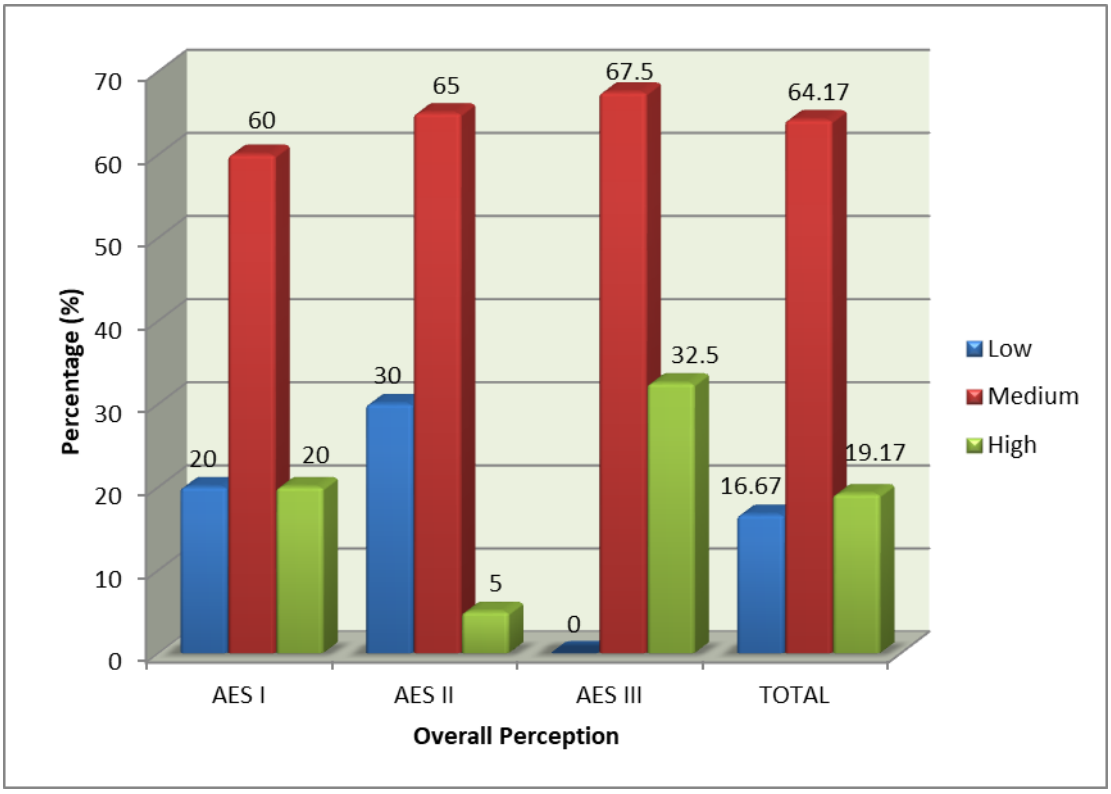


**FIG. 4.39: DISTRIBUTION OF RESPONDENTS ACCORDING TO OVERALL PERCEPTION ON QUALITY DIMENSIONS ABOUT HYVS OF RICE**

Table 4.40 indicates the ranks of perception statements based on the mean weightage scores (MWS). The perception statement 'HYVs of rice have greater productivity' ranked first with a mean weightage score (MWS) of 4.68 followed by 'HYVs can perform optimally in a favourable season while it will give at least subsistence yield in an unfavourable season' with a mean weightage score of 4.32 and the statement 'High yielding varieties have good cooking quality, good taste' ranked third with a MWS of 4.32. The fourth and fifth ranks were given for the statements 'Number of panicles per plant is high for HYVs of rice' and 'High yielding Varieties are better than other varieties in withstanding floods' with MWS of 4.18 and 4.02 respectively. The sixth, seventh and eighth ranks were allotted to the statements 'HYV of rice have suitable plant height', 'There are varieties with submergence resistance' and 'HYV of rice have high tillering capacity' with MWS of 3.99, 3.97 and 3.89 respectively. The ninth and tenth ranks were given to the statements 'Grain quality of HYV of rice is suitable for the production of value added products' and 'HYVs of rice have less shattering' with MWS of 3.85 and 3.68 respectively. The rest of the statements were also ranked according to mean weightage score (MWS) (Table 4.40).

From this data set, it can be inferred that the quality characteristics like greater productivity, better climatic adaptability, grain quality and other plant characteristics were the main qualities of HYVs of rice which were perceived better by the farmers compared to other varieties of rice.

For a further detailed understanding of the level of perception of farmers in the three AES, AES-wise ranking of the perception statements was done and presented in Appendix II.

**Table 4.40: Ranking of statements of Perception**

| Sl. No. | Statements | MWS | Rank |
|---|---|---|---|
| | **Plant Characteristics** | | |
| 1 | HYVs of rice have greater productivity | 4.68 | I |
| 2 | HYV of rice have suitable plant height | 3.99 | VI |
| 3 | HYV of rice have high tillering capacity | 3.89 | VIII |
| 4 | No. of panicles per plant is high for HYVs of rice | 4.18 | IV |
| 5 | HYVs of rice are resistant to most of the pest and diseases | 3.48 | XVI |
| 6 | HYVs of rice have less shattering | 3.68 | X |
| 7 | Threshing loss is minimum for HYVs | 3.63 | XII |
| 8 | There are varieties with submergence resistance | 3.97 | VII |
| 9 | HYVs have lodging resistance | 3.61 | XIII |
| | **Climatic Adaptability** | | |
| 10 | Cultivation of High yielding varieties are suitable for most of the rice based farming system | 3.59 | XIV |
| 11 | High yielding Varieties are better than other varieties in withstanding floods | 4.02 | V |
| 12 | High yielding Varieties are better than other varieties in withstanding droughts | 3.67 | XI |
| 13 | Cultivating HYVs of rice will help to combat with the changing climatic conditions and have higher environmental adaptability | 3.30 | XVII |
| 14 | HYVs can perform optimally in a favourable season while it will give at least subsistence yield in an unfavourable season. | 4.32 | II |
| | **Technological Aspects** | | |
| 15 | Labour requirement is more for cultivating high yielding varieties. | 3.24 | XVIII |
| 16 | To get better, consistent yield and productivity from HYV, we need to follow the recommended cultivation practices | 3.58 | XV |
| | **Grain Quality** | | |
| 17 | High yielding varieties have good cooking quality, good taste | 4.22 | III |
| 18 | Grain quality of HYV of rice is suitable for production of value added products | 3.85 | IX |

### 4.2.2 Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice

For an in-depth analysis of the perception of farmers on the various HYVs cultivated by them, the varieties were ranked according to their total mean weightage score. Table 4.41 indicates that the variety Bina Dhan-11 ranked first among the 11 high yielding varieties cultivated in the area with a total mean weightage score of 16.50. But it can be noted that it was adopted by only 2.5 per cent of the respondents and cultivated in 1.11 per cent of the total rice area. The aromatic HYV Keteki Joha ranked second with a total mean weightage score of 16.25. The varieties Ranjit Sub-1 and Bahadur Sub-1 ranked third and fourth respectively with total mean weightage scores of 15.92 and 15.90. Varieties Numoli, Joymati and Boro-1 ranked fifth, sixth and seventh respectively with total mean weightage scores of 15.88, 15.06 and 14.87. The eighth and ninth ranks were assigned to the varieties Ranjit, Jalashree with respective total mean weightage scores of 14.68 and 14.67. The variety Mahsuri occupied the tenth rank with a total mean weightage score of 14.18 and Boro-9 ranked eleventh rank with a total mean weightage score of 13.67.

**Table 4.41: Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice**

| Variety | % of adopters | % share of area | Mean Weightage Score | | | | Total mean weightage score | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | Plant Characteristics | Climatic Adaptability | Technological Aspects | Grain Quality | | |
| Ranjit | 58.33 | 33.7 | 3.75 | 3.71 | 3.28 | 3.94 | 14.68 | VIII |
| Ranjit Sub-1 | 29.17 | 17.22 | 4.15 | 3.91 | 3.66 | 4.20 | 15.92 | III |
| Bahadur Sub-1 | 18.33 | 11.42 | 4.15 | 3.95 | 3.57 | 4.23 | 15.90 | IV |
| Mahsuri | 25.00 | 9.44 | 3.66 | 3.57 | 3.17 | 3.78 | 14.18 | X |
| Numoli | 9.17 | 6.54 | 4.10 | 3.87 | 3.55 | 4.36 | 15.88 | V |
| Jalashree | 2.50 | 2.41 | 3.67 | 4.00 | 3.50 | 3.50 | 14.67 | IX |
| Keteki Joha | 3.33 | 1.23 | 4.00 | 4.00 | 4.00 | 4.25 | 16.25 | II |
| Bina Dhan-11 | 2.50 | 1.11 | 4.26 | 4.07 | 3.67 | 4.50 | 16.50 | I |
| Joymati | 3.33 | 13.64 | 3.78 | 3.88 | 3.40 | 4.00 | 15.06 | VI |
| Boro -1 | 2.50 | 3.21 | 4.00 | 3.53 | 3.33 | 4.00 | 14.87 | VII |
| Boro - 9 | 1.67 | 1.85 | 3.67 | 3.50 | 2.50 | 4.00 | 13.67 | XI |

Table 4.41 and Fig. 4.40 shows that the dimension grain quality had the highest score among the four dimensions for all the varieties except the variety Jalashree. For the variety Jalashree, the dimension 'climatic adaptability' had the highest mean score compared to other dimensions. So the variety Jalashree was perceived high for its climatic adaptability. The dimension 'technological aspects' had the lowest perception score among the four quality dimensions. The variety Bina Dhan-11had the highest MWS for the dimensions, plant characteristics, climatic adaptability and grain quality among these 11 HYVs. That means the farmers had a higher perception on plant characteristics, climatic adaptability and grain quality of Bina Dhan-11. In terms of technological aspects, the variety Keteki Joha had the highest mean weightage score (4.00) among the HYVs. But the Variety Keteki Joha was perceived highly for its grain quality (WMS- 4.25).

It can be noted from the data presented that the Bina Dhan-11 variety which ranked first among the HYVs was cultivated by only a few respondents whereas the Ranjit variety which had the highest adoption (58.33%) and the highest share of area (33.70%) was ranked eighth. So it indicates that the varieties like Bina Dhan-11 and Keteki Joha had a high perception regarding the quality traits among the farmers who had adopted it but it is not much penetrated among the community. So, measures should be taken to popularise these varieties among the farmers of the region.

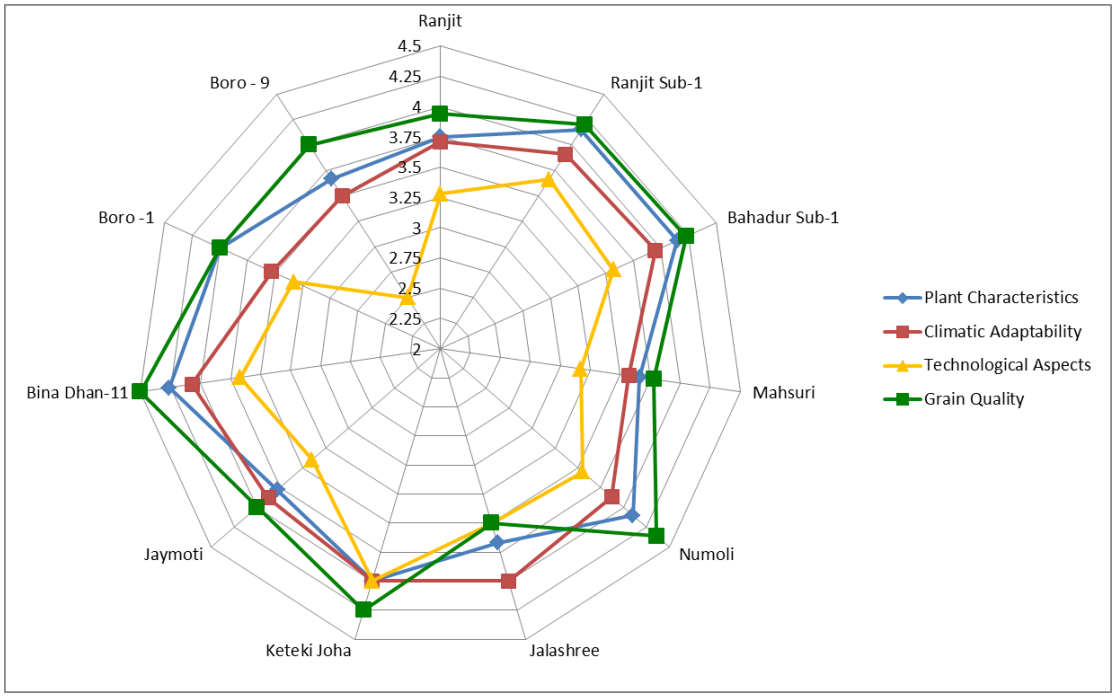


**FIG 4.40: VARIETY WISE FARMERS' PERCEPTION ON DIFFERENT DIMENSIONS OF HIGH YIELDING VARIETIES OF RICE**

### 4.2.2.1 Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice in AES I

From Table 4.42 it is observed that Bina Dhan -11 was ranked first among the nine high yielding varieties cultivated in the area with a total mean weightage score of 16.50. But it can be noted that it was adopted by only 7.50 per cent of the respondents and cultivated in 3.10 per cent of the total rice area. Ranjit Sub-1 ranked second with a total mean weightage score of 15.57 and it was the highest adopted (52.50%) variety among the farmers of AES I with the highest area (28.45 per cent to the total rice area). The varieties Boro-1and Jalashree ranked third and fourth respectively with total mean weightage scores of 14.87 and 14.67. Varieties Mahsuri, Bahadur Sub-1 and Ranjit ranked fifth, sixth and seventh respectively with total mean weightage scores of 14.41, 14.18 and 14.07. The eighth and ninth ranks were assigned to the varieties Boro-9 and Joymati with respective total mean weightage scores of 13.67 and 13.54.

**Table 4.42: Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice in AES I**

| Variety | % of Adopters | % share of area | Mean Weightage Score | | | | Total Mean Score | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | Plant Characteristics | Climatic Adaptability | Technological Aspects | Grain quality | | |
| Ranjit | 40.00 | 24.14 | 3.57 | 3.69 | 3.06 | 3.75 | 14.07 | VII |
| Rabjit Sub-1 | 52.50 | 28.45 | 4.07 | 3.86 | 3.64 | 4.00 | 15.57 | II |
| Bahadur Sub-1 | 15.00 | 8.28 | 3.72 | 3.63 | 3.08 | 3.75 | 14.18 | VI |
| Mahsuri | 25.00 | 14.48 | 3.73 | 3.78 | 3.1 | 3.8 | 14.41 | V |
| Jalashree | 7.50 | 6.72 | 3.67 | 4.00 | 3.50 | 3.50 | 14.67 | IV |
| Bina Dhan-11 | 7.50 | 3.10 | 4.26 | 4.07 | 3.67 | 4.50 | 16.50 | I |
| Joymati | 2.50 | 4.49 | 3.44 | 3.60 | 3.00 | 3.5 | 13.54 | IX |
| Boro-1 | 7.50 | 8.97 | 4.00 | 3.53 | 3.33 | 4.00 | 14.87 | III |
| Boro-9 | 5.00 | 5.17 | 3.67 | 3.50 | 2.50 | 4.00 | 13.67 | VIII |

From Table 4.42 it can be seen that the rice variety Bina Dhan-11 had the highest MWS for all four dimensions. So it can be inferred that the farmers who had cultivated Bina Dhan-11 had perceived the plant characteristics, climatic adaptability, technological aspects and grain quality higher for the variety compared to other varieties. It can also be identified that the variety Jalashree had the second highest score for climatic

adaptability. Even though Jalashree ranked fourth in overall perception, the farmers had the second highest perception for its climatic adaptability. The main reason for its lower adoption can be due to the lower perception of its grain quality. The variety Ranjit Sub-1 ranked second in terms of its overall perception score and it was the popular variety among the farmers of AES I. It was ranked second in terms of plant characteristics, third in terms of climatic adaptability, second highest for technological aspects and second highest perception in terms of grain quality. It was a variety highly perceived among the farmers regarding the quality dimensions and it had the highest adoption percentage in the region. So measures can be taken to increase the adoption of the variety Ranjit Sub-1 and to enhance the popularization and adoption of the variety Bina Dhan -11 in the community.

#### 4.2.2.2 Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice in AES II

From Table 4.43 it is revealed that the aromatic HYV Keteki Joha was ranked first among the four high yielding varieties cultivated in the area with a total mean weightage score of 16.25. But it can be noted that it was adopted by only 10.00 per cent of the respondents and cultivated in 4.20 per cent of the total rice area. The variety Joymati ranked second with a total mean weightage score of 15.44 and it was adopted by 7.50 per cent of the farmers and cultivated in 4.62 per cent of the total rice area. The varieties Ranjit and Mahsuri ranked third and fourth respectively with total mean weightage scores of 14.41 and 14.07.

**Table 4.43: Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice in AES II**

| Varieties | % of Adopters | % share of area | Mean Weightage Score | | | | Total Mean Score | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | Plant Characteristics | Climatic Adaptability | Technological Aspects | Grain Quality | | |
| Ranjit | 100 | 57.14 | 3.69 | 3.59 | 3.28 | 3.85 | 14.41 | III |
| Mahsuri | 50 | 14.5 | 3.62 | 3.47 | 3.2 | 3.78 | 14.07 | IV |
| Keteki Joha | 10 | 4.20 | 4.00 | 4.00 | 4.00 | 4.25 | 16.25 | I |
| Joymati | 7.5 | 4.62 | 3.86 | 3.95 | 3.5 | 4.13 | 15.44 | II |

From Table 4.43 it can be understood that the aromatic variety Keteki Joha had the highest overall perception on quality dimensions and had the highest score for grain quality, plant characteristics, and technological aspects. For all four varieties, the dimension grain quality scored the highest. Hence it can be inferred that farmers of AES II

were concerned more about the grain quality of the varieties. The dimension technological aspects scored least among the four dimensions for all the HYVs cultivated in the AES. The variety Ranjit had full adoption (100%) in AES II, but the farmers had perceived it as the third most good variety bsed on quality dimensions and the highest perceived variety Keteki Joha's adoption percentage was the lowest. The varieties Keteki Joha and Joymati were perceived better than other varieries by the farmers who had adopted these varieties. So there is scope to enhance the awareness and adoption of these varieties in the community.

#### 4.2.2.3 Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice in AES III

The results presented in Table 4.44 indicate that the submergence tolerant HYV Bahadur Sub-1 was ranked first among the four high yielding varieties cultivated in the AES with a total mean weightage score of 16.55 and it was the highest adopted (40%) variety with the highest area under cultivation (24.29 per cent of the total area under rice). The variety Ranjit Sub-1 ranked second with a total mean weightage score of 16.43 and it was adopted by 35 per cent of the farmers and cultivated in 20.21 per cent of the total rice area. The varieties Ranjit and Numoli ranked third and fourth respectively with total mean weightage scores of 16.20 and 15.88.

**Table 4.44: Variety wise farmers' perception on different dimensions of High Yielding Varieties of Rice in AES III**

| Varieties | % of Adopters | % share of area | Mean Weightage Score | | | | Total Mean Score | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | Plant Characteristics | Climatic Adaptability | Technological Aspects | Grain Quality | | |
| Ranjit | 35.00 | 23.76 | 4.13 | 4.10 | 3.54 | 4.43 | 16.20 | III |
| Ranjit Sub-1 | 35.00 | 20.21 | 4.25 | 4.00 | 3.68 | 4.50 | 16.43 | II |
| Bahadur Sub-1 | 40.00 | 24.29 | 4.31 | 4.08 | 3.75 | 4.41 | 16.55 | I |
| Numoli | 27.50 | 18.79 | 4.10 | 3.87 | 3.55 | 4.36 | 15.88 | IV |

From Table 4.44 it is evident that Bahadur Sub-1 had the highest perception score regarding the quality dimensions followed by Ranjit Sub-1. Both these varieties are submergence tolerant varieties but the AES is having a medium land situation where the submergence occurence is low. So it can be implied that these varieties are perceived

higher for their higher yield and grain quality. There is a possibility to increase the adoption of these varieties among the farmers of the region as these varieties had been adopted by less than 25.00 per cent of the respondents. Also, there is scope to enhance the adoption of these varieties in similar flood free medium land situations of other agro-climatic zones. The specific quality traits of these varieties which were highly perceived by the farmers can be incorporated in the development of new varieties.

### 4.3 Relationship between selected profile characteristics and perception of farmers on HYVs of rice released by AAU

An effort has been made to identify the nature of the relationship between selected profile characteristics of the rice farmers and their perception about the quality dimensions of HYVs of rice released by AAU. To have an understanding of the nature of the relationship between selected profile characteristics of rice farmers and their perception towards HYVs of rice released by AAU, correlation coefficient values (r) and chi-square values were computed and the values are presented in Table 4.45 and Table 4.46. The value of the correlation coefficient provides the direction and the degree of correlation between the selected parameters and the perception of farmers. While chi-square analysis of the nominal variables only explains whether there exists a significant association between the selected characters and the perception of farmers.

The relationship between the selected profile characteristics of the respondents and their perception of HYVs of rice released by AAU were tested by relevant null and alternative hypotheses. And the findings are discussed in the following subheads.

#### 4.3.1 Correlation between selected profile characteristics and perception of farmers on HYVs of rice released by AAU

It is revealed from Table 4.45 that, the computed Pearson's correlation coefficient (r) values of profile characteristics like annual income, the status of infrastructural facilities, family labour were positively significant with the perception of farmers towards HYVs at 5.00 per cent level of significance. The variable land scatteredness was negatively significant with the perception of farmers at 5.00 per cent level of significance. The other profile characteristics like degree of innovativeness, degree of commercialization, economic motivation, extension contact and mass media were positively significant with the perception of farmers towards HYVs of rice at 1 per cent level of significance. The other profile characteristics like age, formal educational experience, size of operational land holdings, area under rice, cropping intensity, and

degree of farm mechanization were non-significant with the perception of farmers on HYVs of rice.

**Table 4.45: Relationship between selected profile characteristics and perception of farmers on HYVs of rice released by AAU**

| Sl. No. | Variables | Pearson's coefficient of correlation (r) | p value |
|---|---|---|---|
| 1 | Age | -0.162 $^{NS}$ | 0.077 |
| 2 | Formal educational experience | 0.03 $^{NS}$ | 0.748 |
| 3 | Annual income | 0.190* | 0.038 |
| 4 | Size of operational land holdings | 0.082 $^{NS}$ | 0.371 |
| 5 | Area under Rice | 0.063 $^{NS}$ | 0.498 |
| 6 | Land scatterdness | -0.218* | 0.017 |
| 7 | Farming experience | -0.126 $^{NS}$ | 0.170 |
| 8 | Cropping Intensity | 0.111 $^{NS}$ | 0.229 |
| 9 | Degree of Innovativeness | 0.628** | 0.000 |
| 10 | Degree of commercialization | 0.523** | 0.000 |
| 11 | Economic motivation | 0.731** | 0.000 |
| 12 | Extension contact | 0.281** | 0.002 |
| 13 | Mass Media Exposure | 0.321** | 0.000 |
| 14 | Degree of Farm Mechanization | 0.164 $^{NS}$ | 0.073 |
| 15 | Status of Infrastructural Facilities | 0.229* | 0.012 |
| 16 | Family Labour | 0.188* | 0.040 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

From Table 4.45 it was evident that the annual income of the farmers had a positive and significant correlation (r=0.190*) with the perception of farmers towards HYVs of rice, which indicated that higher the annual income higher would be the perception of farmers towards HYVs of rice. The association was found to be significant at 0.05 level of significance (p=0.038). Hence the formulated null hypothesis was rejected and the alternative hypothesis was accepted. The positive and significant relationship might be because with higher annual income the farmers might be able to invest more capital in rice cultivation which will result in higher production and productivity and which ultimately result in a higher perception of farmers. This finding is in line with the findings of Sahoo (2005), Bagri (2011), Dharmendra (2016), Aanadrao(2017), Sharma (2019).

The degree of land scatteredness was found to have a negative and significant correlation (-0.218*) with the perception of farmers towards HYVs of rice. This implies as the degree of land scatteredness decreases the perception of farmers increases. The relationship between the land scatteredness and the perception of farmers was significant at 5.00 per cent significance level (p=0.017). Hence the null hypothesis formulated was rejected and the alternative hypothesis was accepted. Farmers will be able to efficiently do all the cultivation practices if the land is not scattered or located in a single place. Also, the labour requirement will also be less if the land is less scattered so the wages of labour can be reduced and they can spend it on inputs and for other inter-cultural operations which in turn gives better productivity. This will ultimately result in a higher perception of farmers towards HYVs of rice. A similar finding was observed by Dev *et al.* (2018).

The degree of innovativeness was found to have a positive and significant (r=0.628**) relation with the perception of farmers on HYVs of rice. This indicates a farmer with a high degree of innovativeness will be having a high perception of the HYVs of rice. The association between the degree of innovativeness and the perception of farmers was significant at 0.01 level of significance (p=0.000). Hence the formulated null hypothesis was rejected and the alternative hypothesis was accepted. Farmer with higher innovativeness tend to have knowledge about the new technologies and new varieties and are more likely to adopt them fast, they might be having a high perception towards the HYVs. Similar results were reported by Patel *et al.* (2011) and Sharma (2019).

The degree of commercialization had a positive and significant correlation (r=0.523**) with the perception of farmers towards HYVs of rice. This indicates the farmers with a high degree of commercialization will be having a high perception of the HYVs of rice. The association between the perception of farmers and the degree of commercialization was significant at 1.00 per cent level of significance (p=0.000). Hence the formulated null hypothesis was rejected and the alternative hypothesis was accepted. Farmers with a high degree of commercialization need quality products that meet the market demand so they prefer the high yielding better performing HYVs of rice.

The economic motivation of the farmers had a positive and significant relationship (r=0.731**) with the perception of farmers towards HYVs of rice. The relationship between economic motivation and the perception of farmers was significant at 1.00 per cent level of probability (p=0.000). Hence the null hypothesis formulated was

rejected and the alternative hypothesis was accepted. The reason for the positive and significant relationship can be that with a high economic motivation they will aim to get higher profit and with the higher yield of HYVs, they will be able to obtain a considerably better income. This is in line with the findings of Patel *et al.* (2011), Dharmendra (2016) and Saikia (2017)

Extension contact of the farmers was found to have a positive and significant correlation (r=0.281**) with the perception of farmers towards HYVs of rice. The relationship was found to be significant at 1.00 per cent level of probability (p=0.002). Hence the null hypothesis formulated was rejected and the alternative hypothesis was accepted. This implies with higher extension contact the farmers would have a higher perception. This implies that the farmers who have high extension contact get more information regarding the HYVs of rice, the recent technologies, and various other aspects of agriculture which leads to a change in their perception towards HYVs of rice. This finding is in conformity with the findings of Sahoo (2005), Patel *et al.* (2011), Ghimire *et al*. (2015), Paltasingh *et al*. (2017), and Sharma (2019)

Mass media exposure of the farmers was found to have a significant and positive correlation (r=0.321**) with their perception of HYVs of rice and it was found to be significant at 1 per cent level of probability (p=0.000). Hence the null hypothesis formulated was rejected and the alternative hypothesis was accepted. With increased mass media exposure, farmers will be able to get more relevant information regarding rice cultivation and that in turn results in better productivity and increased perception. Similar results were reported by Bagri (2011) and Patel *et al.* (2011).

The status of infrastructural facilities was found to be positively and significantly correlated (r=0.229*) with the perception of farmers towards HYVs of rice and it was significant at 5.00 per cent level of probability (p=0.012). Hence the null hypothesis formulated was rejected and the alternative hypothesis was accepted. With better access to resouces and markets created by better infrastructural facilities available for farming, farmers will be able to obtain better production from rice cultivation and better marketing opportunities which will significantly affect their perception of HYVs.

The availability of family labour was found to have a positive and significant correlation (r=0.188*) with the perception of farmers on HYVs of rice. The relationship was found to be significant at 5.00 per cent level of significance (p=0.040). Hence the null hypothesis formulated was rejected and the alternative hypothesis was

accepted. With more family labour available farmers can reduce their cost of hired labour and can invest more in cultivation practices and inputs like quality seeds, fertilizers and plant protection measures which will ultimately result in better performance of HYVs and increase their perception level. Similar results were found by Mehar *et al*. (2017) and Danso-Abbeam *et al*. (2017)

The age of the farmers was found to be negative and non-significantly correlated ($r=-0.162^{NS}$) with the perception of farmers towards HYVs and it was found to be non-significant. Hence the formulated null hypothesis was accepted. Similar results were reported by Dharmendra (2016).

The formal educational experience was found to be positive but non-significantly correlated ($r=0.03^{NS}$) to the perception of farmers towards the HYVs of rice. Hence the formulated null hypothesis was accepted.

The size of operational land holdings was found to be positively and non-significantly correlated ($r= 0.082^{NS}$) with the perception of farmers towards the HYVs of rice. Hence the null hypothesis formulated was accepted.

The area under rice was found to have a positive but non-significant correlation ($r=0.063^{NS}$) with the perception of farmers on HYVs of rice. Hence the null hypothesis formulated was accepted.

The farming experience of farmers was found to be having a non-significant, negative correlation ($r=-0.126^{NS}$) with the perception of farmers on HYVs of rice. Hence the formulated null hypothesis was accepted.

The cropping intensity had a positive but non-significant correlation ($r= 0.111^{NS}$) with the perception of farmers towards HYVs of rice. Hence the null hypothesis formulated was accepted.

### 4.3.2 Chi-square analysis of nominal variables and perception

It is evident from Table 4.46 the chi-square analysis between the perception of farmers and the profile characteristics like gender, caste, occupation and irrigation facility, there is a significant association between caste and occupation of the respondents and their perception towards HYVs of rice. Gender and irrigation facilities showed a non-significant relationship with the perception of farmers.

**Table 4.46: Relationship between nominal variables and perception**

| Sl. No. | Profile Characteristics | Chi-square value ($\chi^2$) | p - value |
|---|---|---|---|
| 1 | Gender | $0.782^{NS}$ | 0.676 |
| 2 | Caste | 21.487** | 0.001 |
| 3 | Occupation | 29.616** | 0.000 |
| 4 | Irrigation facility | $4.690^{NS}$ | 0.096 |

** Significant at 1 per cent level of significance

Caste had a significant association ($\chi^2$=21.487**) with the perception of farmers at 1.00 per cent level of significance. Hence the null hypothesis formulated was rejected and the alternative hypothesis was accepted. The food habits of different people have a significant relation to their caste culture and traditions. There might be differences in preferences of rice varieties their grain qualities etc. among different castes. This might be the reason for the significant association of caste with perception on HYVs. This finding is in line with the findings of Pathak and Sharma (2008), Meher *et al*. (2017),

Occupation of the respondents had a significant ($\chi^2$=29.616**) association with perception of farmers on HYVs at 1.00 per cent level of significance. Hence the null hypothesis formulated was rejected and the alternative hypothesis was accepted. Occupation and perception of farmers towards HYVs showed significant association because all the farmers had agriculture as either their primary or secondary occupation. If the farmers are entirely dependent on agriculture they might be interested in knowing more about the new varieties and recent technological advances which will result in a change in their perception towards HYVs of rice. Similar findings were found by Bagri (2011).

Gender ($\chi^2$=$0.782^{NS}$) and irrigation facility ($\chi^2$=$4.690^{NS}$) did not show any significant association with the perception of farmers on HYVs.

## 4.4 Problems faced by the farmers in cultivating HYVs of rice and the suggestive measures given by the farmers

### 4.4.1 Problems faced by the farmers

The farmers were asked to express the problems faced by them in the cultivation of HYVs of rice. The results in Table 4.47 show that farmers faced many constraints in the cultivation of HYVs. The problems faced by them were categorized into different groups such as economic problems, market-related problems, problems related to

infrastructural facilities, extension-related problems, technology-related problems, cultivation-related problems, and institutional problems.

**Table 4.47: Problems faced by the respondents in cultivating high yielding varieties of rice**

| Categories | Frequency | Percentage | MWS | Rank |
|---|---|---|---|---|
| **Economic Problems** | | | | |
| High cost of HYV seeds | 81 | 67.50 | 1.10 | XV |
| High cost of Inputs | 104 | 86.67 | 2.20 | II |
| High wages of labour | 82 | 68.33 | 1.85 | IV |
| **Market Related** | | | | |
| Fluctuating Market Price | 120 | 100.00 | 3.00 | I |
| Poor Marketing Channel | 69 | 57.50 | 1.18 | XIII |
| Exploitation by middlemen | 60 | 50.00 | 1.08 | XVII |
| Low market price- low price than MSP | 87 | 72.50 | 1.76 | VI |
| **Infrastructural facilities** | | | | |
| Lack of electricity at farm | 43 | 35.83 | 0.81 | XXII |
| Lack of Irrigation facility | 95 | 79.17 | 2.12 | III |
| Inadequate storage facility and other infrastructure facilities | 42 | 35.00 | 0.51 | XXIV |
| **Extension Related** | | | | |
| Lack of timely advisory service | 56 | 46.67 | 1.00 | XVIII |
| Insufficient training programmes | 50 | 41.67 | 0.95 | XIX |
| **Technology Related** | | | | |
| Inadequate knowledge about suitable HYVs of rice | 54 | 45.00 | 0.88 | XX |
| Lack of awareness about recent recommendations | 70 | 58.33 | 1.48 | XI |
| Non-availability of farm machinery | 69 | 57.50 | 1.33 | XII |
| **Cultivation Related** | | | | |
| Non- availability of quality seed materials | 49 | 40.83 | 0.83 | XXI |
| Non- availability of inputs on time | 79 | 65.83 | 1.68 | VII |
| Shortage of labour | 69 | 57.50 | 1.53 | X |
| Chances of uncertainty or failure | 55 | 45.83 | 1.09 | XVI |
| Flood related problem | 63 | 52.50 | 1.11 | XIV |
| Pest and disease infestation | 87 | 72.50 | 1.78 | V |
| Uncertainty in rainfall | 120 | 100.00 | 3.00 | I |
| **Institutional** | | | | |
| Inadequate financial assistance from the government | 80 | 66.67 | 1.57 | IX |
| Lack of subsidy on inputs | 89 | 74.17 | 1.65 | VIII |
| Unaware of the policies and subsidies offered by the government | 36 | 30.00 | 0.65 | XXIII |

The results in Table 4.47 show the major problems faced by the farmers in cultivating HYVs of rice. The most severe problems faced by the respondents were fluctuating market price and uncertainty in rainfall which ranked first among all the problems with a MWS of 3.00. The second most severe problem faced by the farmers was the high cost of inputs with a MWS of 2.20. The third and fourth severe problems were lack of irrigation facility and high wages of labour with respective MWS of 2.12 and 1.85. Pest and disease infestation was ranked fifth among the problems with a MWS of 1.78. The problems low market price *i.e.*, getting low price than minimum support price (MSP), non-availability of inputs on time, and lack of subsidy on inputs were ranked sixth, seventh and eighth respectively, with MWS of 1.76, 1.68 and 1.65. The ninth and tenth most severe problems were inadequate financial assistance from the government and shortage of labour with respective MWS of 1.57 and 1.53.

The economic problems faced by the farmers were the high cost of HYV seeds, high cost of inputs and high wages of labour. The market related problems like fluctuating market price, poor marketing channel, exploitation by middlemen and low market price- getting a lower price than MSP for their produce. The problems related to infrastructural facilities were lack of electricity at farms, lack of irrigation facility, and inadequate storage facilities. The problems related to extension services were lack of timely advisory services and insufficient training programmes. The technology related problems faced by the farmers were inadequate knowledge about suitable HYVs of rice, lack of awareness about recent recommendations and non-availability of farm machinery. The cultivation related problems faced by the respondents were non-availability of quality seed materials, non-availability of inputs on time, shortage of labour, chances of uncertainty or failure and flood damages. The problems from the institutional end were inadequate financial assistance from the government and lack of awareness of the policies and subsidies offered by the government.

It can be concluded that the most severe problems faced by the farmers in the cultivation of HYVs of rice were the fluctuating market price for the produce and uncertainty in rainfall. The farmers are not getting a consistent price for their produce and farmers have reported that they were getting a low price than MSP for their produce. It is a serious problem as they were not able to get even a subsistent income from the rice cultivation as the cost of cultivation is also higher. This makes the farmers to leave farming and take up other occupations. Uncertainty in rainfall also makes the rice cultivation difficult for farmers as the agriculture in Assam and the district Golaghat is generally

rainfed and there is a lack of irrigation facilities. The AES I was flood prone region and farmers of the region expressed that they used to have flood damages every year but during the last year they faced the problem of insufficient rainfall. The highly changing climatic conditions makes the weather dependent rice cultivation challenging for the farmers. Due to the lack of irrigation facilities, the farmers were not able to cultivate rice in the *Ahu* and *Boro* seasons. Due to the lack of availability of farm machinery and due to the small size of land holdings farmers are forced to depend on manual labour and hence the shortage and high cost of labour in the peak season were other major problems faced by the farmers in the cultivation of HYVs of rice.

The majority of the problems faced by the farmers in cultivating HYVs of rice can be solved by improving the infrastructural facilities, providing timely assistance to farmers by the extension system and strengthening the support system by and policy implications by the government.

### 4.4.2 Suggestions as proposed by farmers

A further attempt was undertaken to get rice farmers' proposals for eliminating all of the barriers in the cultivation of HYVs of rice**.** The suggestive measures were obtained **t**hrough focus group discussion with the farmers and presented in Table 4.48.

**Table 4.48: Suggestions as proposed by farmers**

| Sl. No. | Suggestions |
|---|---|
| 1 | Ensuring timely supply of seeds and other inputs |
| 2 | Trainings on HYVs of rice |
| 3 | Subsidized electricity for farm practices and irrigation purposes |
| 4 | Timely weather forecast |
| 5 | Provision of irrigation facility |
| 6 | Supply of suitable HYV rice seeds |
| 7 | Farmers' choice or preference should be given due consideration during variety development programme. |
| 8 | Custom hiring center for farm machinery |
| 9 | Market Price related information- Provision for knowing prospective buyers |
| 10 | Provide adequate advisory services |
| 11 | Provision of government incentives for growing HYVs |
| 12 | Strengthening crop insurance, support for crop failure |

One of the suggestions provided by the farmers was to ensure timely supply of seeds and other inputs and supply of suitable HYV seeds. The timely availability of the seeds is important for any cultivation. So the seeds and other inputs like fertilizers and plant protection chemicals can be made available through some public distribution system for inputs either at Panchayat or village level. Farmers can also take up seed entrepreneurship to provide enough supply of HYVs of rice, which are highly perceived by the farmers. It will ensure the supply of suitable seeds and additional income to the farmers. Another suggestion was to conduct training on HYVs of rice. Usually, extension agents perceive that farmers have enough knowledge on the rice cultivation practices, but they lack the scientific and technological knowledge of cultivating HYVs of rice. So in order to eliminate this gap, more trainings can be conducted on cultivation of HYVs of rice.

'Provision of subsidized electricity for farm operations and irrigation purposes' was another suggestion proposed by the farmers. One of the main issues faced by them was lack of electricity at farms and even if they had electrical connectivity, because of the high electrical charges they were not using it. But providing electricity at farms will be a costly affair and its practicality is to be checked. The more practical and sustainable solution can be the installation of solar-powered water pumps.

Due to the highly uncertain weather, farmers often face problems, hence they suggested for the provision of timely weather forecasting. Weather forecasting in the state is efficient but the problem might be that it is not reaching all sectors of farmers. So provision should be made to reach it to all farmers. Weather information can be provided to the farmers through weekly SMS-based weather forecast-advisory services. Another major suggestion provided by farmers was the 'provision of irrigation facility'. Assam's agriculture is primarily rainfed. But due to the recent extreme climatic changes and uncertain rainfall farmers are in fear of crop failure. Also, due to the lack of irrigation facility the majority of the farmers do not cultivate rice in *Ahu* and *Boro* seasons. So through by providing irrigation faciity they can go for multiple rice crops in a year.

Farmers' choices or preferences should be given due consideration during the variety development programmes. Farmers prefer to cultivate the variety suitable with their choice and preference of varietal characteristics.

The facility of ‘custom hiring center for farm machinery’ was one suggestion proposed by the farmers. Due to shortage of labour, high wages of labour and lack of suitable farm machinery, farmers face problems during the peak seasonal cultivation practices. So, they prefer to hire farm machinery for the fam operations at a lower cost through custom hiring centers.

Farmers suggested to provide market price related information and provision for knowing prospective buyers. One of the most severe problems faced by the farmers was fluctuating market price and due to the poor marketing channels and exploitation by the middle men farmers were often left with a price, less than MSP for their produce. So if they have the information about the trend of the market price and prospective buyers they could get a good price for their produce. If they have enough information regarding the market and the prospective buyers, their bargaining power will increase.

To assist with the cost incurring the cultivation of HYVs of rice farmers suggested for ‘provision of government incentives for growing HYVs. Even though farmers can meet with the cost requirements through the high yield obtained from HYVs, they need some financial assistance to start with. If the government provides special incentives for cultivating HYVs, farmers will be more interested in cultivating them.

In the current scenario of various climatic changes and flood occurences in the region, farmers suggested to ‘Strengthen the crop insurance and support for crop failure’. Due to uncertainty in climatic conditions and rainfall, the chances of crop failure are comparatively higher now than ever before. So, they need assurance from the side of the government if crop failure happens, they can sustain with the compensation provided as the majority of the respondents are entirely dependent on agriculture for a living.

# CHAPTER V

# SUMMARY AND CONCLUSION

This chapter delivers the summary and conclusion of the entire research process with a focus on the findings.

## 5.1 Introduction

Rice is the important staple food of the people of India and Assam. Rice is a substantial contributor to the state's agricultural GDP and hence plays an important part in the state's economy. It ensures food and nutritional security to the people of the state. With a production of 5.10 million tonnes, Assam is the country's tenth-largest rice producer, accounting for 4.30 per cent of the country's total rice production. Assam's rice-growing area accounts for 5.19 percent of India's total rice-growing area and it is in the eighth position in terms of area under rice with a total area of 2.27 million hectares (Anon., 2020). The agro-climatic conditions of the state are suitable for rice cultivation and the state has three unique rice producing seasons viz. *Sali* or winter rice, *Ahu* or autumn rice and *Boro* or summer rice.

Despite the fact that the productivity of rice in the state has increased over time, Assam's rice productivity (2243 kg/ha) is lower than the national average (2705 kg/ha). With the increasing population of the state, the food requirement also increases and a better solution is to increase the productivity per unit land area. This gap can be reduced by increasing the area under HYVs of rice. Over the years, Assam Agricultural University has developed and released several location-specific high yielding rice varieties. Every year, a significant amount of money is set aside and spent on research to generate superior rice varieties. But the adoption of these varieties is yet to be full-fledged and farmers continue to cultivate the traditional varieties. Farmers' perception of the HYVs plays crucial part in their adoption decision (Sall *et al.*, 2000). The favourable or unfavourable perception developed by perceiving a variety based on the advantages or disadvantages compared to other varieties, compatibility to their existing land and resource situations, etc. farmers decide to continue or reject a variety. Hence, it is important to understand their perception of the existing HYVs of rice released by AAU and the factors that influence their perception.

Considering these facts and views, the research study entitled **"Perception of farmers on High Yielding varieties of rice released by Assam Agricultural University- A study in Golaghat District of Assam"** was carried out with the following objectives:

**Objectives of the study**

1. To determine the perception of farmers towards AAU released HYV of rice.
2. To study the correlation between the selected profile of the farmers and their perception towards HYV of rice.
3. To analyse the problems faced by the farmers in cultivating HYV of rice along with their suggestive measures.

**5.2 Research methodology**

The present study was conducted in Golaghat district of Assam, which was purposively selected for the study since the district is having the highest area under HYVs of rice in the UBVZ. Three rice growing agro-ecological situations were selected from the four agro-ecological situations present in the district. From each AES, two villages were selected randomly. Thus a total of six villages, namely Dani Chapori and Gormora Chapori from Humid Alluvial Flood Prone situation (AES I), Dadhora and Raja Bahar from Humid Alluvial Flood Free Situation (AES II), and Gomariguri and Amgurichukh villages from Sub Humid Alluvial Medium Land situation (AES III) were selected for the study. From each selected village, 20 rice growing farmers were selected randomly making the total sample size 120.

Keeping in mind the objectives of the study and after reviewing the relevant literatures available and as per the suggestions of the advisory committee, one dependent variable *viz.* perception of farmers about HYVs of rice; 22 independent variables *viz*. age, gender, education, caste, family size, occupation, annual income, size of operational land holdings, area under rice, varieties grown, degree of land scatteredness, farming experience, cropping intensity, degree of innovativeness, degree of commercialization, economic motivation, extension contact, mass media exposure, irrigation facility, degree of farm mechanization, labour availability, and status of infrastructural facilities and two descriptive variables namely problems faced by the farmers, suggestive measures proposed by the farmers were selected in the present study.

The data were collected from the respondents by personal interview method and focus group discussion with the help of the interview schedule developed for the study. The collected data were tabulated and analyzed using appropriate statistical techniques.

## 5.3 Research findings

### 5.3.1 Profile characteristics of the respondents.

The analysis of profile characteristics of the respondents revealed that the majority (70.83%) of the rice farmers of the study area belonged to 30-50years of age group and most of them were male (94.17%). The majority of the respondents had a high school education *i.e.,* formal education experience of 9-10 years (41.67 %), belonged to the OBC category (50.83%), with a medium family size of 5 to 6 members (55.83%) having of low annual income of less than ₹ 69101 (41.67%). Agriculture was the only occupation for 51.67 per cent of the respondents, followed by agriculture + business (30.83%). Agriculture was the primary source of income for 83.33 per cent of the respondents, while business was the secondary occupation for 23.33 per cent of the respondents. Marginal land holders (less than 1 ha) were the majority (60.00%) in the study area with 80 to 100 per cent of the total operational land holding under rice cultivation (60.83%). The land area under rice cultivation was less than 1 hectare for the majority (71.67%) of the respondents. The operational land holding of the majority (65.00%) of the respondents was least scattered (scattered in 2-3 plots). The majority (58.33%) of the respondents had a medium level of farming experience with an average of 26.57 years. The majority (60.00%) of the respondents had a medium degree of cropping intensity with an intensity of 114.66-179.97 per cent and the average cropping intensity in the study area was 147.32 per cent. More than half (58.33%) of the respondents were found to have medium degree of innovativeness and medium degree of commercialization (81.67%) with an average degree of commercialization of 78.26 per cent. Nearly two-thirds (63.33%) of the respondents had a medium level of economic motivation, medium level of extension contact (70.00%) and the farmers had the most contact with ‘farmers’ organization’. Most of the respondents (70.83%) had a medium level of mass media exposure and T. V. was the most utilized mass media followed by the internet and radio. Irrigation facility was not available for majority (79.17%) of the respondents. The majority of the respondents (40.00%) were having a medium degree of farm mechanization and on average 30.19 per cent of the farm operations were mechanized in the region. Out of 12 farm operations for rice, only five were mechanized in the study area. Labour availability was at a medium level for majority

(64.17%) of the respondents. Majority (55.83%) of the respondents had medium infrastructural facilities and the irrigation system was the least available facility among the farmers.

Farmers of the study area cultivated a total of 33 varieties including *Ahu*, *Sali*, and *Boro* rice varieties. The rice varieties grown in *Ahu* season were the traditional varieties like Rongadoria, Borhoola and Koleguma and they cultivated 25 *Sali* rice varieties. These include 13 HYVs (9 released by AAU, 3 under trial, and one not reported by AAU) and 12 traditional rice varieties. Farmers cultivated five *Boro* rice varieties, including three AAU-released HYVs, one traditional variety, and one non-AAU-released variety. Among the HYVs of rice, the majority (58.33%) of the farmers cultivated the variety Ranjit, while 29.17 percent cultivated the variety Ranjit Sub-1 and 25.00 percent cultivated Mahsuri. Bahadur sub-1 was cultivated by 18.33 percent of respondents. The high yielding *Boro* season variety Jaymoti was cultivated by 3.33 per cent of the respondents. In the *Sali* season, the total area under HYVs of rice was 90.00 hectares, accounting for 83.33 percent of the entire rice-growing area of the study region. The variety Ranjit, which accounted for 33.70 per cent of the total rice cultivated area of the region, had the highest area among the HYVs. Ranjit Sub-1 had the second-largest area under HYVs, accounting for 17.22 per cent of the total rice area with 18.6 hectares. HYVs of rice released by AAU covered 6.91 per cent of the entire rice acreage in *Boro* season of the study region, covering an area of 7.47 hectares. With an area of 3.47 hectares, the HYV, Boro-1 occupied the largest area in *Boro* season paddy, accounting for 3.21 percent of the total rice producing area.

Farmers of the study area had cultivated 16 varieties other varieties of rice in *Sali* season. With an area of 17.87 hectares, these 16 varieties contributed 16.59 per cent of the total area under rice in the *Sali* season. Bora Chokuwa which accounted for 3.64 per cent of the total area under rice had the highest area (3.93 ha) among these varieties. *Boro* varieties Bora Dhan and Pusa covered 3.20 ha and 1.33 ha, respectively, accounting for 2.96 and 1.23 per cent of the total area under rice in *Boro* season. Borhoola, Koleguma, and Rongadoria, the three traditional *Ahu* varieties, accounted for 2.10 per cent of the total rice area under cultivation, covering 2.27 hectares.

In *Sali* season a major proportion (83.33%) of the total area under rice was covered by HYVs of rice released by AAU. In AES I the percentage share of area under HYVs was 85.86, in AES II it was 75.84 per cent which was less than the overall

percentage share and in AES III it was 87.06 per cent and it was higher than the overall per cent share. Ranjit Sub-1 was the HYV that covered the most area in AES I, accounting for 28.45 per cent of total rice area with 11.00 hectares, and it was the variety that was adopted by the majority (52.50%) of the farmers in the region. All of the farmers in AES II cultivated the HYV Ranjit, which had the largest area (18.13 ha) among the HYVs and accounted for 57.14 per cent of the total area under rice. Joymati was the only high yielding variety cultivated in AES II in the *Boro* season. Bahadur Sub-1 covered the largest area among the HYVs of rice and it covered an area of 9.13 ha, which accounted for 24.29 per cent of the total area under rice in AES III.

### 5.3.2 Perception of farmers on High Yielding Varieties of rice released by AAU.

The majority (64.17%) of the respondents had a medium level of perception on quality dimensions of HYVs of rice released by AAU, followed by 19.17 per cent of the respondents who had a high level of perception and 16.67 per cent of them had a low level of perception. A similar trend is observed in all three AES. The majority of the respondents of AES I (60.00%), AES II (65.00%), and AES III (67.50%) reported to have a medium level of perception on qualities of HYVs released by AAU compared to other varieties. The perception statements which ranked the first three positions were 'HYVs of rice have greater productivity' (MWS- 4.68), 'HYVs can perform optimally in a favourable season while it will give at least subsistence yield in an unfavourable season'(WMS-4.32) and 'High yielding varieties have good cooking quality, good taste' (WMS- 4.22) in this respective order.

On analysis of variety-wise farmers' perception on different dimensions of HYVs of rice, it was found that the variety Bina Dhan-11 ranked first among the 11 high yielding varieties cultivated in the study area. Keteki Joha, the aromatic HYV of rice released by AAU ranked second. The varieties Ranjit Sub-1 and Bahadur Sub-1 ranked third and fourth respectively. The grain quality was the highest perceived dimension by the farmers for all the varieties except Jalashree as it was mostly valued for its ability to adapt to climate change. The dimension technological aspects had the lowest perception scores for all the varieties. Bina Dhan-11 had a higher perception among farmers in terms of plant characteristics, climatic adaptability, and grain quality, while Keteki Joha had the highest score for technological aspects. Even though the varieties Bina Dhan-11 and Keteki Joha had the higher perception score, the adoption level of these varieties was low in terms of the percentage of adopters. It implies that cultivars like Bina Dhan-11 and Keteki Joha

have a high perception of quality attributes among farmers who have adopted them, but they have not yet infiltrated the population. Hence, proper actions should be taken to increase the popularity of these cultivars among the region's farmers.

In AES I, the variety Bina Dhan -11, was perceived highest among the nine HYVs grown in the area. However, only 7.50 per cent of respondents had adopeted it, and only 3.10 per cent of the total rice area was cultivated with it. The variety Ranjit Sub-1 was ranked second, and it was the most widely accepted (52.50 %) variety among the farmers of AES I with highest land area (28.45 per cent of the total rice area).

In AES II, variety Keteki Joha received the greatest overall perception score on quality dimensions, as well as the highest scores for grain quality, plant characteristics, and technical aspects. The dimension grain quality received the highest score for all four varieties. In AES II, the variety Ranjit received full adoption (100.00 %) yet farmers rated it as the third-best variety in terms of qualitative dimensions, and the highest-rated variety, Keteki Joha, had the lowest adoption percentage. Farmers who had adopted the varieties Keteki Joha and Joymati perceived it as higher than other varieties.

In AES III, the submergence tolerant HYV Bahadur Sub-1 was perceived best among the four high yielding varieties cultivated in the AES, and it was the most widely chosen (cultivated by 40.00 per cent of the respondents) variety with the highest area under cultivation (24.29 per cent of the total area under rice. The variety Ranjit Sub-1 was perceived as second best with 35.00 per cent of farmers adopting it and 20.21 per cent of the total rice area cultivated in AES III.

### 5.3.3 Relationship between profile characteristics and perception of farmers towards HYVs of rice released by AAU

On the analysis of the correlation between selected profile characteristics of the respondents and perception of farmers on HYVs of rice released by AAU, it was found that annual income, infrastructural facilities, and family labour are positively correlated and significant at 5.00 per cent level. The degree of land scatteredness of the respondent is negatively correlated and significant at 5.00 per cent level to the perception of farmers. Degree of commercialization, economic motivation, extension contact and mass media exposure were positively correlated to the perception level of farmers and are significant at 1.00 per cent level of significance. Chi-square analysis revealed a significant relationship between caste and occupation of the respondent and perception of farmers towards HYVs of rice.

The profile characteristics of farmers such as age, gender, formal educational experience, size of the operational land holding, area under rice, farming experience, cropping intensity, degree of farm mechanization, and availability of the irrigation facility had a non-significant relationship with farmers' perception towards HYVs of rice released by AAU.

### 5.3.3 Problems faced by the farmers in cultivating HYVs of rice and their suggestive measures

The most serious constraints that rice farmers encountered in the cultivation of HYVs were fluctuating market prices and uncertainty in rainfall, which placed top among all problems. The farmers' second most serious problem was the high cost of inputs. The third and fourth major issues were a lack of irrigation and high labour wages. Infestation with pests and diseases ranked fifth among the issues. Low market price (*i.e.*, getting a lower price than the MSP), non-availability of inputs on time, and lack of input subsidy were listed sixth, seventh, and eighth, respectively. Inadequate government financial support and labour shortage were the ninth and tenth most serious issues, respectively.

The suggestive measures proposed by the farmers for solving the problems faced by them were, ensuring timely supply of seeds and other inputs, training on HYVs of rice, subsidized electricity for farm practices and irrigation purposes, timely weather forecast, provision of irrigation facility, supply of suitable HYV rice seeds, farmers' choice or preference should be given due consideration during variety development programmes, preservation and maintenance of local varieties having importance in the socio-cultural activities, custom hiring center for farm machinery, market price-related information, provision for knowing prospective buyers, and provide adequate advisory services.

## 5.4 Conclusion and implication of the findings

- The majority of the respondents had a medium level of perception towards HYVs of rice released by AAU and a similar trend was observed across the different AES.
- The quality attributes of HYVs of rice like higher yield, better climatic adaptability, and grain quality were the major factors influencing farmers' perception towards the HYVs of rice. Hence, in the varietal development programmes, scientists and breeders should try to incorporate these quality attributes.

- The quality dimension grain quality was perceived high among the four dimensions for all the varieties except Jalashree. For the variety Jalashree, the dimension climatic adaptability had the highest mean score compared to other dimensions.
- Among the HYVs of rice Bina Dhan -11 is the highly perceived variety, followed by Keteki Joha, then Ranjit sub-1. In plant characteristics, climatic adaptability, and grain quality, Bina Dhan-11 ranked first in terms of perception. In terms of technological aspects, the variety Keteki Joha perceived highly than other varieties. Appropriate strategies should be formulated by the extension system for popularizing these highly perceived varieties. Large-scale demonstrations, trainings and awareness programmes, result demonstrations, etc. can be conducted by concerned departments.
- The breeders and scientists should strategize breeding plans for the refinement of the quality of the lowly perceived varieties.
- The technological aspects of all the varieties were perceived as low by the farmers. Generally, the performance of HYVs is dependent on external inputs and it is input-intensive and labour intensive. So farmers have a low perception of the technological aspects of HYVs. But the high yield of these varieties is dependent on the external inputs. The possible implication to improve their perception is to utilize the nano- fertilizers and to reduce the labour requirement government should establish custom hiring centers so that farmers can mechanize their farming operation easily.
- The varieties like Bina Dhan-11 and Keteki Joha had a high perception regarding the quality dimensions among the farmers who had adopted it but its adoption among the farmers is very less. So possible implications are to popularize such varieties and enhance their adoption by appropriate extension strategies.
- The aromatic HYV, Keteki Joha was the most perceived variety by the farmers of the AES II, but the percentage of adopters was low for this variety. The farmers who had cultivated this variety might have had a high perception of its high yield and grain quality and aroma. The extension system can put sincere efforts to popularize this variety in similar flood free alluvial situations of other agro-climatic zones.

- In AES III, Bahadur Sub-1 was the highest perceived variety with a high percentage of adopters and the second most perceived variety was Ranjit Sub-1. Both these are submergence tolerant varieties. Even though AES III is a medium land region, they had a high perception for these submergence varieties and their adoption level is high. So the higher perception of these varieties might be because of their higher yield and grain quality. It implies that these submergence varieties can also be popularized in the flood free situation.

- The formal and informal (farmer to farmer) seed system should be strengthened to enhance the adoption of these highly perceived varieties and The Farmers Producer Company (FPC) and Farmer Producer Organization (FPO) can play an important role in this.

- Farmers of the study area continue to grow the traditional varieties as they have importance in their food traditions. The farmers of the region cultivated traditional varieties like Bora Chokuwa, Joha, Rongdoi, Kon Joha, Bora Dhan, etc. Preservation and maintenance of local varieties having importance in the socio-cultural activities' need to be considered. Assam Agricultural University, Regional Agricultural Research Station, and other research institutes are conserving the germplasms of these varieties, but appropriate measures are to be taken for conserving these varieties in the farmers' field itself. The government can plan some programmes and campaigns and promote the value-added food items made from these varieties and thus popularizing it which will, in turn, increase the farmers' income.

- The perception of farmers towards HYVs of rice released by AAU was found to have a positive relationship between annual income, degree of innovativeness, economic motivation, extension contact, mass media exposure, the status of infrastructural facilities, and availability of family labour. So to improve the perception of farmers towards HYVs of rice, proper measures to be taken to improve the extension contact and mass media exposure of the farmers, provide better infrastructural facilities like irrigation systems, transpotation and storage facilities. Because economic motivation and degree of commercialization are related to farmers' perception of HYVs of rice released by AAU, extension approaches can be used to raise awareness among farmers about economic benefits and the potential for commercialization of HYVs of rice.

- The degree of land scatteredness was found to have an inverse relationship between the perception of farmers towards HYVs of rice. If the land is scattered in more plots, their cost of cultivation increases due to higher labour requirements. So the possible solution is to do group farming and mechanize the farm operations with suitable machinery.
- One of the major problem faced by the farmers were fluctuating market price. The policies should be strengthened to ensure at least MSP for the produce. Farmers should have the access to information on market prices and prospective buyers in order to increase their bargaininig power.
- Some other problems faced by the farmers were uncertainty in rainfall and lack of irrigation systems. The Government of India had formulated the programmes like Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) aiming to increase the area under irrigation and water use efficiency. So the Department of Agriculture of the state should formulate plans to effectively implement these programmes and extend them to all regions of the farming community.
- The suggestive measure proposed by the farmers were ensuring timely supply of seeds and other inputs, supply of suitable HYV rice seeds, and training on HYVs of rice. The seeds and other inputs like fertilizers and plant protection chemicals can be made available through some public distribution system for inputs either at Panchayat or village level ensuring timely supply. More inclusive training programmes regarding HYVs should be conducted as the farmers lack knowledge of the scientific cultivation practices of HYVs of rice. The FPC, and FPO can have an effective role in providing suitable HYV seeds to the farmers.
- Another important suggestion proposed by the farmers was the provision of custom hiring centers for farm machinery. The majority of the farmers had a medium degree of farm mechanization and the Government should establish custom hiring centers so that farmers can afford to hire machinery and reduce the cost of cultivation.

**5.5 Suggestions for further research**

- The present study was limited to one district of the state from the Upper Brahmaputra Valley Zone. So further studies can be conducted in other districts of UBVZ and other agro-climatic zones of the state.

- The present investigation studied only four quality dimensions of the HYVs of rice released by AAU. So studies with more dimensions can be done.
- AES-wise in-depth study is required.
- A more intensive study considering a few selected varieties in detail can be conducted.
- As perception plays an important role in the adoption decision of farmers, varietal development programmes with a farmer participatory approach can be conducted.

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# APPENDIX I

**RESEARCH SCHEDULE**

**DEPARTMENT OF EXTENTION EDUCATION: FA: ASSAM AGRICULTURAL UNIVERSITY: JORHAT -13**

**TITLE OF RESEARCH**: Perception of Farmers on High Yielding Varieties of Rice released by Assam Agricultural University- A study in Golaghat district of Assam

**Investigator**: Varna Murali
M.Sc. (Agri.) II year
Dept. of Ext. Education

**Major Advisor**: Dr. Sundar Barman
Asst. Professor (S-2),

## PART I: General Information

Name of the Respondent : ……

Date of Interview : ……

Contact No. : ……

Name of Village : ……...

Panchayat : ……..

Block : ……

AES : ……

District : Golaghat

## PART II: Profile of the Respondents

1. **Age**: _____years
2. **Gender**: Male ☐ Female ☐ Transgender/Others ☐
3. **Education Level** : _____
4. **Caste:** Please give tick (✓) mark wherever necessary

   a) SC ☐
   b) ST ☐
   c) OBC ☐
   d) General ☐

5. **Family Size (Number)**:……

6. **Annual income:**

   Total income: ₹ ……..

7. **Occupation:**

| **Sl. No.** | **Occupation** | **Percentage share in Annual income** |
|---|---|---|
| 1 | Agriculture | |
| 2 | Agricultural labour | |
| 3 | Service | |
| 4 | Business | |

8. **Size of operational land holding:**

   a) Land owned (bigha):…….
   b) Land leased in (bigha):…….
   c) Land leased out (bigha):…….

   Total= (land owned + land leased in) - land leased out

Area under rice: ……bigha

9. **Degree of land scatteredness** :

Please state the number of plots into which your operational land is divided: --------

10. **Rice Varieties Grown**

| **Sl. No.** | **Season** | **Varieties Grown** | **Area** |
|---|---|---|---|
| **1** | **Ahu** | | |
| | | | |
| | | | |
| **2** | **Sali** | | |
| | | | |
| | | | |
| **3** | **Boro** | | |
| | | | |
| | | | |

11. **Farming Experience:**

No. of years (completed years) engaged in farming-

12. **Cropping Intensity:**

    a. Gross cropped area:
    b. Net sown area:

13. **Degree of Innovativeness:** Please indicate your most likeliness and least likeliness about each of the following statements- there are 3 sets of statement, from each set select 2 statements, one most like and another least like.

| Sl. No. | Statements | Most like (3) | Least like (1) |
|---|---|---|---|
| A | i) I try to keep myself up to date with information on new farming practices but that does not mean that I try out all new methods on farm (2) | | |
| | ii) They talk of many new farming practices these days but who knows whether they are better than old ones. (1) | | |
| | iii) I feel restless till I try out new farming practices that I have been heard (3) | | |
| B | i) From time to time I have heard of several new farming practices and I have tried out most of them in the last year (3) | | |
| | ii) I usually wait to see what results my neighbours obtain before I try out the new farm practices (2) | | |
| | iii) Somehow I believe that the traditional ways of farming are the best. (1) | | |
| C | i) I am cautious about trying a new farming practice (2) | | |
| | ii) After all, our forefathers were wise in their farming practices and I do not see any reason for changing these old methods (1) | | |
| | iii) Often new farm practices are not successful, however, if they are promising I would surely like to adopt. (3) | | |

14. **Degree of Commercialization:**
    a. Total Farm produce (in qt.):
    b. Total value of farm produce: ₹
    c. Total marketed produce (in qt.):
    d. Total value of marketed produce: ₹

15. **Economic Motivation:** What is your opinion about the following statements? Please states whether you strongly agree, agree, undecided, disagree and strongly disagree to each of the following statements.

| Sl. No. | Statements | SA | A | UD | DA | SD |
|---|---|---|---|---|---|---|
| 1 | A rice farmer should look towards larger yield and economic profit | | | | | |
| 2 | The most successful paddy cultivator is one who makes the most profit | | | | | |
| 3 | A rice farmer should try any new farming idea which helps him to earn money | | | | | |
| 4 | A rice farmer should grow HYVs to increase monetary profit instead of local varieties of rice. | | | | | |
| 5 | It is difficult for a farmer's children to make a good start unless he provides them with economic assistance. | | | | | |
| 6 | A farmer must earn his living but the most important things in life cannot be defined in economic terms. | | | | | |

**16. Extension Contact:** Please put a tick (✓) mark wherever necessary.

| Sl. No. | Categories of Extension Agents | Frequency of Contact | | | |
|---|---|---|---|---|---|
| | | **Once in a Week (4)** | **Once in one/ two months (3)** | **Need Based (2)** | **Never (1)** |
| 1 | A.E.A. | | | | |
| 2 | A. D. O. | | | | |
| 3 | KVK personnel | | | | |
| 4 | ATMA personnel | | | | |
| 5 | Extension functionaries from RARS, Scientists from RARS, AAU and APART | | | | |
| 6 | Farmers, Organization | | | | |
| 7 | Others (Specify) | | | | |

**17. Mass media exposure:** Please put a tick (✓) mark wherever necessary.

| Sl. No. | Sources | Always (3) | Often (2) | Never (1) |
|---|---|---|---|---|
| 1. | News paper | | | |
| 2. | Farm literature (magazine, leaflet, pamphlet etc.) | | | |
| 3. | Agricultural books | | | |
| 4. | Radio | | | |
| 5. | Television | | | |
| 6. | Internet | | | |
| 7. | Exhibitions | | | |

**18. Irrigation facility**

I. Do you have irrigation facility: Yes ☐ No ☐

II. If yes, Please give tick (✓) mark wherever necessary

a. Tank
b. Canal
c. Open well
d. Tube well
e. River
f. Others (specify):
g. Not Available

**19. Farm mechanization**

| Sl. No. | Farm Operations | Whether Machineries and implements used | | Name of the machinery or implements used |
|---|---|---|---|---|
| | | No (0) | Yes (1) | |
| 1 | Nursery bed Preparation | | | |
| 2 | Ploughing | | | |
| | Puddling | | | |
| 3 | Sowing | | | |
| 4 | Transplanting | | | |
| 5 | Irrigation | | | |
| 6 | Weeding | | | |
| 7 | Pesticide application | | | |
| 8 | Harvesting | | | |
| 9 | Threshing | | | |
| 10 | Winnowing | | | |
| 11 | Drying | | | |
| 12 | Milling | | | |

**20. Labour availability :**

| | Family Labour | Hired labour | Total |
|---|---|---|---|
| **No. of Labourers** | | | |

**21. Infrastructural facilities**

| Sl. No. | Infrastructure facility | Yes | No |
|---|---|---|---|
| **1** | Electricity | | |
| **2** | Room for keeping implements and machinery | | |
| **3** | Storage room for seeds, fertilizers and other inputs | | |
| **4** | Storage room for keeping rice and straw | | |
| **5** | Milling facility | | |
| **6** | Irrigation system | | |
| **7** | Transportation facility | | |
| **8** | Telecommunication facilities | | |

## PART III- Perception

### Perception of farmers towards High Yielding Varieties of Rice

Following are the few statements with 5 response categories against each statement. Please choose appropriate response category according to your agreement or disagreement with the statement and give a tick (✓) mark.

*SA- Strongly Agree, A- Agree, UD- Undecided, DA- Disagree, SD- Strongly Disagree*

| Sl. No. | Statements | SA | A | UD | DA | SD |
|---|---|---|---|---|---|---|
| | **Plant Characteristics** | | | | | |
| 1. | HYVs of rice have greater productivity | | | | | |
| 2. | HYV of rice have suitable plant height | | | | | |
| 3. | HYV of rice have high tillering capacity | | | | | |
| 4. | No. of panicles per plant is high for HYVs of rice | | | | | |
| 5. | HYVs of rice are resistant to most of the pest and diseases | | | | | |
| 6. | HYVs of rice have less shattering | | | | | |
| 7. | Threshing loss is minimum for HYVs | | | | | |
| 8. | There are varieties with submergence resistance | | | | | |
| 9. | HYVs have lodging resistance | | | | | |
| | **Climatic Adaptability** | | | | | |
| 10. | Cultivation of High yielding varieties are suitable for most of the rice based farming system | | | | | |
| 11. | High yielding Varieties are better than other varieties in withstanding floods | | | | | |
| 12. | High yielding Varieties are better than other varieties in withstanding droughts | | | | | |
| 13. | Cultivating HYVs of rice will help to combat with the changing climatic conditions and have higher environmental adaptability | | | | | |
| 14. | HYVs can perform optimally in a favourable season while it will give at least subsistence yield in an unfavourable season. | | | | | |
| | **Technological Aspects** | | | | | |
| 15. | Labour requirement is more for cultivating high yielding varieties. | | | | | |
| 16. | To get better, consistent yield and productivity from HYV, we need to follow the recommended cultivation practices | | | | | |
| | **Grain Quality** | | | | | |
| 17. | High yielding varieties have good cooking quality and good taste | | | | | |
| 18. | Grain quality of HYV of rice is suitable for production of value added products | | | | | |

## PART IV

**1. Problems faced by farmers in cultivating High yielding Varieties of rice**

| Sl. No. | Problem faced | Very Severe (3) | Less Severe (2) | Least Severe (1) |
|---|---|---|---|---|
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**2. Suggestions of respondents for overcoming the problems.**

**Please give your suggestions to overcome the above mentioned problems in cultivating HYVs of rice.**

1.

2.

3.

4.

5.

# APPENDIX II

## AES-wise ranking of the perception statements

| Statements | AES I | | AES II | | AES III | |
|---|---|---|---|---|---|---|
| | Mean | Rank | Mean | Rank | Mean | Rank |
| HYVs of rice have greater productivity | 4.60 | I | 4.60 | I | 4.83 | I |
| HYV of rice have suitable plant height | 3.98 | VII | 3.78 | V | 4.23 | VIII |
| HYV of rice have high tillering capacity | 3.65 | VIII | 3.75 | VI | 4.28 | VI |
| No. of panicles per plant is high for HYVs of rice | 4.18 | III | 3.83 | IV | 4.53 | IV |
| HYVs of rice are resistant to most of the pest and diseases | 3.40 | XV | 3.25 | XVI | 3.78 | XIV |
| HYVs of rice have less shattering | 3.55 | XIII | 3.50 | XI | 4.00 | X |
| Threshing loss is minimum for HYVs | 3.40 | XVI | 3.58 | IX | 3.93 | XI |
| There are varieties with submergence resistance | 4.03 | VI | 3.58 | X | 4.30 | V |
| HYVs have lodging resistance | 3.63 | X | 3.35 | XV | 3.85 | XII |
| Cultivation of High yielding varieties are suitable for most of the rice based farming system | 3.58 | XII | 3.45 | XIII | 3.75 | XV |
| High yielding Varieties are better than other varieties in withstanding floods | 4.20 | II | 3.73 | VII | 4.13 | IX |
| High yielding Varieties are better than other varieties in withstanding droughts | 3.65 | IX | 3.50 | XII | 3.85 | XIII |
| Cultivating HYVs of rice will help to combat with the changing climatic conditions and have higher environmental adaptability | 3.20 | XVII | 3.13 | XVII | 3.58 | XVII |
| HYVs can perform optimally in a favourable season while it will give at least subsistence yield in an unfavourable season. | 4.15 | IV | 4.13 | II | 4.68 | II |
| Labour requirement is more for cultivating high yielding varieties. | 3.13 | XVIII | 3.10 | XVIII | 3.50 | XVIII |
| To get better, consistent yield and productivity from HYV, we need to follow the recommended cultivation practices | 3.53 | XIV | 3.45 | XIV | 3.75 | XVI |
| High yielding varieties have good cooking quality, good taste | 4.08 | V | 4.03 | III | 4.55 | III |
| Grain quality of HYV of rice is suitable for production of value added products | 3.63 | XI | 3.68 | VIII | 4.25 | VII |