



Research
Program on
Roots, Tubers
and Bananas



Report

Support baseline studies (household survey) for potato-based systems and agro-ecologies

Project: Improving Farmer's Livelihood through Intensification and Diversification of Agri-Food Systems with Climate Smart Potato Technology



CIP-APART Potato Value Chain Program
WORLD BANK-FINANCED ASSAM AGRIBUSINESS & RURAL
TRANSFORMATION PROJECT (APART)

Submitted to:
Directorate of Horticulture and Food Processing
Government of Assam, Guwahati Assam

Submitted by :
International Potato Center (CIP)

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International Potato Centre

Directorate of Horticulture and Food Processing

REPORT FOR THE APART POTATO VALUE CHAIN

BASELINE SURVEY 2018-19

I. Summary:

CIP-APART Potato Value Chain Program aims to provide technical backstopping, innovations, and capacity building along the entire potato value chain to increase its productivity, competitiveness, and improve the livelihoods of small and marginal farmers, thereby contributing to sustainable intensification and diversification of rice fallow systems, including strengthening market linkages and supporting post-harvest value chain development.

International Potato Centre (CIP) is consulting government of Assam in implementing the potato value chain component in 14 districts of Assam. CIP has been engaged in the component C of the overall project implementation framework. The overall objective of CIP's engagement is to provide technical backstopping, innovations, and capacity building along the entire potato value chain to increase its productivity, competitiveness, and improve the livelihoods of small and marginal farmers, thereby contributing to sustainable intensification and diversification of rice fallow systems, including strengthening market linkages and supporting post-harvest value chain development. To this end CIP proposed to implement the project component entitled “

Improving farmers' livelihoods through sustainable intensification and diversification of agri-food systems with climate-smart potato technologies”.

This report basically presents the findings of baseline survey carried out to understand the potato system in Assam. This study was carried out at the beginning of the project so that the proposed activities are given a direction towards its fulfilment. The survey was carried out in 14 potato growing districts of Assam in a period of six months depending on various constraints faced by the enumerators. The Research Associate (RA) of Krishi Vigyan Kendra (KVKs) of 14 districts were engaged in the survey work. A central workshop was organized to orient the enumerators in

Guwahati. The enumerators were trained in a three day training workshop in the month of October 2018.

An innovative way of carrying out the survey was applied with the help of an android based application. The survey questionnaire was converted to an app to take record of the survey information. A tablet was provided to each one of the enumerators to carry out the activity. It was ensured that the app is enabled with internet facility to have real time data from field. All the GPS coordinates were recorded for the household surveyed.

Total 700 households were targeted to cover in the survey in 14 districts. The target households were selected randomly for the survey to execute. Out of 700 targeted households, only 654 households could be covered in the survey. Two of the districts Cachar and Nagaon could not complete the targeted households due to shuffle in staffing in KVKs. Later on, two the ATMA officials carried out the activity but could not complete. They submitted partial household data.

There were delay in payment to the agency who developed the application for the survey. As a result, data access was limited to CIP. As it was done through an App so the data was stored in server with a backend access. Later on, CIP paid the sum from its own source and got the backend data access and accordingly data was analyzed.

The analyzed data are grouped in different sections to understand the potato system in Assam that comprises of basic profile of the respondents, potato seed scenario, agronomic practices, farm mechanization and post-harvest management, marketing and finally training, capacity building and gender role in potato value chain.

Overall data shows a poor performance of potato value chain in Assam. It was found awareness about potato seed among farmers in Assam is very low, the agronomic practices are with many flaws, post-harvest losses are quite huge, involvement of women in the value chain is quite poor. Moreover, potato market is quite unorganized in the state. Access to cold storage is almost nil for the farmers. Training and capacity building among farmers about potato is lacking. However, activity of extension machinery is encouraging from the survey. The details of these findings are discussed in the report.

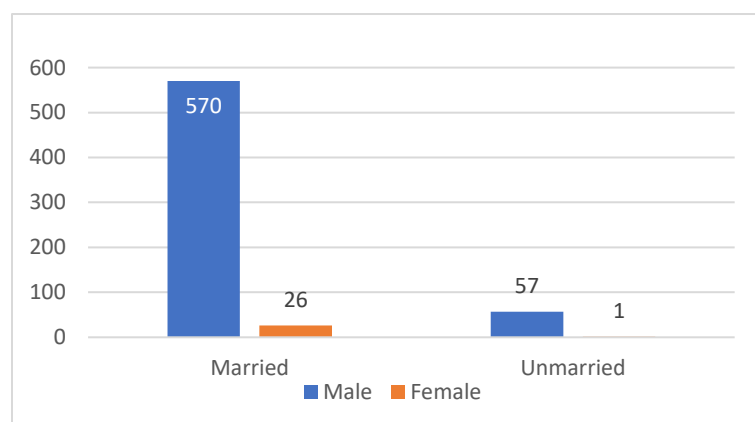
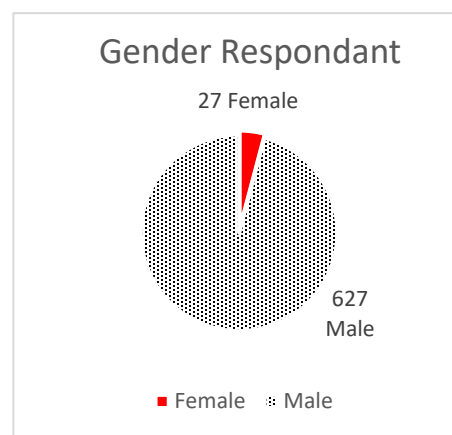
II. Detailed Analysis

1. Basic profile

A total of 654 households were interviewed in the 14 districts of the Assam state. The district with the highest number of respondents were Darrang and Karbi Anglong with 55 respondents from each district.

81 out of 654 respondents responded in Assamese language as shown in the data. However, the enumerators had to translate the questionnaire in Assamese in other 573 cases. None of the respondent was thorough in English language.

15 out of 654 respondents have not cultivated potato in the cropping season 2018-19 due to the financial crises, pest disease, storage and animal damage problems however they had cultivated potato in the cropping season 2017-18. Only 4.1% female respondents were found during the survey in the entire sample. In most cases the female respondents were the household heads being the elderly in the family after her husband. In some cases, the female in a household responded as the male counterpart was away from home during the survey.

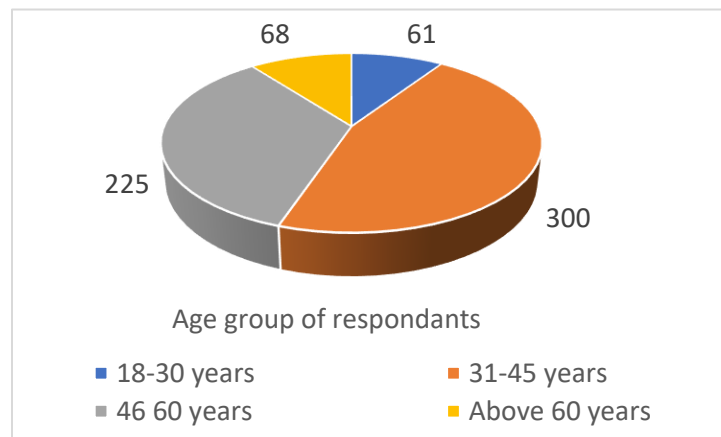


The respondents were predominantly found to be married male in all the districts. Exceptionally, an unmarried female was also found to be the respondent to the survey questionnaire. There were about 8% unmarried males found as the respondent during the survey. The

male dominated agriculture in Assam is the result of a patriarchal society. However, contribution of female cannot be underestimated as most of the agriculture labourers are female who are engaged in a number of activities ranging from transplanting, weeding, harvesting, sorting and grading of agricultural produces. The survey data also gives a hint of this fact. Although not much, there are women who are spearheading the activities in many households in Assam.

Jorhat and Kamrup district show the highest experience of the respondents in agriculture, respectively. It also shows that the respondents in both the districts were comparatively of older age than what is seen in Nagon, Nalbari and Morigaon. In these three districts, the overall experience of a respondent is 10 years. Which is a good sign that younger generation is engaged in agriculture as well as potato cultivation.

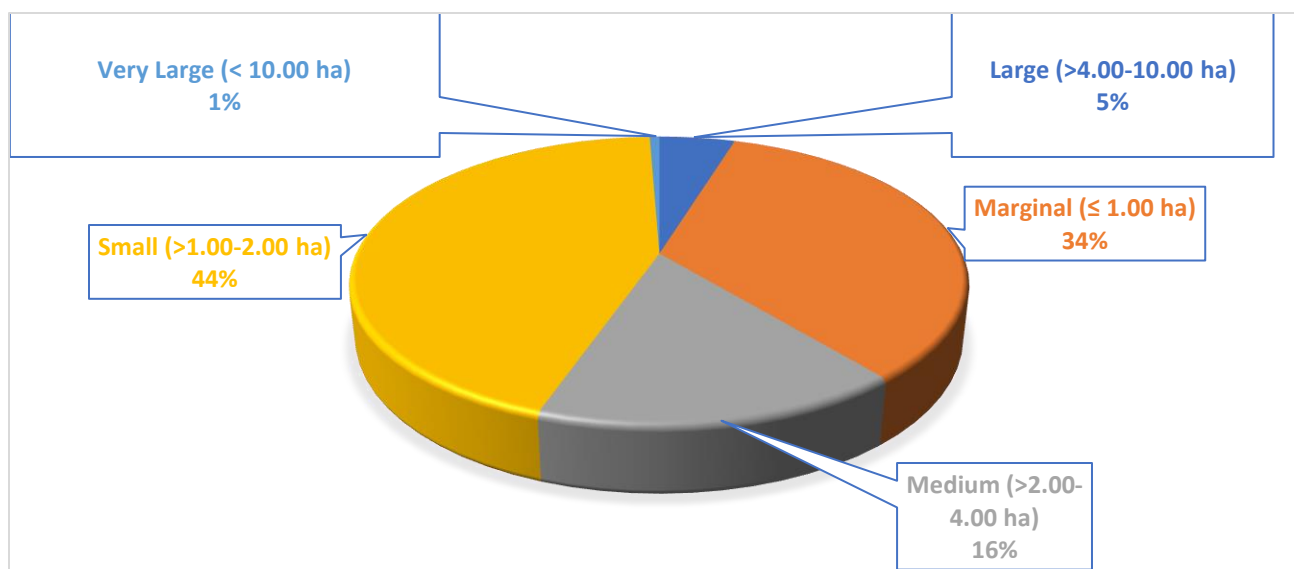
It is quite evident and has a correlation with the experience of respondent in potato cultivation. As shown in the table above, maximum respondents were of the age between 31-45. Hence, it is an incentive for the agricultural sector in Assam. The young generation is engaged in the activities. Therefore, availability of scientific and innovative technology in agriculture can boost up the sector with right exploitation of young energy.



The survey has covered all the potato clusters in respective district as shown in the table. This gives a comprehensive idea about potato cultivation in the state.

2. District-wise land holding size of respondent's family

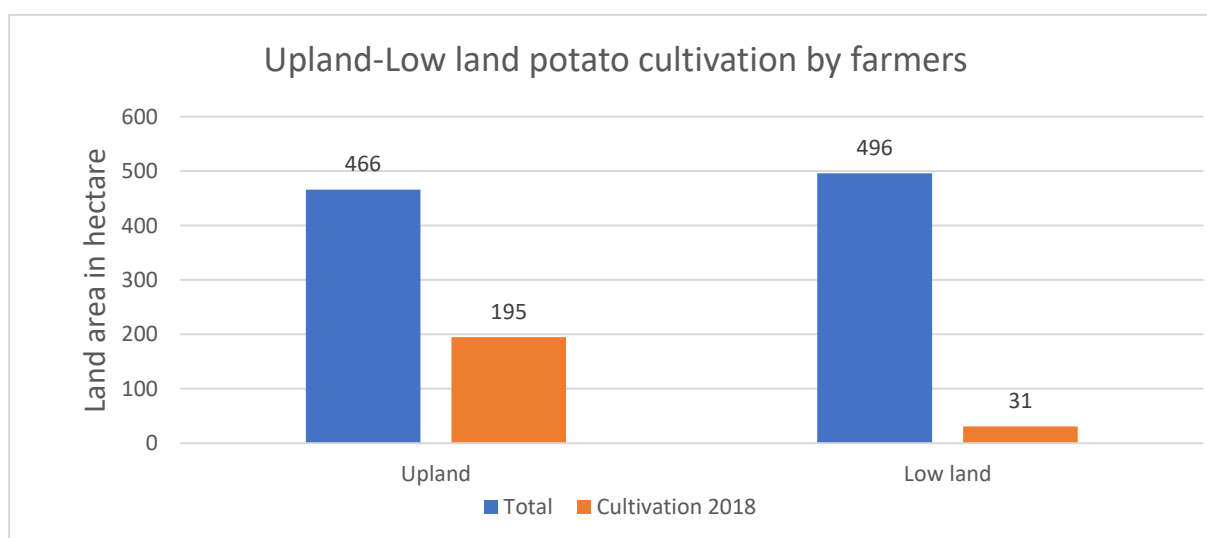
Out of all respondent, majority of them are small and marginal farmers with land holding size below 1-2 hectare. In majority of the cases, potato is not the principal crop for these farmers. It largely the second crop after paddy. Moreover, land size mentioned in the response is not meant for potato cultivation. Potato cultivation is done just on a portion of land. Most of these small and marginal farmers cultivate potatoes in areas like 1-2 bighas (1 bigha=1333 sq. m). Medium and



large farmers were very few in all the districts. Only 4.5% large farmers are reported in the survey and about 16% farmers are medium farmers engaged in potato cultivation.

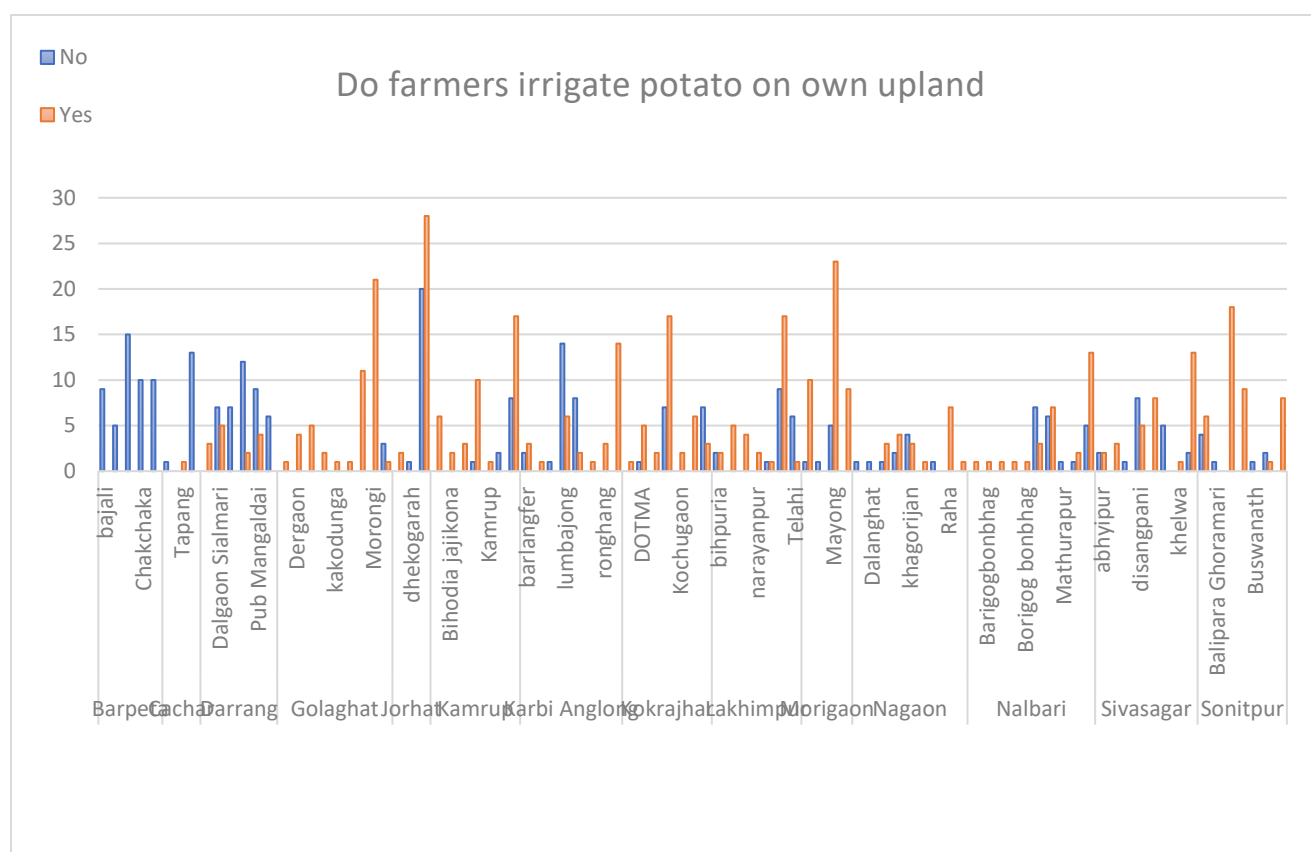
3. Irrigation practice

The study shows that the farmers prefer to cultivate potato on upland than the low land areas. Low land areas are mostly the paddy fields and in upland areas it is mostly the front yard or the back yard of households. In 2017-18 about 41% of total upland areas were under potato cultivation whereas only 6% of total low land area was under potato cultivation. This scenario calls for a need to intensify and diversify paddy field at a higher rate to encourage farmers to



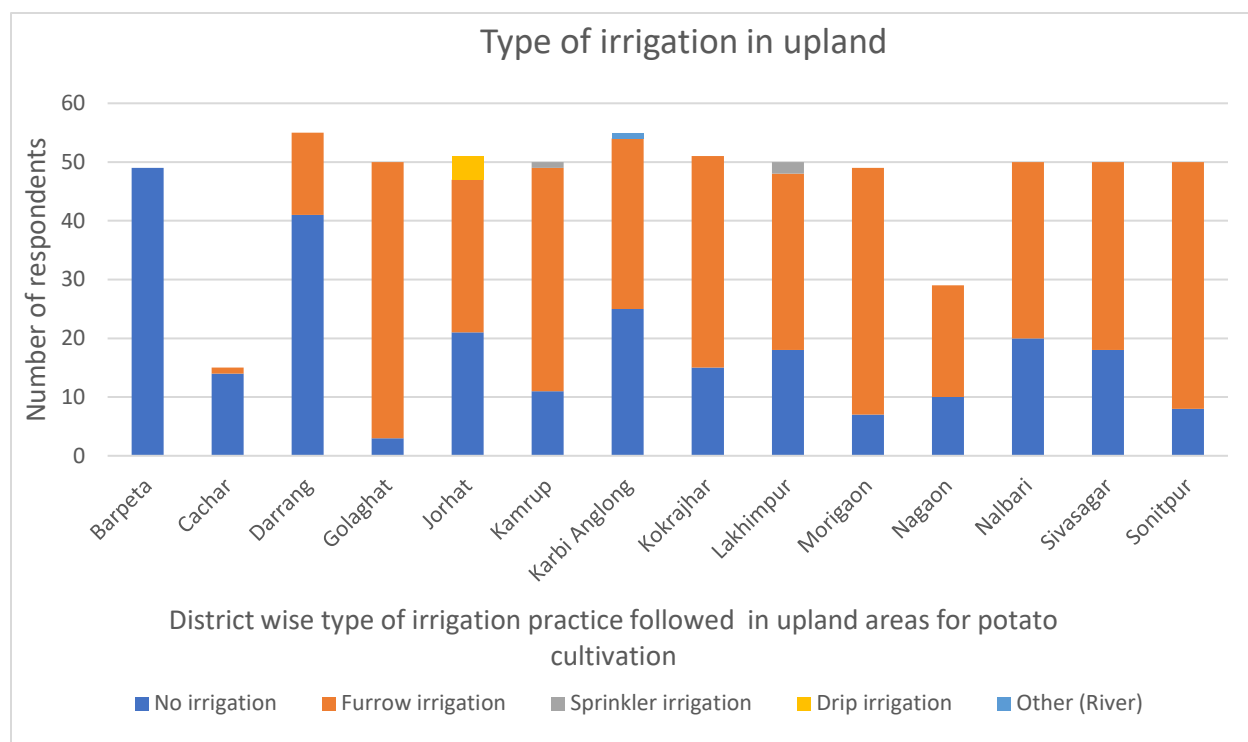
follow a cropping system approach. This is another reason why farmers grow potato on very small plots and their preference is the upland and it is not abundant.

It is seen that the major portion of respondents use irrigation in their upland potato fields. However, the number is not significant because 40% farmers still do not irrigate their potato fields. It clearly shows ill management of potato crop in the state. The water requirement of potato crop is not well understood by the farmers in the state. But the study indicates a positive practice by respondent farmers.



About 36% respondents shows using ground water for irrigating the crop. It shows a great pressure on ground water during the dry season, as potato is grown in winter and water table is already shrinks during this time.

Study shows that the respondent use furrow irrigation (flood irrigation) method where water loss is maximum. There are only 1% respondent who uses conservation irrigation methods like drip or sprinkler.



It is evident from the table that only about 4.5% own low land area was under potato cultivation during the cropping season 2017-18. This indicates that the paddy fields are hardly under potato crop in most of the cases. As a result, the potato crop area is quite low in the state compared to paddy area.

In this case also the irrigation method is the furrow irrigation using ground water. Hence, it is common to use ground water for irrigation in potato crop in the state.

Again, the available land and area under potato crop is quite different. It is only about 25% of total available land. It clearly indicates difficulties of potato crop management and other associated constraints that refrains the farmers from growing potato.

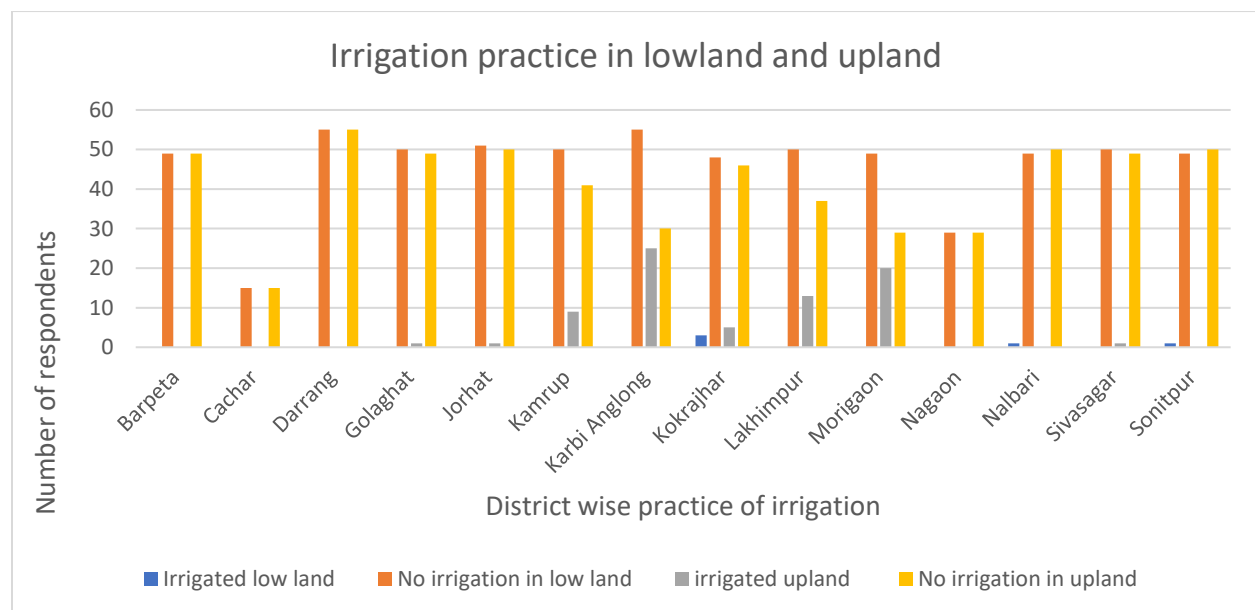
There was no response from farmers of Barpeta, Cachar, Nalbari, when asked about irrigation of potato crop. Which shows an ill practice of potato cultivation among farmers in these districts. However, 11% respondent said yes to irrigation of potato in the districts like Morigaon, Karbi-Anglong, Lakhimpur etc. But the responses significantly show poor irrigation practice in potato among farmers in the entire state. This is one of the reasons that farmers in Assam get low potato yield. Whatever, small number of farmers irrigate potato, they use ground water as the water source. There are few instances where it has been found that the farmers are pumping water from

a river flowing nearby. Karbi-Anglong is one district where farmers are seen using river water for irrigation.

Furrow irrigation was significantly high among farmers when asked about type of irrigation they use. About 99% respondent who said yes to irrigation has been found using furrow irrigation.

4. Type of land used for potato cultivation

Potato cultivation in total available low land was found quite low in all the district. It shows that most of the farmers are using their land only for paddy. The area left barren once the paddy is harvested in most of the cases as reported in the survey. There are only 3% land area utilized for potato cultivation out of total available low land. This is reason why large tracts of land area is seen unutilized after paddy in Assam. One of the reasons may be the late sowing of paddy and late harvest which eventually delays the potato sowing. As a result, farmers refrain from going for potato cultivation anticipating loss. However, there is a slight trend of increased potato area for the upcoming season out of the total available area.

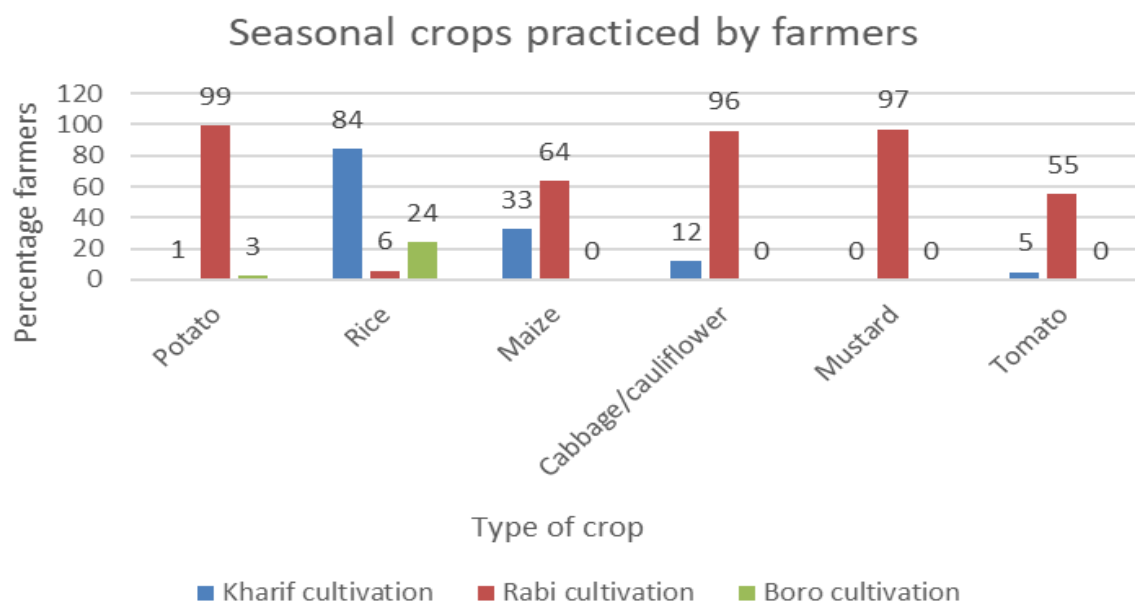


Irrigation in low land area was found almost nil. Majority of the farmers said that they don't irrigate potato crop in low land area. They see that moisture in soil is quite good in low lying areas. Therefore, they feel there is hardly any need of irrigation in such land areas.

5. Seasonal crops apart from potato

Kharif and Boro season potato in Assam is not grown because of unsuitable climate for the crop. Although, some farmers in Kamrup and Lakhimpur have responded yes to kharif potato but it can be regarded as early rabi rather than considering it as Kharif potato. There are few farmers in these areas who grow potato during the second week of October in the upland areas and harvest by December end. There are some farmers in Darrang and Kamrup who responded to have grown Boro season potato. But that is actually late sowing of potato that is harvested in April which they say Boro season potato. There are some areas where potato is grown as second crop in rabi itself, but the harvesting reaches mid period of boro season. Otherwise, the entire state cultivate potato in rabi between November to February.

90% respondents were found to be involved in paddy cultivation. 84% of the respondents are engaged in Kharif paddy whereas 24% respondents are also engaged in Boro season paddy. 6% respondent informed that they are engaged in rabi season paddy which is also known as Ahu season in Assam (Feb-March to June- July). Traditionally, people in Assam have been practicing DSR during the Ahu season of paddy. People now shifted to boro rice due to available irrigation systems like STW. Primarily, the state grows low land kharif paddy as the staple food.



Cultivation of wheat is found to be very rare in Assam except for a few pockets in Kokrajhar, Golaghat, Darrang etc. Only 3% out of total respondent reported about their involvement in cultivation of wheat at a very low scale. Whatever, wheat is cultivated it is found to be grown during rabi season.

Maize is another important crop that is grown in Assam. 20% respondent reported their engagement in Maize cultivation, out of which 64% farmers grow maize in rabi season and 33% reported that they grow maize during kharif season.

75% of the respondents said that they are engaged in cultivation of cabbage and cauliflower in their available land. However, cultivation of cabbage and cauliflower is not significantly seen in the same plot of land where potato is grown. About 96% of respondent who grow cabbage and cauliflower grow the crop only in rabi season. Whereas, about 12% respondent reported to have cultivated cabbage and cauliflower in kharif season. It is mostly seen in Sonitpur district.

Farmers cultivate cucumber in almost all districts of Assam. However, rabi season cultivation of cucumber is higher than the kharif season cultivation. 65% respondent have reported their cucumber cultivation during rabi season and 48% respondent reported it in kharif.

Chilies are another crop grown by farmers in Assam. Mostly, farmers grow chili during rabi season. There are few farmers who grow chili in kharif as well. About 21% respondents reported that they grow chili in kharif season in land areas other than paddy fields.

About 58% respondents informed about their involvement in tomato cultivation, of which about 55% farmers cultivate tomato during rabi season only. There are few farmers in Sonitpur, Barpeta, Darrang, Nagaon etc. where they reported to grow tomato in kharif season.

Pea is another important crop grown in Assam. About 57% farmers are found to be involved in pea cultivation during the survey. 96% of these farmers grow pea in rabi season, soon after the paddy harvest. Many also practice relay cropping of pea. The leftover rice straw become stack for the pea to creep on.

97% of total respondent farmers who grow mustard has reported that they grow it during rabi season. Almost in all district mustard cultivation was reported.

Only 2% farmers reported cultivation of fodder for livestock. Otherwise, farmers leave the livestock and cattle free after paddy harvest to graze in paddy fields in places where there are large tracts of unutilized land area after paddy harvest. About 1% farmers reported to have engaged in cultivation of fodder during the survey.

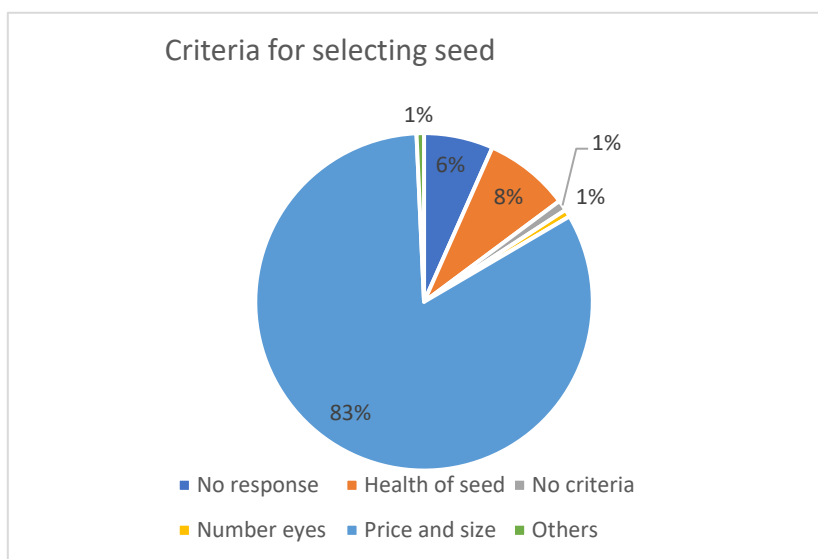
Among other crops, people have reported beans, carrot, banana, brinjal, ginger, groundnut etc. to have grown in various districts. Some the farmers grow these as second crop on the same plot. But majority grow it on different plots.

Maximum of the respondents grew paddy before sowing potato in their fields. Some farmers also grew other vegetables prior to potato. Cabbage, chili, cucurbit, black gram, green gram etc. are some of the crops grown by respondents other than paddy in the fields where they grew potato. When asked about post potato cultivation of crop, the respondents informed that the plot was used to grow different crops. About 16% respondents reported to have grown summer paddy after potato but it is not clear if they have used the same plot for paddy or not. 4% respondents informed that they used the land for maize cultivation after potato. About 25% of them have used the plot for growing cucurbit, cabbage, chili and other crops after potato.

About 41% respondent reported to have intercropped the potato with cucurbit, chili, radish, ginger etc. for more produce per unit area of land. Traditionally, farmers believe that intercropping of two or more crops compliments and support each other.

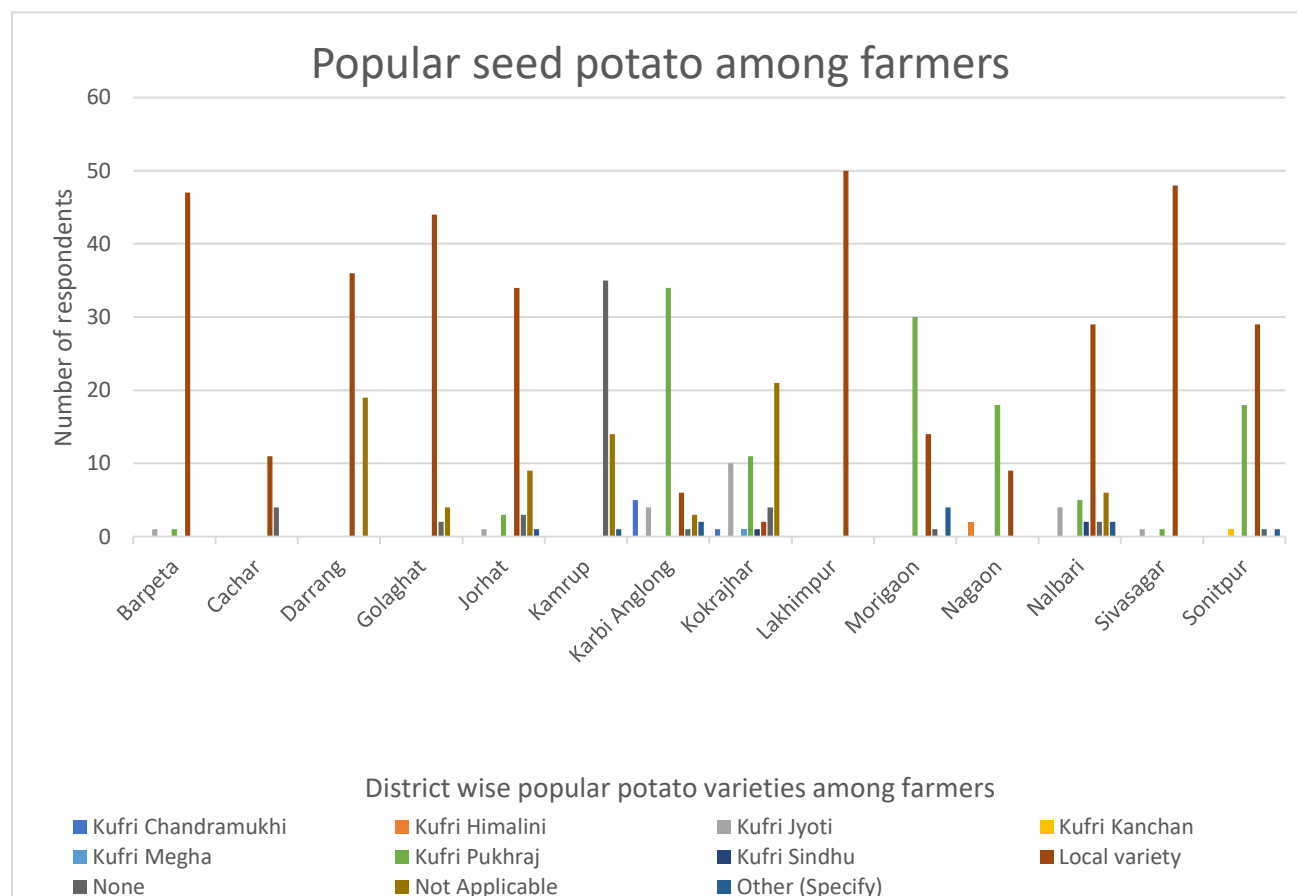
6. Seed scenario

About 70% farmers responded that they know the name of potato varieties when they buy seed. However, in depth investigation shows that the farmers know the seed by company or the place name like Technico seed, Bengal Jyoti, Jalandhar Alu, Bhatti Alu etc. and not by its original name. Hence, it naturally



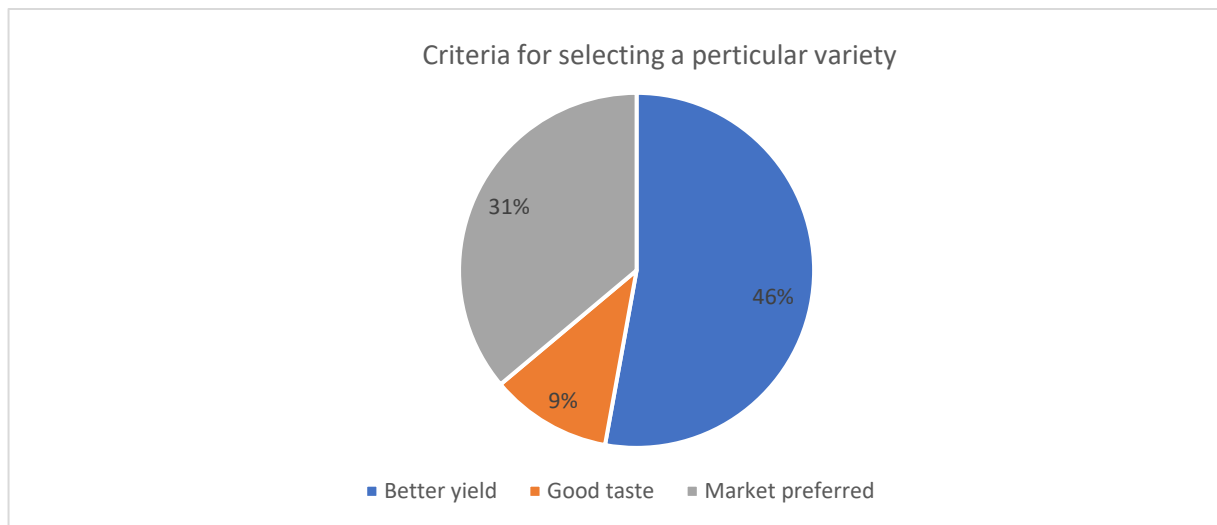
shows how much they know about the potato varieties! This is one of the reasons why potato productivity in Assam is low. Farmers hardly know the quality of the planting material they buy. About 81% farmer respondents have

informed that they buy the seeds based on price. Price for them is the primary factor and then comes the shape, size and health of the seed.



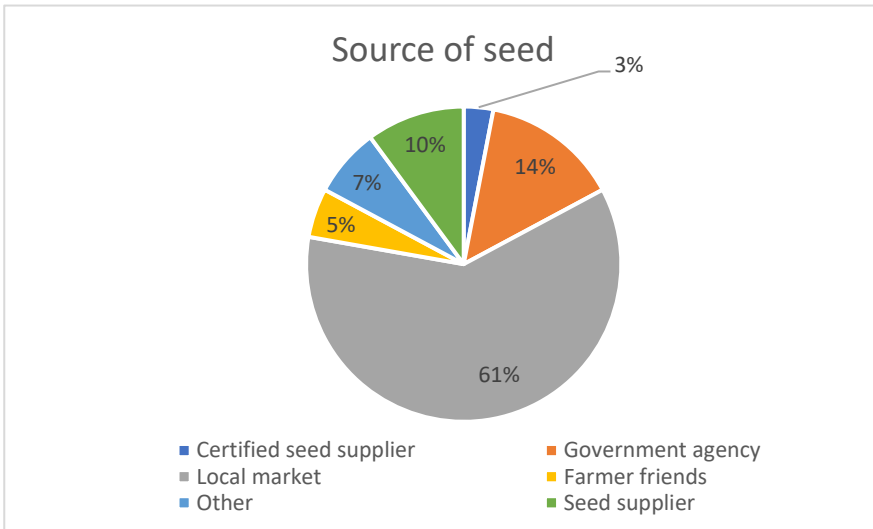
36% respondents informed that they are concerned about the diseased seed tubers while they buy the seed and try to ensure they buy healthy seed. Other characters like number of eyes, its colour etc. are not much noticed by farmers. The average price paid by the farmers during 2018-19 season was Rs 25 kg and it varied from Rs 17 to Rs 38 in various districts

About 46% of the respondents reported that they use local varieties to grow their potato crop. It proves the low potato seed replacement in Assam. Farmers basically keep portion of their produce as seed and grow it in next season. About 35% farmers reported to have grown Kufri Pukhraj- Jalandhar potato in their crop fields. They like it as it is an early bulker and short duration variety. It has a good demand in the state as fresh potato. About 8% farmers said they grow Kufri Jyoti. The farmers mostly buy seed from local traders.



46% farmers revealed that they grow what they grow is because of better yield. About 31% farmers said it has market demand therefore they grow it. Taste was least considered for preferring a potato variety. There were very few responses for maturity time of the potato as a preference for choosing a particular variety. Kufri Pukhraj is widely grown by farmers effortlessly without knowing its maturity or any other character.

About 60% farmers informed that they take seeds from local market when asked about seed sources. Some 14% respondent told that they got seed support from government under various schemes. While 3% reported that they got certified seeds from seed supplier. Overall, the dependency is on local market for seeds in Assam

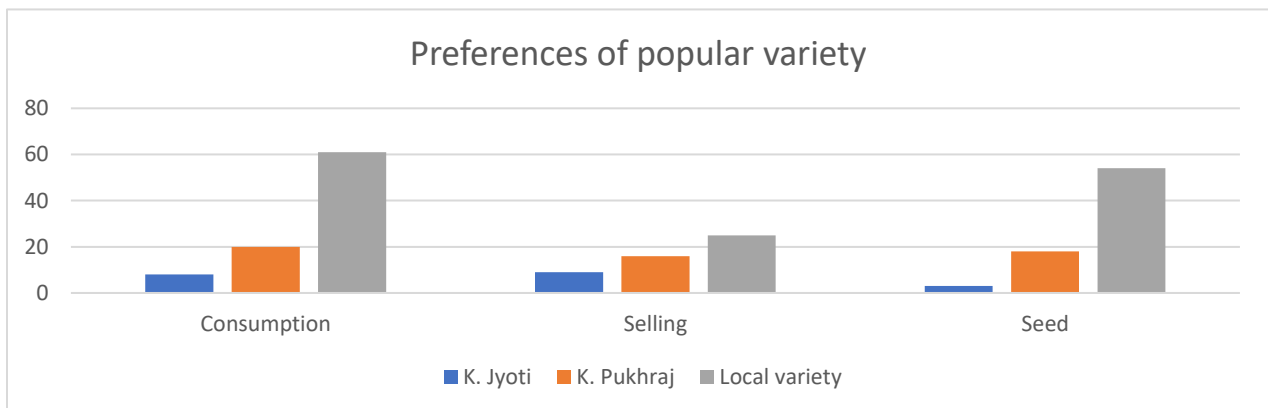


Potato seed price is quite unstable in Assam as the sector is quite unorganized. Farmers pay as much as INR 35-40 and as low as INR 10-15 for a kg of potato seed. However, higher price does not guarantee the good quality seed.

Most of the time farmers end up paying more price for non-seed potatoes. Mostly it is left over and sprouted ware potato at the planting season which is sold as seed to farmers.

The number one preferred variety K. Pukhraj is found to be grown in about 190 hectare land out of the sample surveyed with an average yield of 13 MT per hectare, which is little higher than the normal productivity of potato in Assam.

For any preferences of potato variety, farmers in Assam consider seed price as the primary factor compared other important factors. They mostly get their seed from local market. Some farmers get it through government support. Area and yield is more or less similar to that of number one preferred variety. Farmers only chose second preferred verity only when farmers are unable to get the seed of number one preferred variety.



While asked about highest preferred variety in terms of consumption, the farmers informed the local variety like Lalpahari, Rangpuria or Badami. About 61% farmers said that they prefer local variety the most for consumption followed by Pukhraj with 20% respondents. Farmers reported that they like local variety for selling. About 53% respondents said that local varieties have good demand in market and good to sell. About 25% farmers preferred K. Pukhraj for selling as fresh potato soon after harvesting.

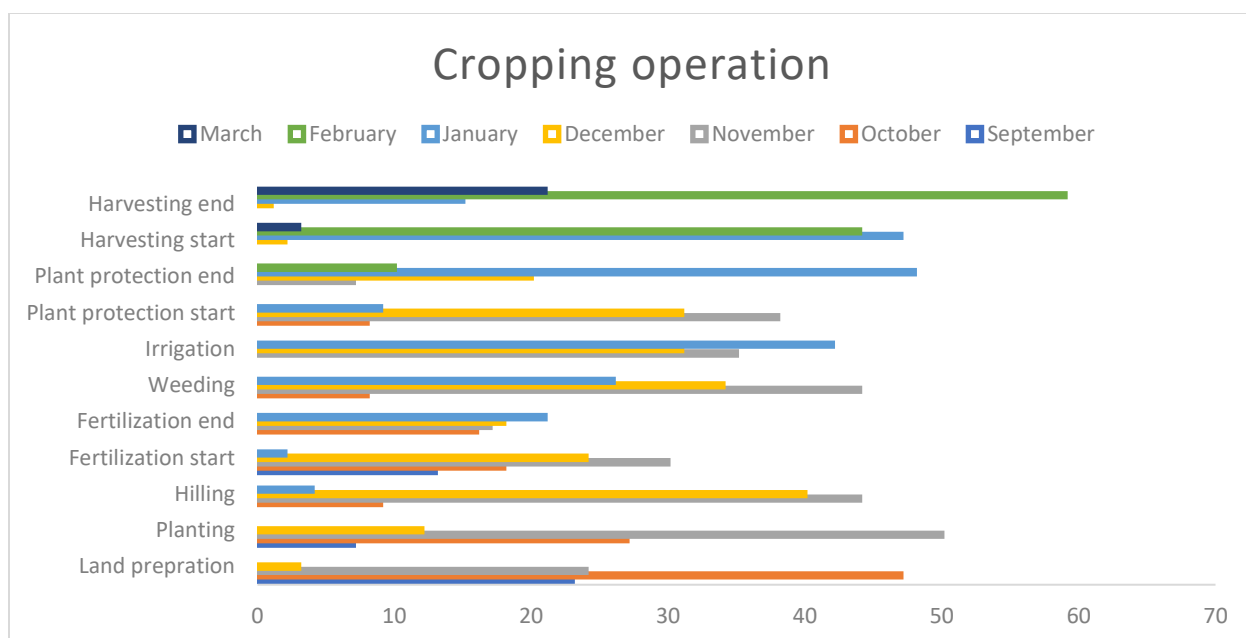
About preference for keeping harvest as seed, local varieties again preferred the most because of its good keeping quality. These are local hence it has good adaptability with climatic condition, therefore, it is easier to keep in normal temperature. K. Pukhraj is kept in cold storage for seed purpose as keeping quality is quite poor owing to its high water content.

97% farmers responded that they do not have any preference of potato for processing purpose. It implies that the farmers in the state are unaware of such varieties. Rest 3% although responded about their preferences for processing purpose but that is unjustified.

Potato in Assam is cultivated in both upland and low land areas. Majority is however, grown in low land areas now a days. About 47% farmers reported that the land preparation starts till the end of October for potato cultivation. Delay of land preparation was reported about 24% due to late harvest of paddy. In some cases, from Barpeta, Lakhimpur, Darrang etc. it is seen that some farmers start land preparation in the month of September itself. Some 23% farmers reported the same which is majorly due to flood and also cropping system which is largely based on vegetable and summer rice in these areas.

7. Cropping operation

Accordingly, planting also is done largely in October and November upto December. More than 50% respondents reported the planting time is in November whereas, the upland planting is done by October. Majority of the planting is over by November which again accounts for 50% of respondents. There is quite a good opportunity for early harvesting of potato which can fetch good amount of return to farmers in Assam. However, such practices will be location specific and fragmented.



Fertilization and hilling are mainly done between November end and December. About 45% of hilling and fertilizer application is completed by December in majority cases. But there are some delay reported where the practice goes up to January in case of late sowing. Apart from this a round of fertilization is carried out during land preparation.

Weeding is also done alongside the hilling and fertilizer application. About 40% of weeding is completed by the month of November and December but some 25% farmers follow the practice even in January. Weeding in the month of October and February is reported from Barpeta to a large extent in the survey.

Irrigation is reported to be based on planting time. Most of the farmers have reported the irrigation in the month of November and December accounting 35% and 30% respondents respectively. There are 25% respondents who do not irrigate their potato fields.

Plant protection measures start from November till January where incidences of foggy days are more. About 48% farmers follow this practice till the end of January. About 40% farmers reported they start plant protection measures in November.

Harvesting is done from the most of January till March. However, it is highest in February with a response of 59% farmers during the survey.

Majority of the respondents said that they do not store potato in any kind of stores. Once harvested it is just sold whatever market price they get. But 27% farmers reported that they keep their produce in country store for staggered selling as well as for seed. Mostly the local varieties are kept for seed purposes for the next season. From the month of February, farmers start to keep the potatoes in country store. 95% farmers reported that they do not keep potatoes in cold store. This is primarily because the accessibility of such facility at the production site.

Major challenges faced by farmers in Assam found to be highly inconsistent. From the survey it is difficult to infer any conclusion about the challenges. The major constraint of available quality seed has not been properly reported by the farmers. It shows lack of knowledge and sheer unawareness among farmers about the potato crop. About 18% farmers reported that they face a challenge of non-availability of cold storage. It is reported mostly in districts like Nalbari, Nagaon and Sonitpur where farmers are engaged in large scale potato cultivation. There are few other challenges mentioned by farmers are like lack of proper knowledge about effective pesticides, high cost of fertilizer, about 10% farmers said low selling price is a problem for them to get good return. Another issue was reported in two of the districts is the menace by domestic cattle during cropping season as these animals are left free to graze in open paddy fields. This need a participatory social approach to solve the problem. Other reported challenges are like rotting of tubers in store, potato diseases etc.

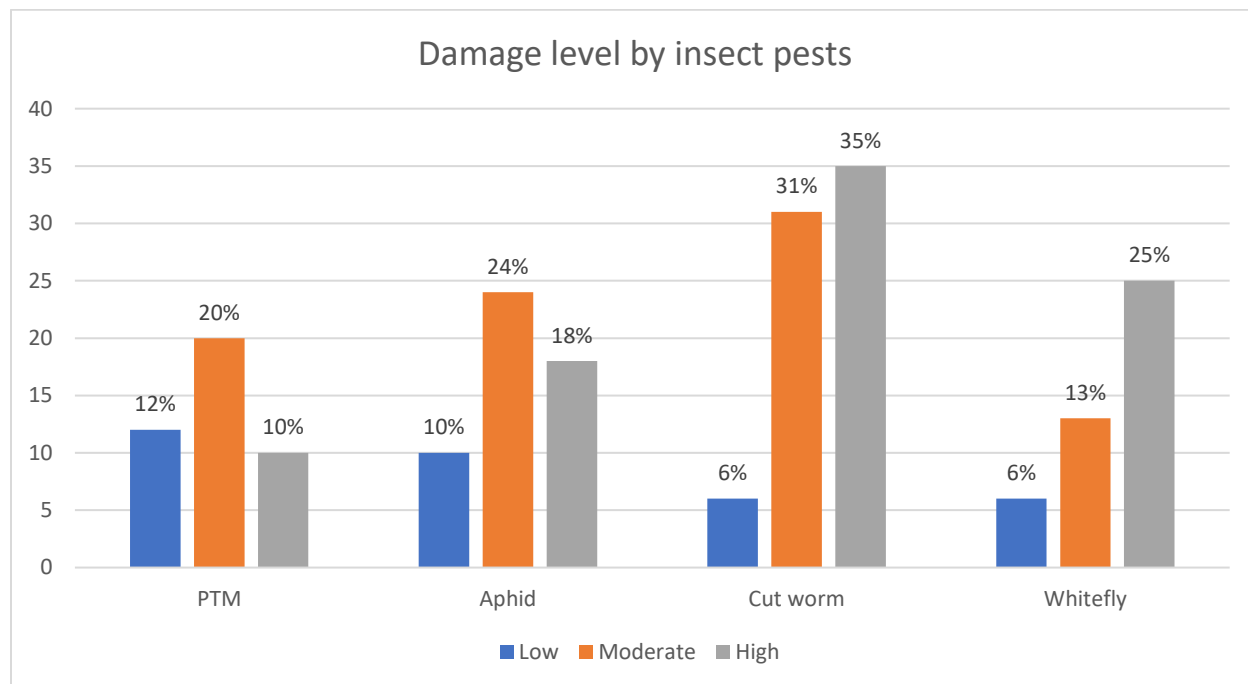
57% respondents informed that they use pesticides for controlling potato diseases. Late blight is quite a big problem in Assam. This problem makes farmers to apply mainly fungicide for controlling the disease.

Regarding insect problems, the farmers reported that they have problem of cutworm, late blight, potato tuber moth, aphids to name some of them. The survey shows severe threat from cutworm during potato season. Cutworm is seen to be found everywhere in the state. Late blight is another challenge the farmers face every year. Regarding bacterial wilt, the responses need careful investigation to find out its authenticity.

8. Damage by insects and pests

When asked about severity of damage caused by different insects and pests, the farmers reported moderate to high severity of various insects and pests. Severity of PTM was reported moderate by 19% of the respondents and they reported that the severity is mainly on the standing crop,

whereas the severity in storage is not significantly high. This is probably because the farmers do not have a practice of storing their produce at a large scale.



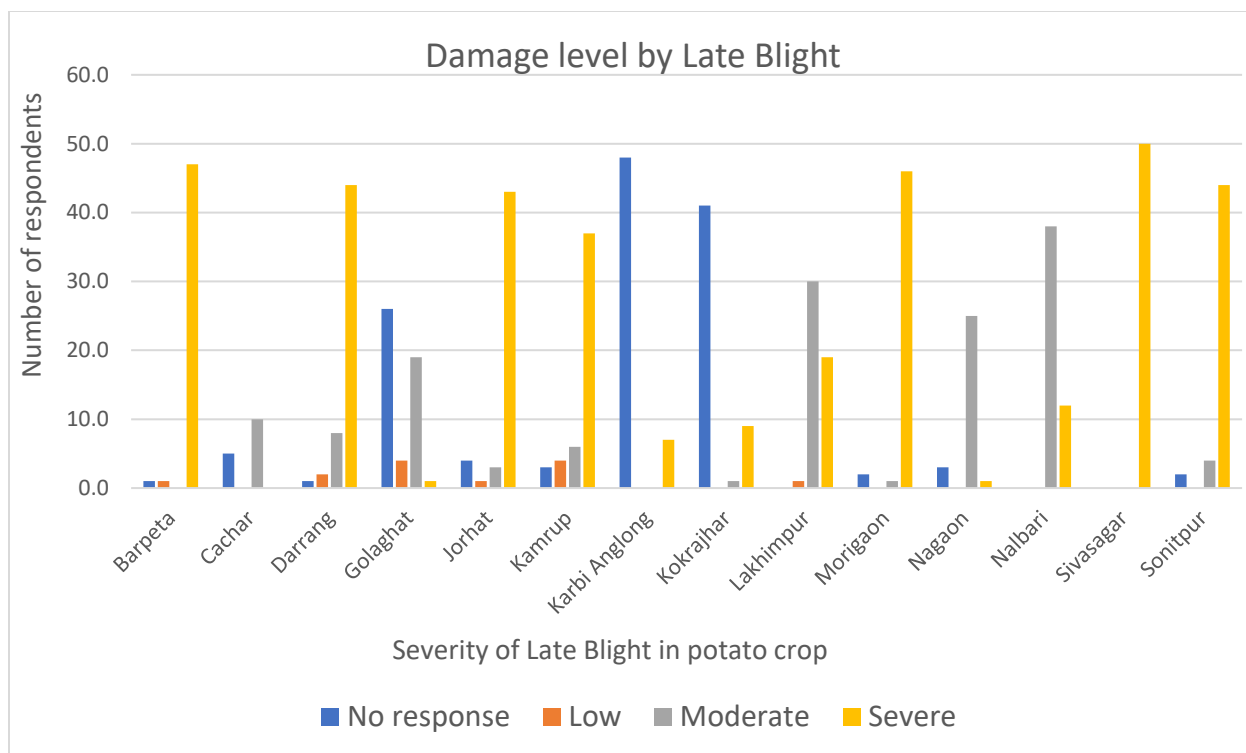
Severity of Aphids were reported moderate by 24% of farmers. Out of these farmers, 53% have reported its severity at the field condition of the crop. Some 18% farmers reported high severity of Aphid in their crop.

35% respondents reported the severity of cutworm is high. Its severity is reported in field by 68% respondents. Some 5% farmers reported its severity both in field and storage.

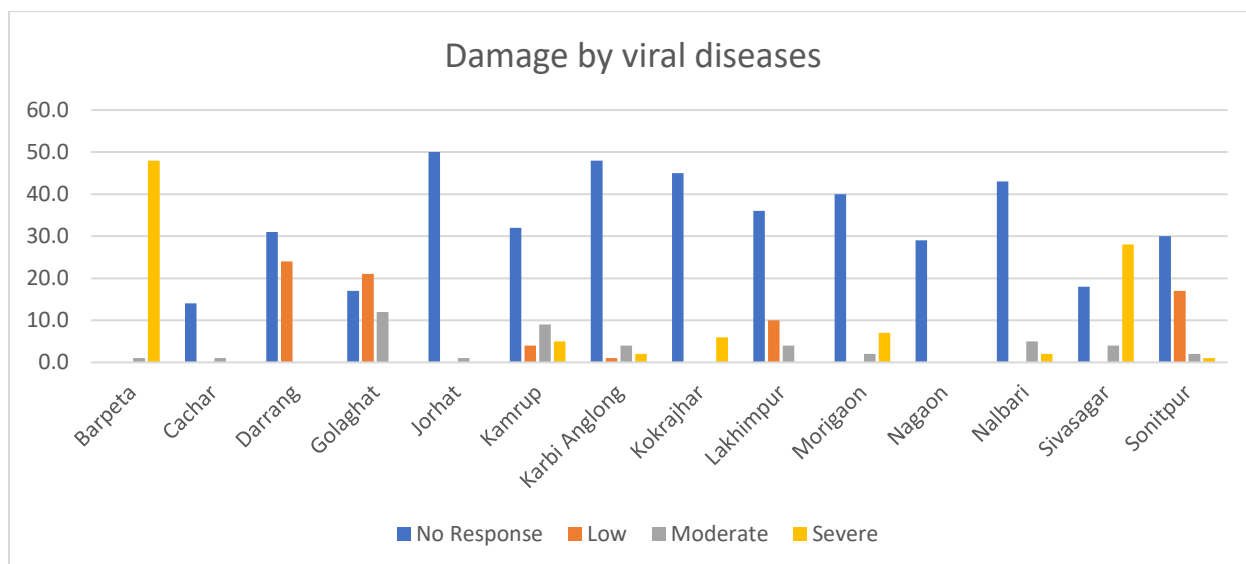
High severity of whitefly was reported by 25% respondents. Out of which 44% said the severity is in field.

The respondents also reported challenges of red ants and rodents in potato fields. Their severity was reported in field condition of the crop.

High severity of Late blight was reported by 55% respondent. About 79% farmers reported its severity during field condition of the crop. About 22% respondents reported the severity of LB as moderate. The incidence of LB was reported equally from all the districts. With exceptional severity in Barpeta, Morigaon, Jorhat etc.



Moderate severity Bacterial wilt was also reported by 15% farmers. 35% respondents informed the severity was in field. 14% farmers reported high severity of Early blight and 10% farmers reported moderate severity of the disease. 26% of them have reported the severity is seen in field



There were reports of viral disease and Fusarium wilt. About 15% farmers have reported sever incidence of virus on the crop. Maximum severity of viral diseases was reported from Barpeta and Sivasagar districts. Majority of the farmers were not aware about the viral diseases. It

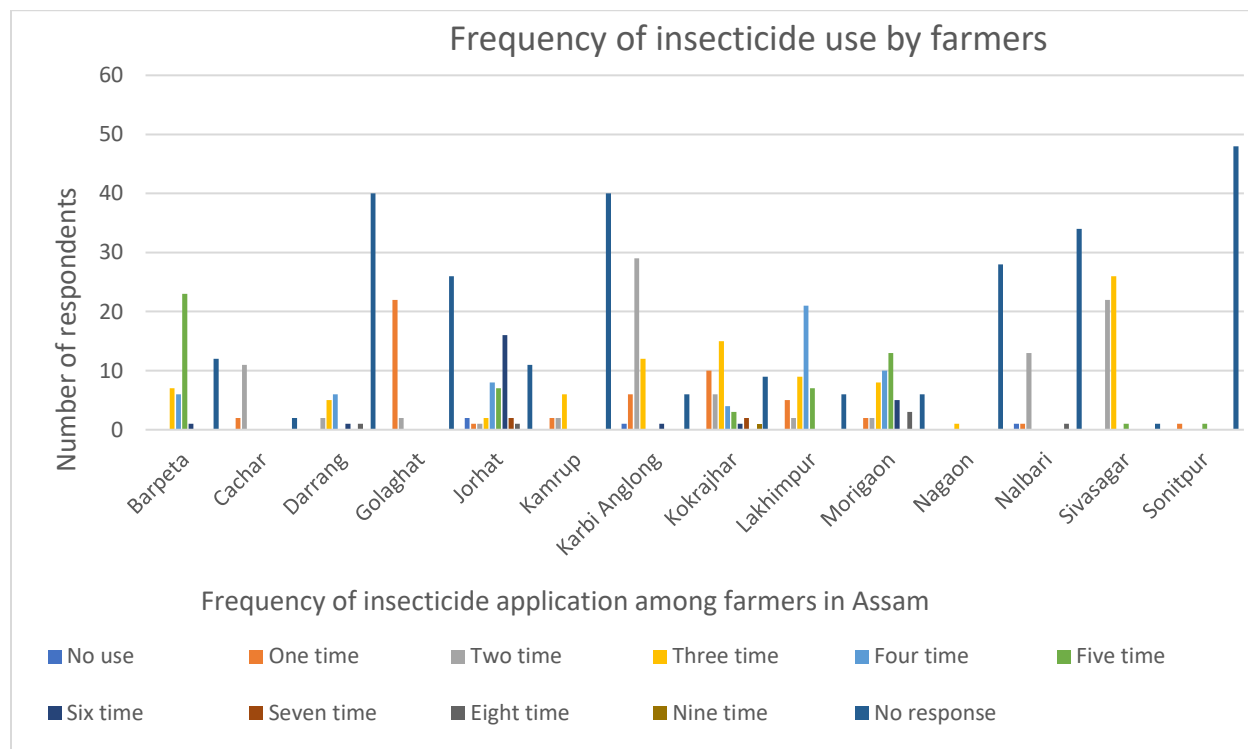
accounts for 33% on field. Whereas severity of Fusarium was reported very minimum with low to moderate severity. There is no other pests are reported as such by the respondents.

About 87% farmers have reported the problem of pest and diseases in their potato crop. About 58% farmers reported to have used insecticide and 32% reported use of fungicides for controlling the pest and diseases.

The respondents informed that they get the information of insecticides from agriculture extension officers as well as fellow farmers. They mostly get the insecticides from agricultural retailer shops in their locality. Half of the respondents knew brand name of some of the insecticides and half were found unaware.

The application frequency was reported between 1-9 times per season. However, maximum farmers were found to have used it between 2-5 times in the season.

Insecticide application was reported to an extent of 500ml on an average by all the farmers interviewed during the survey on an area of 183 hectare.



About 48% respondents reported that they use fungicide for disease control in their potato crop. However, 52% respondents either said they do not use it or abstain from reporting anything.

While late blight incidences are quite high the practice among farmers shows a poor situation of potato crop in the state. Moreover, 86% respondents were found unaware of the level of toxicity of different fungicide they use. 76% respondents also said that they use the fungicide without knowing its target pest or insects. On the contrary, most of the farmers reported that they use Mancozeb widely for plant protection. Overall findings show sheer unawareness of farmers about potato disease and its protection measures in a scientific way. Which has ultimately resulted in poor cultivation practice of potato among farmers.

99% farmers responded that they do not use herbicides for managing their potato crop. They have no idea about the chemicals, their toxicity and target. Those 1% who use it has reported that they do not know the name of the chemical. They simply get it from an Agro-chemical shop and use it. Few farmers have reported Mancozeb as the herbicide they use. This is because of the lack of awareness about such chemicals among farmers. Although it seems unawareness, yet it creates an opportunity for farmers to develop a niche market for potatoes that are grown using less chemical compared to what is being done in other parts of the country. However, this needs proper handholding and capacity building of farmers to be able to leverage the benefit of their current practices.

While asked about target host for a particular chemical, 99% farmers responded no idea about such things. It was also found that farmers did not know any name of the herbicides. As maximum farmers did not use herbicides, so they are unaware of the quality used for such chemicals.

Only 4% farmers knew about IPM in terms of its literary meaning. However, while asked about the practice few could articulate the real sense of IPM. Many of the farmers were culturally doing such practices but they were found unaware of the scientific basis of it.

39% farmers reported that they have issues with using pesticides. Most common problem of using pesticide was reported to be itchy skin among farmers. Apart from that issues like burning sensation of eyes and skin, sore throat, irritation of eyes etc. were also reported by farmers.

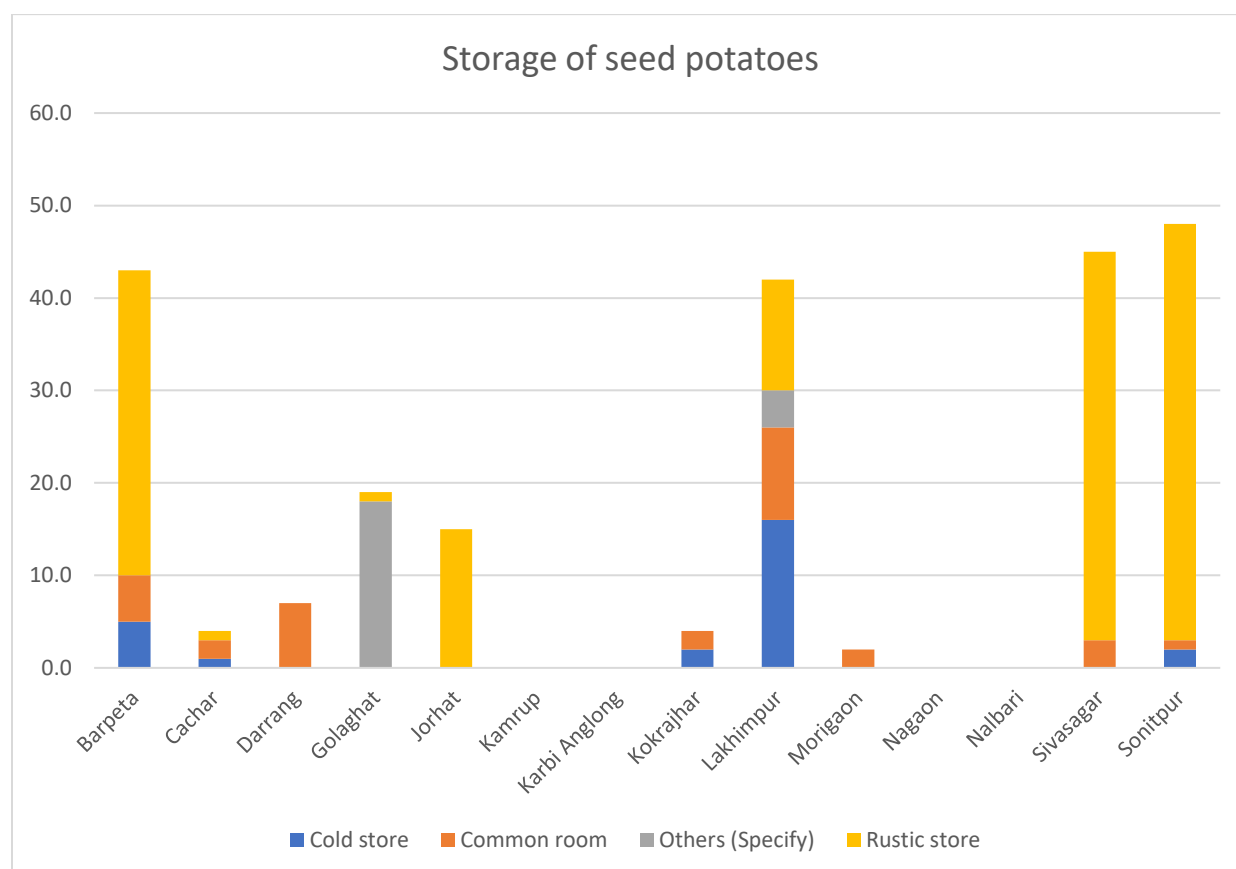
About 70% farmers reported that they take precautionary measures before using pesticides in their crop fields. However, proper PPE kit use was not seen during spraying of such chemicals.

Most of the farmers reported to have used long sleeve shirts, face cover with cloth, use of eye glass etc. as protective measures.

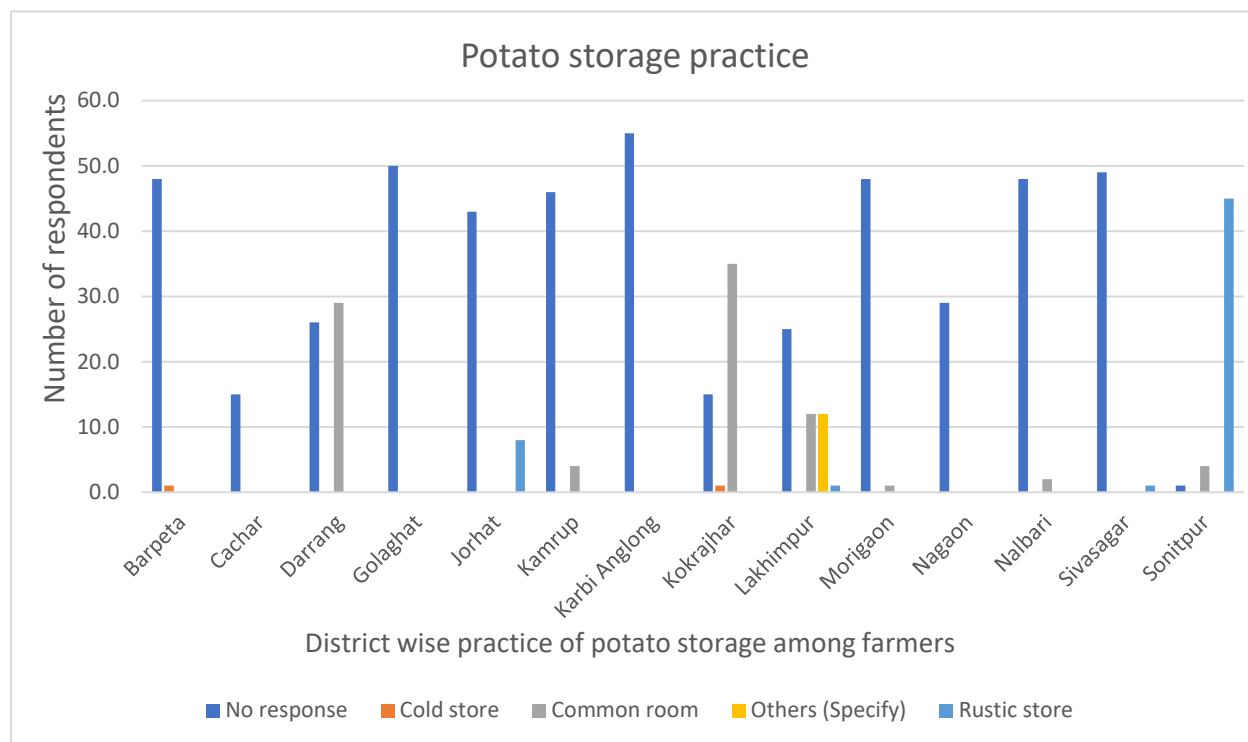
About 56% farmers reported that do not have to compromise on selling price of potato due to damage by disease. It is probably because the farmers are small holders and they do not store potatoes but sell it immediately after harvest.

9. Storage practices

Although 61% farmers reported that they store potato after harvest but in practice it was not seen except for household consumption storage. It is quite evident from the response of 58% farmers who reported to have stored their potato for consumption. About 35% farmers reported to have stored their potatoes for seed for next season. Out of the farmers who store potato for seed purpose have reported that they store it in rustic storage facilities basically at household level.



While asked about cold storage facility and its accessibility, only few farmers from Lakhimpur, Barpeta and Cachar have reported that there is some private run cold storage and they have accessibility to it.

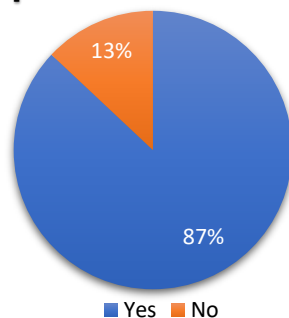


About 57% farmers reported that there is no market available nearby for potato seed. 68% farmers reported that a local market is available for selling their produce once it is harvested. While asked about an organized market for potato 66% farmers reported that an organized market is not available in the locality for buying and selling of potatoes. When asked about involvement of women in selling of potatoes, 90% farmers reported that women are not involved in selling of potatoes.

10. Marketing

About 87% farmers reported that they sold their potatoes in local market in the cropping season 2017-18. They also reported that the price ranges from 6-25 INR per kg of potatoes depending on the time of sale. Seed potato price was reported between 15-45 INR per Kg.

Sale of potato in local market

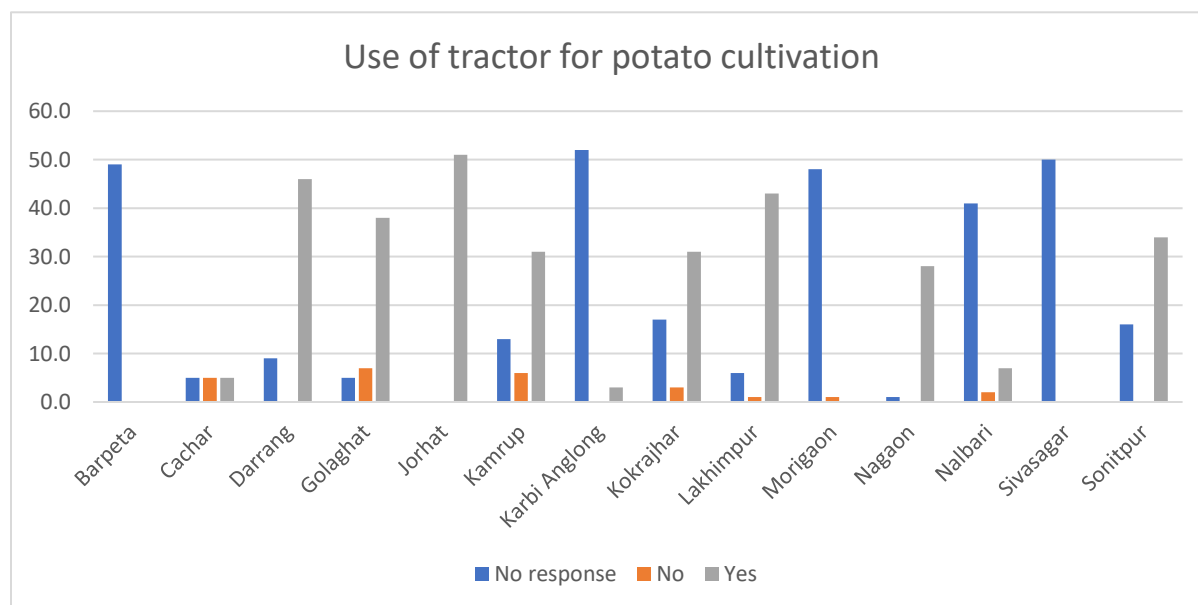


Cost of Cultivation (CoC) was reported between 60000-225000 INR per Hectare. However, CoC was seen high in Barpeta, Sonitpur, Nagaon, Kokrajhar etc. due to use of high input.

While asked about profit utilization from potato, most of the farmers reported that they use it for household activities. Some also save it for agricultural activities. Apart from that farmers also use the profit for education of children, medical expenses, entertainments etc.

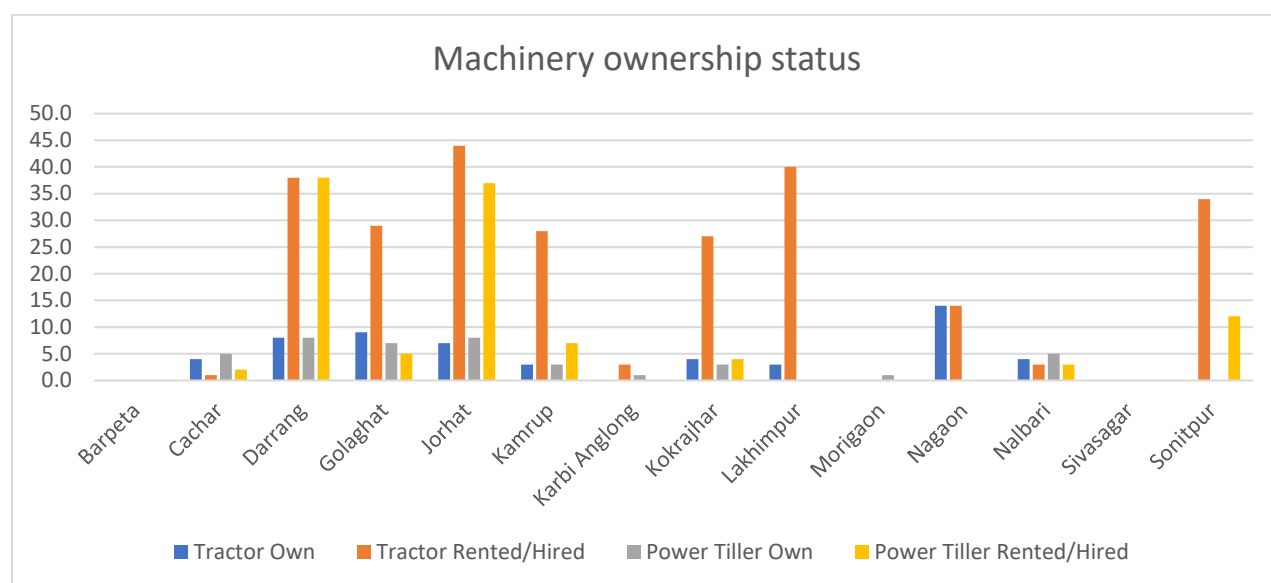
11. Farm mechanization

Mechanization in potato in Assam is not very advance. About 52% farmers reported use of mechanization for potato cultivation. Another 48% respondents said that they use tractor for mechanization of potato fields. reported for a case where both male and female members

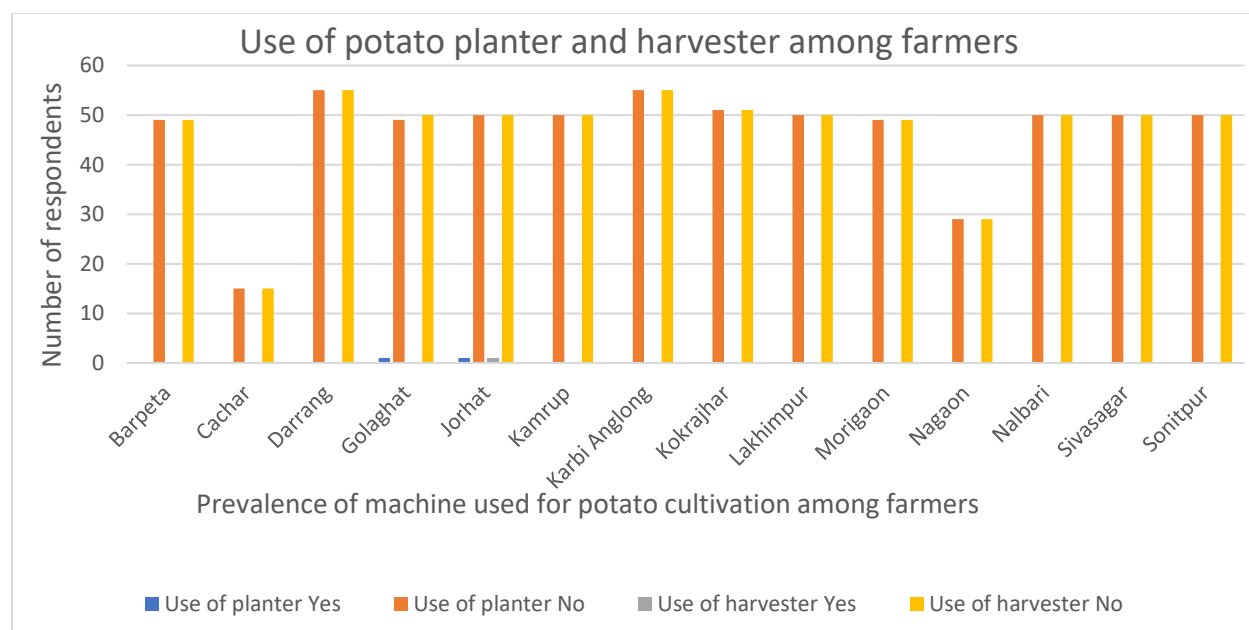


use the tractor. However, ownership of tractors is very low among the farmers who reported to have used tractor. Of all the respondents 40% of the tractor used was on rent. Only 8% have their

own tractors. When asked about operation of tractors, it was informed that only male members are responsible for the operation in majority of the cases.



But in Jorhat only 22% farmers reported that they use power tiller for potato cultivation. Out of which 16% take it on rent to prepare their fields. It can be understood that the small landholders use the power tiller for land preparation. Only 6% farmers reported that they own a power tiller. About operation, male members are responsible in almost all cases. However, there are two cases reported from Darrang and Kamrup where male and female members both use the power tiller.



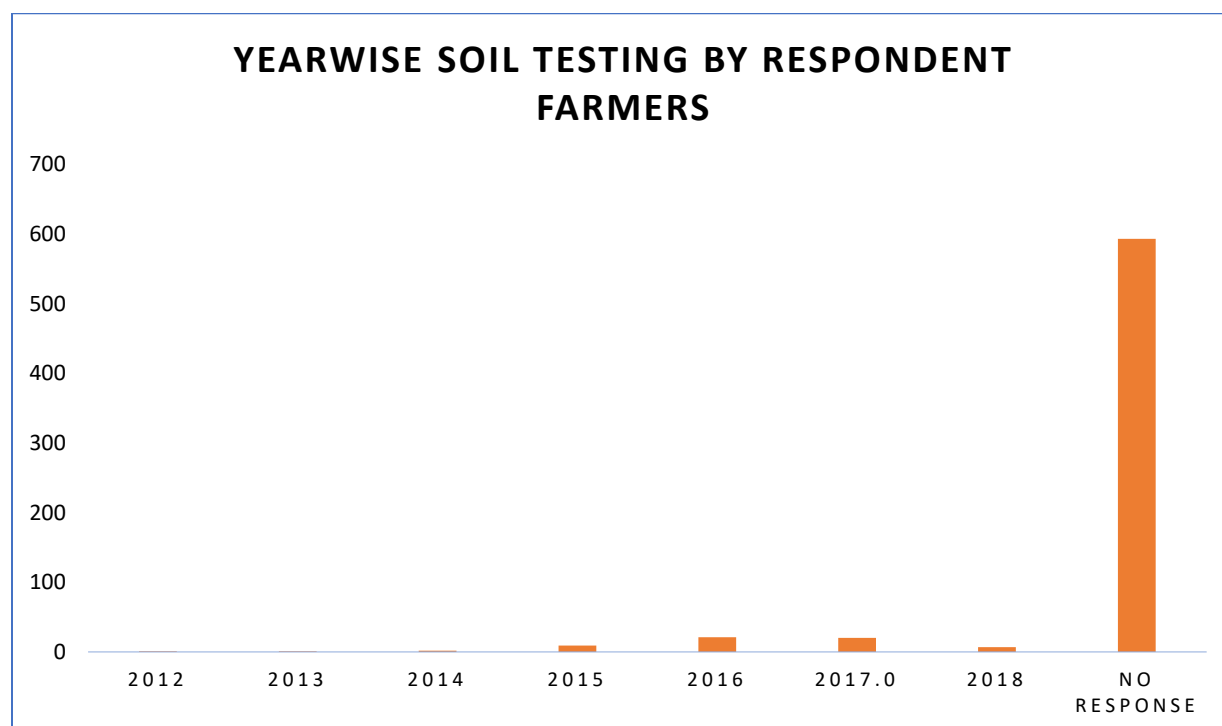
When asked about use of potato planter, rotavator, power weeder and potato harvester the use of these machines is near nil. However, there are few famers who reported the use of power weeder on rent as well as the rotavator. Only two farmers one each from Jorhat and Golaghat reported the use of potato planter and harvester in their fields. There was no other machine use as reported by farmers during the survey.

When asked about asset value only 7% farmers knew about it. Cachar district reported the highest farm asset value amounting to INR 40 Lakh.

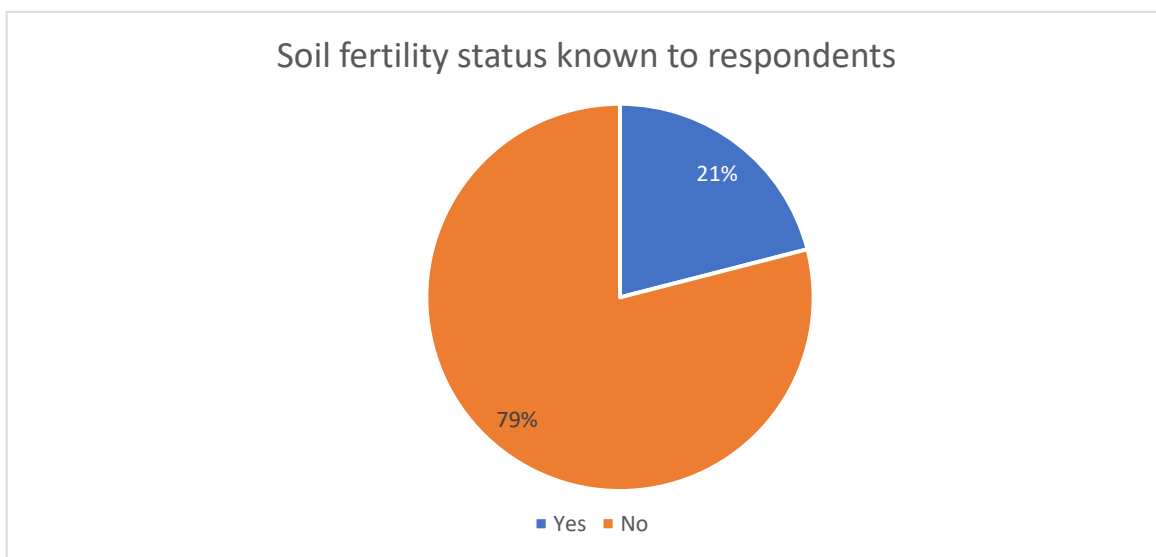
Skill and experience of machine operation among farmers are not very high. It shows that the exposure of these facilities among farmers is very new. Only 14% farmers have reported that they are skilled and experienced on the machine operation skills. Moreover, 100% of the skilled respondents are found to be male member in a family.

12. Soil quality

Only 9% respondents reported about testing soil, which eventually gives the idea about poor awareness about soil quality among farmers. Maximum soil testing reported during 2016-17 compared to other years.



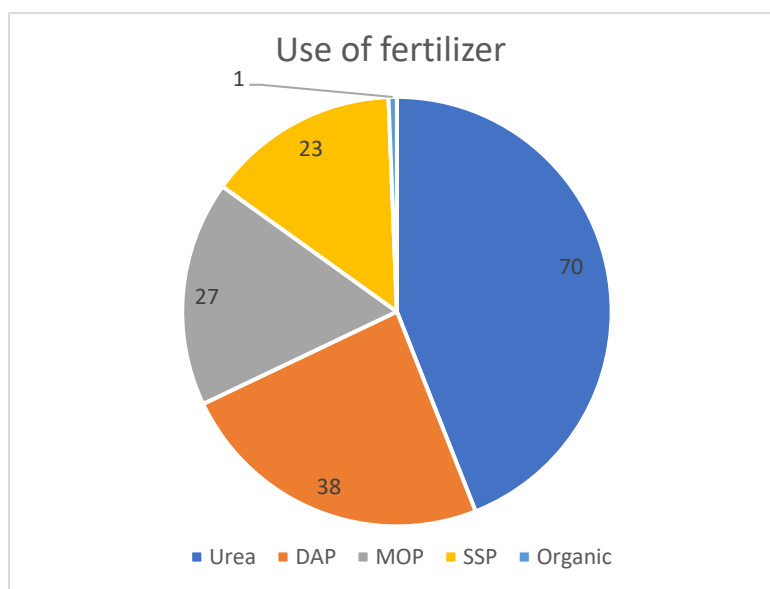
About 21% farmers said that they know the fertility status of the land where they grow potato. Of which 16% reported the medium fertility of their soil and about 3% reported high fertility of soil. Kamrup district one among them reported the high soil fertility.



13. Fertilizer use

Among the fertilizer used, use of urea is quite prevalent which accounts for about 70% farmers.

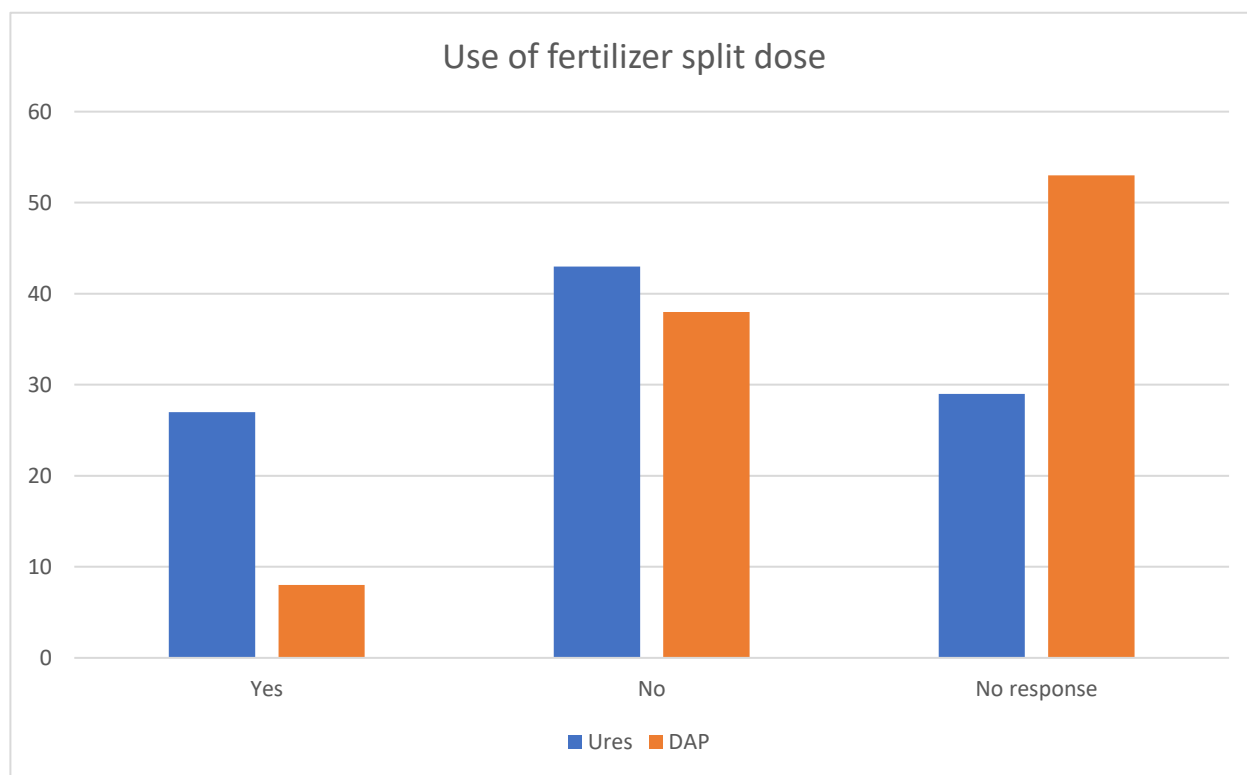
Moreover, use of DAP and MoP is also seen among farmers. 38% farmers reported use of DAP and 29% farmers reported use of MoP. About 23% farmers were found to use SSP in their potato fields. Only 1% farmers reported using organic fertilizers including FYM.



About 70% farmers reported that they use urea before planting of potato. Whereas 27% farmers reported use of split dose of urea in crop field. 36% farmers reported use of DAP before planting and only 8% reported the split dose of DAP in potato. Only 1.5% farmers reported use of other fertilizers in their potato field. However, no specific names were reported for such fertilizers.

About 10% farmers reported the use of micro-nutrients in potato fields of which 5.5% reported the use of Boron and 4.5% percent reported the use of Zinc in crop.

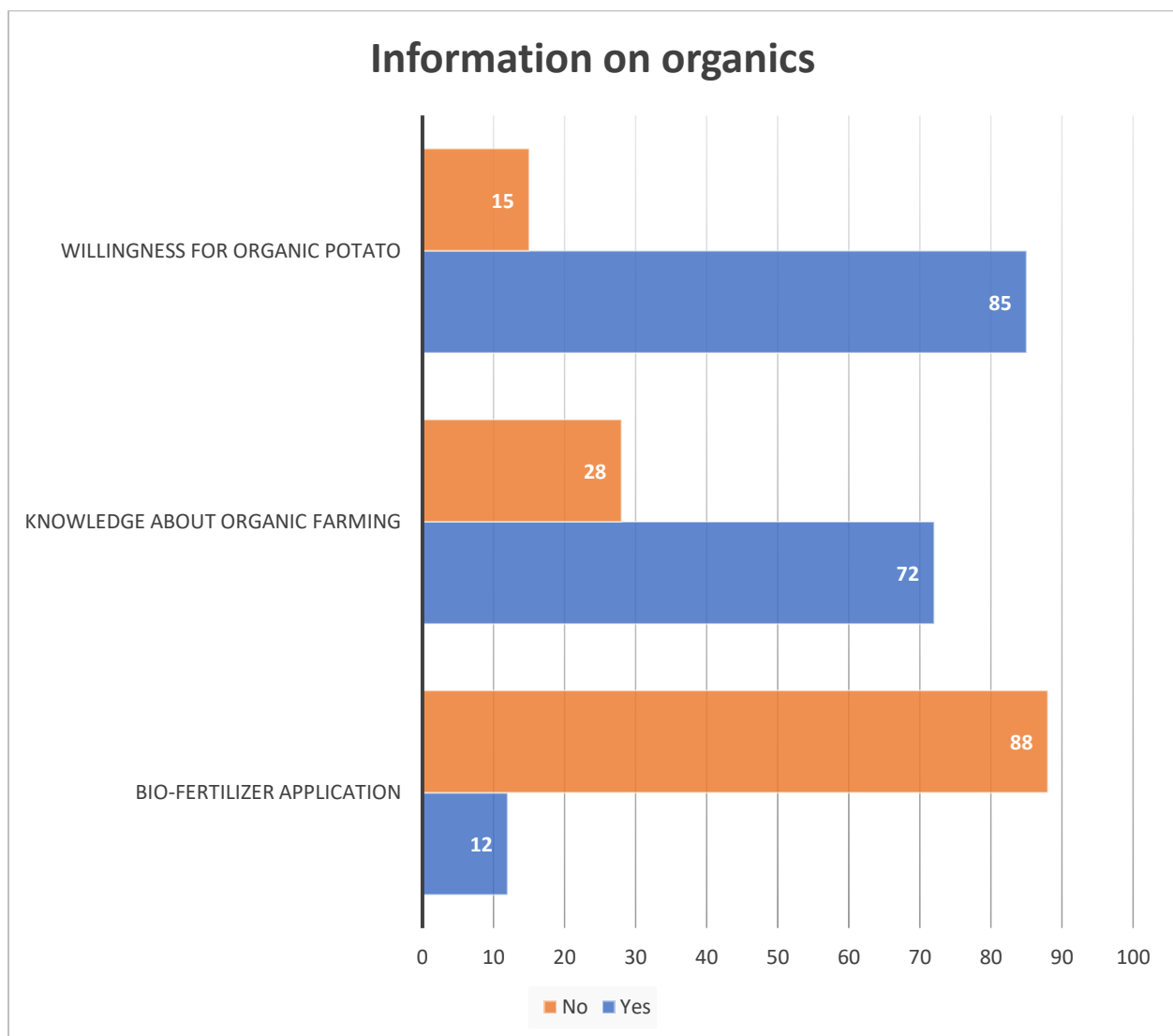
Similarly, the use of DAP and MoP was also found highest in rabi season and then khrif and in boro season. However, there are few exceptions like in Kokrajhar and Cachar etc. Only 8% farmers reported foliar application of fertilizers. About 7% reported spraying of NPK and 1% reported spraying of Zinc.



80% farmers reported use of FYM in their crop field. The average use of FYM was found in the tune of 2.5 MT per hectare. Use of green manure was not very prominent among farmers in Assam.

14. Information on organic cultivation

About 11% farmers reported use of bio-fertilizers in their crop fields. When asked about their awareness on organic cultivation practices 72% farmers said they know about the organic practice of cultivation. About 85% farmers showed interest in organic cultivation of potato. 52% of the farmers said that they would like to do it in homestead gardens where women can also involve themselves in cultivation. About 81% respondents reported their willingness towards involving women in organic cultivation of potatoes in homestead gardens. This is probably because the women can easily look after the crop in the homestead gardens while doing other household activities. About 32% farmers showed their willingness to do the organic practices in large paddy fields.

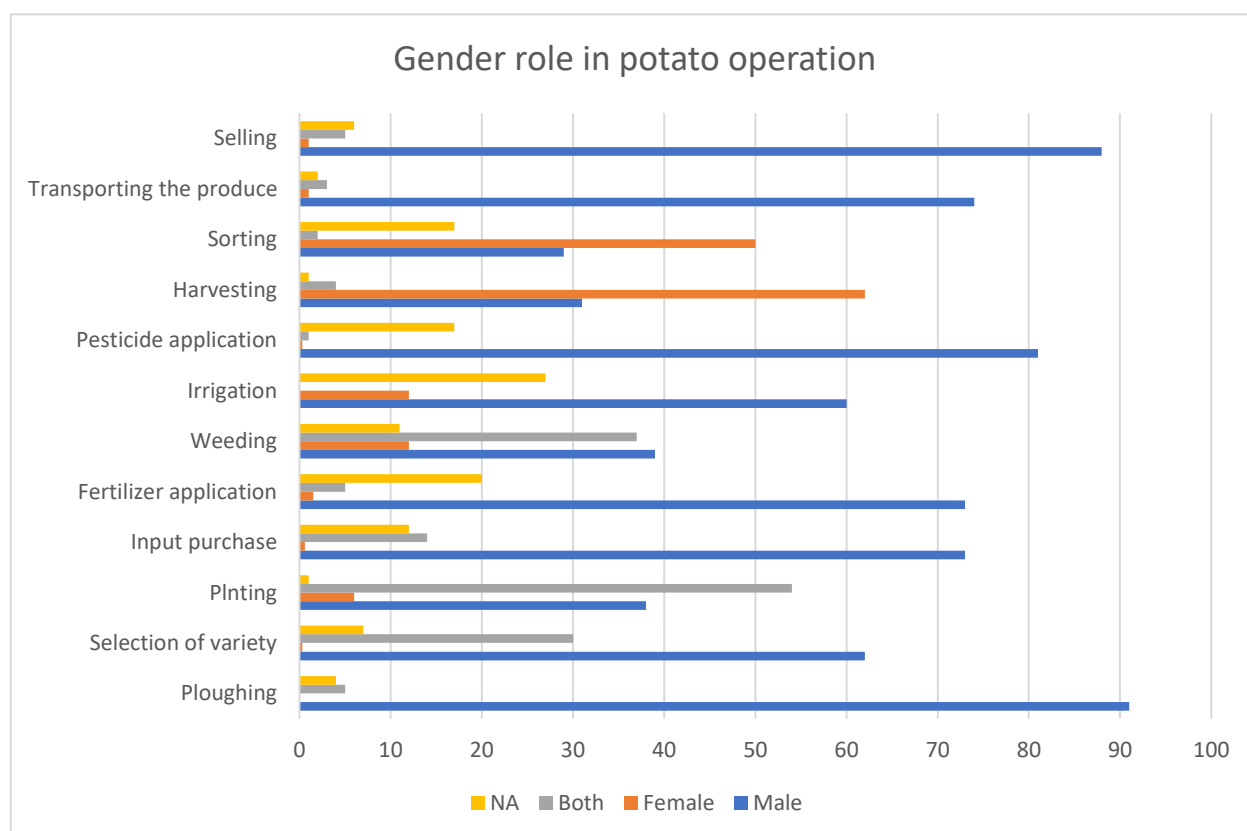


Ploughing and harrowing were common in all the districts. About 95% farmers said they practice ploughing and harrowing. Majority of the cases family members together carry out such activities in field. About 51% respondents reported that the activity is done with support from family members. 24% reported that the activity is done by hired labour and 19% reported both family and hired labours do the activity. In most cases male members were responsible for this activity but in some 5% cases where both male and female do the activity.

Variety selection was mainly done by the male members. However, proper knowledge about variety is not very high among farmers. Hence, it is interpreted more towards the purchase of seed from market. In this case male members are responsible for it.

15. Gender participation

Like ploughing and harrowing, planting was also done basically by family members which accounts for about 55% respondents. Hired labours for planting was found comparatively low.



This is because of women's involvement in planting. About 40% cases were found where male and female equally involve themselves in planting activity.

About 73% cases male members decide which fertilizer and chemical to use in crop fields. There are hardly any cases where females are involved in decision making and purchase of inputs.

In 70% cases it was found that the family members together carry out the activities like fertilizer application and chemical application for plant protection. Involvement of female in these activities are quite minimum. Only 5% cases were found where women are equally involved in this operation.

Weeding operations are also done by family members together. However, in this operation involvement of women are quite high along with men. About 70% cases are reported where women are equally involved in weeding operation. It is evident that this activity needs less labour and therefore, women are allowed to do it.

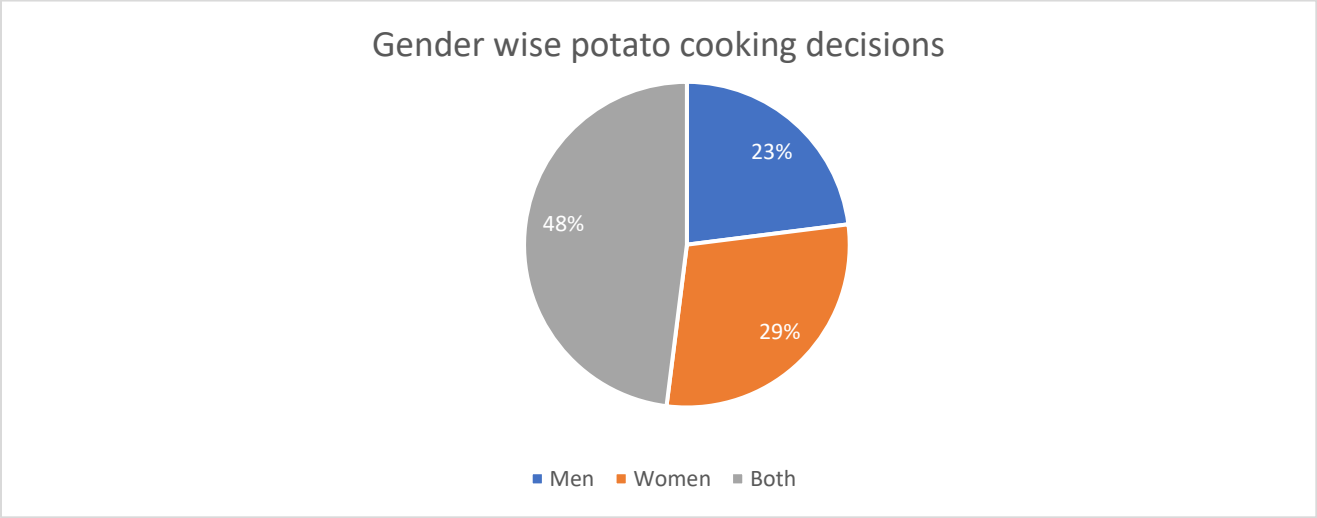
Irrigation was also found to be male dominated activity in all the districts. About 60% cases where male only involved in the irrigation of crop. Only 12% cases were found where both male and female members were involved in the activity.

About 69% cases were found where family members are involved in pesticide application. Hired labours in this activity was found very minimum accounting just 7%.

In 54% cases it was found that the harvesting is done with support from family members together. There were 34% cases where harvesting is done by both family members and also hired labours. While family members are mentioned, about 43% cases were found where both male and female farmers were equally involved in harvesting.

In 40% cases it was found that both men and women were equally involved in sorting and bagging of the potatoes. Majority of this activity is done by family members together.

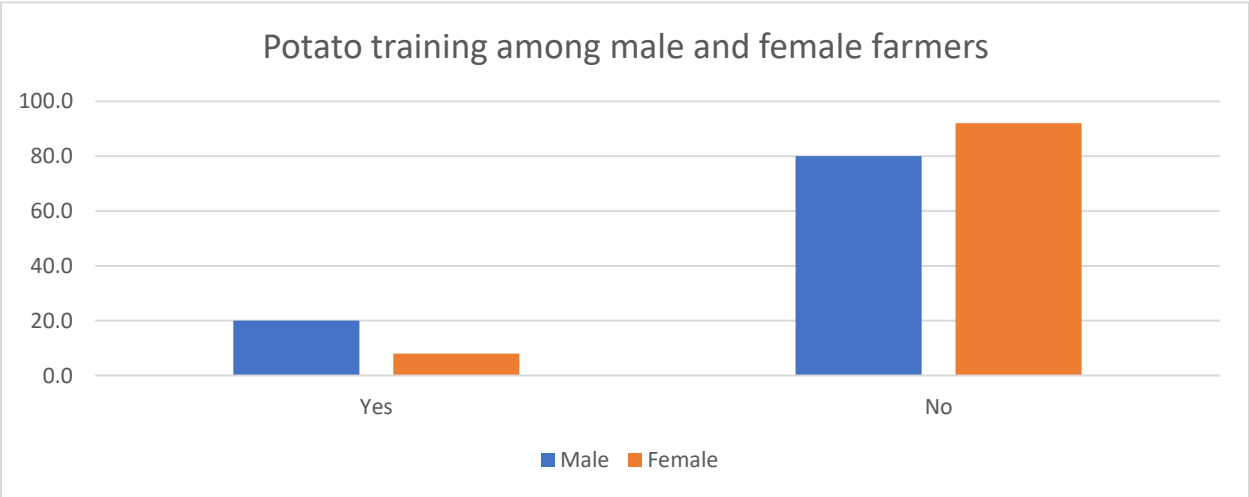
When asked about transporting, storing and selling of the produce majority of the cases were found where these activities were done by the family members themselves and male members were found more involved in these activities.



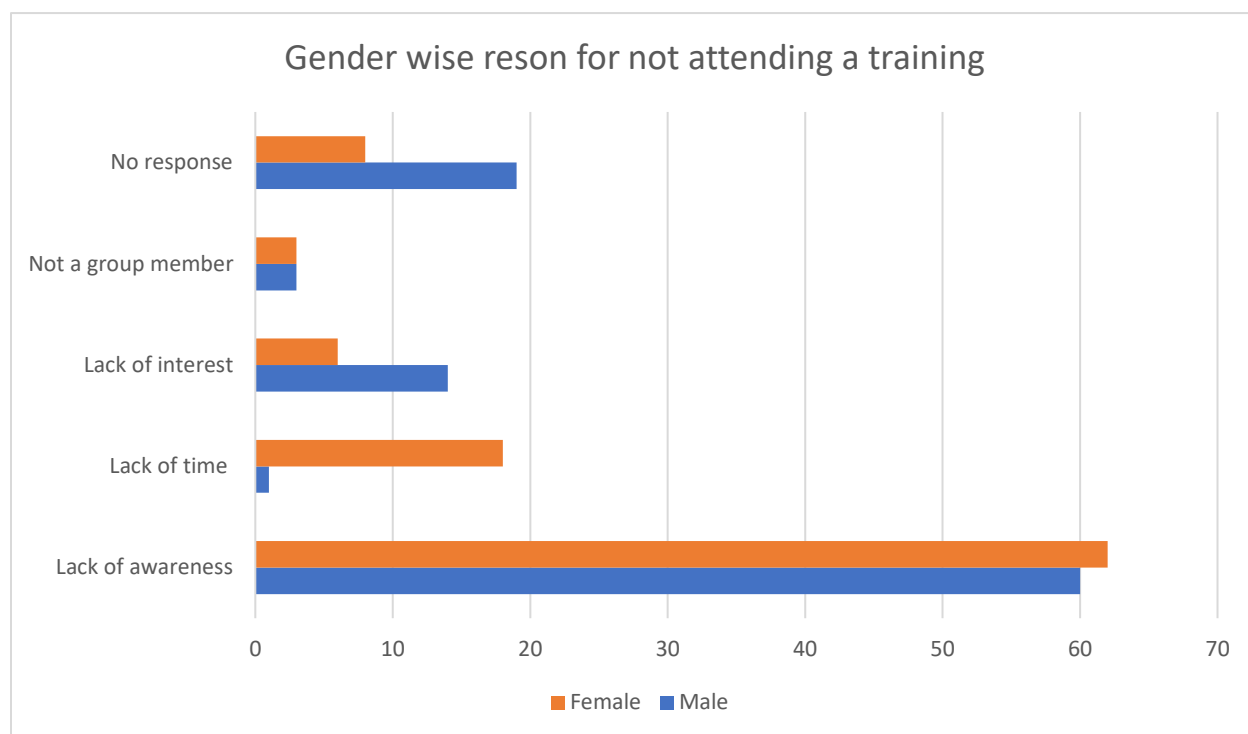
Regarding cooking of particular variety, it is seen to be decided by both male and female members at household levels in all the districts. About 48% such cases were found where both male and female decides the same. In 29% cases it was found that only female counter parts decides what to cook when it comes to potato cooking.

16. Training and capacity building

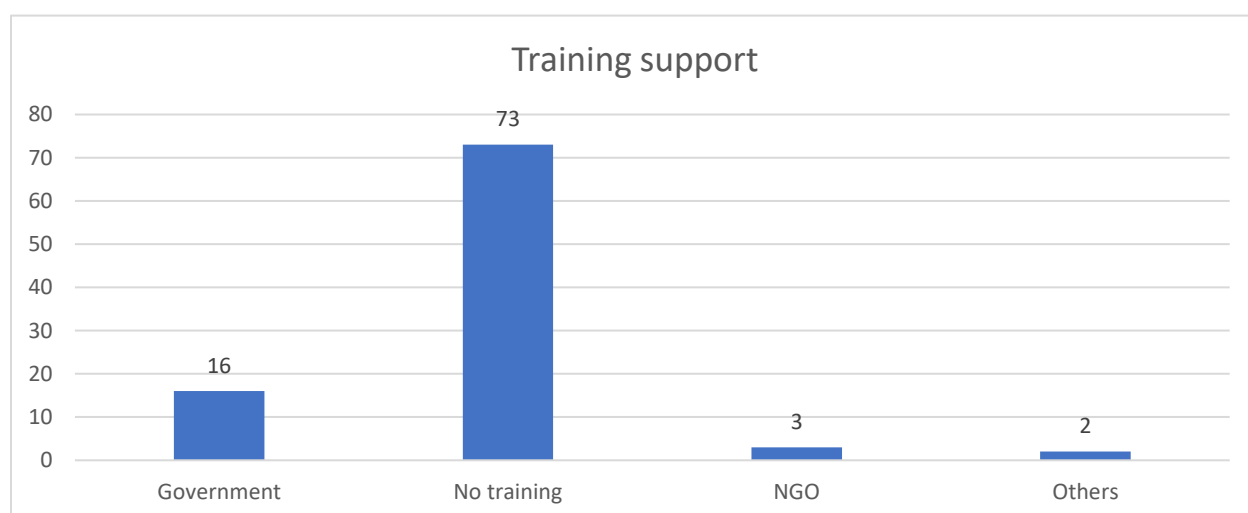
Only 20% male members found to attend a training on potato. While asked about their poor participation, 60% farmers reported lack of information about such trainings and also some 14% reported that even if they have information yet time is a constraint for them to attend such trainings.



About female also hardly some 8% female reported to have under gone any potato training. The main reason being the time constraint.

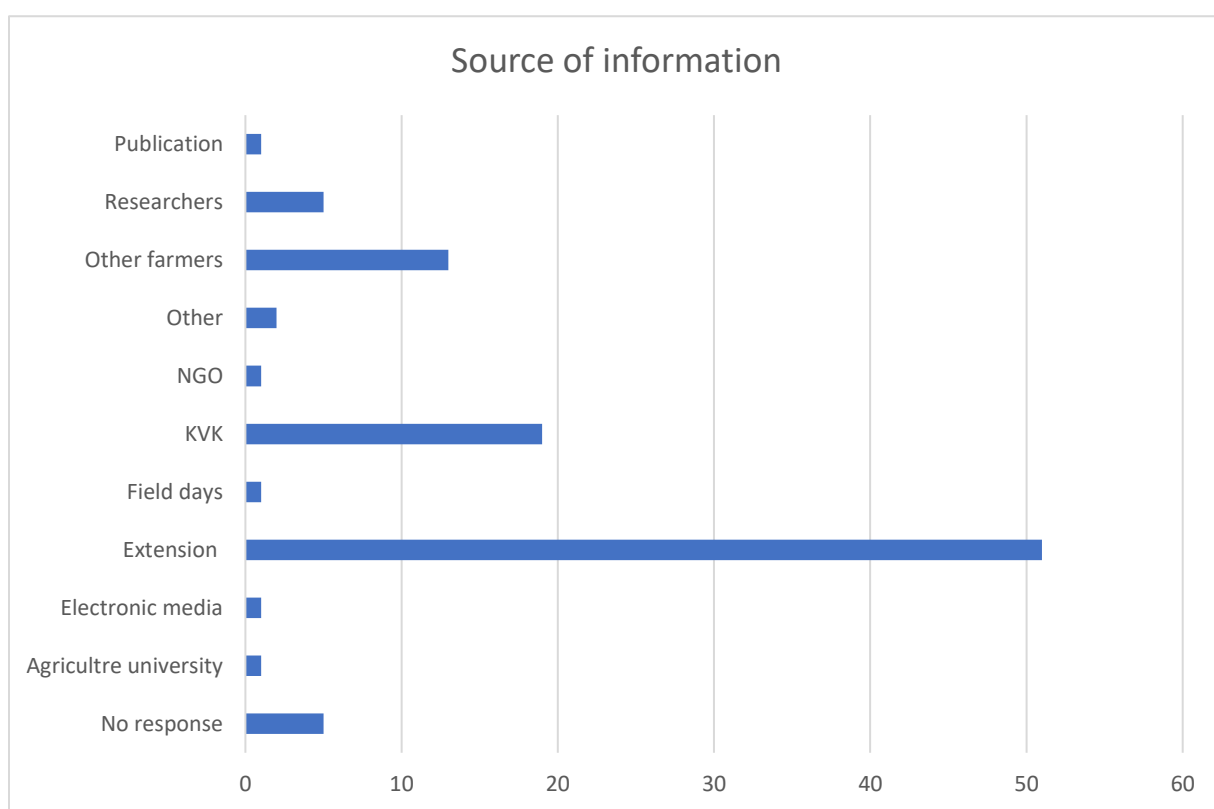


Training support by various institutions are found to be quite poor among farmers. Whatever training the farmers have, are from a government source. These are basically under various schemes. About 16% farmers reported that they got training support from government so



urces whereas 73% have no training support. There are very small number of training that are reported from NGO sources.

Entrepreneurial skill development training, skill training on modern farm mechanization, training on machine operation, post-harvest management and processing training, training on best management of potato crop, training on market strategy, training on potato pest and disease management etc. were some of the training topics that have emerged from the respondents during the survey. The lack of many of these skills are already evident from the results shown in this analysis, hence, it is important to organize these trainings regularly for farmers in Assam.



Availability for extension service in the villages were reported by 52% farmers but other 48% said they do not have such facility. District extension machinery and Krishi Vigyan Kendra (KVK) were named most when it was asked about source of information that farmers get from. About 50% farmers said it's the extension official who provide information regarding various improved ways of potato cultivation.

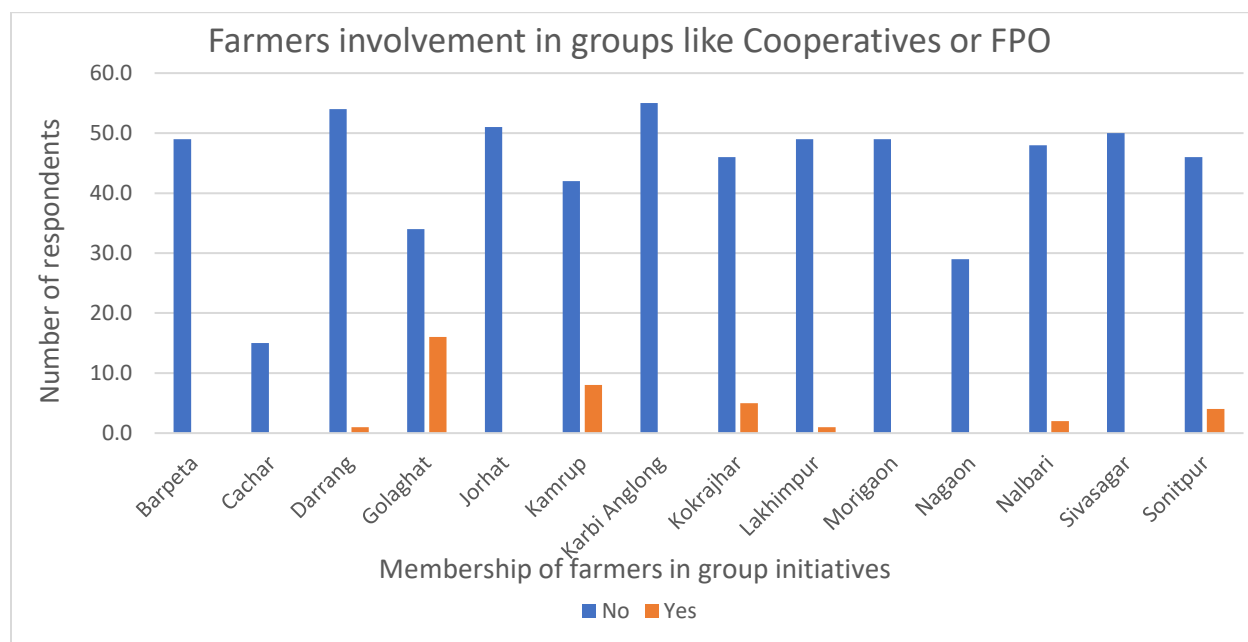
16. Group initiatives

Farmers were hardly found to be associated with any group that operate together for potato cultivation. Only 8% farmers said they are a member in a group essentially the credit society and

not any potato growing groups. It was also rare that PRI or other such organization provide any support to the farmers at local level.

72% farmers reported that they have not received any training from any source or other support. About 16% farmers said that they received training from government. Another 2% said they received some trainings from NGOs. Overall, training support to farmers are not very satisfactory. Whatever support some farmers have received are basically in the form of demonstration of crop under various schemes.

Credit and borrowing of money for potato cultivation was not seen much among farmers. This is because of small landholding. Only 10% farmers reported that they take credit for potato cultivation either from money lender or from a credit society in their village. Most of the farmers reported that they could manage their potato cultivation from their own source of money.

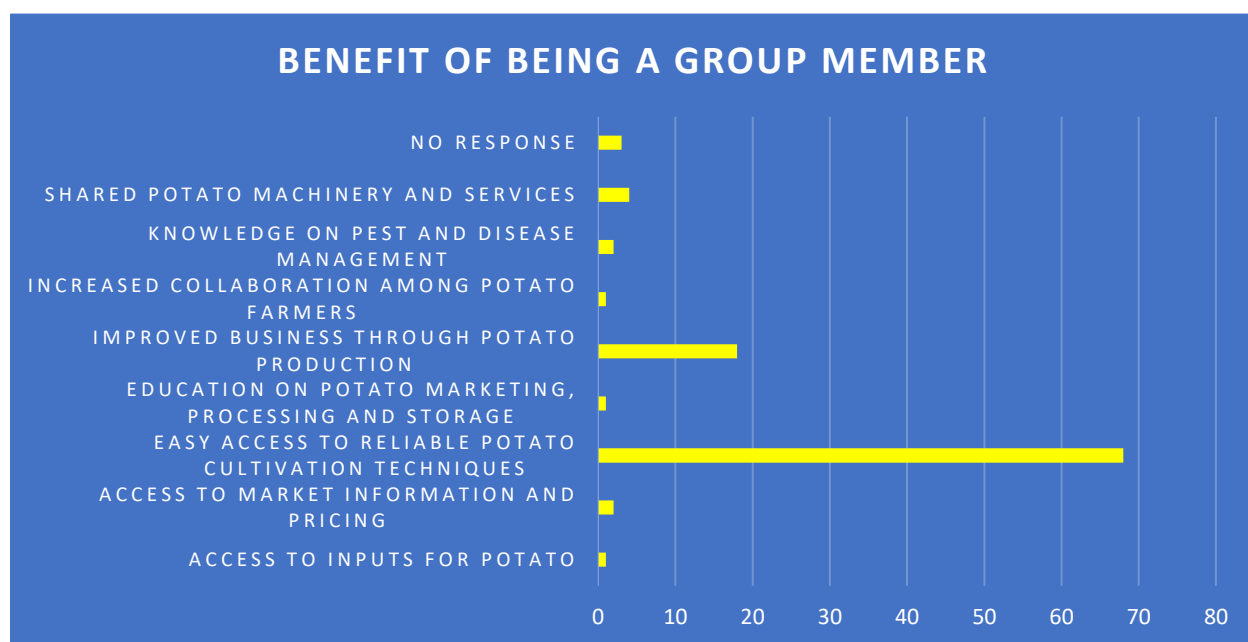


District wise scenario of farmers being a member in any group that works for potato is quite poor. There are only a few districts where farmers have reported that they are members of groups like PFO or a credit society. Golaghat shows highest number of farmers having membership in any group.

Only 8% farmers reported that they are a member in some groups like FPO, Cooperative society etc. However, the number is quite low.



When asked about their willingness to join such a group about 81% farmers responded yes. About 68% farmers believe by engaging in such a group information access will be easier for them to carry out potato cultivation.



When asked the farmers to recommend something for betterment of potato sector in their respective districts, 70% farmers urged to have better quality seed for their potato practices. They

asked the government to create such facilities that ensure availability of good quality seed for cultivation. About 50% farmers recommended to have cold storage facility for better return from the potato crop. About 20% farmers asked for better training on improved potato production techniques. There were other recommendations like better coordination between farmers and extension machinery, improved access to inputs etc. put forth by the farmers across the state.



The International Potato Center (known by its Spanish acronym CIP) is a research-for-development organization with a focus on potato, sweetpotato, and Andean roots and tubers. CIP is dedicated to delivering sustainable science-based solutions to the pressing world issues of hunger, poverty, gender equity, climate change, and the preservation of our Earth's fragile biodiversity and natural resources. www.cipotato.org



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