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# Identification and Management of Risks in Groundnut Production in the Pothwar Region of Punjab, Pakistan

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## ABSTRACT

Groundnut (*Arachis hypogaea* L.*)* is one of the world's most ancient and important oil seed crops. This study was designed to explore the farmers' knowledge about risk identification and management practices that impact groundnut production. This study was conducted in the Rawalpindi division, a major groundnut-producing region. For the research, district Chakwal of Division Rawalpindi was selected. Chakwal consists of 5 tehsils, of which 2 tehsils Chakwal and Talagang were selected through simple random sampling. Four Union Councils were chosen from each Tehsil and 2 villages from each Union Council. 12 respondents from certain villages were carefully selected for a sample size of 192 respondents. The interview schedule was prepared based on the review of the literatures and research objectives. Based on results majority of the respondents claimed that environmental factors affected groundnut production; temperature 92.7%, humidity 88.5%, hailstorm 87.7%, frequency of rain-fall 91.5%, timing of rain-fall 88.5%, and drought 88%. 22.9% to 49.5% answered the impact of environmental factors was very high. Majority of the respondents were aware of the diseases, weeds and insects' identification but unaware of their management practices. The majority of the respondents 92.2% were aware of the optimum time of sowing in April. The respondents used 1-2 ploughing only. 56.8% of the respondents adopted the erect seeding method, and 43.2% used spreading. The majority of the respondents 43.8% did not use any seed treatment, 37.0% used Topsin-M and 19.3% Benlate. 24.5% of the respondents had adopted hoeing 3-4 weeks after cultivation, 37.5% before flower germination, 12.5% applied both hoeing methods, and 25.5% did not use any hoeing process. 56.8% of the respondents had knowledge of R-R distance, and 49% knew P-P distance. 35.9% applied R-R distance, 6.7% used P-P distance, 13.1% used both, and 44.3% not used any method. 29.7% of the respondents knew 1st irrigation, and 11.8% practiced, 36% knew about 2nd irrigation and 14.6% practiced, 31.8% knew about 3rd irrigation and 17.7% practiced. The majority 66.1% of the respondents started digging before the maturity period. The majority of respondents 72.3% were not aware of the use of fungicides, 83.8% did not apply fungicides. The respondents 97.4% reported high inputs prices affect their production. The respondents had high institutional risks impact on their production like unavailability of infrastructure 90.1%, government policy on groundnut production 84.9% and 72.7% market distance from the farm.

**Key words:** Groundnut; Risk identification; Management; Chakwal.

## INTRODUCTION

Groundnut is known to be started in South America. In the 16th century, the Portuguese took them to the zone of Brazil, Western Africa and afterwards to South Western India. In the 17th era, the Dutch took them from Brazil to Indonesia. Groundnuts are presently developed in numerous tropical, sub-tropical and temperate nations, including Asia, North and South America (Ayub, 2005).

Groundnut is a significant summer crop. It contains 50% oil content, compared to 40% sunflower, 20% soybean, and 50% sesame. Some erect varieties grow to a height of one foot. It produces yellow plants and a complex underground shell with three to four edible seeds in each chamber. These are long, cylinder-shaped, and expand over the seed, which is valuable as a source of hydrogenated oil (Naeem-ud-Din et al., 2012)

In Pakistan, Groundnut is cultivated generally in rain fed (Barani areas) of Punjab and also in zones of the KPK and Sindh. Cultivated area under groundnut production is 81.5 thousand hectares with the average yield of 91.4 thousand tones (Malik, Javed, & Ayyaz, 2015). About

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87% of its production is in Rawalpindi division which consists on district Chakwal, Attock, Jhelum and Rawalpindi. Groundnut is an essential source of oil and protein. Its nut is rich in oil as well as protein (44 to 56 %). Its oil comprises around 22 % of linoleic acid and 61 % of oleic acid and is deliberated one of the greatest vegetable oil for domestic utilization. The region wise dispersion of groundnut crop demonstrated that around 85% zone in Punjab, 10 % in NWFP and 5 % in Sindh. (Akram, ÇELEN, & Naeem, 2020).

There are many abiotic and biotic stresses that effect groundnut production in Asia and Africa. The main diseases early and delayed leaf spot, rust and bacterial rot. Other major biotic stresses are insect pests (aphids, thrips. and jassids) and feeding insects (peanut leaf miner, red. furry caterpillar, and pod borers). High abiotic stresses are droughts, high temperatures and nutrient.(Javed, Iqbal, & Mateen, 2014). Increased temperatures due to climate change will affect crop growth and development flowering, pollen, or grain filling. (Craufurd, Prasad, Waliyar, & Taheri, 2006).

Pakistan's annual groundnut production is estimated at 100790 tons in 2018-19, with a per hectare dry pod yield of 800-1100 kg, which is relatively low compared to global production, like China's production is about 3897 kg per hectare. This was due to a lack of pre- and post-harvest management skills; crop productivity has been severely impacted by climate change, pest infestation, and conventional groundnut seed verities.(Ghosh, 2004) Early research mainly focused on single aspects like productivity, genetics, and protection. At the same time, this study also examined farmer's risk identification knowledge and skill level to better manage risks and enhance productivity.

## MATERIALS AND METHODS

### Study Area

This study was conducted in the district Chakwal of Division Rawalpindi. Chakwal contains five tehsils namely Chakwal, kallar kahar, Talagang, Lawa and Choa Saidan Shah and covers 68 union councils. It is situated in the north of Pakistan's Punjab Domain, not far from the nation's capital Islamabad. The entire area around the city is Pothwar plateau. The Chakwal district area is 6524 sp. Kilometers. Total populace of district Chakwal is 1.496 million according to the 2017 census (Mehmood, Rehman, & Khan, 2021). The district is located in the arid zoon and Jhelum in the east of Chakwal, Attock in the north-west, Mianwali in the west and Rawalpindi in the north of district Chakwal. Most of the local farming relies on rainfall. Some farmer use tube well and mini dam for irrigation.

### Population and Sampling

It was very hard to obtain data about the research from the entire district. Chakwal consisted of five tehsils out of which two tehsils Chakwal and Talagang were selected through simple random sampling (Table 1).

Four Union Councils were chosen from each Tehsil and 2 villages from each Union Council 12 respondents from certain village were carefully selected for making a sample size of 192 respondents (Table 2).

**Table 1:** Distribution of the respondents Based on Tehsil

| Tehsil | Frequency | Percent |
|---|---|---|
| Chakwal | 96 | 50.0 |
| Talagang | 96 | 50.0 |
| Total | 192 | 100.0 |

**Table 2:** Distribution of the respondents Based on Union Council and Villages

| Union Council | Village | Frequency |
|---|---|---|
| Kot Chaudury | Mool Wal | 12 |
| | Kot Chaudury | 12 |
| Bakari Kala | Mari | 12 |
| | Bakari Kala | 12 |
| Bal Kasar | Darabhi | 12 |
| | Bal Kasar | 12 |
| Karsal | Chavali | 12 |
| | Bhagval | 12 |
| Dhular | Dhular | 12 |
| | Mogla | 12 |
| Peera Fetehal | Choke Baza | 12 |
| | Peera Fetehal | 12 |
| Saghar | Bilal Abad | 12 |
| | Saghar | 12 |
| Bid-her | Bid-her | 12 |
| | Wan-har | 12 |
| | Total | 192 |

### Instrument for Data Collection

To obtain results about groundnut production questionnaire was prepared based on open and close ended queries. The schedule was organized in English. But questions asked to the respondents in their native language for their better understanding.

### Pre Testing

To access and authenticity of the interview program before the assembling of authentic data Pre testing is used. It is beneficial in a method in which queries are being inquired in order to catch maximum information. It also helps the investigator to discover and identify the rationality the rising complications in studied zone.

In order to guarantee the rationality of statistics interview schedule was pre tested on 10 erratically chosen farmers having just about same features as those of the definite farmers. Moreover, this testing was used as research mechanism.

### Analysis of Data

After assembling the data, it was statistically explored by Statistical Package for Social sciences (SPSS). Consequently, conclusions were given and recommendations were arranged.

### Limitation of Study

- The study was confined to District Chakwal.
- The consistency of responses was limited to the level of honesty of the respondent.
- The study also depended on the data provided by respondents.
- The study was restricted to knowledge and awareness level of the farmers about production of the groundnuts only.

### Problems Faced During the Data Collection

Numerous difficulties were confronted throughout the whole process of data gathering. It is a tough task

especially in studied area where mostly respondents were not so well educated. It was a hard assignment for the researcher to go to the villages and assemble data. Minority of the farmers were cautious about enquiring. They deliberated that this figures taken from them can be used contrary to them. So that it acquired so much time to clarify farmers about the nature of study but when they understood, they approved to offer the wanted information.

## RESULTS and DISCUSSION

This study aimed to examine the risks and management practices that affected the groundnut production of farmers in the Pothwar region of Punjab.

### Evaluate the Knowledge and Awareness of the Respondent About the Identification and Management of Various Risks in Groundnut Production

The objective of this research was to evaluate the knowledge and awareness of the respondent about the identification and management of various risks in groundnut. This study measured awareness about groundnut production, price & market, financial, human and personal, and institutional risks.

### Production Risks

Those risks that directly impacts on crop production is known as production risks. These risks are environmental, diseases, weeds, insect/pest and pre-post harvesting risks.

### Awareness of the Environmental Risks among the Respondents

Many risks affect the groundnut crops very severely. High temperatures, humidity, frequency of rain, hailstorm, floods and droughts destroy the crops.

The most farmers are familiar with these risks affecting their groundnut production except flood because Chakwal and Talagang are the arid region of the Pothwar platue. According to geographic status, there is less chance of flood in this region. The temperature was one of the main factors that affected groundnut production at 92.7%, and then the frequency of rainfall at 91.5%. other factors were 88.5% humidity, 87.7% hailstorm and 88% drought (Table 3).

The level of effectiveness of different factors were different.1.6% to 2.1% of the respondent answered that the impact was very low, 0.5% to 2.1% answered the impact was low, 6.8% to 19.3% responded that the impact was medium, 24.5% to 46.4% related to the answer high and 22.9 to 49.5 answered the impact was very high (Table 4).

### Awareness of the Diseases Risks among the Respondents

In this question, respondents were asked about knowledge about the identification and management of diseases.

The majority of the respondents were aware of the disease's identification, 74% leaf spot,61.4 wilts, and 77.1 root rot. But most farmers were unaware of management practices of 59.9% leaf spot, 49% wilt, and 76.1 root rot (Table 5). The (Sastry et al., 2019), also reported similar findings as those mentioned above that many farmers were unaware of disease control which caused a considerable impact in production.

**Table 3:** Awareness of the Environmental Risks among Respondents

| Environmental Factors | YES | | NO | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| Temperature | 178 | 92.7 | 14 | 7.3 |
| Humidity | 170 | 88.5 | 22 | 11.5 |
| Hailstorm | 168 | 87.7 | 24 | 12.5 |
| Frequency of Rainfall | 175 | 91.5 | 17 | 8.9 |
| Timing of Rainfall | 170 | 88.5 | 22 | 11.5 |
| Flood | 0 | 0 | 192 | 100 |
| Drought | 169 | 88 | 23 | 12 |
| Other | 0 | 0 | 192 | 100 |

F = Frequency, Y = Yes, N = No

### Awareness of the Weeds Risks among the Respondents

Weeds are plants that grow where they are not wanted or required. The next step is figuring out how to control the weeds when they have been identified. Crops can be protected from weeds, insects, and diseases. The most common way is chemical control, which involves applying chemicals like weedicide, fungicide, and other pesticides to protect the crop from insect pests and plant disease.

The respondents were aware in case of identification of weeds 88% finger grass, 86.5 foxtails, 79.7% deccan rice, and 75.5 grass spurge. But majority were unaware of management practices 80.7% grass spurge, 76.1% deccan rice, 53.6 foxtails, and 44.8% finger grass. Awareness of weed control was deficient between 19.3% to 55.2% (Table 6).

### Insect/Pests Risks Knowledge and Management of the Respondents

Insects/pests are tiny creatures harmful to humans, agriculture and livestock. These have a very destructive impact on crop production. Early steps should be taken to avoid significant crop yield loss.

The respondents were familiar with insects/pests risks identification. The 85.9% of the respondents were aware about termites, 84.4% chronogonus, 82.8% hairy caterpillar, and 81.8% cutworms respectively. The results showed that 74.5%, 72.9%, 53.6% and 42.7% farmer did not have knowledge about management practices of chronogonus, hairy caterpillar, cutworm, and termites respectively because most respondents were illiterate (Table 7).

### Awareness level of the respondents regarding Pre and Post-Harvesting Risks in Groundnut Production

Analyzing the level of production-related knowledge of groundnut producers was the objective of this study. This study assessed people's understanding of methods for growing, harvesting, and protecting groundnuts. Using recommended practices like seed rate, seed treatment, and land preparations can help a farmer produce more crops (Johnson & Subramanyam, 2009). While applying the necessary fertilizers helps the crop produce more. Groundnut yield is also affected by the irrigation system (Saifullah, Karim, & Ahmad-Yazid, 2014).

**Table 4:** Level of effectiveness of environmental factors

| Environmental Factors | None | | Very Low | | Low | | Medium | | High | | Very High | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | N% | F | VL% | F | L% | F | M% | F | H% | F | VH% |
| Temperature | 14 | 7.3 | 4 | 2.1 | 16 | 8.3 | 14 | 7.3 | 50 | 26 | 94 | 49 |
| Humidity | 22 | 11.5 | 1 | 0.5 | 8 | 4.2 | 19 | 9.9 | 47 | 24.5 | 95 | 49.5 |
| Hailstorm | 24 | 12.5 | 3 | 1.6 | 7 | 3.6 | 24 | 12.5 | 47 | 24.5 | 87 | 45.3 |
| Frequency of Rainfall | 17 | 8.9 | 1 | 0.5 | 8 | 4.2 | 28 | 14.6 | 89 | 46.4 | 49 | 25.5 |
| Timing of Rainfall | 22 | 11.5 | 3 | 1.6 | 5 | 2.6 | 13 | 6.8 | 78 | 40.6 | 71 | 37.0 |
| Flood | 192 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Drought | 23 | 12 | 3 | 1.6 | 4 | 2.1 | 37 | 19.3 | 81 | 42.2 | 44 | 22.9 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 5:** Awareness of the Diseases Risks among the respondents

| Diseases | | Knowledge | | | | Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| Name | Local Name | F | Y% | F | N% | F | Y% | F | N% |
| Leaf spot | Tika | 142 | 74 | 50 | 26 | 77 | 40.1 | 115 | 59.9 |
| Wilt | Murjow | 118 | 61.4 | 74 | 38.5 | 98 | 51 | 94 | 49 |
| Root rot | Jar ka galow | 148 | 77.1 | 44 | 22.9 | 46 | 23.9 | 146 | 76.1 |

F = Frequency, Y = Yes, N = No

**Table 6:** Awareness of the Weeds Risks among the respondents

| Weeds | | Knowledge | | | | Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| Name | Local Name | F | Y% | F | N% | F | Y% | F | N% |
| Finger grass | Jungligass | 170 | 88.5 | 22 | 11.5 | 106 | 55.2 | 86 | 44.8 |
| Foxtail | Lumargass | 166 | 86.5 | 26 | 13.5 | 89 | 46.4 | 103 | 53.6 |
| Deccan Rice | Swank | 153 | 79.7 | 39 | 20.3 | 46 | 23.9 | 146 | 76.1 |
| Grass Spurge | Dhodka | 145 | 75.5 | 47 | 24.5 | 37 | 19.3 | 155 | 80.7 |

F = Frequency, Y = Yes, N = No.

**Table 7:** Awareness of the insects/pests Risks among the respondents

| Insect/Pests | | Knowledge | | | | Management | | | |
|---|---|---|---|---|---|---|---|---|---|
| Name | Local Name | F | Y% | F | N% | F | Y% | F | N% |
| Termites | Demak | 165 | 85.9 | 27 | 14.1 | 110 | 57.3 | 82 | 42.7 |
| Cutworm | ChorKera | 157 | 81.8 | 35 | 18.2 | 89 | 46.4 | 103 | 53.6 |
| Hairy Caterpillar | BaaldarSundi | 159 | 82.8 | 33 | 17.2 | 52 | 27.1 | 140 | 72.9 |
| Chronogonus | Toka | 162 | 84.4 | 30 | 15.6 | 49 | 25.5 | 143 | 74.5 |

F = Frequency, Y = Yes, N = No

**Table 8:** Awareness the respondents about Sowing Time

| Sowing Time | Knowledge | | | | Adoption | |
|---|---|---|---|---|---|---|
| | F | Y% | F | N% | F | % |
| End March to End April | 192 | 100 | 0 | 0 | 121 | 63 |
| May and June | 135 | 70.3 | 57 | 29.7 | 24 | 12.5 |
| Optimum Time April | 177 | 92.2 | 15 | 7.8 | 47 | 24.5 |

F = Frequency, Y = Yes, N = No

**Table 9:** Ploughing Knowledge

| Ploughing | Knowledge | | | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| Deep Ploughing 2-3 times before Sowing | 139 | 72.4 | 53 | 27.6 |
| After rain 2-3 time with planking | 77 | 40.1 | 115 | 59.9 |

F = Frequency, Y = Yes, N = No

**Table 10:** Ploughing Adoption

| Ploughing | Adoption | | | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| Deep Ploughing 2-3 times before Sowing | 78 | 40.6 | 114 | 59.4 |
| After rain 2-3 time with planking | 61 | 31 | 131 | 69 |
| Ploughing 1-2 times only | 53 | 27.8 | 139 | 72.2 |
| Both A&B | 55 | 28.6 | 137 | 71.2 |

F = Frequency, Y = Yes, N = No

**Sowing Time Awareness**

Even though it is a non-monetary phase of crop production, sowing time is important. It is important to plant yield according to the agrarian advice because any change in sowing time can significantly affect crop yield (Benkova, Nenova, Simeonova, & Atanassova, 2020).

Results show the 100% of farmers were aware of the sowing period from March to the end of April, 70.3% were aware of the sowing time of May and June, and 92.2% aware of the optimum time of sowing in April. 63% of the respondents adopted sowing time end of March to the end of April, 24.5% in April, and 12.5% in May and June (Table 8).

**Ploughing Knowledge and Adoption**

The process of digging the land, bringing fresh nutrients to the upper layer, and burying down weeds and other leftovers of the crop to enhance nutrients in the soil.

Results showed 72.4% of respondents had knowledge of deep ploughing 2-3 times before sowing, and 40.1% of respondents had knowledge of ploughing after 2-3 times with planking (Table 9).

The results showed that 40.6% of respondents adopted deep ploughing 2-3 times before sowing and 31.0% of respondents knew ploughing after 2-3 times with planking, 28.6% applied both ploughing methods, and 27.8% of respondents used 1-2 ploughing only (Table 10).

**Seed Rate Knowledge and Adoption**

For better production of the crop selecting seed and seed rate is an important factor. If the seed rate is low, the yield of the crop decreases, and if the seed rate is high, the crop will bear a lack of oxygen supply and the germination process will slow down.

**Table 11:** Seed Rate Knowledge and Adoption

| Seed Rate | Knowledge | | | | Adoption | | | |
|---|---|---|---|---|---|---|---|---|
| | F | Y% | F | N% | F | Y% | F | N% |
| Erect 30-40kg/acre | 123 | 64.1 | 69 | 35.9 | 109 | 56.8 | 83 | 43.2 |
| Spreading 30-40kg/acre | 169 | 88 | 23 | 12 | 83 | 43.2 | 109 | 56.8 |

F = Frequency, Y = Yes, N = No

Data revealed that 64.1% respondents had knowledge of erect 30-40kg/acre, and 88% had knowledge of spreading 30-40kg/acre. 56.8% adopted the erect seeding method, and 43.2% used spreading (Table 11).

**Seed Treatment Knowledge and Adoption**

To avoid diseases, weeds and insects attack the treatment of seeds using recommended chemicals, which is an essential step in achieving optimal crop production. The findings show that most farmers knew about seed treatments, but the majority did not adopt seed treatments. Seeds that have been chemically treated and disease-free significantly increase the crop productivity.(Chand & Meena, 2011).

**Table 12:** Farmers Knowledge about Seed Treatment

| Seed Treatment | Knowledge | | | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| Topsin M | 139 | 72.4 | 53 | 27.6 |
| Benlate | 125 | 65.1 | 67 | 34.9 |

F = Frequency, Y = Yes, N = No

72.4% of farmers knew about chemical Topsin M, and 65.1 knew Benlate as a seed treatment due to workshops of pesticide dealers (Table 12).

**Table 13:** Farmers Adoption Seed Treatment

| Seed Treatment | Adoption | |
|---|---|---|
| | F | Y% |
| None | 84 | 43.8 |
| Topsin M | 71 | 37.0 |
| Benlate | 37 | 19.3 |

F = Frequency, Y = Yes

43.8% of the farmers did not use any seed treatment, 37.0% used Topsin M and 19.3% Benlate. Most farmers did not use seed treatment due to lack of sources, and others faced the unavailability of chemicals at the time of sowing (Table 13).

**Hoeing Knowledge and Adoption**

The hoeing method has a significant role throughout crop production process. It helps the crop get maximum nutrients from the soil and a maximum oxygen supply for the crop germination process.

**Table 14:** Farmer Knowledge about Hoeing

| Hoeing | Knowledge | | | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| 3-4 weeks after cultivation | 156 | 81.2 | 36 | 18.2 |
| Before flower germination | 106 | 55.2 | 86 | 44.8 |

F = Frequency, Y = Yes, N = No

Results indicated that 81.2% of respondents had knowledge of hoeing 3-4 weeks after cultivation, and 55.2% had knowledge before flower germination (Table 14).

**Table 15:** Farmers Hoeing Adoption Rate

| Hoeing | Adoption | |
|---|---|---|
| | F | Y% |
| 3-4 weeks after cultivation | 47 | 24.5 |
| Before flower germination | 72 | 37.5 |
| Both A&B | 24 | 12.5 |
| None | 49 | 25.5 |

F = Frequency, Y = Yes

The Table 15 results showed that 24.5% of respondents adopted hoeing 3-4 weeks after cultivation, 37.5% before flower germination, 12.5% applied both hoeing methods, and 25.5% did not use any hoeing process.

**Spacing Knowledge and Adoption**

The result showed that 56.8% of respondents had knowledge of Row to Row distance, and 49% had knowledge of Plant to Plant distance (Table 16).

**Table 16:** Farmers Knowledge about Spacing

| Spacing | Knowledge | | | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| R-R Distance (40-45cm) | 109 | 56.8 | 83 | 43.2 |
| P-P Distance (15-20cm) | 94 | 49 | 98 | 51 |

F = Frequency, Y = Yes, N = No

**Table 17:** Farmers Spacing Adoption

| Spacing | Adoption | |
|---|---|---|
| | F | Y% |
| R-R Distance (40-45cm) | 69 | 44.3 |
| P-P Distance (15-20cm) | 13 | 35.9 |
| Both A&B | 25 | 6.8 |
| None | 85 | 13 |

F = Frequency, Y = Yes,

35.9% farmers applied R-R distance, 6.7% used P-P distance, 13.1% used both and 44.3% not used any method (Table 17).

**Awareness of Fertilizer Application and Adoption among the Respondents**

The additional supplements applied to the soil raise nutrients to produce more yield. And farm yard manure is another substance that enhances crop production by providing essential elements to the crop. The **Table 18** results indicate that 100% of respondents knew about FYM and 90.1% used it on their land, 58.3% knew about Gypsum, and 35.9% adopted it. The dosage of recommended fertilizer application is specific for all varieties. To enhance the productivity of groundnuts, farmers should have applied recommended fertilizer dose for better production.

**Irrigation Application Knowledge**

Groundnut requires three irrigations in the whole period. But due to the water shortage in the pothwar region, farmers mainly depend on rainfall even though they have less knowledge about irrigation application. The results indicated that 29.7% farmer knew 1$^{st}$ irrigation and 11.8% practiced, 36% knew about 2$^{nd}$ irrigation and 14.6% practiced, 31.8% knew, and 17.7% practiced (Table 19). Farmers cannot adopt advanced technologies because most farmers are poor and cannot afford expensive methods.

**Table 18:** Respondents Awareness about Fertilizer Application and Adoption

| Fertilizer application | Knowledge | | | | Adoption | | | |
|---|---|---|---|---|---|---|---|---|
| | F | Y% | F | N% | F | Y% | F | N% |
| Farm Yard Manure | 192 | 100 | 0 | 0 | 173 | 90.1 | 19 | 9.9 |
| TSP ½ bag/acre | 139 | 72.4 | 53 | 27.6 | 89 | 46.4 | 103 | 53.6 |
| Potassium ½ bag/acre | | | | | | | | |
| Urea ½ bag/acre | 107 | 55.7 | 85 | 44.3 | 94 | 49 | 98 | 51 |
| SSP 3.5bag/acre | | | | | | | | |
| Potassium Sulphate ½ bag/acre | | | | | | | | |
| DAP ½ bag/acre | 155 | 80.7 | 37 | 19.3 | 115 | 59.9 | 77 | 40.1 |
| Potassium Sulphate ½ bag/acre | | | | | | | | |
| Gypsum 200kg/acre | 112 | 58.3 | 80 | 41.7 | 69 | 35.9 | 123 | 64.1 |

F = Frequency, Y = Yes, N = No

**Table 19:** Farmers Knowledge about Irrigation Application

| Irrigation Application | Knowledge | | | | Practices | | | |
|---|---|---|---|---|---|---|---|---|
| | F | Y% | F | N% | F | Y% | F | N% |
| 1st irrigation 2-3 weeks after sowing | 57 | 29.7 | 135 | 70.3 | 23 | 11.8 | 169 | 88.2 |
| 2nd irrigation on flowering | 70 | 36 | 122 | 64 | 28 | 14.6 | 164 | 85.4 |
| 3rd irrigation on seed germination | 61 | 31.8 | 131 | 68.2 | 34 | 17.7 | 158 | 83.3 |

F = Frequency, Y = Yes, N = No

**Harvesting Knowledge and Adoption**

The optimum time for harvesting groundnut is when 70-75% of pods mature, but most farmers started digging before 70% mature. Early digging is one of the main reasons for less productivity of groundnut crops. Because crops depend on weather conditions, the prescribed time for harvesting is not always fixed.

**Table 20:** Farmers Knowledge about Harvesting Time

| Harvesting | Knowledge | | | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| Start digging when 70-75% mature | 156 | 81.2 | 36 | 18.8 |
| Late Nov to Dec | 148 | 77.1 | 44 | 22.9 |

F = Frequency, Y = Yes, N = No

Data in the Table 20 above indicated that farmers aware about harvesting time. The 81.2% farmer knows digging 70-75% mature, and 77.1 late Nov to Dec.

**Table 21.** Farmers Adoption about Harvesting Time

| Harvesting | Adoption | |
|---|---|---|
| | F | Y% |
| Start digging when 70-75% mature | 46 | 24 |
| Late Nov to Dec | 19 | 9.9 |
| Before 70% pod mature | 127 | 66.1 |

F = Frequency, Y = Yes

The **Table 21** explained that 66.1% of the farmers started digging before the maturity period, 46% started digging when 70-75% matured, and 9.9% harvested from late Nov to Dec.

**Post Harvesting Knowledge and Adopoton**

Post-harvesting is a technique of handling of crop production after being harvest. It includes all the process of cooling, cleaning, packaging, and storage of the yield.

**Table 22:** Awareness of Harvesting Among the Respondents

| Post-Harvesting | Knowledge | | | | Adoption | | | |
|---|---|---|---|---|---|---|---|---|
| | F | Y% | F | N% | F | Y% | F | N% |
| Place grain in Sunlight for 1 week | 163 | 84.9 | 29 | 15.1 | 129 | 67.2 | 63 | 32.8 |
| Use of fungicides | 53 | 27.3 | 139 | 72.3 | 31 | 16.2 | 161 | 83.8 |
| Use Dried Neem (48 hours) | 149 | 77.6 | 22.4 | 32.8 | 91 | 47.4 | 101 | 52.6 |

F = Frequency, Y = Yes, N = No

The results of the post-harvesting survey reveal that while the majority of respondents 72.3% were not aware of the use of fungicides, 83.8% did not apply fungicides, 84.9% of respondents were aware of the methods of storing grain after drying and placing it in the sun for a week, 67.2% used sunlight method, and 47.4% sealed the store for 48 hours with dried neem (Table 22).

**Awareness of Price, Financial, and Personal Risks and their Level of Effectiveness**

Other than harvesting and post-harvesting risks, numerous other risks can affect the productivity of the groundnut. It includes the high price of the inputs, low price of crop production, and the respondents' financial situation, as we knew that most of the farmers in the countryside are poor and have limited sources of income. Personal health is also a factor that can affect crop production.

The Table 23 showed level of effectiveness of different factors was different. 57.3% to 0.5% of the respondent answered that the effect was very high, 35.9% to 12.5% answered the effect was high, 21.9% to 13.5% responded that the effect was medium, 19.8% to 1.6% relate to the answer low, and 0.5% to 26.6 answered the effect was very low.

**Institutional Risks and their Level of Effectiveness**

One significant institutional risk was EFS attitude towards farmers in promoting groundnuts and capacity building. As the Table 24 showed, 91.1% responded to the effect of Extension Field Staff attitude towards farmars,

**Table 23:** Level of Effectiveness Price, Financial, and Personal Risks

| Factors | Yes | | No | | None | | Very Low | | Low | | Medium | | High | | Very High | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | Y% | F | N% | F | N% | F | VL% | F | L% | F | M% | F | H% | F | VH% |
| High input price | 187 | 97.4 | 5 | 2.6 | 5 | 2.6 | 1 | 0.5 | 3 | 1.6 | 19 | 9.9 | 54 | 28.1 | 110 | 57.3 |
| Low output price | 179 | 93.2 | 13 | 6.8 | 13 | 6.8 | 3 | 1.6 | 13 | 6.8 | 29 | 15.1 | 69 | 35.9 | 65 | 33.9 |
| Lack of Income | 173 | 90.1 | 19 | 9.9 | 19 | 9.9 | 4 | 2.1 | 16 | 8.3 | 42 | 21.9 | 66 | 34.4 | 45 | 23.4 |
| Debt | 157 | 81.7 | 35 | 18.3 | 35 | 18.2 | 32 | 16.7 | 14 | 7.3 | 39 | 20.3 | 47 | 24.5 | 25 | 13 |
| Illness | 175 | 91.1 | 17 | 8.9 | 17 | 8.9 | 32 | 16.7 | 37 | 19.3 | 36 | 18.8 | 45 | 23.4 | 25 | 13 |
| Personal motivation | 94 | 49 | 98 | 51 | 98 | 51 | 24 | 12.5 | 15 | 7.8 | 26 | 13.5 | 24 | 12.5 | 5 | 2.6 |
| Lack of labor force | 183 | 95.3 | 9 | 4.7 | 9 | 4.7 | 41 | 21.4 | 16 | 8.3 | 40 | 20.8 | 67 | 34.9 | 19 | 9.9 |
| Personal Crises | 166 | 86.5 | 26 | 13.5 | 26 | 13.5 | 32 | 16.7 | 18 | 9.4 | 41 | 21.4 | 60 | 31.2 | 15 | 7.8 |
| Family issues | 146 | 76 | 46 | 24 | 46 | 24 | 51 | 26.6 | 38 | 19.8 | 32 | 16.7 | 24 | 12.5 | 1 | 0.5 |

F = Frequency, Y = Yes, N= No, Scale: N=None, VL=Very low, L=Low, M=Medium, H=High, VH= Very high

**Table 24:** Institution Risks Knowledge among the Respondents

| Institutional Risks | Yes | | No | |
|---|---|---|---|---|
| | F | Y% | F | N% |
| Unavailability of infrastructure | 173 | 90.1 | 19 | 9.9 |
| Govt. Policy on groundnut production | 163 | 84.9 | 29 | 15.1 |
| EFS Attitude towards farmer in promoting groundnuts | 175 | 91.1 | 17 | 8.9 |
| Market Distance from farm | 140 | 72.7 | 52 | 27.3 |

F = Frequency, Y = Yes, N = No

**Table 25:** Level of Effectiveness of Institution Risks

| Institutional Risks | None | | Very Low | | Low | | Medium | | High | | Very High | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | N% | F | VL% | F | L% | F | M% | F | H% | F | VH% |
| Unavailability of infrastructure | 19 | 9.9 | 28 | 14.6 | 29 | 15.1 | 36 | 18.8 | 55 | 28.6 | 25 | 13 |
| Govt. Policy on groundnut production | 29 | 15.1 | 20 | 10.4 | 26 | 13.5 | 28 | 14.6 | 61 | 31.8 | 28 | 14.6 |
| EFS Attitude towards farmer in promoting groundnuts | 17 | 8.9 | 16 | 8.3 | 13 | 6.8 | 25 | 13 | 56 | 29.2 | 65 | 33.9 |
| Market Distance from farm | 52 | 27.1 | 22 | 11.5 | 45 | 23.4 | 28 | 14.6 | 33 | 17.2 | 12 | 6.2 |

F = Frequency, N=None, VL=Very low, L=Low, M=Medium, H=High, VH= Very high

**Table 26:** Extension Field Staff Awareness and Guidance about Parameters to the Respondents

| Parameters | Knowledge | | | | Guidance | | | |
|---|---|---|---|---|---|---|---|---|
| Name | F | Y% | F | N% | F | Y% | F | N% |
| Varieties | 153 | 79.7 | 39 | 20.3 | 82 | 42.7 | 110 | 57.3 |
| Sowing time | 145 | 75.5 | 47 | 24.5 | 63 | 32.8 | 129 | 67.2 |
| Land Preparation | 69 | 35.9 | 123 | 64.1 | 55 | 28.7 | 137 | 71.3 |
| Planting Method | 117 | 60.9 | 75 | 39.1 | 70 | 36.5 | 122 | 63.5 |
| Spacing | 106 | 55.4 | 86 | 44.7 | 41 | 21.4 | 151 | 78.6 |
| Fertilizer application | 129 | 67.2 | 63 | 32.8 | 47 | 24.5 | 145 | 75.5 |
| Irrigation application | 85 | 44.3 | 107 | 55.7 | 28 | 14.6 | 164 | 85.4 |
| Weeds management | 138 | 71.9 | 54 | 28.1 | 37 | 19.3 | 155 | 80.7 |
| Insect/pests management | 127 | 66.1 | 65 | 33.9 | 50 | 26.1 | 142 | 73.9 |
| Diseases management | 71 | 37 | 121 | 63 | 19 | 9.9 | 173 | 90.1 |
| Harvesting | 134 | 69.8 | 58 | 30.2 | 87 | 45.3 | 105 | 54.7 |
| Environmental Risks | 91 | 47.4 | 101 | 52.6 | 32 | 16.7 | 160 | 83.3 |
| Storage Management | 116 | 60.4 | 76 | 39.6 | 84 | 43.7 | 108 | 56.3 |
| Market Risks | 107 | 55.7 | 85 | 44.3 | 33 | 17.2 | 159 | 82.8 |

F = Frequency, Y = Yes, N = No.

90.1% of unavailability of infrastructure, 84.9% of government policy on groundnut production and 72.7% market distance from the farm.

The Table 25 Show level of effectiveness of different factors. 33.9% to 6.2% of the respondent answered that the effect was very high, 31.8% to 17.2% answered the effect was high, 18.8% to 13.0% responded that the effect was medium, 6.8% to 13.5% relate to the answer low, and 8.3% to 14.6 answered the effect was very low.

**Awareness of Extension Field Staff about Production Parameters and Guidance to the Respondents**

The **Table 26** data indicate that farmers did not get proper guidance from the extension field staff to understand risks during groundnut production better. Farmers had a very high guidance gap about disease management (90%), irrigation application (85.4), environment risks (83.3%), market risks (82.8%) and weeds management 80.7%. Farmers had a high guidance gap about spacing (78.6%), fertilizer application (75.5%), insects/pests management (73.9%) and land preparation (71,3%). Planting and sowing had less guideline gap of 67.2% and 63.5%, respectively.

**Conclusion**

Temperature, humidity and hailstorm were the major environmental risks affecting respondents crop production. Majority of the respondents knew production technologies but lacked management skills regarding diseases, weeds, and insects/pests management. In pre-harvesting, most farmers lacked management knowledge about land preparation, seed rate, seed treatment, hoeing, spacing, fertilizer applications, irrigation, and harvesting. Due to the lack of management of these risks in production technologies, groundnut production was affected badly.

High inputs prices, low output prices, lack of income and labor force, debt, personal crises, unavailability of infrastructure, and extension field staff attitude towards farmers were those major risks that had a high negative impact on groundnut production.

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