



# Package of practices of few selected crops suitable for rice-based cropping system



অসম চৰকাৰ



GOVERNMENT OF ASSAM



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Assam Rural Infrastructure and Agricultural Services Society





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## **First Edition 2022**

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## Rice-based cropping systems

Cropping system, an important component of a farming system, represents a cropping pattern used on a farm and its interaction with farm resources, other farm enterprises and available technology, which determine its make-up. It is defined as the order in which different crops are grown on a piece of land over a fixed period. In the cropping system, sometimes a number of crops are grown together, or separately at short intervals in sequence on the same field. The objective of any cropping system is efficient utilization of all resources *viz.*, land, water and solar radiation, maintaining stability in production and obtaining higher net return. The efficiency is measured by quantity of produce obtained per unit resource in a unit time.

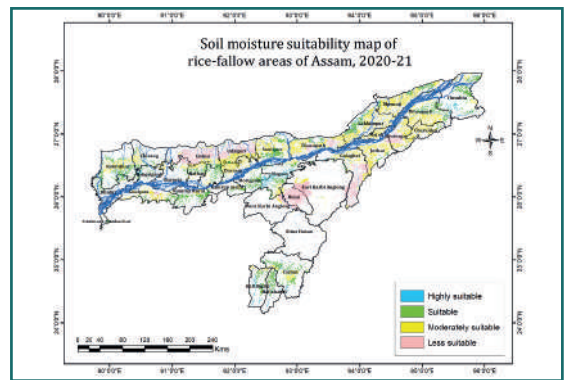
For the characterization of existing cropping systems of Assam, Assam Agricultural University of (AAU) with the technical support of International Rice Research Institute (IRRI) under APART, has used geospatial technologies (Remote Sensing and Geographical Information System) to create cropping system, cropping intensity, rice area, rice-fallow area and soil moisture suitability maps using satellite images. Rice-

fallow areas with suitable soil moisture can be targeted to bring a significant increase in agricultural outputs in low productivity areas and enhance system productivity.

Under APART, AAU with the technical support from IRRI, carried out field testing demonstrations at few representative sites of specific rice environments to test four innovative cropping systems including stress-tolerant rice cultivars. These cropping systems are **Rice-Green pea**, **Rice-Mustard**, **Rice-Potato** and **Rice-Lentil**. These cropping systems will help in increasing the net income of the farmers, and in the long run one of the cropping systems having highest return and system productivity can be adopted. Based on the availability of soil moisture, a total rice-fallow area of 100 ha each year was selected in few districts in different years for **Blackgram** and **Maize** demonstrations during *rabi* season. The primary objective was to increase the cropping intensity in areas where farmers are cultivating a single crop during the *kharif* season. In this booklet, the package of practices of these selected crops are included which can be cultivated in rice-based cropping system.



Maize sowing in rice-fallow areas at Sivasagar district of Assam



Soil moisture suitability in rice-fallow areas of Assam

## Green Pea (*Pisum sativum L*)

Pea is one of the important crops grown in Assam. This crop can be targeted for increasing the cropping intensity in the areas where farmers are not practicing any crop after harvesting of the *Sali* season rice crop. There are many high-yielding, short-duration varieties which can be easily grown in these

areas by using previous season moisture available in the soil.

**Varieties:** The green pea variety Kashi Nandini is suitable for north and eastern plains. The variety is resistant to leaf miner and pod borer. The specific characteristics of the variety are given in the table below.

### Characteristics of green pea variety for summer season

| Crop/variety  | Shelling percentage | Yield (q/ha) | Maturity | Disease resistance                    |
|---------------|---------------------|--------------|----------|---------------------------------------|
| Kashi Nandini | 47-48               | 110-120      | Early    | Resistant to leaf miner and pod borer |

**Time of sowing:** The optimum sowing time for green pea is from mid-January to February

**Soil type:** Peas can be grown on a variety of soils; well drained light soils are suitable.

**Land selection:** Well drained sandy loam soil is to be selected. Field should never be water-logged. After soil test to bring pH around 6.0, requisite quantity of lime is to be applied at least 2-3 weeks before sowing.

**Field preparation:** Peas generally require reasonably deeply worked soils. The field is to be ploughed 3 to 4 times to obtain a good tilth. Field preparation is not required in zero tillage sowing.

**Seed treatment:** Seeds are to be treated with benomyl @ 2 g/kg seeds.

**Fertilizer management:** FYM @ 4.5 t/ha (6 q/bigha) should be applied at the time of field preparation.

| Nutrient                      | Requirement (kg/ha) | Source of fertilizer | Fertilizer requirement |          |
|-------------------------------|---------------------|----------------------|------------------------|----------|
|                               |                     |                      | kg/ha                  | kg/bigha |
| N                             | 20                  | Urea                 | 4.5                    | 0.6      |
| P <sub>2</sub> O <sub>5</sub> | 46                  | DAP                  | 100                    | 13       |
| K <sub>2</sub> O              | 0                   | MOP                  |                        |          |



**Seed inoculation with Rhizobium:** The seed should be inoculated with Rhizobium culture using either of Shillongani, Ahatguri, Kamalabari or any other suitable strain @ 50 g/kg of seeds. Seeds should be moistened carefully with clean water to avoid excessive wetting. Rhizobium culture is mixed with seeds so that a thin layer of inoculum is deposited as the seed-coat. Treated seeds should be dried in shade, and not exposed to direct sunlight.

**Seed rate, spacing and method of sowing:** The crop should preferably be sown in lines 30 cm apart by seed-drill using a seed rate of 75 kg/ha or 10 kg/bigha. The plant-to-

plant distance should ideally be maintained at 10 cm.

**Weed Control:** Fluchloralin 45% EC @ 1.5 kg a.i./ha as pre-emergence check one day before sowing should be incorporated into the soil with light hoeing.

**Irrigation:** If required and available, one irrigation should be given at 40-50 days of sowing.

**Intercultural operations:** One weeding at 20–25 days after sowing needs to be done. Alternatively, apply Atrazine @ 0.5 - 1.0 kg a.i./ha as pre-emergence herbicide *i.e.* 2-3 days after sowing. For better efficiency of weedicide, the field should be moist and clod-free.

### Plant protection: Insect pests

| Insect-pests | Fungicide/ Insecticide  | Dose      |
|--------------|-------------------------|-----------|
| Aphids       | Thiamethoxam 25% WG     | 100 gm/ha |
| Pod borer    | Flubendiamide 39.35% SC | 100 gm/ha |

**Harvesting:** Harvesting should be done when the pods are green and fully filled with grains at frequent intervals.

**Protection against storage pests:** Properly dried seeds of pea should be mixed thoroughly

with black pepper powder @ 3g/kg of seed for protection against bruchid infestation during storage. Treated seeds should be kept in super bag with outer covering of gunny bags.

## Lentil (*Lens culinaris*)

It is a valuable human food, mostly consumed for its edible seeds after cooking. In Indian sub-continent lentil is mostly consumed as 'Dal' after removal of outer skin and separation of cotyledons, snacks and soup preparation, *etc.* It is easy to cook and easily digestible with high biological value, hence also recommended to patients. Dry leaves, stems, empty and broken pods are used as valuable cattle feed. Lentil

is one of the important pulse crops grown in Assam. This crop can be targeted for increasing the cropping intensity in the areas where farmers are not practicing any crop after harvesting of the *Sali* season rice crop. There are many high-yielding, short-duration varieties which can be easily grown in these areas by using previous season moisture available in the soil.

### Nutritive value

|                           |                                  |
|---------------------------|----------------------------------|
| Protein - 24-26%          | Iron - 7 mg /100 g               |
| Carbohydrate - 57-60%     | Vitamin C - 10-15 mg/100 g       |
| Fat - 1.3%                | Calcium - 69 mg/100g             |
| Fibre - 3.2%              | Calorific value - 343 Kcal/100 g |
| Phosphorus - 300 mg/100 g | Vitamin A - (450 IU)             |

**Varieties:** The lentil variety WBL 77 is suitable for North-East Plain Zones and resistant to rust. The other varieties for Assam are PL 406, HUL 57, Axom Masur 1 (SL-2-24) and Axom Masur 2 (SL 2-28) with

their specific characteristics are given in the table below. The specific characters of other two varieties recommended for Assam are also given in the table below.

**Characteristics of lentil varieties for summer season**

| Crop/variety           | Yield (q/ha) | Days to maturity |
|------------------------|--------------|------------------|
| WBL 77                 | 18-20        | 118-120          |
| PL 406                 | 10-12        | 120-125          |
| HUL 57                 | 12-14        | 112-115          |
| Axom Masur 1 (SL 2-24) | 12-14        | 115-120          |
| Axom Masur 2 (SL 2-28) | 12-14        | 115-120          |

**Sowing time:** The optimum sowing time for lentil is from mid-October to mid-November.

**Soil type:** Loam or silty loam is preferable.

**Land selection:** Well drained sandy loam soil is to be selected. Field should never be water-logged.

**Field preparation:** The field is to be ploughed 3-4 times to obtain a good tilth. Field preparation is not required in zero tillage sowing.

**Seed treatment:** Seeds are to be treated with Carboxin @ 2 g/kg seeds.

**Seed inoculation with Rhizobium:** Seed should be inoculated with Rhizobium and PSB each @ 50g/kg seed.

**Seed rate, spacing and method of sowing:** The crop should preferably be sown in lines by seed-drill using a seed rate of 30 kg/ha or 4 kg/bigha. The row spacing of 25 cm and seed to seed spacing of 5-7 cm is maintained for higher yields.

**Fertilizer Management:** FYM @ 4.5 t/ha (6 q/bigha) should be applied at the time of field preparation.





| Nutrient                      | Requirement (kg/ha) | Source of fertilizer | Fertilizer requirement |          |
|-------------------------------|---------------------|----------------------|------------------------|----------|
|                               |                     |                      | kg/ha                  | kg/bigha |
| N                             | 15                  | Urea                 | 15                     | 2.0      |
| P <sub>2</sub> O <sub>5</sub> | 20                  | DAP                  | 43                     | 5.8      |
| K <sub>2</sub> O              | 15                  | MOP                  | 25                     | 3.3      |

**Foliar spray:** Two foliar sprays of 2% urea at branching (35 DAS) and pod formation (75 DAS) stages may be done.

**Intercultural operations:** Two weedings at 20 and 30 DAS or apply Oxfluorofen @ 150 g a.i./ha as pre-emergence herbicide followed

by one hand weeding at 20 DAS.

**Irrigation:** If necessary and available, one light irrigation is to be given during the pod filling stage.

**Plant protection:**

| Disease/ Insect pest | Fungicide/ Insecticide  | Dose              |
|----------------------|-------------------------|-------------------|
| Pod borer            | Flubendiamide 39.35% SC | 100 g/ha          |
| Stem rot/Blight      | Chlorothalonil 75 % WP  | 1-2 g/litre water |
| Ascochyta blight     | Chlorothalonil 75 % WP  | 1-2 g/litre water |

**Harvesting:** Harvesting should be done when 75-80% of the pods turn yellow.

**Protection against storage pests:** Properly dried seeds of lentil should be mixed thoroughly

with black pepper powder @ 3g/kg of seed for protection against bruchid infestation during storage. Treated seeds should be kept in super bag with outer covering of gunny bags.

## Summer Maize (*Zea mays*)

Maize is one of the important crops grown in Assam. This crop can be targeted for increasing the cropping intensity in the areas where farmers are not practicing any crop after harvesting of the *Sali* season rice crop. There are many high-yielding, short-duration varieties which can be easily grown in these areas by using previous

season moisture available in the soil.

**Varieties:** The Ganga-5 is suitable for north and eastern plains. The variety is resistant to leaf blight, brown strip, downy mildew, stem borer and drought. The specific characteristics of different varieties are given in the table below .

### Characteristics of maize varieties for summer season.

| Crop/variety       | Yield (q/ha) | Days to maturity | Resistance  |
|--------------------|--------------|------------------|---|
| Ganga-5            | 48           | 110-120          | Resistant to leaf blight, brown strip, downy mildew, stem borer and drought |
| Bio 9637(Maharaja) | 65           | 85-95            | -   |
| Bio 9544           | 73           | 90-110           | Drought resistant   |

**Sowing time:** The optimum sowing time for maize is from mid-January to February.

**Soil type:** Maize can be grown on a wide range of soils, but well-drained sandy-loam soils are most preferable.

**Land selection:** Leveled lands are preferred and field should never be water-logged.

**Field preparation:** Field should be ploughed thoroughly to obtain a deep, fine and firm tilth. Laddering should be done properly for leveling

as well as to conserve moisture in the soil. Field preparation is not required in zero tillage sowing.

**Seed treatment:** Seeds are to be treated with Carboxin @ 2 g/kg seeds.

**Fertilizer management:** FYM @ 4.5 t/ha (6 q/bigha) should be applied at the time of field preparation. Whole of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O and half of N are to be applied in the furrows

before sowing. The remaining quantity of N is to be topdressed at 30 days after emergence of seedlings. Where irrigation facilities are available, N should be applied in 3 split doses, one fourth, half and one fourth at sowing, 30 days after seedling emergence (knee-high stage) and at the time of silking, respectively. Placement of fertilizer is more effective than broadcasting.

| Nutrient                      | Requirement (kg/ha) | Source of fertilizer | Fertilizer requirement |          |
|-------------------------------|---------------------|----------------------|------------------------|----------|
|                               |                     |                      | kg/ha                  | kg/bigha |
| N                             | 60                  | Urea                 | 96                     | 13       |
| P <sub>2</sub> O <sub>5</sub> | 40                  | DAP                  | 87                     | 11.6     |
| K <sub>2</sub> O              | 40                  | MOP                  | 67                     | 8.3      |

**Seed rate, spacing and method of sowing:**

The crop should preferably be sown in lines 60 cm apart by seed-drill using a seed rate of 24 kg/ha or 3.2 kg/bigha. The plant-to-plant distance should ideally be maintained at 25 cm. In broadcast sown crop, slightly higher seed rate (27 kg/ha or 3.6 kg/bigha) is used. Seeds are to be dibbled in lines at a

spacing of 60 cm × 25 cm to maintain a plant population of around 60,000 to 65,000/ha.

**Intercultural operations:** One weeding at 20-25 days after sowing needs to be done or apply Atrazine @ 0.5 - 1.0 kg a.i./ha as pre-emergence *i.e.* 2-3 days after sowing. For better efficiency of weedicide, the field should be moist and clod-free.

**Plant protection: Insect-pests:**

| Plant Protection Disease/insect-pests | Fungicide/ Insecticide   | Dose     |
|---------------------------------------|--------------------------|----------|
| Fall armyworm                         | Thiamethoxam 25 WG       | 100 g/ha |
| Stem borer                            | Emamectin benzoate 5% SG | 220 g/ha |

**Harvesting:** Cobs are harvested when the husk cover turns pale yellow. This does not necessarily coincide with complete drying of the plant, and therefore, one should not wait

till the plant becomes bone dry. It should not be harvested immediately after a shower. The harvested ears should be sun dried before shelling.



## Mustard (*Brassica campestris*)- (*Brassica juncea*)

Mustard is one of the important oilseed crops in Assam. This crop can be targeted for increasing the cropping intensity in the areas where farmers are not practicing any crop after harvesting of the *Sali* season rice crop. There are many high yielding short-duration varieties which can be easily grown in these areas by using previous season moisture

available in the soil.

**Varieties:** The mustard variety NRCHB 101 is suitable for both irrigated and rainfed conditions. Moderately resistant to *Alternaria* blight and tolerant to Ahipds. The specific characters of the variety are given in the table below.

### Characteristics of mustard varieties for summer season

| Crop/variety | Yield (q/ha) | Days to maturity | Oil content  | Remarks   |
|--------------|--------------|------------------|--------------|---|
| NRCHB 101    | 13.8-14.9    | 105-135 (108)    | 34.6- 42.1 % | Suitable for late sown irrigated and rainfed conditions                 |
| DRMR 150-35  | 18           | 86-140 (114)     | 39.8 %       | Early maturity, tolerant to Powdery mildew and <i>Alternaria</i> blight |

**Time of sowing:** The optimum sowing time for mustard is from 1st week of November to end of November for different varieties.

**Soil type:** Mustard generally do well in sandy soils. However, other light soils are also equally good.

**Land selection:** Well drained sandy loam soil is to be selected. Field should never be water-logged.

**Field preparation:** The field should be ploughed 4-6 times followed by laddering in order to obtain a fine tilth. Field preparation is not required in zero tillage sowing.

**Seed treatment:** Seed treatment with Metalaxyl<sup>1</sup> 35 WS @ 6 g/kg of seed is recommended for eliminating downy mildew and white rust.

| Nutrient                      | Requirement (kg/ha) | Form   | Fertilizer requirement |          |
|-------------------------------|---------------------|--------|------------------------|----------|
|                               |                     |        | kg/ha                  | kg/bigha |
| N                             | 80                  | Urea   | 140                    | 18.6     |
| P <sub>2</sub> O <sub>5</sub> | 40                  | DAP    | 87                     | 11.6     |
| K <sub>2</sub> O              | 30                  | MOP    | 50                     | 6.7      |
| B                             | -                   | Borax  | 7.5                    | 1        |
| S                             | 20                  | Gypsum | 133                    | 17.7     |

**Fertilizer management:** Application of FYM or compost @ 2-3 t/ha is beneficial for the crop.

**Foliar spray:** Two foliar applications of 2% urea at flowering and pod filling.

**Seed rate, spacing and method of sowing:** The crop should preferably be sown in lines 60 cm apart by seed-drill using a seed rate of 7.5 kg/ha or 1 kg/bigha. The seeds are to be

sown in line at a spacing of 60 cm between rows and 5-7 cm from seed to seed.

**Intercultural operations:** Normally no weeding is required. Whenever necessary, one weeding at 15-20 days after sowing is sufficient to keep the field weed-free.

**Irrigation:** Irrigation of 6 cm depth of water may be applied either at 50% flowering or at

early siliqua formation stage. For moisture conservation after *Sali* rice one cross ploughing with power tiller, incorporating rice stubbles need to be done. In medium

textured soils field capacity 23-25%, soil moisture at the time of land preparation around 22.5% should be available.

**Plant protection: Insect-pests**

|                   | Fungicide/ Insecticide | Dose             |
|-------------------|------------------------|------------------|
| Saw fly           | Ethofenprox 10% EC     | 500 ml/ha        |
| White fly, Aphids | Buprofezin 25% EC      | 500 ml/ha        |
|                   | Thiamethoxam 25% WG    | 100 g/ha         |
| Alternaria blight | Iprodione 50% WP       | 5-6 g/L of water |

**Bee pollination:** For enhancing yield through increased pollination, 5 honey bee colonies/ ha are recommended in rapeseed-mustard.

is harvested by uprooting whole plants or cutting by sickle.

**Harvesting:** The crop is ready for harvest when 75-80% siliquae turn yellow. The crop

**Protection against storage pests:** Properly dried seeds of mustard should be kept in super bag with outer covering of gunny bags for safe storage.



## Potato (*Solanum tuberosum*)

Potato is one of the important crops in Assam. This crop can be targeted for increasing the cropping intensity in the areas where farmers are not practicing any crop after harvesting of the *Sali* season rice crop. There are many high-yielding, short-duration varieties which can be easily grown in these areas by using previous season

moisture available in the soil.

**Varieties:** The potato variety Kufri Pukhraj is suitable for north and eastern plains. The variety is resistant to rust and tolerant to wilt. The specific characteristics of the suitable varieties are given in the table below.

### Characteristics of potato varieties for summer season

| Crop/variety       | Yield (q/ha) | Days to maturity | Disease resistance  |
|--------------------|--------------|------------------|---|
| Kufri Pukhraj      | 350-400      | 70-90            | Resistant to early blight, moderately resistant to late blight and immune to wart |
| Kufri Jyoti        | 300          | 90-100           | Moderately resistant to late and early blight and resistant to wart.              |
| Kufri Chandramukhi | 150-160      | 80-100           | Tolerant to leaf roll and Potato Virus Y (PVY)                                    |

**Time of Sowing:** The optimum sowing time for potato is from mid-November to Mid-December.

**Soil type:** Well drained sandy loam and loam soils, rich in organic matter are suitable.

**Land selection:** Field should be thoroughly

ploughed to obtain a good tilth. It should be leveled for uniform distribution of irrigation water or to maintain soil moisture uniformly under rainfed situations. The furrows should be prepared at 50 cm apart. No field preparation required in zero tillage sowing.



**Method of planting:** The sprouted tubers should be planted in furrows with sprouts facing upward. Care should be taken to avoid sprout damage handling the tubers.

**Seed selection:** Virus-free, healthy, medium-sized sprouted tubers are to be selected for planting. Ideal size is about 2.5 cm of diameter (25-40 g). Bigger-sized tubers may be cut into pieces longitudinally with 2-3 eyes in each piece.

**Seed sources:** Certified seeds of the recommended varieties are to be procured from govt. or other recognized agencies.

**Seed treatment:** In case of cut seeds, the pieces are to be dipped in Monceren @ 1 g per kg tuber for black scurf and stem canker (dry or flowable seed dressing). Benomyl 0.1% solution may be used if other chemicals

are not readily available. After treatment, the seeds are to be spread thinly and dried under shade for 48 hours, or should be covered with moist gunny bags for 2-3 days for suberization.

**Seed rate:** The seed requirement is 22.5-25 q/ha when the tubers are about 2.5 cm in diameter (about 25 g) and planted with an intra-row spacing of 15 cm. Intra-row spacing is increased when bigger-sized tubers are used.

**Fertilizer management:** Ten tonnes or 5 truck loads or 20 cart loads of well decomposed FYM should be applied per hectare in the furrows before planting.

**Foliar spray:** Two foliar applications of 19:19:19 N:P: K and 13:00:45 N:P: K.

| Nutrient                      | Requirement (kg/ha) | Source of fertilizer | Fertilizer requirement |          |
|-------------------------------|---------------------|----------------------|------------------------|----------|
|                               |                     |                      | kg/ha                  | kg/bigha |
| N                             | 60                  | Urea                 | 45                     | 6.0      |
| P <sub>2</sub> O <sub>5</sub> | 100                 | DAP                  | 217                    | 29       |
| K <sub>2</sub> O              | 100                 | MOP                  | 167                    | 22       |

**Seed rate, spacing and method of sowing:** The crop should preferably be sown in lines, using a seed rate of 300-330 kg/bigha. The seeds are to be sown in line at a spacing of 70 cm between beds and 20-25 cm from seed to seed.

**Intercultural operations:** Earthing up is to be done just before first and second irrigation. Under rainfed conditions, this should be done at stolon and tuber formation stages. One or two intercultural operations may be necessary when weed infestation is high. Apply Metribuzin @ 0.75 kg/ha.

**Plant protection:**

**Insect-pests & disease:**

**Irrigation:** The furrow method of irrigation has to be adopted. Three irrigations should be applied, first at 25 days (stolon formation stage), second at 60 days (tuber formation stage) and third at 80 days (tuber development stage) after emergence of sprouts. In case of application of mulching materials in furrows, only two irrigations are to be applied at 25 and 60 days after emergence of sprouts. At the time of application of irrigation, care should be taken not to submerge the ridges completely

| Disease/ Insect pest  | Fungicide/ Insecticide                               | Dose            |
|-----------------------|--|-----------------|
| Aphids                | Thiamethoxam 25% WG                                  | 100g/ha         |
| Late and Early blight | Chlorothalonil 75% WP                                | 1000 g/ha       |
| Late blight           | Propineb 70% WP                                      | 1500 g/ha       |
|                       | Azoxystrobin 23% SC                                  | 500 ml/ha       |
|                       | Fluopicolide 62.5 + Propamocarb hydrochloride 625 SC | 1250-1500 ml/ha |
|                       | Iprovalicarb 5.5% + Propineb 61.25 % WP              | 2000 g/ha       |



**Harvesting:** Fully matured leaves which develop yellowish tinge and copper-/brown coloured spots, are to be harvested by priming in 3-4 installments.

**Practices for on-farm storage of seed potatoes:**

- The seed tubers for preservation in on-farm storages should be harvested from fully matured potato crop.
- Among the different tuber grades, small-sized (5-15g) tubers can be kept suitably in on-farm stores as compared to big-sized tubers (>20g).
- Loading density of 75g/m<sup>2</sup> is more beneficial than higher loading density for stored tubers under traditional stores.
- Seed potatoes collected from the main field should be cured properly for 10-15 days in cool place and then the healthy tubers are treated with 3% boric acid for 30 min followed by 0.25% mancozeb for 20 min. After shade-drying, the tubers should be loaded in the bamboo rakes fitted in the store.
- Treat potato tubers with malathion 5% dust @ 1.25g/kg of seed to prevent potato tuber moth (PTM) incidence during storage. Chemicals should not be applied in the potato wares.
- Use 4 cm thick layer of shade-dried 'Neem' or Eucalyptus leaves under and over stored tubers for controlling potato tuber moth.
- Stored potatoes should be covered with mosquito nets in PTM endemic areas.
- Frequent inspection of the tubers in the store is essential. Remove the rotten tubers periodically.
- Sprout breaking during August is essential in order to minimize over-shrinkage and shriveling of tubers.

## Summer black gram (*Vigna mungo L.*)

Black gram is one of the most important pulse crops grown in Assam. This crop can be targeted for increasing the cropping intensity in the areas where farmers are not practicing any crop after harvesting of the *Sali* season rice crop. There are many high yielding, short-duration varieties which can be easily

grown in these areas by using previous season moisture available in the soil.

**Varieties:** The variety KU 301 is resistant to yellow mosaic virus (YMV) and *Cercospora* leaf spot disease. The specific characteristics of the varieties are given in below table

### Characteristics of black gram varieties for summer season

| Crop/variety | Released by | Average yield (q/ha) | Days to maturity | Disease resistance                                  |
|--------------|-------------|----------------------|------------------|---|
| IPU 02-43    | IIPR        | 9-11                 | 75               | Resistant to Yellow Mosaic Virus and Powdery mildew |
| KU 301       |             | 13-15                | 80-90            | Resistant to YMV and <i>Cercospora</i> leaf spot    |

**Sowing time:** The optimum sowing time for summer black gram is from mid-February to March

**Soil Type:** Black gram can be grown on a wide range of soils, but well-drained sandy-loam soils are most preferable.

**Field Preparation:** The land should be

ploughed 2-3 times followed by leveling to obtain a fine tilth.

**Fertilizer management:** If possible, apply FYM or compost @ 4-5 t/ha or 6 q/bigha for improving soil structure. Additionally, the crop should be provided N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O at 15-35-15kg/ha

| Nutrient                         | Requirement (kg/ha) | Source of fertilizer | Fertilizer requirement |          |
|----------------------------------|---------------------|----------------------|------------------------|----------|
|                                  |                     |                      | kg/ha                  | kg/Bigha |
| <b>Without Rhizobium culture</b> |                     |                      |                        |          |
| N                                | 15                  | Urea                 | 3.0                    | 0.4      |
| P <sub>2</sub> O <sub>5</sub>    | 35                  | DAP                  | 76                     | 10       |
| K <sub>2</sub> O                 | 15                  | MOP                  | 25                     | 3.3      |
| <b>With Rhizobium culture</b>    |                     |                      |                        |          |
| N                                | 10                  | Urea                 | 0                      | 0.0      |
| P <sub>2</sub> O <sub>5</sub>    | 35                  | DAP                  | 76                     | 10       |
| K <sub>2</sub> O                 | 15                  | MOP                  | 25                     | 3.3      |

The recommended quantity of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O when no Rhizobium culture is applied can be supplemented with 3.0 kg urea, 76 kg DAP and 25 kg MOP/ha.

When the seed is treated with Rhizobium culture, the N dose may be reduced from 15 to 10 kg/ha, and accordingly fertilizer urea application is reduced from 3.0 kg to nil/ha or 0.4 kg to nil/bigha.

For Upper Brahmaputra Valley Zone (UBVZ), Lower Brahmaputra Valley Zone and North Bank Plains Zone, 10 kg (K<sub>2</sub>O)/ha is recommended in addition to normal doses of N and P for Central Brahmaputra Valley Zone, 15 kg K<sub>2</sub>O/ha is recommended as basal dressing.

**Seed inoculation with Rhizobium:** The seed should be inoculated with Rhizobium culture using either of Shillongani, Ahatguri,



Kamalabari or any other suitable strain @ 50 g/kg of seeds. Seeds should be moistened carefully with clean water to avoid excessive wetting. Rhizobium culture is mixed with seeds so that a thin layer of inoculum is deposited on the seed-coat. Treated seeds should be dried in shade, and not exposed to direct sunlight.

**Sowing:** The crop should preferably be sown in lines 30 cm apart by seed-drill using a seed rate

of 25 kg/ha or 3.0-3.3 kg/bigha. The plant-to-plant distance should ideally be maintained at 10 cm. In broadcast sown crop, slightly higher seed rate (27 kg/ha or 3.6 kg/bigha) is used.

**Intercultural operations:** One weeding at 20-25 days after sowing needs to be done.

### Plant Protection

| Insect-pests             | Fungicide/ Insecticide  | Dose      |
|--------------------------|-------------------------|-----------|
| Aphids, Jassids & Thrips | Thiamethoxam 25% WG     | 100 g/ha  |
| Pod borer                | Flubendiamide 39.35% SC | 100 ml/ha |

**Harvesting:** Harvest the crop when pods mature indicating full darkish colour and brittle on slight pressure. Harvesting should be completed in 2 to 3 pickings.

**Protection against storage pests:** Properly dried seeds of black gram should be mixed

thoroughly with black pepper powder @ 3g/kg of seed for protection against bruchid infestation during storage. Treated seeds should be kept in IRRI super bags or in jute bags with inner polythene lining.



## Knowledge Management Committee

| Sl. No  | Name                         | Designation  | Department  |
|---|------------------------------|--|---|
| <b>Assam Agricultural University</b>  |                              |  |   |
| 1   | Dr. Ashok Bhattacharyya      | Director   | Directorate of Research (Agri.), AAU, Jorhat  |
| 2   | Dr. Mrinal Saikia            | Assoc. Director of Research  | Directorate of Research (Agri.), AAU, Jorhat  |
| 3   | Dr. Rupam Borgohain          | Principal Scientist and Nodal officer  | Directorate of Research (Agri.) and OPIU_AAU Jorhat                                       |
| 4   | Dr. Debanand Das             | Principal Scientist and Alternate Nodal officer                                      | Directorate of Research (Agri.), AAU, Jorhat  |
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| 6   | Dr. Ramani Kanta Thakuria    | Principal Scientist  | Horticulture Research Station, Kahikuchi, AAU, Jorhat                                     |
| 7   | Dr. Kalyan Pathak            | Professor and Head   | Department of Agronomy, AAU, Jorhat   |
| 8   | Dr. Kulendra Nath Das        | Professor  | Department of Soil Science, AAU, Jorhat   |
| 9   | Dr. Bipul Deka               | Principal Scientist  | AICRP on Water Management, Department of Soil Science, AAU, Jorhat                        |
| 10  | Dr. Khagen Kurmi             | Principal Scientist  | AICRP on Weed Management, Department of Agronomy, AAU, Jorhat                             |
| 11  | Dr. Phuleshwar Nath          | Senior Extension Specialist  | Directorate of Extension Education, AAU, Jorhat   |
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| 14  | Dr. Sailen Gogoi             | Principal Scientist  | AICRP on Vegetables, Department of Horticulture, AAU, Jorhat                              |
| 15  | Dr. Surajit Kalita           | Junior Scientist   | Directorate of Research (Agri.)   |
| 16  | Mr. Manash J Barooah         | Assistant Professor  | AICRP on Farm Implements and Machinery, Department of Agriculture Engineering, AAU Jorhat |
| 17  | Dr. Sundar Barman            | Assistant Professor  | Department of Extension Education, AAU, Jorhat  |
| 18  | Mr. Apurba Das               | Assistant Professor  | Department of Plant Pathology, College of Sericulture, AAU, Jorhat                        |
| <b>International Rice Research Institute</b>                                |                              |  |   |
| 19  | Dr. Kanwar Singh             | Senior Associate Scientist II - Precision Agronomist & Resident Project Coordinator  |   |
| 20  | Dr. Virendar Kumar Yadav     | Consultant   |   |
| 21  | Dr. Suryakanta Khandai       | Associate Scientist (Post harvest & Rice Value Chain)                                |   |
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| 25  | Mr. Vivek Kumar              | Specialist - Agriculture Research & Development (Agriculture Extension)              |   |
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| 28  | Mr. Baljeet Singh            | Market Analyst cum Operations Specialist   |   |
| 29  | Dr. Pranab Mahanta           | Agri Adviser, APART  |   |
| <b>Department of Agriculture, Govt. of Assam</b>                            |                              |  |   |
| 30  | Mr. Madhura Patiri           | Nodal Officer, APART, DoA  |   |





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