

**PACKAGE OF PRACTICES FOR
CLIMATE SMART
TECHNOLOGIES FOR ASSAM
2023**

Published jointly by
**Assam Agricultural University, Jorhat &
Department of Agriculture, Govt. of Assam**

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**Assam Agricultural University, Jorhat
&
Department of Agriculture, Govt. of Assam**

Atul Bora

Minister

**Agriculture, Horticulture, Animal Husbandry &
Veterinary, Border Protection & Development.
Implementation of Assam Accord.**



सत्यमेव जयते

GOVERNMENT OF ASSAM

MESSAGE

I am very happy to know that the Assam Agricultural University, Jorhat jointly in association with Department of Agriculture, Government of Assam is going to publish the recent version of the “Package of Practices for Kharif/Rabi/Horticultural Crops of Assam, 2023” along with the “Organic PoP for selected Crops of Assam, 2023” with the inclusion of 59 number of recently developed technologies pertaining to crop improvement, management and protection. I am also happy to know that Assam Agricultural University, Jorhat has developed the “Package of Practices for Climate Resilient Technologies of Assam, 2023” for the first time to combat the adverse effects of climate change on agriculture in the recent times, which will provide impetus to the agricultural growth and development in the state.

Agriculture is the mainstay of the Assam’s economy as the majority of the people depend on agriculture and allied activities for their livelihood directly or indirectly. Adoption of sustainable, cost effective and advanced agricultural technologies could help in achieving rapid agricultural growth through optimum utilization of available resources of the state.

I sincerely believe that this Package of Practices, 2023 will be a great help for our extension machineries and farming community to boost up production and productivity of major crops in the state.

I convey my best wishes on this auspicious occasion.

(ATUL BORA)

Date : 30th August, 2024

Aruna Rajoria, IAS

Commissioner & Secretary to the Govt. of Assam,
Departments of Agriculture, Information & Public
Relation and Printing & Stationery &
Agriculture Production Commissioner



Block-I, 1st Floor,
Janata Bhawan, Dispur,
Guwahati-781006

Tele : +91 361 2237086

E-mail : apcagrivet@gmail.com

MESSAGE

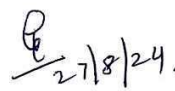


Agriculture plays a vital role in the economy of the state, contributing to about 45% of the State's Gross Domestic Product (SGDP) with an annual growth rate of 8.15% (2021-22). Owing to the availability of fertile soil and abundance of rain, the state provides a favourable environment to produce both food and cash crops. Over 70 percent of the state's population relies on agriculture as farmers, agricultural laborers, or both for their livelihood, which emphasizes the importance of agriculture in the state. Hence, a rapid growth of agriculture could help not only in achieving self-reliance on food grain production but also in attaining food security and to reduce poverty in the state.

I am glad to know that the Assam Agricultural University, Jorhat jointly with the Department of Agriculture, Govt. of Assam is going to publish the Package of Practices for Crops of Assam, 2023 with inclusion of recently developed technologies pertaining to crop improvement, management and protection. I am confident that this will serve as a handbook to empower our extension machineries and farming community towards production and productivity enhancement of the state. I am sure that the package of practices included will be adopted by the farming community of state boosting the agricultural production systems.

With best wishes,

Date: 27-08-2024


(Smt. Aruna Rajoria, IAS)

Dr. Bidyut C. Deka
Vice Chancellor



ASSAM AGRICULTURAL UNIVERSITY
JORHAT-785013, ASSAM (INDIA)

(Recipient of Sardar Patel Outstanding Institution Award)



Message

I am happy to learn that the Director of Research (Agriculture) of Assam Agricultural University in collaboration with the Department of Agriculture, GoA is bringing out the publication on '*Package of Practices for Kharif, Rabi and Horticultural Crops, 2023 as well as Organic Package of Practices, 2023*' wherein a total of 59 new technologies pertaining to crop improvement, management, and protection have been incorporated as per the recommendations of a workshop jointly organized by AAU and Govt. of Assam.

I sincerely believe that the technologies so generated and included in the publication through the dedicated service of the scientists shall be great help to the farmers, scientists and extension functionaries of the state increasing agricultural growth, productivity and farm income.

I place on record my sincere gratitude to the team of scientists associated with the preparation of the manuscript.


(Bidyut C. Deka)

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IMPORTANT ABBREVIATIONS USED IN THIS HANDBOOK

Agroclimatic Zones

NBPZ	= North Bank Plains Zone
UBVZ	= Upper Brahmaputra Valley Zone
LBVZ	= Lower Brahmaputra Valley Zone
CBVZ	= Central Brahmaputra Valley Zone
HZ	= Hill Zone
BVZ	= Barak Valley Zone

Reaction to pests & diseases

R	= Resistant
MR	= Moderately Resistant
S	= Susceptible
MS	= Moderately Susceptible
T	= Tolerant

Others

FYM	= Farmyard Manure
HYV	= High Yielding Variety
a.i.	= Active ingredient

CLIMATE SMART TECHNOLOGIES RECOMMENDED FOR ASSAM

Climate smart agriculture is an integrated approach to manage crops, livestock, fisheries and forest which aims to achieve productivity improvement, enhanced resilience to climate change and reduced emissions simultaneously. Climate smart technologies mainly include water smart technology, energy smart technology, nutrient smart technology, carbon smart technology, weather smart technology and knowledge smart technology.

A. KNOWLEDGE SMART TECHNOLOGY

a. Climate smart variety for moisture deficit / drought like situation

1. Rice varieties for Delayed monsoon and early season drought during *kharif* season

Normal time of onset of monsoon in Assam is 1st week of June. However, sometimes farmers experience delayed onset of monsoon. As *kharif* rice is the most important crop of Assam grown in medium and medium low land situation, so under such delayed onset of monsoon condition, selection of suitable rice varieties for rice mono-cropped and rice-based cropping system is very much important to cope up with early season drought. Suitable rice varieties for *kharif* season depending on the onset of monsoon rain are as follows

- i. Long duration rice varieties ‘Ranjit’, ‘Bahadur’, ‘Piolee’, ‘Kushal’, ‘Moniram’, ‘Mahsuri’ and ‘Ketekijoha’ (transplanting up to last week of July) for Rice – Rice and Rice mono-cropped areas when monsoon is delayed by 2 to 4 weeks

Rice variety	Duration (days)	Agroclimatic zone
Ranjit	150-155	All zones of Assam
Bahadur	150-155	Do-
Piolee	150-155	Do-
Kushal	150-155	Do-
Moniram	150-155	Do-
Mahsuri	140-145	Do-
Ketekijoha	155-165	Do-

- ii. Medium duration rice varieties ‘Shraboni’, ‘Numali’, ‘Mulagabharu’, ‘Dholi’ for rice – rabi crop cropping sequence when delayed by 4 to 6 weeks (transplanting up to mid-August)

Rice variety	Duration (days)	Yield (t/ha)	Agroclimatic zone
Shraboni	135	5.0	All zones of Assam
Numali	130-135	5.0-5.5	All zones of Assam
Mulagabharu	135	4.6	All zones of Assam
Dholi	130	5.0-5.5	All zones of Assam

- iii. Staggered planting rice variety ‘Gitesh’ (30 - 60 days old seedlings) for Rice – Rice sequence and Rice monocropped areas (June/July transplanting)

Rice variety	Duration (days)	Yield (t/ha)	Agroclimatic zone
Gitesh	150-160	5.0-5.5	All zones of Assam except hill zone

2. Rice varieties for low rainfall situation during ahu season

- i. For upland situation, *Rongadoria* a local selection recommended for Ahu season having drought tolerant ability.
- ii. Direct seeded autumn rice var. *Inglongkiri* can be grown under aerobic situation with 20% less available soil moisture.

Rice variety	Duration (days)	Yield (t/ha)	Agroclimatic zone
<i>Rongadoria</i>	115-120	2.4 -3.0	NBP, CBVZ, LBVZ
<i>Inglongkiri</i>	110	3.4	Hill zone

3. Chickpea variety for drought like situation during rabi

- i. Drought tolerant desi type chickpea variety ‘KPG 59’ (125 -130 days) having yield potential of 12 -15 q/ha which is tolerant to *Fusarium* wilt

b. Climate smart variety for flood /waterlogged/ excess moisture situation

1. Rice varieties for flood affected areas

- i. Grow submergence tolerant rice varieties ‘Ranjit Sub 1’, ‘Bahadur Sub 1’, ‘BR 11Sub 1’ (flash flood situation) and ‘Swarna Sub 1’ (for rice mono-cropping & rice –rice cropping sequence) & ‘Dholi’ (for double cropped areas) in chronically flood affected areas (10 - 12 days submergence)

Rice variety	Duration (days)	Yield (t/ha)	Agroclimatic zone
Ranjit Sub 1	145-150	5.5-6.0	All zones of Assam
Bahadur Sub 1	140-145	5.5-6.0	Do-
BR 11Sub 1	150	4.5-5.0	Do-
Swarna Sub 1’	140-145	4.5-5.0	Do-
Dholi	130	5.0-5.5	Do-

- ii. Grow medium duration rice varieties ‘Shraboni’, ‘Numali’, ‘Dholi’ and ‘Bina Dhan 11’ (125 -130 days) where flood water recedes by mid-August (For rice – rabi crops & rice – rice cropping sequences)
- iii. Grow short duration rice varieties ‘Luit’, ‘Kapilee’, ‘Dishang’ for post (Direct seeding up to last part of August) flood situation

Rice variety	Duration (days)	Agroclimatic zone
Luit	90-95	All zones of Assam except hill zone
Kapilee	90-95	Do-
Disang	90-95	Do-

- iv. Grow staggered planting rice variety ‘Gitesh’ (30 - 60 days old seedlings) for rice – rice and rice mono-cropped areas (June/ July)

2. Rice varieties for waterlogged situation (up to 50 cm)

Rice variety	Duration (days)	Yield (t/ha)	Agroclimatic zone
Dhanshiri	150-160	5.0-6.0	For UBVZ, LBVZ, NBPZ & BVZ
Diphalu	150-160	5.0-6.0	
Manah	150-160	5.0-6.0	
Chakra sali	150-160	5.0-6.0	

3. Rice varieties for semi deep-water situation (50 - 100 cm)

Variety	Duration (days)	Yield (t/ha)
Padmanath	-	2.7
Panindra	-	2.5
Podumoni	180 (T), 230 (DS)	2.6
Panchanan	186 (T), 240 (DS)	3.0

4. Rice varieties for deep water situation (> 100 cm)

- i. Maguri, Panikekuwa, Kekuwa, Amona, Dalbao for true deep-water situation, average yield: 2.0 t/ha

5. Sugarcane varieties for waterlogged situation

Variety	Sucrose content (%)	Cane yield (t/ha)
Dhansiri	18 - 20	70-80
Nambor	18 - 19	70 – 90
Kapilipar	20 - 21	70 - 85

6. Black gram variety for delayed sowing condition due to heavy rain during monsoon period

Variety	Duration (days)	Yield (q/ha)
Sonkush	80 - 90	9.2

7. Toria varieties for late sown condition due to extended rainy period (up to mid-October)

Variety	Duration (days)	Yield (q/ha)
TS 67, TS 46	90-95	10-12
Jeuti	90-95	10-12

8. Toria varieties for escaping early pre-monsoon shower - Grow all recommended Toria varieties for normal sowing

Variety	Duration (days)	Yield (q/ha)
TS 36	90-95	10-12
TS 38	90-95	10-12
M 27	90-95	10-12
TS 46	90-95	9.0
TS 67	90-95	7.0
Jeuti	90-95	7.0

9. Grow short duration varieties of Mustard ‘PM – 26’, ‘PM -27’ and ‘NRCHB 101’ to avoid pre-monsoon rain

Variety	Duration (days)	Yield (q/ha)
PM 26	107	12-14
PM 27	107	13.5
NRCHB 101	108	13-15

c. Crop management strategies for moisture deficit / drought like situations**1. Early season drought during *kharif* season**

- Recycling of rainwater harvested during pre-monsoon months for on time sowing of *Sali* rice
- In *Sali* rice, treat the seed with 4% MOP (600 ml/kg of seed) for 24 hours, dry in shade for 24 hours and sow

2. Mid-season drought (long dry spell) during *kharif* season

- If drought like situation appears, top dress additional quantity of MOP @ 37.5 kg/ha in rice and incorporate it.
- Spray 2% KCl solution on leaves of rice if and when drought appears
- Top dressing of urea in rice may be delayed up to heading stage if drought like situation prevails at the time of top dressing.

- iv. Apply irrigation water at critical stages of crop growth where irrigation facility is available

3. Terminal drought during *kharif* season

- i. Provide supplemental irrigation from harvested rainwater or from other sources of water

4. Soil moisture deficit condition at the time of sowing of *rabi* crops

Due to insufficient rain during *kharif* season especially during later part of the season, moisture stress condition appears in the field during early in the *rabi* season, affecting germination and growth of *rabi* crops like oilseeds and pulses grown under rainfed condition by harvesting residual soil moisture. Under such situation, following management practices should be adopted by the farmers

- i. Sow *rabi* crops early in the season to harvest residual soil moisture
- ii. In case of dry top soil, provide pre sowing irrigation for quick and uniform germination of *rabi* crops where irrigation facility is available
- iii. Finger Millet is suitable for growing in areas where *Sali* paddy cannot be cultivated under medium land situation
- iv. Select stress tolerant crops like Buckwheat, Lathyrus, Linseed, Niger, Foxtail millet
- v. Utera cropping of *rabi* oilseed like linseed and pulses like lentil, lathyrus, pea, chickpea etc. with *Sali* rice.
- vi. In case of zero tilled crops, sow seeds immediately after harvest of rice.
- vii. In wheat, soak the seeds overnight before sowing, for faster emergence and uniform crop establishment
- viii. In lentil and lathyrus, soak seeds for 6 hours in water and then bringing down to almost original weight by drying under shade before sowing
- ix. Provide supplemental irrigation water should be provided at critical growth stages under irrigated condition

5. Normal rainfall during *kharif* season and low rainfall during *rabi*

- i. Grow short duration varieties of *rabi* crops and select stress tolerant crops like buckwheat, lathyrus, linseed, niger and millets
- ii. Grow Foxtail Millet (Variety: Gossaigaon Local (yellow seeded) which is suitable for growing in sandy soil where water retention is very less.
- iii. In lentil, foliar spray 2% urea 2 times at branching (35 DAS) and at pod formation (75 DAS) in addition to use of recommended P and K
- iv. Application of life saving irrigation at critical stages under irrigated condition

d. Crop management strategies for extended rainy period/ pre-monsoon shower

1. Mitigating the effect of pre-monsoon shower

In wheat “Spraying 7.5% NaCl (Common salt) or 150 ppm Sodium Molybdate at milk and maturity stages can control the Pre-harvest sprouting (PHS) and seed damage due to rain

2. Mitigating the effect of extended rainy period up to mid-October

Surface seeding of wheat is recommended for low land rice – wheat cropping system, where excessive soil wetness is the main constraint for taking another crop after harvest of rice in the Central Brahmaputra Valley Zone.

e. Contingency package of practices for rice for flood affected areas

1. Rice cultivation (transplanted) in flood affected areas

Raising Community Nurseries: Community nurseries may be raised to meet the seedling requirement of flood affected areas. Community nursery may either be raised by the farmers of flood affected areas in non-flood prone or high lands or by other farmers from flood free areas to help distressed farmers.

Varietal Selection: Select recommended varieties for late planting having wide flexibility in respect of seedling age and transplanting time.

- In occasionally flood affected areas if flood recedes early and rice can be transplanted by mid-August, use varieties viz., Kushal, IET-6666, Pankaj, Biraj, Anderw Sali, Solpona, Gitesh and Prasadbhog.
- In chronically flood affected areas where flood is expected to recede by the last part of August, varieties like Andrew Sali, Biraj, Monohar Sali, Kmj-1-19-1, Luit, Kapilee, Dum Sali, Gitesh and Prafulla should be selected. In absence of these varieties any traditional photoperiod sensitive coarse grain *sali* variety can be used.
- In areas where transplanting is not possible before mid-September, extra early varieties such as Luit, Kapilee, Culture-1, Heera and Disang should be selected.

Seedbed preparation: Seedbed should be initially ploughed with addition of adequate FYM/compost. The Flat beds may be selected and a gap of 30 cm (1 ft.) may be left at an interval of every 1.25 m (4 ft.) as passage between the beds. Beds within the strip should be well levelled. Chemical fertilizers @ 500 g urea, 500 g SSP and 250 g MOP for the area should be used to transplant one bigha of land should be applied at the time of final puddling. Strip beds to be made after levelling the field.

Seed Rate: About 10 kg seeds are needed to transplant 1 bigha of land i.e. ten strips of 10 m × 1.25 m size @ 1 kg seed/bed.

After care: The gap of 30 cm may be converted into channels one week after sowing for draining out excess water during heavy showers and to supply water to the channels to keep the raised beds moist in the event of drought

Transplanting: Transplanting may be done at a convenient time particularly soon after flood recession. It is to be noted that moisture stress is a common feature after flood recession in flood affected areas.

Plant population: Closer planting is essential in case of late planting since tiller development is checked due to emergence of non-effective tillers. In the case of modern varieties 36 hills/sq.m (20 cm × 15 cm) and in case of tall varieties 25 hills/sq. m (20 cm × 20 cm) are to be maintained.

Seedlings/hill: In late planting situations, the only option to have maximum panicles per unit area is from that of the main culm and primary tillers. Therefore, 6-8 seedlings per hill may only yield 18 panicles per hill, as the growth phase of the rice plant almost expires in the seedbed.

Fertilizer: In chronically flood affected areas where high silt deposition occurs; there may not be any need for fertilizer application. However, in occasionally flood affected areas irrespective of varieties, a basal application of fertilizer should be done. The fertilizer doses are 40 : 20 : 20 or 20 : 20 : 40 N, P₂O₅, K₂O as the case may be.

Double Transplanting: Double transplanting is a method for seedling multiplication under seedling scarcity conditions. Traditional or improved varieties may be transplanted during July with closer spacing of 20 × 10 cm (50 hills/sq.m) and each tiller developed may be separated and planted once again, which fulfills the seedling requirement by 5-7 times.

Varietal Selection: Traditional or improved varieties with long duration (150 days or more) having photoperiod sensitivity, should be selected.

Sowing: Sowing should be done during the early part of June in well prepared seedbeds as indicated earlier.

First transplanting: Transplanting should be done in the early part of July with 25-30 days old seedlings. About 50 hills/sq.m (20 cm × 10 cm) is to be maintained during first planting. Fertilizers @ 20 : 10 : 10 kg/ha is to be applied for rapid and healthy tiller development.

Second transplanting: Uprooting should be done at 25-30 days after the first planting and each tiller may be separated and re-transplanted with a single tiller/hill. In case of further delay however, 3-4 tiller/hill may be planted with closer spacing. In flood affected areas, there is no need of any fertilizer application in second transplanting if planting is delayed beyond August and fertilizer is added only in first planting.

2. Direct Seeding of rice (Wet Sowing) in flood affected areas:

This is an effective and remunerative method of rice cultivation in flood affected areas after recession of flood. In general, very short duration or extra-early (less than 100 days), such as Luit, Kapilee, and any traditional photo period sensitive coarse grain varieties are suitable for wet sowing in the main field. Seeds @ 75 kg/ha are to be soaked for 24 hours and incubated for 24-48 hours for sprouting. In the meantime, the field has to be puddled with minimum tillage and levelled properly by laddering to ensure uniform moisture retention. Sprouted seeds are then broadcast uniformly on to the puddled and levelled field after application of basal dose of fertilizer @ 40 : 20 : 20 kg/ha. Nitrogen should be applied in 2 splits, viz., top dressing at 20 days after sowing and at 45-50 days after sowing. Only P and K are to be applied as basal dose. Direct seeding of sprouted seeds on puddled soil can be done at any convenient time after flood recession up to September 10. Water management as moisture stress is a common problem after flood recession. Late sowing may result in spikelet sterility if temperature falls early.

F. Special package for low and delayed rainfall for Upper Brahmaputra Valley Zone of Assam

- i. **Pre sowing operation:** Follow ploughing after harvest of rice in light soil either with

tractor or M.B. plough for moisture conservation.

ii. Varietal selection:

a). Direct Seeded *Ahu*:

- Traditional variety for early *ahu*.
- Lachit, Chilarai, Luit, Kapilee, Govind, Rasi and other recommended varieties for regular *ahu*.

b). Direct Seeded Rice (*Kharif*): Use modern recommended varieties.

c). Transplanted *Sali* Rice: As per recommendation for normal situation.

- Varieties that can be grown up to August 15 with 45-50 days old seedlings: Pankaj, Kushal, Lakhimi
- Varieties that can be grown up to the end of August with 60 days old seedlings: Photosensitive traditional varieties.
- Varieties that can be grown up to the end of August: Short duration varieties like Luit, Kapilee

iii. Seedling raising:

- Treat the seeds with 4% MOP (KCl) (600 ml/kg of seed) for 24 hours, dry in shade for 24 hours and sow.
- Prepare dry, well bunded, flat seedbed with adequate FYM (30 kg), 80 g urea, 80 g SSP and 80 g MOP per bed size of 10 m × 1.25 m.
- Under zero tillage condition, mulch with dry FYM powder up to 2 cm thickness and keep the beds moist.

iv. Application of fertilizers:

- If drought situation appears, top dress additional quantities of MOP @ 5 kg/bigha and incorporate it.
- Spray 2% muriate of potash solution on leaves, when drought appears.
- Top dressing of urea may be delayed up to heading if drought prevails at the stage of top-dressing. Other recommendations will be as per Package of Practices.

g. Seed and fodder bank

- Seeds production of situation specific crop varieties at village level through community seed production programme
- Fodder production in community land to supply fodder to animals during flood and lean period

h. Custom hiring centre for farm machineries

- Utilize services of farm machinery centers established under various schemes at district level

i. Crop diversification

Technologies for intensive cropping in different agroclimatic zones of Assam

1. Situation: Upland

Upper Brahmaputra Valley Zone

i. Annual crop

- Sugarcane (spring) + Cowpea
- Sugarcane (autumn) + *Toria*
- Pigeon pea +Ginger/turmeric
- Summer rice/vegetables
- Blackgram/green gram (Sept)/Pea/*Rajmah* (Oct)/Vegetables (Chilli + French bean +Cucumber)
- Cowpea/maize (fodder)

ii. Perennial crop

- Arecanut + Banana + Pineapple
- Arecanut + Black pepper + Banana + Pineapple

North Bank Plains Zone

- Summer green gram - Groundnut/Potato/Pea/*Toria*
- Summer rice –Vegetables /lentil/ Pea/*Rajmah*

Central Brahmaputra Valley Zone:

- Summer greengram - *Kharif* vegetables - Lentil/pea/*Toria*
- Summer rice - *Kharif* vegetables - *Rabi* vegetables
- *Kharif* vegetables - *Rabi*vegetables
- Sesamum + Blackgram (1: 1)
- Pigeonpea + Sesamum

Lower Brahmaputra Valley Zone:

i. Annual

- As in Central Brahmaputra Valley Zone
- Rice - Blackgram-Potato
- Rice – Sesamum -Wheat.
- Vegetables + vegetable
- Vegetables + flower
- Brinjal + French bean/Knolkho /*Methi*
- Pea + Tuberose
- Coriander + marigold

ii. Perennial crop

- Coconut + ginger + Turmeric
- Coconut + betelvine + Assam lemon
- Coconut + betelvine + Pineapple
- Coconut + betelvine + Ginger.
- Coconut + betelvine + Assam lemon + banana + Pineapple + Ginger.

Hills Zones (Slopes of 20-25%)

- Rice (DS)- Blackgram/green gram
- Rice (DS)- Cotton
- Rice- Green gram – *Toria*
- Pigeonpea + Sesamum/black gram/green gram
- Rice (DS) +Green gram/Black gram (2 : 1)

2. Situation: Medium/Medium Lowland:

Upper Brahmaputra Valley Zone

March - June	June - Oct	Nov – Feb/March
-	Rice(Transplanted)	<i>Toria</i> /Niger/Linseed/Potato/Pea/Vegetables
Rice (DS)	Rice(Transplanted)	<i>Toria</i> /Relay pea/oat (F)

April – July	July – November	Nov /Dec – Feb
Rice (DS)	Rice(Transplanted)	Oat (F)/Wheat (irrigated)
Vegetables	Rice(Transplanted)	Vegetables (Chilli / Radish + French bean/Tomato / Potato
Maize	Rice(Transplanted)	-
First rice crop of sequence is of 100-110 days duration: second rice of 130-140 days duration		

North Bank Plain Zone:

March - July	July/Aug - November	Nov /Dec – Feb
Green gram	Rice(Transplanted)	Potato <i>Toria</i> (with low input level)
	Rice(Transplanted)	<i>Rajmah</i> /pea
	Rice(Transplanted)	Wheat/vegetables

	Rice(Transplanted)	Oat (fodder)
	Rice(Transplanted)	Maize
Maize (Feb)	Rice(Transplanted)	-

Central Brahmaputra Valley Zone:

March - June	July - November	Nov – Feb/March
Jute	Rice (Transplanted)	<i>Toria</i> /Wheat
Summer moong	Rice (Transplanted)	Pea/vegetables
Cow pea (fodder)	Rice (Transplanted)	<i>Toria</i>
	Rice (Transplanted)	Rice(Transplanted) -Irrigated
Lady's finger	Rice (Transplanted)	<i>Toria</i>
Jute	-	Wheat/ <i>Toria</i> /Pea/Potato
	Rice (Transplanted)	Maize (Nov)
Maize (Feb)	Rice (Transplanted)	-

Lower Brahmaputra Valley Zone:

March - July	July/August – October/November	Oct/Nov – Feb
Rice (DS)	Rice (Transplanted)	Potato
Green gram/Black gram	Rice (Transplanted)	<i>Toria</i> /Buckwheat/Linseed
	Rice (Transplanted)	Vegetables/Pea
Jute	Rice (Transplanted)	Potato
	Rice (Transplanted)	Maize
Maize (Feb)	Rice (Transplanted)	-

Barak Valley Zone:

Feb/March – June/July	July/August – October /November	Oct/Nov – Feb
Rice (Transplanted)	Rice (Transplanted)	-
Rice (Transplanted)	Rice (Transplanted)	Pea/ <i>Toria</i> /Niger/Rajmah
Rice (Transplanted)	-	Pea/ <i>Toria</i> /Rajmah

Hill Zone

- Maize -Green gram/Black gram/Pigeon pea
- Maize – *Rabi* vegetables

- Rice (DS) – Green gram -Torla
- Rice (DS) Blackgram - Torla

3. Situation: flood prone areas

Flood prone areas are spreading along the river systems are found in all the districts of the state. Though the advent of flood differs in different areas and the intensity differs from year to year in the same area, the features of the areas are almost identical; hence the recommended technologies apply to all the areas.

Feb-May	Late Aug-Nov	Dec- Feb
Early summer rice (DS)	Late winter rice (T)	-
Summer vegetables	-do-	Pea-potato
Summer vegetables	-do-	Groundnut/Pea
Summer rice/	Fallow	Potato/Vegetable/
Summer pulse		Toria/ Wheat/Pea
Groundnut/melons	Fallow	Early pulse/Vegetables
Summer rice (Feb-June)	-	Sweet potato (Sept-Feb)

B. WATER SMART TECHNOLOGIES

a. Technology for rainwater harvesting (in situ)

1. In situ rainwater harvesting in sugarcane

In sugarcane, planting the setts in furrows and subsequently mulching the ridges with 50-micron plastic film and furrows with sugarcane trashes conserves soil moisture and gives higher cane yield.

b. Technology for drainage of excess water

1. Drainage management in *kharif* crops

In case of *kharif* maize, sesamum, black gram and green gram, drain out excess rainwater through surface drainage channel of 25 cm width, 15 cm deep spaced at 6 m distance

2. Raised bed planter for *kharif* green gram and black gram

Mechanical seed placement in raised bed having bed width 600-700 mm and bed height 150-220 mm by tractor drawn raised bed planter with either fluted roller type or cell type seed metering is recommended for growing green gram and black gram in *Kharif* season. This equipment has provided a solution for risky *kharif* pulse due to water logging

c. Technology for soil moisture conservation

1. Crop residue management and soil moisture conservation

- i. In wheat, use rice straw mulching with 3 irrigations of 6 cm depth each at CRI stage, booting stage and milk stage for soil moisture conservation with higher monetary return in rice - wheat system
- ii. Grow chickpea in rice fallows under rainfed condition with two harrowing followed by one planking and application of 2.0 t rice straw per ha as mulch after sowing of seeds.
- iii. As moisture conservation tillage practice for rapeseed after Sali rice, one cross ploughing by power tiller incorporating rice stubbles is recommended. The situation for this practice should be medium land with medium textured soil, field capacity 23 -25%, soil moisture at the time of land preparation around 22.5%, and time of sowing 4th week of November to 1st week of December

d. Water saving technology

1. Alternate wetting and drying method of irrigation in summer rice / early *ahu* rice

Apply 5 cm irrigation at 15 cm depletion of water from soil surface measured in field installed perforated open plastic pipe (15 cm diameter and 30 cm length).

Description of technology:

A practical way to measure irrigation water precisely is by (*'Pani Pipe'*) to monitor the water depth on the field. After irrigation, water depth will gradually decrease. When the water level has dropped to about 15 cm below the surface of the soil, irrigation should be applied to re-flood the field to a depth of about 5 cm over the surface. When the field is flooded, check that the water level inside the tube is the same as outside the tube. If it is not the same after a few hours, the holes are probably blocked with compacted soil and the tube needs to be

carefully re-installed. The tube should be placed in a readily accessible part of the field close to a bund, so that it is easy to monitor ponded water depth. The location should be representative of the average water depth in the field (i.e. it should not be in a high spot or a low spot).

The field water tube can be made of 30 cm long plastic pipe or bamboo and should have a diameter of 10–15 cm so that the water table is easily visible, and it is easy to remove soil inside. Perforate the tube with many holes on all sides, so that water can flow readily in and out of the tube. Hammer the tube into the soil so that 15 cm protrudes above the soil surface. Take care not to penetrate through the bottom of the plow pan. Remove the soil from inside the tube so that the bottom of the tube is visible.

2. Drip irrigation in garlic:

- Drip irrigation of 2-3 mm (100% Evaporation Replenishment) should be applied after every 2 days from 10 days after emergence during rainless period.
- Installation of lateral-Alternately (i.e. leaving one row without lateral), Dripper-15 cm Capacity-2 lph

3. Drip cum fertigation in Banana:

- Drip irrigation at 75% EpR during November to March can be applied for banana cultivar 'Barjahaji' with Benefit: Cost ratio of 5.72.
- 75% recommended dose of N and K (82.5 g N and 247.5 g K) can be applied through drip.

C. ENERGY SMART TECHNOLOGY

a. Relay cropping/ reduce tillage system – energy saving technology

1. Relay cropping of field pea with Sali rice

Pea seeds at 25-50% higher seed rate are to be broadcast in the standing crop of rice about 15-20 days before harvest provided the soil is in moist condition. In rice + pea relay cropping, seeding of pea at 20 days after 50% flowering of rice with a seeding rate of 90 kg/ha is recommended in medium *sali* land for Hills zone. Pea seeds are to be soaked overnight before sowing.

2. Relay cropping of grass pea (*Khesari*) with winter rice

Under medium land situation, broadcast 50-60 kg grass pea seed per hectare, 15-20 days before harvesting of *sali* rice when the soil is in moist condition.

3. *Utera* cropping of chickpea:

Broadcast chickpea seed in standing crop of *sali* rice at 15-20 days after 50% flowering provided the soil is in moist condition

4. Rotary Tillage with rotavator and reduced tillage (2-3 ploughing followed by laddering) can be used profitably for wheat cultivation in rice-wheat system.

In rice-wheat cropping system, zero tillage with the use of zero till cum seed cum fertilizer drill for sowing of wheat is recommended in light textured soil of Central Brahmaputra Valley Zone and Upper Brahmaputra Valley Zone.

5. Conservation agricultural practices in lentil

In zero tilled lentil after rice, broadcast seed @ 45 kg/ha immediately after harvest of rice in moist loamy soil keeping 30 cm high rice stubbles. Sowing should be completed within November. Under rice *utera* condition, 45 kg/ha seed rate should be used.

D. CARBON SMART TECHNOLOGY

a. Agro-forestry is a multiple land use system, practiced in two ways by integrating the farm crops with the forestry or by integrating forest trees into the farming system. The different types of Agroforestry systems along with their components being practiced are:

1. AGRI-SILVICULTURE (Trees + Crops/trees + Trees)
2. SILVI-PASTORAL SYSTEM (Trees + Pasture + Animals)
3. AGRI-HORTICULTURAL SYSTEM (Crops + Fruit trees)
4. HORTI-SILVI-PASTORAL SYSTEM (Fruit trees + Trees + Pasture + Animals)
5. AGRI-HORTI-SILVICULTURE (Crops + Fruit trees + Multipurpose trees)
6. AGRI-SILVI-PASTORAL SYSTEM (Crops + Trees + Pasture + Animals)
7. HOMESTEAD AGROFORESTRY (Multiple combination of various components)
8. AGRI-PISCI-SILVICULTURAL SYSTEM (Crops + Fish + Trees)
9. SILVI-APICULTURE (Trees + Honeybees)
10. PISCI-SILVICULTURE (Fish + Trees)

Different components of agroforestry systems

- Tree species Subabul (*Leucaena leucocephala*), Bamboo (*Dendrocalamus strictus*), Siris (*Albizia lebbeck*), Neem (*Azadirachta indica*), Sissoo (*Dalbergia sissoo*), Modar (*Erythrina* spp.), Kanchan (*Bauhinia variegata*), Khoir (*Acacia catechu*), Kadam (*Anthocephalus cadamba*).
- Fruits: Anola (*Terminalia officinalis*), Ber (*Ziziphus* spp.), Citrus (*Citrus* spp.), Mango (*Mangifera indica*), Guava (*Psidium guajava*), Jackfruit (*Artocarpus heterophyllus*), Mulberry (*Morus alba*).
- Short duration crops: Wheat, paddy, mustard, lentil, pea, soyabean, gram, ground nut, ginger, turmeric, chillies, tomato, coriander, fenugreek, French bean, green gram etc.

Management practices:

Trees and crop systems may be modified to facilitate management practices like pruning of trees, changes in sowing time of crop etc. Both the tree crops as well as associated crops need proper management of irrigation and drainage. The soil should not be hard and should have good water holding capacity. Preventive measures against the infestation of pests and diseases should be taken in advance.

- b. Conservation agriculture practices for enhancing productivity of lentil in rice-fallows - Direct seeding of lentil @ 45 kg ha⁻¹ with retention of 30 cm high stubbles in zero tilled *Sali* rice-lands just after harvest of *Sali* rice.
- c. Biochar Application in Soil: Apply 0.4 % (v/v) biochar (or 80 kg /bigha) produced from weed biomass or crop residue along with RDF (Plenary TCM Rabi 2022)

E. NUTRIENT SMART TECHNOLOGY

a. Fertilizer prescription equations for site specific nutrient management

3. Fertilizer recommendation for HYVs of winter rice (Sali rice) as per fertilizer prescription equations (FPE)

Fertilizer prescription equations can be used to find out the amount of NPK fertilizers required to obtain a certain yield target of the crop based on soil test values for NPK. The FPEs can be used under cultivation practices where only chemical fertilizers are used and where chemical fertilizers + FYM/Vermicompost/Enriched compost etc. are applied. The FPEs are valid for different varieties of the same crop having not more than 15% variations in yield. The amount of NPK fertilizers will vary according to yield target and soil test values. Yield targets must not cross the potential yield of a particular crop.

i. *Fertilizer Prescription Equations (Only chemical fertilizer)*

$$FN = 5.22 \times T - 0.75 \times STVN$$

$$FP = 0.67 \times T - 1.64 \times STVP$$

$$FK = 5.12 \times T - 1.70 \times STVK$$

ii. *Fertilizer Prescription Equations (Chemical fertilizer + FYM)*

$$FN = 5.22 \times T - 0.75 \times STVN - 0.11 \times OM$$

$$FP = 0.77 \times T - 1.64 \times STVP - 0.10 \times OM$$

$$FK = 5.12 \times T - 1.70 \times STVK - .30 \times OM$$

where, FN, FP, FK-Fertilizer N, P₂O₅, K₂O; STVN, STVP, STVK-Soil Test Values for N, P₂O₅, K₂O, T-Targeted yield, OM- Organic component (FYM, Vermicompost, Enriched Compost etc).

(Ready Reckoners for two yield targets for this equation are given in Appendix-IA & IB)

4. Fertilizer recommendation for scented rice variety as per fertilizer prescription equations (FPE)

i. *Fertilizer Prescription Equations (Only chemical fertilizer)*

$$FN = 6.80 \times T - 0.79 \times STVN$$

$$FP = 1.46 \times T - 1.40 \times STVP$$

$$FK = 5.20 \times T - 0.87 \times STVK$$

iii. *Fertilizer Prescription Equations (Chemical fertilizer + FYM)*

$$FN = 6.80 \times T - 0.79 \times STVN - 0.50 \times M$$

$$FP = 1.46 \times T - 1.40 \times STVP - 0.15 \times M$$

$$FK = 5.20 \times T - 0.87 \times STVK - 0.44 \times M$$

where, FN, FP, FK-Fertilizer N, P₂O₅, K₂O; STVN, STVP, STVK-Soil Test Values for N, P₂O₅, K₂O, T-Targeted yield, M- Organic component.

(Ready Reckoners for two yield targets for this equation are given in Appendix-IIA, IIB,

IIC & IID)**5. Fertilizer recommendation for hybrid boro rice as per fertilizer prescription equations (FPE)**

Fertilizer prescription equations can be used to find out the amount of NPK fertilizers to obtain a certain yield target of the crop based on soil test values for NPK. The yield target must not cross the potential yield of the crop. For hybrid rice, calculate fertilizer requirement using

i. Fertilizer Prescription Equations (Only chemical fertilizer)

$$FN = 4.08 * T - 0.75 * STVN$$

$$FP = 1.39 * T - 2.57 * STVP$$

$$FK = 4.17 * T - 1.15 * STVK$$

ii. Fertilizer Prescription Equations (Chemical fertilizer + FYM)

$$FN = 4.08 * T - 0.75 * STVN - 0.59 * M$$

$$FP = 1.39 * T - 2.57 * STVP - 0.37 * M$$

$$FK = 4.17 * T - 1.15 * STVK - 0.58 * M$$

Where FN, FP & FK- Fertilizer N, P, and K; T- Targeted yield, STV- Soil test values, M- FYM

(Ready Reckoners for two yield targets for this equation without and with organic matter are given in Appendix-III A, IIIB, IIIC and IIID)

6. Fertilizer recommendation for rapeseed as per fertilizer prescription equations (FPE)

Fertilizer prescription equations can be used to find out the amount of NPK fertilizers required to obtain a certain yield target of the crop based on soil test values for NPK. The FPEs can be used under cultivation practices where only chemical fertilizers are used and where chemical fertilizers + FYM/Vermicompost/Enriched compost etc. are applied. The FPEs are valid for different varieties of the same crop having not more than 15% variations in yield. The amount of NPK fertilizers will vary according to yield target and soil test values. Yield target must not cross the potential yield of a particular crop.

For Normal Sowing:**i. Fertilizer Prescription Equations without IPNS (Fertilizer alone)**

$$FN = 10.37 * T - 0.39 * STVN$$

$$FP = 1.86 * T - 1.07 * STVP$$

$$FK = 4.47 * T - 0.74 * STVK$$

ii. Fertilizer Prescription Equations with IPNS (Fertilizer + FYM)

$$FN = 10.37 * T - 0.39 * STVN - 0.58 * M$$

$$FP = 1.86 * T - 1.07 * STVP - 0.10 * M$$

$$FK = 4.47 * T - 0.74 * STVK - 0.21 * M$$

where, FN,FP,FK-Fertilizer N,P₂O₅, K₂O; STVN, STVP, STVK-Soil test values forN, P₂O₅, K₂O, T-Targeted yield, M-IPNS component

For Late Sowing

i. Fertilizer Prescription Equations without IPNS (Fertilizer alone)

$$FN = 8.71 * T - 0.27 * STVN$$

$$FP = 5.90 * T - 3.13 * STVN$$

$$FK = 9.42 * T - 0.78 * STVN$$

ii. Fertilizer Prescription Equations with IPNS (Fertilizer + FYM)

$$FN = 8.71 * T - 0.27 * STVN - 0.22 * M$$

$$FP = 5.90 * T - 3.13 * STVN - 0.08 * M$$

$$FK = 9.42 * T - 0.78 * STVN - 0.18 * M$$

where, FN,FP,FK-Fertilizer N,P₂O₅, K₂O; STVN, STVP, STVK-Soil test values for N, P₂O₅, K₂O, T-Targeted yield, M-IPNS component

(Ready Reckoners for two yield targets for normal and late sown conditions for this equation are given in Appendix-IVA, IVB, IVC and IVD)

7. Fertilizer recommendation for submergence tolerant rice variety (Ranjit sub 1) as per fertilizer prescription equations (FPE)

i. Fertilizer Prescription Equations (Only chemical fertilizer)

$$FN = 6.36 * T - 1.61 * STVN$$

$$FP = 1.35 * T - 2.65 * STVP$$

$$FK = 3.92 * T - 1.39 * STVK$$

ii. Fertilizer Prescription Equations (Chemical fertilizer + FYM)

$$FN = 6.36 * T - 1.61 * STVN - 0.34 * M$$

$$FP = 1.35 * T - 2.65 * STVP - 0.45 * M$$

$$FK = 3.92 * T - 1.39 * STVK - 0.18 * M$$

(Ready Reckoners for two yield targets for this equation are given in Appendix-VA, VB, VC & VD)

8. Fertilizer recommendation for summer green gram as per fertilizer prescription equations (FPE)

Fertilizer prescription equations can be used to find out the amount of NPK fertilizers required to obtain a certain yield target of the crop based on soil test values for NPK. The FPEs can be used under cultivation practices where only chemical fertilizers are used and where chemical fertilizers + FYM/Vermicompost/Enriched compost etc. are applied. The FPEs are valid for different varieties of the same crop having not more than 15% variations in yield. The amount of NPK fertilizers will vary according to yield target and soil test values. Yield target must not cross the potential yield of a particular crop.

i. Fertilizer Prescription Equations with only chemical fertilizers

$$FN = 11.37 \times T - 0.62 \times STVN$$

$$FP = 3.82 \times T - 0.22 \times STVP$$

$$FK = 12.81 \times T - 1.29 \times STVK$$

ii. Fertilizer Prescription Equations with chemical fertilizers+ organic manure

$$FN = 11.37 \times T - 0.62 \times STVN - 0.13 \times OM$$

$$FP = 3.82 \times T - 0.22 \times STVP - 0.17 \times OM$$

$$FK = 12.81 \times T - 1.29 \times STVK - 0.2 \times OM$$

where, FN, FP, FK-Fertilizer N, P₂O₅, K₂O; STVN, STVP, STVK-Soil Test Values for N, P₂O₅, K₂O, T-Targeted yield, OM- Organic component (FYM, Vermicompost, Enriched Compost etc.).

*Seeds should be inoculated with 150 g of Rhizobium culture/3-4 kg of seeds.

(Ready Reckoners for two yield targets for summer green gram for this equation are given in Appendix-VIA & VIB)

b. Nutrient management in utera cropping in field pea

Inoculate the seeds with *Rhizobium* -PSB consortium @ 50 g /kg + sodium molybdate @ 0.5 g/kg seed, and spray 0.5% N-P₂O₅-K₂O (19-19-19) or 2% urea at branching and 15 days after first spray in field pea under relay cropping with *sali* rice.

c. Use of Leaf colour chart (LCC) for determining top dressing of urea in Sali rice

Apply urea in Sali rice only when LCC reading is less than 4. Check LCC from 14 days after transplanting up to flowering at weekly interval

d. Use of neem coated urea in Sali rice

Use Neem coated urea by mixing 50kg urea with 500 ml neem oil over a polythene sheet till uniform yellow colour is obtained. As an alternative to neem coated urea, application of 4% urea solution as foliar spray at maximum tillering stage (150 DAS) @ 30kg N/ha is recommended.

e. Green manuring and use of bio-fertilizer in rice

i. Use of Azolla and Bio-fertilizer in Ahu Rice

Use of Azolla to supplement nitrogenous fertilizers

About 300 kg fresh Azolla per hectare is to be inoculated in the main field, ponded with 5 -10 cm depth of water for about 2-3 weeks prior to final puddling. At the time of inoculation, super phosphate @ 8-10 kg/ha is to be applied in the main field. Thereby, corresponding quantity of phosphatic fertilizer should be reduced at the time of transplanting. Fresh Azolla @ 500 kg may also be applied in the standing water in a transplanted crop after the establishment of the seedling. There is no need for application of additional phosphatic fertilizer in the field at the time of inoculation with fresh Azolla after transplanting. Thereafter, Azolla will multiply to cover the field. Care should be taken to keep 5-10 cm depth of water for rapid multiplication. Normally sufficient quantities of biomass will be produced for two weeks. Natural depression

and ponds or tanks may be used for Azolla multiplication outside the main field and may be incorporated at the time of land preparation @ 6 t/ha of fresh Azolla. Nitrogen dose can be reduced up to 50% when Azolla is applied and incorporated in the field.

Use of Biofertilizer:

Application of organic manure @ 1 t/ha (on dry weight basis) along with mixed inoculum of *Azospirillum amazonense* A-10 and *Bacillus megaterium* P-5 @ 4 kg/ha (0.4-0.5kg/bigha), rock phosphate @ 10 kg P₂O₅ per ha (rock phosphate 56 kg/ha or 7.5 kg/bigha) and muriate of potash @ 40 kg K₂O per ha (muriate of potash 67 kg/ha or 9 kg/bigha) is recommended for rice in rice-rice, rice-legume-rice and sole rice sequences.

Method of application of Biofertilizer:

Technique of application of the components if the INM package for transplanted rice

Application of the organic manure and fertilizer component: The required quantity of compost (approx. 1.5 q or 2 bullock cart loads per bigha should be applied at least a week before transplanting or at the time of final ploughing. Required quantity of potassium (40 kg K₂O per ha or 5.5 kg per bigha) should be applied prior to transplanting. Rock phosphate component is used along with the biofertilizer as slurry to treat the seedling roots.

Treatment of rice seedling roots with the biofertilizer component and rock phosphate by slurry method:

Prepare a pit in the corner of a plot in the morning of the transplanting day by simply raising a bund that touches the two already existing bunds to obtain a triangular shape. The size of the pit should be proportionate to place the quantity of seedlings required for a bigha of land. Excess water from the pit should be removed so that only mud remains. Now add 10 kg of dried compost to the required quantity of rock phosphate and mix with mud and then add the biofertilizer. The mixture of the mud, compost, rock phosphate and biofertilizer should form uniform slurry. The rice seedling roots in the bundles should be free of adhered soil and dipped in the slurry mixture and kept for two hours. During the two hours, the biofertilizer and rock phosphate adhere well to the seedling roots. Then remove the seedling bundles from the pit and keep on the raised bund. Care should be taken so that the seedlings are not swept in water of the plot as the Assamese farmwomen are habituated in occasional sweeping of the seedlings during transplanting. The biofertilizer on the root surface keep multiplying as the root grows bigger and by 20/30 days, they start supplying N, hormone and also soluble P to the roots in adequate quantity.

ii. Use of Azolla in sali Rice

Use of Azolla to Supplement Nitrogenous Fertilizer:

Inoculate 500 kg of fresh Azolla/ ha in the field after transplanting. Allow it to grow for 2-3 weeks to cover the water surface. After coverage, either incorporate to the soil or allow it for self-decomposition.

To obtain 500 kg fresh Azolla, add 16 kg inoculum to an area of 400 cm water surface and allow it to grow for 3-4 weeks. Depending on the growth of Azolla, top dressing of nitrogen could be avoided.

iii. Use of Bio-fertilizer in Sali rice

Integrated nutrient management: Integrated nutrient management (INM) package of organic manure @ 1 t/ha (on dry weight basis) mixed inocula of *Azospirillum amazonense* A-10 and *Bacillus megaterium* P-5 @ 4 kg/ha (0.4 to 0.5 kg/bigha), rock phosphate @ 10 kg P₂O₅ (56 kg/ha or 7.5 kg/bigha), MOP @ 40 kg K₂O/ha (67 kg Potash/ha or 9 kg/bigha) is recommended for rice in rice-rice, rice-legume-rice and sole rice sequence.

In low land *kharif* rice (Sali), incorporation of 45 days old dhaincha can substitute 50% of recommended N-P₂O₅-K₂O in Hills Zone.

Method of application of bio-fertilizer: Same as Normal *ahu*.

Potash Solubilizing Bacteria for K Nutrition in rice:

Apply consortia of potash solubilizing bacteria (*Bacillus proteolyticus* + *Serratia liquifaciens*) @ 3.5 kg/ha or 500 g/bigha as seedling root dip treatment with N-P₂O₅-K₂O @ 60-20-20 Kg/ha

Zinc Solubilizing Bacteria for Zn Nutrition in rice:

Apply Zn solubilizing bacteria (biofertilizer) @ 3.5 kg/ha or 500 g/bigha as seedling root dip treatment in Zn deficient soils for rice along with recommended N-P₂O₅-K₂O.

- iv. Green manuring with *S. aculeata*, *S. rostrata* in Sali rice – sowing of green manure crop is to be done during March/April and is to be incorporated into the soil when the crop attains one and half month of age.

f. Intercropping with legumes

i. Food –Forage intercropping system

- Pea (Grain) + Oat (F)
- Rapeseed/Niger + Oat (F)
- Lentil/gram + Oat (F)
- Rice + Cowpea (F)

ii. Forage crop mixture

- Oats + Pea
- Oats + *Khesari*
- Maize + Pea/*Lathyrus*
- Maize + Cowpea/Ricebean
- Teosinte + Cowpea/Ricebean
- Sorghum + Cowpea

iii. Intercropping with perennial grasses

- Guinea/Seteria + Ricebean/Cowpea–Dinanath grass/Cowpea/Ricebean–Oat/Pea/*Khesari*
- Hybrid Napier + Cowpea–Cowpea–Oat

iv. Intercropping of pulse crops with sesame:

- Sesame + black gram in 1 : 1 row proportion
- Sesame + green gram in 2 : 2 row proportion
- Sowing time: Mid-August – Mid September

Row spacing: 30 cm

Fertilizers: 30 : 20 : 20 N : P₂O₅ : K₂O/ha

v. Intercropping of lathyrus with oats after Sali rice :

- Cutting three rows of rice stubbles at ground level leaving next three rows without cutting
- Application of FYM @ 2 t/ha along with 10 : 20 : 20 kg/ha N : P₂O₅ : K₂O as basal
- Broadcasting the seeds of Lathyrus to the strips with rice stubbles using seed rate 25 kg/ha.

vi. Intercropping of black gram in summer okra: Sow black gram in between rows of summer season okra (45 cm x 30 cm)

vii. Summer green gram/cowpea followed by toria as intercrop in khasi Mandarin up to bearing stage

F. WEATHER SMART TECHNOLOGY

a. Agro-met advisory service: Agro-met advisory services are provided through the following centers with following mode of dissemination

ACZ	Centre	Frequency	Type of forecast	Mode of dissemination
UBVZ	AAU, Jorhat	Bi-weekly (Every Tuesday & Friday)	Medium range weather forecast (5 days)	• Meghdoot App • All India radio (Prog-Krishak Bani) • Mobile SMS to registered farmers • Mobile WhatsApp group
CBVZ	AAU-ZRS, Shillongani			
LBVZ	AAU-ZRS, Gossaigaon			
HZ	AAU-ZRS, Diphu			
NBPZ	BNCA, AAU			
BVZ	AAU-ZRS, Karimganj			

b. District Agro-Met Unit: Same services is being downscaled to block level

c. Crop insurance – Contact officials of concerned department for available schemes and application procedure

G. CLIMATE SMART TECHNOLOGY FOR PEST MANAGEMENT**a. Disease management**

Weather condition	Disease incidence	Management practices
Dry soil due to limited rainfall/ water shortage but heavy dew	Brown spot in rice	Dry or wet seed treatment with carboxin 2 g/kg of seed followed by one spraying of ediphenphos @ 1 ml/l at initial symptom development stage is recommended for managing brown spot disease.
High temperatures (28–32°C) and relative humidity (85–100%), mainly during rainy period	Sheath blight of rice	a) Two sprays of hexaconazole 5EC (2 ml/l) should be given, first at the appearance of symptoms and the other at 10 days after the first spraying. b) Spraying of two commercial plant derived Cymbopogon products @ 5 ml/l and Neem based fungicide @ 3 ml/l is recommended for management of sheath blight disease of rice. The first spraying should be given as soon as symptom of the disease is observed in the field followed by a second spraying at 10-12 days interval.
Continuous and heavy rain, high wind, heavy dew, and flooding	Bacterial blight of rice	Avoid top dressing with nitrogen at panicle initiation stage if BLB has already appeared. Instead, top dress with 10 kg of K ₂ O /ha or apply 5 kg of K ₂ O/ha in the form of foliar spray of 3% solution
Cloudy weather and low temperature	Late blight of potato	Against late blight, six spraying with copper oxychloride 50 WP @ 2 g commercial formulation per liter of water at an interval of 12 days. Or spraying with dimethomorph 50 WP @ 1g commercial formulation per liter followed by copper oxychloride 50 WP @ 2 g commercial formulation per liter in alternate application (3 sprays with the dimethomorph & 3 with copper

		oxychloride) at an interval of 12 days give very good control The first spray should be given 40-45 days after planting (canopy closure stage). Use of sticker Triton (0.5 ml/l) will be essential in the spray solution for spraying during rainy weather. Depending upon weather conditions, particularly in cloudy weather, copper oxychloride should be sprayed as a prophylactic measure. If disease appears, spraying should be done at an interval of 7 to 10 days depending upon weather conditions. While spraying, care should be taken to ensure wetting of the lower sides of the leaves.
Warm and humid weather conditions (rainy weather) with high wind speed	Citrus canker	It is a bacterial disease. The disease occurs in lime, lemons and also primary and secondary nursery of Khasi mandarin. The canker lesions appear as minute water-soaked round spots, enlarge slightly, turn brownish, corky which can be managed by alternate sprays of copper oxychloride (0.3% <i>i.e.</i>, 3 g/l) + streptomycin @100 ppm (<i>i.e.</i>, 1 g /10 liter of water) and NSKE 5% during new flushes.
Hot and humid climate	Fruit rot or Anthracnose disease of chilli	Spray chlorothalonil @ 0.2% (2 g/l of water) or azoxystrobin 23SC @ 0.1%. (1 ml/l)

b. Insect pest management

Weather condition	Insect pest incidence	Crop stage and parts	Management practices
Prolong draught after flood or water inundation	Rice swarming caterpillar	Early tillering; Cut leaf tip, leaf margin, leaves and even the plant at the base	-Follow best IPM practices

	Rice ear-cutting caterpillar	Ripening stage: cut panicle during nighttime and hide under the grasses during daytime	-Application of chlorantaniliprole 18.5 SC @ 1 ml per 3 liter of water.
Sunny days with high temperature	Fall army worm	- Infest Maize, rice, sorghum, sugarcane and vegetable crops - Leaves, stems and reproductive parts	Application of thiamethoxam 5 SG @ 0.4 g/l Or chlorantaniliprole 18.5 SC @ 1 ml / 3 liter of water
Draught condition followed by intermittent rainfall, appears during summer and rainy season	Red hairy caterpillar	Jute, black gram, green gram	Application of chlorantaniliprole 18.5 SC @ 1 ml / 3 liter of water.
Low night temperature followed by foggy morning situation	Mustard aphid	Rape seed and mustard	Application of emamectin benzoate 5 SG @ 220 g/ha

APPENDIX IA

Ready Reckoner for Fertilizer Recommendation for HYV of Transplanted Winter Rice for Target Yield of 60q/ha

Sl. No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			g/bigha		
1	150.00	2.50	1 0.00	192.8	33.3	101.0	25.7	4.4	13.5
2	152.00	4.50	1 5.00	191.3	30.0	92.4	25.5	4.0	12.3
3	154.00	6.50	1 0.00	189.8	26.8	83.9	25.3	3.6	11.2
4	156.00	8.50	1 5.00	188.3	23.5	75.4	25.1	3.1	10.1
5	158.00	10.50	1 0.00	186.8	20.2	66.9	24.9	2.7	8.9
6	160.00	12.50	1 5.00	185.3	17.0	58.4	24.7	2.3	7.8
7	162.00	14.50	1 0.00	183.8	13.7	49.9	24.5	1.8	6.7
8	164.00	16.50	1 5.00	182.2	10.4	41.4	24.3	1.4	5.5
9	166.00	18.50	1 0.00	180.7	7.2	32.9	24.1	1.0	4.4
10	168.00	20.50	1 5.00	179.2	3.9	24.4	23.9	0.5	3.2
11	170.00	22.50	1 0.00	177.7	0.6	15.9	23.7	0.1	2.1
12	172.00	24.50	1 5.00	176.2	0.0	7.4	23.5	0.0	1.0

APPENDIX IB

Ready Reckoner for Fertilizer Recommendation for HYV of Transplanted Winter Rice for Target Yield of 70q/ha

Sl.No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/bigha		
1	150.00	2.50	110.00	245.0	40.0	152.1	32.7	5.3	20.3
2	152.00	4.50	115.00	243.5	36.8	143.6	32.5	4.9	19.1
3	154.00	6.50	120.00	242.0	33.5	135.1	32.3	4.5	18.0
4	156.00	8.50	125.00	240.4	30.2	126.6	32.1	4.0	16.9
5	158.00	10.50	130.00	238.9	27.0	118.1	31.9	3.6	15.7
6	160.00	12.50	135.00	237.4	23.7	109.6	31.7	3.2	14.6
7	162.00	14.50	140.00	235.9	20.4	101.1	31.5	2.7	13.5
8	164.00	16.50	145.00	234.4	17.1	92.5	31.3	2.3	12.3
9	166.00	18.50	150.00	232.9	13.9	84.0	31.1	1.9	11.2
10	168.00	20.50	155.00	231.4	10.6	75.5	30.9	1.4	10.1
11	170.00	22.50	160.00	229.9	7.3	67.0	30.7	1.0	8.9
12	172.00	24.50	165.00	228.4	4.1	58.5	30.5	0.5	7.8

APPENDIX IIA**Ready Reckoner for Fertilizer Recommendation for scented rice variety
for Target Yield of 30q/ha without FYM**

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				Kg ha ⁻¹		
1	200.0	14.0	120.0	46.2	21.2	51.4
2	202.0	16.0	125.0	44.6	18.4	47.1
3	204.0	18.0	130.0	43.0	15.6	42.7
4	206.0	20.0	135.0	41.4	12.8	38.3
5	208.0	22.0	140.0	39.8	10.0	34.0
6	210.0	24.0	145.0	38.3	7.2	29.6
7	212.0	26.0	150.0	36.7	4.4	25.2
8	214.0	28.0	155.0	35.1	1.6	20.9
9	216.0	30.0	160.0	33.5	0.0	16.5
10	218.0	32.0	165.0	31.9	0.0	12.1
11	220.0	34.0	170.0	30.3	0.0	7.8
12	222.0	36.0	175.0	28.8	0.0	3.4

APPENDIX IIB**Ready Reckoner for Fertilizer Recommendation for scented rice variety
for Target Yield of 30q/ha with 5t/ha FYM**

Sl. No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				Kg ha ⁻¹		
1	200.0	14.0	120.0	32.1	18.9	40.0
2	202.0	16.0	125.0	30.6	16.1	35.6
3	204.0	18.0	130.0	29.0	13.3	31.3
4	206.0	20.0	135.0	27.4	10.5	26.9
5	208.0	22.0	140.0	25.8	7.7	22.5
6	210.0	24.0	145.0	24.2	4.9	18.2
7	212.0	26.0	150.0	22.6	2.1	13.8
8	214.0	28.0	155.0	21.1	0.0	9.4
9	216.0	30.0	160.0	19.5	0.0	5.0
10	218.0	32.0	165.0	17.9	0.0	0.7
11	220.0	34.0	170.0	16.3	0.0	0.0
12	222.0	36.0	175.0	14.7	0.0	0.0
13	224.0	38.0	180.0	13.1	0.0	0.0
14	226.0	40.0	185.0	11.6	0.0	0.0

APPENDIX IIC

Ready Reckoner for Fertilizer Recommendation for scented rice variety for Target Yield of 40q/ha without FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				Kg ha ⁻¹		
1	200.0	14.0	120.0	100.3	32.5	92.1
2	202.0	16.0	125.0	98.7	29.7	87.7
3	204.0	18.0	130.0	97.1	26.9	83.4
4	206.0	20.0	135.0	95.6	24.1	79.0
5	208.0	22.0	140.0	94.0	21.3	74.6
6	210.0	24.0	145.0	92.4	18.5	70.3
7	212.0	26.0	150.0	90.8	15.7	65.9
8	214.0	28.0	155.0	89.2	12.9	61.5
9	216.0	30.0	160.0	87.6	10.1	57.2
10	218.0	32.0	165.0	86.1	7.3	52.8
11	220.0	34.0	170.0	84.5	4.5	48.4
12	222.0	36.0	175.0	82.9	1.7	44.0
13	224.0	38.0	180.0	81.3	0.0	39.7
14	226.0	40.0	185.0	79.7	0.0	35.3

APPENDIX IID

Ready Reckoner for Fertilizer Recommendation for scented rice variety for Target Yield of 40q/ha with 5t/ha FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				Kg ha ⁻¹		
1	200.0	15.0	120.0	72.2	33.9	67.4
2	202.0	17.0	125.0	70.9	31.1	63.2
3	204.0	19.0	130.0	69.6	28.3	59.1
4	206.0	21.0	135.0	68.4	25.5	54.9
5	208.0	23.0	140.0	67.1	22.7	50.8
6	210.0	25.0	145.0	65.8	20.0	46.6
7	212.0	27.0	150.0	64.6	17.2	42.5
8	214.0	29.0	155.0	63.3	14.4	38.3
9	216.0	31.0	160.0	62.0	11.6	34.2
10	218.0	33.0	165.0	60.7	8.8	30.0
11	220.0	35.0	170.0	59.5	6.0	25.9
12	222.0	37.0	175.0	58.2	3.2	21.7
13	224.0	39.0	180.0	56.9	0.4	17.6
14	226.0	41.0	185.0	55.6	0.0	13.4

APPENDIX IIIA

Ready Reckoner for Fertilizer Recommendation for hybrid rice for Targeted Yield of 60q/ha without FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O	Urea	SSP	MOP
				-----Kg/ha-----					
1	250	18	180	58	37	44	130	231	73
2	252	20	185	57	32	38	127	199	64
3	254	22	190	56	27	32	123	166	54
4	256	24	195	54	21	27	120	134	45
5	258	26	200	53	16	21	117	102	35
6	260	28	205	51	11	15	113	70	26
7	262	30	210	50	6	10	110	38	16
8	264	32	215	48	1	4	107	6	6
9	266	34	220	47	0	0	103	0	0
10	268	36	225	45	0	0	100	0	0

APPENDIX IIIB

Ready Reckoner for Fertilizer Recommendation for hybrid rice for Targeted Yield of 60q/ha with 5t/ha FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O	Urea	SSP	MO P
				-----Kg/ha-----					
1	250	18	180	42	31	29	93	196	49
2	252	20	185	40	26	24	90	164	40
3	254	22	190	39	21	18	87	132	30
4	256	24	195	37	16	12	83	100	20
5	258	26	200	36	11	7	80	67	11
6	260	28	205	34	6	1	77	35	1
7	262	30	210	33	1	0	73	3	0
8	264	32	215	31	0	0	70	0	0
9	266	34	220	30	0	0	67	0	0
10	268	36	225	29	0	0	63	0	0

APPENDIX IIIC

Ready Reckoner for Fertilizer Recommendation for hybrid rice for Targeted Yield of 70q/ha without FYM

Sl. N o.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O	Urea	SSP	MOP
				-----Kg/ha----- --					
1	250	18	180	99	51	86	221	317	143
2	252	20	185	98	46	80	217	285	133
3	254	22	190	96	41	74	214	253	124
4	256	24	195	95	35	68	211	221	114
5	258	26	200	93	30	63	207	189	105
6	260	28	205	92	25	57	204	157	95
7	262	30	210	90	20	51	201	125	85
8	264	32	215	89	15	46	198	92	76
9	266	34	220	87	10	40	194	60	66
10	268	36	225	86	4	34	191	28	57

APPENDIX IIID

Ready Reckoner for Fertilizer Recommendation for hybrid rice for Targeted Yield of 70q/ha with 5t/ha FYM

Sl. N o.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O	Urea	SSP	MOP
				-----Kg/ha----- -----					
1	250	18	180	83	45	71	184	283	119
2	252	20	185	81	40	65	181	251	109
3	254	22	190	80	35	60	177	218	100
4	256	24	195	78	30	54	174	186	90
5	258	26	200	77	25	48	171	154	80
6	260	28	205	75	20	43	167	122	71
7	262	30	210	74	14	37	164	90	61
8	264	32	215	72	9	31	161	58	52
9	266	34	220	71	4	25	157	26	42
10	268	36	225	69	0	20	154	0	33

APPENDIX IVA

Ready Reckoner for Fertilizer Recommendation for Normal Sown Rapeseed for Target Yield of 10 q/ha

Sl.No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/bigha		
1	150	5.5	40	30.4	10.63	9.74	4.1	1.4	1.3
2	152	7.5	45	29.6	8.48	6.03	3.9	1.1	0.8
3	154	9.5	50	28.8	6.33	2.32	3.8	0.8	0.3
4	156	11.5	55	28.0	4.18	0.00	3.7	0.6	0.0
5	158	13.5	60	27.3	2.03	0.00	3.6	0.3	0.0
6	160	15.5	65	26.5	0	0	3.5	0.0	0.0
7	162	17.5	70	25.7	0	0	3.4	0.0	0.0
8	164	19.5	75	24.9	0	0	3.3	0.0	0.0
9	166	21.5	80	24.1	0	0	3.2	0.0	0.0
10	168	23.5	85	23.3	0	0	3.1	0.0	0.0
11	170	25.5	90	22.6	0	0	3.0	0.0	0.0
12	172	27.5	95	21.8	0	0	2.9	0.0	0.0

APPENDIX IVB

Ready Reckoner for Fertilizer Recommendation for Normal Sown Rapeseed for Target Yield of 12 q/ha

Sl.No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/bigha		
1	150	5.5	40	51.12	14.35	18.68	6.8	1.9	2.5
2	152	7.5	45	50.33	12.2	14.97	6.7	1.6	2.0
3	154	9.5	50	49.55	10.05	11.26	6.6	1.3	1.5
4	156	11.5	55	48.77	7.9	7.55	6.5	1.1	1.0
5	158	13.5	60	47.99	5.75	3.85	6.4	0.8	0.5
6	160	15.5	65	47.2	3.6	0.14	6.3	0.5	0.0
7	162	17.5	70	46.42	1.46	0	6.2	0.2	0.0
8	164	19.5	75	45.64	0	0	6.1	0.0	0.0
9	166	21.5	80	44.85	0	0	6.0	0.0	0.0
10	168	23.5	85	44.07	0	0	5.9	0.0	0.0
11	170	25.5	90	43.29	0	0	5.8	0.0	0.0
12	172	27.5	95	42.5	0	0	5.7	0.0	0.0

APPENDIX IVC

Ready Reckoner for Fertilizer Recommendation for Late Sown Rapeseed for Target Yield of 10 q/ha

Sl. No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/big a		
1	150	5.5	6 .5	32.34	41.1	37.5	4.3	5.5	5.0
2	152	7.5	6 .5	31.8	34.83	33.59	4.2	4.6	4.5
3	154	9.5	7 .5	31.27	28.56	29.69	4.2	3.8	4.0
4	156	11.5	7 .5	30.74	22.29	25.79	4.1	3.0	3.4
5	158	13.5	8 .5	30.21	16.03	21.88	4.0	2.1	2.9
6	160	15.5	8 .5	29.67	9.76	17.98	4.0	1.3	2.4
7	162	17.5	9 .5	29.14	3.49	14.07	3.9	0.5	1.9
8	164	19.5	9 .5	46.03	9.03	29.02	6.1	1.2	3.9
9	166	21.5	100.5	45.50	2.76	25.11	6.1	0.4	3.3
10	168	23.5	105.5	44.96	0.00	21.21	6.0	0.0	2.8
11	170	25.5	110.5	44.43	0.00	17.31	5.9	0.0	2.3
12	172	27.5	115.5	43.90	0.00	13.40	5.9	0.0	1.8

APPENDIX IVD

Ready Reckoner for Fertilizer Recommendation for Late Sown Rapeseed for Target Yield of 12 q/ha

Sl. No.	STV N	STV P	ST K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/bigha		
1	150	5.5	60.5	49.75	52.91	56.34	6.6	7.1	7.5
2	152	7.5	65.5	49.22	46.64	52.44	6.6	6.2	7.0
3	154	9.5	70.5	48.69	40.37	48.54	6.5	5.4	6.5
4	156	11.5	75.5	48.16	34.1	44.63	6.4	4.5	6.0
5	158	13.5	80.5	47.62	27.83	40.73	6.3	3.7	5.4
6	160	15.5	85.5	47.09	21.57	36.83	6.3	2.9	4.9
7	162	17.5	90.5	46.56	15.3	32.92	6.2	2.0	4.4
8	164	19.5	95.5	46.03	9.03	29.02	6.1	1.2	3.9
9	166	21.5	100.5	45.50	2.76	25.11	6.1	0.4	3.3
10	168	23.5	105.5	44.96	0.00	21.21	6.0	0.0	2.8
11	170	25.5	110.5	44.43	0.00	17.31	5.9	0.0	2.3
12	172	27.5	115.5	43.90	0.00	13.40	5.9	0.0	1.8

APPENDIX VA

Ready Reckoner for Fertilizer Recommendation for submergence tolerant rice variety (Ranjit sub 1) for Target Yield of 60 q/ha without FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				-----kg/ha-----		
1	180	12	70	93	49	138
2	182	14	75	89	44	131
3	184	16	80	86	39	124
4	186	18	85	83	33	117
5	188	20	90	80	28	110
6	190	22	95	77	23	103
7	192	24	100	73	17	96
8	194	26	105	70	12	89
9	196	28	110	67	7	83
10	198	30	115	64	2	76
11	200	32	120	60	0	69
12	202	34	125	57	0	62

APPENDIX VB

Ready Reckoner for Fertilizer Recommendation for submergence tolerant rice variety (Ranjit sub 1) for Target Yield of 60 q/ha with 5 t/ha FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				-----kg/ha-----		
1	180	12	70	79	38	132
2	182	14	75	76	33	125
3	184	16	80	72	27	118
4	186	18	85	69	22	111
5	188	20	90	66	17	104
6	190	22	95	63	12	97
7	192	24	100	60	6	91
8	194	26	105	56	1	84
9	196	28	110	53	0	77
10	198	30	115	50	0	70
11	200	32	120	47	0	63
12	202	34	125	44	0	56

APPENDIX VC

Ready Reckoner for Fertilizer Recommendation for submergence tolerant rice variety (Ranjit sub 1) for Target Yield of 70 q/ha without FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				-----kg/ha-----		
1	180	12	70	156	63	177
2	182	14	75	153	57	170
3	184	16	80	150	52	163
4	186	18	85	147	47	156
5	188	20	90	143	42	149
6	190	22	95	140	36	143
7	192	24	100	137	31	136
8	194	26	105	134	26	129
9	196	28	110	131	20	122
10	198	30	115	127	15	115
11	200	32	120	124	10	108
12	202	34	125	121	4	101

APPENDIX VD

Ready Reckoner for Fertilizer Recommendation for submergence tolerant rice variety (Ranjit sub 1) for Target Yield of 70 q/ha with 5 t/ha FYM

Sl.No.	STV N (kg/ha)	STV P (kg P ₂ O ₅ /ha)	STV K (kg K ₂ O/ha)	N	P ₂ O ₅	K ₂ O
				-----kg/ha-----		
1	180	12	70	142	52	171
2	182	14	75	139	46	164
3	184	16	80	136	41	157
4	186	18	85	133	36	150
5	188	20	90	130	30	144
6	190	22	95	126	25	137
7	192	24	100	123	20	130
8	194	26	105	120	14	123
9	196	28	110	117	9	116
10	198	30	115	114	4	109
11	200	32	120	110	0	102
12	202	34	125	107	0	95

APPENDIX VIA

Ready Reckoner for Fertilizer Recommendation for Summer Green Gram for Target Yield of 10 q/ha

Sl. No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/ bigha		
1	175	9	100.5	10.56	12.33	8.11	1.4	1.6	1.1
2	177	11	105.5	10.05	10.93	6.66	1.3	1.5	0.9
3	179	13	110.5	9.54	9.54	5.21	1.3	1.3	0.7
4	181	15	115.5	9.03	8.14	3.76	1.2	1.1	0.5
5	183	17	120.5	8.52	6.75	2.31	1.1	0.9	0.3
6	185	19	125.5	8.02	5.36	0.86	1.1	0.7	0.1
7	187	21	130.5	7.51	3.96	0	1.0	0.5	0.0
8	189	23	135.5	7.00	2.57	0	0.9	0.3	0.0
9	191	25	140.5	6.49	1.17	0	0.9	0.2	0.0
10	193	27	145.5	5.98	0	0	0.8	0.0	0.0
11	195	29	150.5	5.47	0	0	0.7	0.0	0.0
12	197	31	155.5	4.96	0	0	0.7	0.0	0.0

APPENDIX VIB

Ready Reckoner for Fertilizer Recommendation for Summer Green Gram for Target Yield of 12 q/ha

Sl. No.	STV N	STV P	STV K	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Kg/ha			Kg/ha			Kg/bigha		
1	210	9	12 .5	14.02	16.34	12.35	1.9	2.2	1.6
2	212	11	12 .5	13.51	14.95	10.9	1.8	2.0	1.5
3	214	13	13 .5	13.00	13.55	9.45	1.7	1.8	1.3
4	216	15	13 .5	12.49	12.16	8.00	1.7	1.6	1.1
5	218	17	14 .5	11.98	10.76	6.55	1.6	1.4	0.9
6	220	19	14 .5	11.47	9.37	5.10	1.5	1.2	0.7
7	222	21	15 .5	10.96	7.97	3.65	1.5	1.1	0.5
8	224	23	15 .5	10.45	6.58	2.20	1.4	0.9	0.3
9	226	25	16 .5	9.95	5.18	0.75	1.3	0.7	0.1
10	228	27	16 .5	9.44	3.79	0	1.3	0.5	0.0
11	230	29	17 .5	8.93	2.4	0	1.2	0.3	0.0
12	232	31	17 .5	8.42	1	0	1.1	0.1	0.0

APPENDIX VII

Fertilizer Calculation

1 Kg N	:2.17 Kg Urea
1 Kg p_2O_5	: 6.25 Kg SSP
1 Kg K_2O	: 1.66 Kg MOP
1 Kg DAP	: 2.875 Kg SSP and 400 g Urea